This builds on the fundamentals of regional sustainability covered in CVEN1701 and design of components of various regional infrastructure covered in:

- CVEN3402 Transport engineering and environmental sustainability
- CVEN3701 Environmental frameworks, law and economics
- CVEN3702 Solid wastes and contaminant transport
- CVEN3502 Water and wastewater engineering

It covers the regional system design of infrastructure in four of the following areas each year:

- Water systems
• Transport systems
• Energy systems
• Material management systems, particularly related to waste and wastewater
• Town planning influences on regional infrastructure
• Use of Life Cycle Assessment for the selection of materials for infrastructure design.

A brief revision of material accounting tools, such as Material Flow Analysis, will be provided, with case studies relevant to the assignment project. New material will be introduced for the energy component, but the aim of the course is to apply the concepts learnt in Year 3 at a regional scale, so the other components will largely provide case study information from other regions, that can be applied to the project region.

**HANDBOOK DESCRIPTION**


The course enables environmental engineers to analyse and design sustainable infrastructure to support the needs of regional economies and populations. It builds on and applies the concepts learned in introductory tools, water and transport courses in Stages 1 to 3 of the program. It provides a regional planning context to the planning and design of infrastructure in the areas of water and waste management, transport services, energy supply and distribution; and provides a series of case studies to illustrate the principles of sustainable infrastructure design.

**OBJECTIVES**

The objectives of the course include:

• Enable students to design a range of infrastructure systems at a regional level, having particular regard to sustainability principles.
• Use information from Material Flow Analysis to direct the design of regional infrastructure so that scarce materials are conserved and not dispersed in an un-recoverable form into the environment. A particular substance will be selected each year, for instance phosphorus, copper, lead.
• Familiarize students with the meaning of sustainability in transport systems.
• Introduce students to the use of transport planning “building block” methods to assess sustainability performance of city wide transport system options.
• Use systems thinking techniques in planning from macro scale to asset specific scale in transport systems so that sustainability outcomes are enabled.

The course aims to have students gain the following attributes:

• An in-depth engagement with the relevant civil and environmental engineering knowledge related to regional infrastructure design in its inter-disciplinary context
• Capacity for analytical and critical thinking and for creative problem solving
• Ability to engage independent and reflective learning
• Information literacy
• Skills for collaborative and multi-disciplinary work
• A respect for ethical practice and social responsibility
• Skills for effective communication
TEACHING STRATEGIES

In the materials flow/infrastructure component, initial lectures will be provided to reinforce the method of Substance Flux Analysis, covering it in more detail than in CVEN1701, and providing some examples of different substances at different regional scales. Tutorial exercises will examine how this information can be used to design solutions for regional economies so that valuable substances, such as copper or lead are conserved, and the quality of the receiving environment is protected.

<table>
<thead>
<tr>
<th>Private Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review lecture material, reference books, and resources on UNSW Moodle via the TeLT Gateway.</td>
</tr>
<tr>
<td>Do set problems and preparation so that you can participate in tutorials.</td>
</tr>
<tr>
<td>Work in groups on class assignments.</td>
</tr>
<tr>
<td>Reflect on class problems and assignments.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take notes on skeleton overheads provided to get a full set of reference notes for the course.</td>
</tr>
<tr>
<td>Participate in working out example problems in class.</td>
</tr>
<tr>
<td>Ask questions on how the content of lectures applies to assignment questions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tutorials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work actively in small ad hoc groups on problems set in class.</td>
</tr>
<tr>
<td>Ask questions on assignment problems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formative assessment of knowledge and skills in assignments, with students encouraged to seek formative informal assessment via consultation with the lecturer during preparation of assignments.</td>
</tr>
<tr>
<td>Demonstrate higher understanding and problem solving on real world problems in hypothetical, but realistic problem settings.</td>
</tr>
</tbody>
</table>

EXPECTED LEARNING OUTCOMES

At the completion of the course, you will be able to:

- Analyze infrastructure provision problems at the regional scale of a city.
- Apply sustainability principles to create solutions to enable regional infrastructure provision.
- Consider solution options that may not be conventional.

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

ASSESSMENT

Students who perform poorly in the tutorials are recommended to discuss progress with the lecturer during the semester.

Note: The Coordinator or Lecturer reserves the right to adjust the final scores by scaling if agreed too by the Head of School.

Details of each assessment component, the marks assigned to it, and the dates of submission are set out below.
ASSIGNMENTS & QUIZZES

<table>
<thead>
<tr>
<th>Component</th>
<th>Project proposal</th>
<th>Main report</th>
<th>Project Mgt</th>
<th>Poster</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials &amp; waste</td>
<td>0</td>
<td>15</td>
<td>2.5</td>
<td>7.5</td>
<td>25</td>
</tr>
<tr>
<td>Water</td>
<td>5</td>
<td>15</td>
<td>2.5</td>
<td>7.5</td>
<td>25</td>
</tr>
<tr>
<td>Energy</td>
<td>5</td>
<td>15</td>
<td>2.5</td>
<td>7.5</td>
<td>25</td>
</tr>
<tr>
<td>Transport</td>
<td>0</td>
<td>15</td>
<td>2.5</td>
<td>7.5</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Poster display and discussion: to be confirmed; probably Friday 6 June 2014.

