The effective treatment and disposal of solid and liquid wastes is the responsibility of the local authority engineer in many communities. The primary responsibility in any waste treatment system is to ensure that community health is not endangered, but increasing concern is also being shown that the environment should not be unnecessarily harmed, and that the systems employed are cost effective.

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This course revises and builds upon basic principles of solid and liquid waste treatment introduced in undergraduate civil engineering studies. The course aims to develop a reasonable postgraduate level of expertise, principally in the areas of solid waste treatment methodology, and the design of wastewater treatment facilities.

On completion of this course, students should be able to:

- demonstrate the processes involved in the collection, storage, management and disposal of solid wastes;
- describe wastewater characterisation;
- discuss the principles and sanitary processes involved in wastewater treatment;
- analyse problems in wastewater treatment and design the components of wastewater treatment systems.
### TOPICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
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<tbody>
<tr>
<td>1. Wastewater Characterisation</td>
<td>10.00</td>
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<tr>
<td>1.1. Sources of wastewater.</td>
<td></td>
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<tr>
<td>1.2. Physical</td>
<td></td>
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<tr>
<td>1.3. Chemical and biological characteristics.</td>
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<tr>
<td>2. Wastewater Treatment</td>
<td>30.00</td>
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<tr>
<td>2.2. Theory of sedimentation.</td>
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<td>2.3. Kinetics of activated sludge.</td>
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<td>2.4. Biological nutrient removal.</td>
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<td>2.5. Disinfection processes.</td>
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<tr>
<td>3. Sludge Treatment and Disposal</td>
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<tr>
<td>3.1. Anaerobic and aerobic digestion.</td>
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<tr>
<td>3.2. Disposal</td>
<td></td>
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<td>4. Characteristics of Solid Wastes</td>
<td>10.00</td>
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<tr>
<td>4.1. Development of solid waste management.</td>
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<tr>
<td>4.3. Waste generation.</td>
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</tbody>
</table>
5. Recycling, Reuse and Waste Minimisation 10.00

5.1. Waste management hierarchy.

5.2. Separation and storage at source.

6. Collection Techniques 15.00

6.1. Transfer stations.

6.2. Handling and collection systems and operations.

7. Solid Waste Disposal Techniques 15.00

7.1. Waste transformation through composting.

7.2. Combustion.

7.3. Controlled landfill and processes within landfill.

TEXT and MATERIALS required to be PURCHASED or ACCESSED:
Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at http://bookshop.usq.edu.au by entering the author or title of the text.
A hand-held, battery-operated calculator.

REFERENCE MATERIALS
Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Hartley, K. J. 1985, Operating the Activated Sludge Process, Gutteridge Haskins and Davey Pty Ltd,
Qasim, S. R. 1994, Wastewater Treatment Plants Planning, Design and Operation, CBS Publishing Japan Ltd,
STUDENT WORKLOAD REQUIREMENTS

ACTIVITY             HOURS
Assessment           20
Directed Study       132
Examinations         3

ASSESSMENT DETAILS

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks Out of</th>
<th>Wtg(%)</th>
<th>Required</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSIGNMENT 1</td>
<td>200.00</td>
<td>20.00</td>
<td>Y</td>
<td>28 Apr 2003</td>
</tr>
<tr>
<td>ASSIGNMENT 2</td>
<td>100.00</td>
<td>10.00</td>
<td>Y</td>
<td>26 May 2003</td>
</tr>
<tr>
<td>3 HOUR OPEN EXAMINATION</td>
<td>700.00</td>
<td>70.00</td>
<td>Y</td>
<td>END S1</td>
</tr>
</tbody>
</table>

NOTES:
- Student Administration will advise students of the dates of their examinations during the semester.

IMPORTANT ASSESSMENT INFORMATION

1 Attendance requirements:
   There are no attendance requirements for this course. However, it is the students' responsibility to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.

2 Requirements for students to complete each assessment item satisfactorily:
   To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for each assessment item.

3 Penalties for late submission of required work:
   If students submit assignments after the due date without prior approval then a penalty of 20% of the total marks available for the assignment will apply for each working day late.

4 Requirements for student to be awarded a passing grade in the course:
   To be assured of receiving a passing grade a student must submit all of the summative assessment items and achieve at least 50% of the available weighted marks for those items.

5 Method used to combine assessment results to attain final grade:
   The final grades for students will be assigned on the basis of the weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course.

6 Examination information:
In an Open Examination, candidates may have access to any material during the examination except the following: electronic communication devices, bulky materials, devices requiring mains power and material likely to disturb other students.

7 Examination period when Deferred/Supplementary examinations will be held:
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.

8 University Regulations:
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL: http://www.usq.edu.au/SECARIAT/calendar/Part5/ or in the printed version of the current USQ Handbook.

ASSESSMENT NOTES

1 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner.

2 Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.

3 In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.

4 The Faculty will normally only accept assessments that have been written, typed or printed on paper-based media.

5 The Faculty will NOT accept submission of assignments by facsimile.

6 Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations may be given special consideration. They should contact the examiner of the course to negotiate such special arrangements.

7 In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.

8 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded the temporary grade: IM (Incomplete - Make up). An IM grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non-directed personal study.

9 Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete...
Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).

10 The Faculty of Engineering and Surveying does not offer supplementary examinations.

OTHER REQUIREMENTS

1 Students will require access to e-mail and internet access to USQConnect for this course.