<table>
<thead>
<tr>
<th>Module Code</th>
<th>CEU11E13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Name</td>
<td>Biology for Environmental Engineering</td>
</tr>
<tr>
<td>ECTS Weighting</td>
<td>5 ECTS</td>
</tr>
<tr>
<td>Semester taught</td>
<td>Semester 2</td>
</tr>
<tr>
<td>Module Coordinator/s</td>
<td>Muhammad Ali</td>
</tr>
</tbody>
</table>

**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:

- **LO1.** Provide an account of the cellular basis of life: from its origins in the abiotic world, to the evolution of unicellular and multicellular organisms.
- **LO2.** Describe the diversity of life forms: including viruses, Prokaryotes (bacteria), Archaea, and Eukaryotes (unicellular organisms, animals and plants).
- **LO3.** Employ a range of laboratory techniques, demonstrating the development of practical scientific skills, knowledge of experimental design and the interpretation of results.
- **LO4.** Apply the scientific method as a fundamental approach to experiment-based investigations, critical analysis of data, and problem solving.
- **LO5.** Outline the diversity of life on earth and describe how it evolved over geological time scales.
- **LO6.** Describe the ecological relationships between individuals, populations, communities and ecosystems, and between organisms and their environment.
- **LO7.** Explain how humans can positively and negatively influence other living organisms and their environment and understand the value of other living organisms for humans.
- **LO8.** Collate, synthesise, organise and present information in written reports.

**Graduate Attributes: levels of attainment**

- To act responsibly - Introduced
- To think independently - Introduced
- To develop continuously - Introduced
- To communicate effectively - Not embedded
Module Content

This module aims to provide an introduction to biology with relevance to both the natural environmental systems and engineered treatment systems. It starts with a description of the possible origin of life, from the abiotic world to single-celled and multicellular organisms, and the ultrastucture of the prokaryotic and eukaryotic cells will be covered in detail. The diversity of life forms, from viruses to prokaryotic and eukaryotic microorganisms, to more complex plant and animal life forms will be described. Then the module will introduce students to the biology of individuals, species, populations and ecosystems, including the biological context of climate change, human impacts on the environment, future food sustainability, urban ecology, ecosystem services and the value and conservation of biodiversity.

- **Origin of Life**
  The Origin of Life from a chemical & cellular perspective. The abiotic world
  The prebiotic world. The first cell

- **Cellular basis of life**
  Cell structure – Prokaryotes, Archaea, Eukaryotes - Animal and Plant
  Organelles & their prokaryotic origin – Mitochondria, Chloroplasts
  Mitosis and Meiosis – Cell division – Regulation of cell division

- **Diversity of microbial life**
  Bacteria
  Fungi and protists
  The archaea
  Viruses
  Relationships (symbiosis / parasites)

- **Evolution**
  Adaptation
  Populations
  Biodiversity

- **Ecology and Environment**
  Global ecology and climate change
  Biomes / niches
  Conservation
  Trophic cascades
  Ecosystem services and natural capital
  Food: env. impacts and ecological impacts
  Biosphere feedbacks on climate system
**Teaching and Learning Methods**

This module is taught by a combination of lectures, tutorials and practicals. *To be completed when new lecturer is appointed.*

**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>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Assessment 1</td>
<td>Multiple choice tests</td>
<td>LO1 – LO8</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Continuous Assessment 2</td>
<td>Laboratory</td>
<td>LO1 – LO8</td>
<td>30%</td>
<td>12</td>
</tr>
<tr>
<td>Examination</td>
<td>Examination [3 hours]</td>
<td>LO1 – LO8</td>
<td>50%</td>
<td>-</td>
</tr>
</tbody>
</table>

**Reassessment Requirements**

Examination [2 hours]

**Contact Hours and Indicative Student Workload**

Contact hours: 40 (27 lecture, 6 labs, 7 tutorial)

- Independent Study (preparation for course and review of materials): 30
- Independent Study (preparation for assessment, incl. completion of assessment): 30

**Recommended Reading List**

- *Campbell Biology* – Urry et al. [Pearson]
- *Fundamentals of Environmental Engineering* – Mihelcic [Wiley]
- *Biology of Wastewater Treatment* – Gray [Imperial College]

**Module Pre-requisite**

n/a

**Module Co-requisite**

n/a

**Module Website**

http://www.tcd.ie/Engineering/undergraduate/

**Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.**

No
<table>
<thead>
<tr>
<th>Module Approval Date</th>
<th>1st September 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved by</td>
<td></td>
</tr>
<tr>
<td>Academic Start Year</td>
<td>1st September 2021</td>
</tr>
<tr>
<td>Academic Year of Date</td>
<td>2021/2022</td>
</tr>
</tbody>
</table>