**Students must submit their assignments as prescribed by each lecturer.** Generally this will be by hard copy in the lecture on the due date; or in a box described by the lecturer if it is late. In some cases, for instance if the lecturer is involved in an overseas posting, emailed attachments may be accepted. This will only be the case if the lecturer allows this. Please ensure all the details on the Assignment cover sheet at the end of this Course Profile are included in your assignment.

Each lecturer will specify late penalties and submission procedures for on time and late assignments at the beginning of their component. Lecturers for each component are wholly responsible for management of their assignments; i.e. late submission details, extensions of time etc. Do not contact the course coordinator relating to assignments for the other three lecturers.
## COURSE PROGRAM

### SEMESTER 1

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Materials flow/infrastructure 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Materials flow/infrastructure 2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Materials flow/infrastructure 3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Water 1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Water 2</td>
<td>Draft material flow assign discussion, to be scheduled</td>
</tr>
<tr>
<td>6</td>
<td>Water 3</td>
<td>Material flow assgmt Noon 11 April 2014</td>
</tr>
<tr>
<td>7</td>
<td>No lectures: week reserved for site visits in other courses</td>
<td>Noon 11 April 2014</td>
</tr>
<tr>
<td>8</td>
<td>Energy 1</td>
<td>Water Final assgmt: Noon 2 May 2014</td>
</tr>
<tr>
<td>9</td>
<td>Energy 2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Energy 3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Transport 1</td>
<td>Energy final assgmt: Noon 23 May 2014</td>
</tr>
<tr>
<td>12</td>
<td>Transport 2</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Transport 3</td>
<td>Poster presentation + Project Mgt report 6 June 2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transport final assgmt: Noon 12 June 2014</td>
</tr>
</tbody>
</table>

### Course Outline:

**Week 1:**
Course introduction and background to the Assignment.
Mabo decision
Uranium and radioactive waste

**Week 2:**
Brief Introduction/Review of environmental material accounting tools
Material Flow Analyses in detail
Phosphorus flows in Australia
Carbon flows in cities

**Week 3:**
Regional Waste Management Systems and waste characterisation review
Compost plant design
Assignment tutorial: technical (Moore and Kobayashi)
Assignment tutorial: social impact (Nakata et al, from Nura Glli)
Week 4: To be provided

Week 5: To be provided

Week 6: To be provided

Week 7: no lectures, free for site visits in other courses.

Easter week break (no academic week number)

Week 8:

Energy fundamentals, services and systems

Engineering and energy infrastructure
  Engineering
  Engineering systems
  Energy systems
Energy fundamentals
  Energy types
  Energy transformation
  Units
Energy services
  Case study – buildings
Energy systems
  Energy resources
  Energy conversion
  End-use equipment
Australia's energy systems

Week 9:

Sustainability drivers and options for energy infrastructure

Sustainability of present energy systems
  Energy services
  Environmental impacts of our energy systems
Sustainability trends
  Energy services
  Environmental impacts
Possible futures: Projections, Present Energy Drivers
Future sustainable energy systems
  What has to be done
  Scenarios

Week 10:

Sustainable energy futures

A framework for action
  Innovation and the role of technology
  Energy efficiency
  Lower emission fossil fuels and renewable energy
Policy drivers
Weeks 11-13 to be provided

RELEVANT RESOURCES

Materials flow/infrastructure:

Brunner PH and Rechberger H, 2004; Practical Handbook of Material Flow Analysis, Lewis Publ, ISBN 1-5667-0604-1 this is available in the UNSW library and the UNSW bookshop (about AUD250).

Internet sites:

http://www.iwa.tuwien.ac.at/

Energy:

Transport:

Water:
UNSW LIBRARY

To obtain materials external students may request books from the UNSW Library by post and also obtain books and articles from non UNSW Library collections through interlibrary loan. *This is the preferred method for external students.*

http://info.library.unsw.edu.au/external/services/externals.html

First time users need to register on-line at http://libraryinfounsw.altarama.com/ rept100.aspx?key=OffCampus

After initial registration, you simply make requests through the Library's Catalogue (LRD) by logging into Your Borrower Record and selecting the ILL Request tab.

The library pays the forward mailing charges for materials sent to you. Return costs must be paid by you. To ensure that the items are not damaged in transit a padded postage bag should be used.

