Module Code: CE7E06

Module Name: E6: Water Resource Planning and Climate Change

ECTS Weighting: 5 ECTS

Semester taught: Semester 2

Module Coordinator/s: Prof. David O’Connell (david.oconnell@tcd.ie)
Lecturer(s): Dr. Paul Nolan

Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline:

On successful completion of this module, students should be able to evaluate a range of water resources problems in different hydrological environments. Specifically, students will gain an understanding of:

LO1. Combined use of surface and groundwater resources, including river augmentation schemes and artificial recharge.
LO2. Water resource planning in large river basins, especially the Nile basin.
LO3. Arid zone hydrology, with emphasis on the Middle East.
LO4. Protecting groundwater from pollution.
LO5. Climate dynamics, including human-induced global warming and the models used to make projections of future climate scenarios.

Graduate Attributes: levels of attainment
To act responsibly - Enhanced
To think independently - Attained
To develop continuously - Attained
To communicate effectively - Enhanced

Module Content:
To introduce students to a range of current water resource planning issues, in both temperate and arid regions.

Module content:

- Conjunctive use of surface and groundwater
- Managed aquifer recharge
- Low river flow analysis and river augmentation
- Bankside well schemes
River basin management, taking the Nile as an example
Water resource planning in arid zones
Groundwater protection strategies in UK and Ireland
Climate change, energy balance, global warming, global and regional climate models
Environmental impact assessment

Teaching and Learning Methods

This module is taught by a combination of lectures and tutorials, along with one assignment, which is linked to one of the module topics. The completed assignment has to be submitted by the end of week 6 of the second semester. The projects are marked and returned to the students with constructive comments.

Assessment Details

Please include the following:
- Assessment Component
- Assessment description
- Learning Outcome(s) addressed
- % of total
- Assessment due date

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Assessment Description</th>
<th>LO Addressed</th>
<th>% of total</th>
<th>Week due</th>
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<tbody>
<tr>
<td>Examination</td>
<td>Examination [3 hours]</td>
<td>LO1-6</td>
<td>80</td>
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<td>COVID contingencies</td>
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<td>Online exam or take home assignment</td>
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<tr>
<td>Coursework</td>
<td>Assignment related topics from one of LO1-6</td>
<td>Annually dynamic LO1-6</td>
<td>20</td>
<td>6</td>
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Reassessment Requirements

Examination [3 hours]

Contact Hours and Indicative Student Workload

Contact hours: 27 hours

Independent Study (preparation for course and review of materials): 40.5 hr

Independent Study (preparation for assessment, incl. completion of assessment): 32 hr

Recommended Reading List

A comprehensive reading list is provided at the beginning of the course. Texts cited include 'Hydrology in practice' by Shaw et al. (2011), 'The hydrology of the Nile' by Sutcliffe & Parks (1999), 'Hydrogeology: Principles and Practice' by Hiscock & Bense (2014), 'Water wells and boreholes' by Misstear et al. (2017), 'Water sustainability: A global perspective' by Jones (2011) and 'Introduction to Environmental
Impact Assessment’ by Glasson et al (2012). In addition, the module includes many case study examples, with an extensive reading list of published papers.

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<tr>
<th>Module Pre-requisite</th>
<th>No specific pre-requisite, but previous engineering hydrology module helpful</th>
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<tbody>
<tr>
<td>Module Co-requisite</td>
<td>No co-requisite</td>
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<td>Module Website</td>
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<td>Are other Schools/Departments involved in the delivery of this module?</td>
<td>No</td>
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<td>If yes, please provide details.</td>
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<td>Module Approval Date</td>
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<td>Approved by</td>
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<td>Academic Start Year</td>
<td>January 2021</td>
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<td>Academic Year of Date</td>
<td>2021</td>
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**COVID-19 contingency statement:**

While the intention is to deliver some lectures, tutorials and labs face-to-face, there is uncertainty due to the Covid-19 situation and the entire module delivery may need to change to an online delivery if required by government restrictions. In the case of a possible new lockdown scenario during teaching term:

- All lectures, tutorials and labs will be delivered online using Blackboard. Some of these sessions will be *live* sessions and your attendance at live sessions is required.
- Assignments and examinations will be conducted and submitted online.