Off campus access to online library resources
For information on usernames/passwords and hardware and software requirements necessary to remotely access online library resources please see the web page:

http://info.library.unsw.edu.au/web/using/require.html

Library online resources
To learn how to use library resources to locate texts and journal articles please refer to the online tutorial ELISE (postgraduate) located on: http://pgelise.library.unsw.edu.au/

Subject Guides
Developed by discipline specialists these guides identify major print and electronic resources in specific subject areas. The Engineering guide is

http://subjectguides.library.unsw.edu.au/content.php?pid=7632

To locate an electronic journal/article and databases via UNSW Library Sirius
Please go to the Electronic Resources page: http://sirius.library.unsw.edu.au/
Click on Find e-Journals
Then login (top right hand of screen) with your z1234567 student number and Unipass. This will allow you free access to many e-journals and articles.
Find out what databases are available in your subject area in Sirius by selecting Find Resources and then Category. For further help with databases see our helpsheets

http://info.library.unsw.edu.au/skills/helpsheets.html

For further information on how to use the library catalogue (LRD) to locate texts and journal articles please see the How to use library web page:

http://info.library.unsw.edu.au/skills/howto/howto.html  As the UNSW Library online environment is constantly changing, it is of benefit for students to use these online How To Use guides for the step by step mechanics. Students can then use these in their own time and/or in conjunction with the Library service in person or by phone 9385 2650 or via an online form


Referencing your work
Use the how to guide http://info.library.unsw.edu.au/skills/howto/referencing/refcr.html
Links to reference management software Endnote & web-based Refworks

http://info.library.unsw.edu.au/skills/endnote.html
**Local Academic Library Access**

Users may join the University Libraries Australia (ULA) Reciprocal Borrowing Scheme, to borrow books from more geographically convenient local academic libraries where access is possible. See [http://info.library.unsw.edu.au/usb/services/off/reciprocalunsw.html](http://info.library.unsw.edu.au/usb/services/off/reciprocalunsw.html)

**New Search Engine for scientific journals**

SCIRUS is an Elsevier’s Science search engine covering over 26 million scientific journal articles. It searches over 167 million science-specific Web pages, enabling you to pinpoint scientific, scholarly, technical and medical data on the Web; find the latest reports, peer-reviewed articles and journals that other search engines miss. Among the other subject areas, SCIRUS covers Engineering, energy and technology and environmental sciences.

Access is via Sirius: [http://www.scirus.com](http://www.scirus.com)

Similar to the Google Scholar library links, we are pleased to announce that the ‘Library Partner links’ feature has been enabled in SCIRUS. It means that you can now link back to full-text journal content where UNSW Library has a subscription. Search results retrieved for journal items will now have a “Find it@UNSW” link if you set up UNSW Library as your default library in SCIRUS Preferences. This feature also works from off-campus.

Instructions for setting up the links:

Go to SCIRUS [http://www.scirus.com](http://www.scirus.com)

1. Click on “Search Preferences”
2. Next to “Library partner links” select the “enable” radio button
3. Click on the letter “U” under “Choose from Institutes”
4. Select “University of New South Wales” from the drop-down menu
5. Click on the “Save Preferences” button. You are automatically taken back to the search page.
6. Enter a search string e.g. “diabetes and children”
7. Next to the number of records found, click on “journal results”
8. The results list shows articles with “Find it@UNSW” as a hyperlink
9. Click on Find it@UNSW to open “SFX Services for this record” window

UNSW Library also has a ‘Library Partner links’ to Google Scholar: see [http://www.library.unsw.edu.au/ubb5.45z/Forum2/HTML/000617.html](http://www.library.unsw.edu.au/ubb5.45z/Forum2/HTML/000617.html)

**COURSE EVALUATION AND DEVELOPMENT**

The School of Civil and Environmental Engineering evaluates each course each time it is run through (i) the UNSW Course and Teaching Evaluation and Improvement (CATEI) process, and (ii) Focus Group Meetings.

As part of the CATEI process, your student evaluations on various aspects of the course are graded; the Course Coordinator prepares a summary report for the Head of School. Any problem areas are identified for remedial action, and ideas for making improvements to the course are noted for action the next time that the course is run.

Focus Group Meetings are conducted by the four Year Managers (academic staff) for any students who wish to attend, in each year of the civil and/or environmental engineering programs. Student
comments on each course are collected and disseminated to the Lecturers concerned, noting any points which can help improve the course.

**DATES TO NOTE**
Refer to MyUNSW for Important Dates available at: https://my.unsw.edu.au/student/resources/KeyDates.html

**PLAGIARISM**
Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment. Plagiarism is the use of another person’s work or ideas as if they were your own. When it is necessary or desirable to use other people’s material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at: http://www.lc.unsw.edu.au/onlib/plag.html

**ACADEMIC ADVICE**
(Formerly known as Common School Information)
For information about:
- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.
Refer to Academic Advice on the School website available at: http://www.civeng.unsw.edu.au/info-about/our-school/policies-procedures-guidelines/academic-advice