<table>
<thead>
<tr>
<th>Course Code:</th>
<th>BENG 212P</th>
<th>Course Title:</th>
<th>Manufacturing Regenerative Medicines: from lab bench to industry</th>
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</thead>
<tbody>
<tr>
<td>Credits:</td>
<td>15 UCL credits (7.5 ECTS)</td>
<td>Teaching Team:</td>
<td>Dr Ivan Wall, Prof Chris Mason, Dr Farlan Veraitch</td>
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<tr>
<td>Term delivered:</td>
<td>Term 2</td>
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<td>Year of study:</td>
<td>2</td>
<td>Pre-requisites:</td>
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### Aims and Learning Outcomes:

The aim of the module is to introduce engineering students to tools and technologies that underpin manufacture of stem cell-based regenerative medicine products, which are becoming increasingly important for 21st Century healthcare and which will require talented multi-disciplinary engineers to create sustainable manufacturing pathways for. Specific aims will be to ensure all students irrespective of their discipline will have a fundamental understanding of the cell biology that underpins stem cell manufacture and an understanding of the process options and challenges for moving into industrial systems.

By completing this module, engineering students from different disciplines will:

1. Develop an understanding of fundamental biology that underpins stem cell behavior and that is critical to understand for successful manufacture of regenerative medicines.
2. Develop an understanding and working knowledge of manual cell handling, including those that are typically used at research scale.
3. Develop an understanding and working knowledge of typical technology platforms and unit operations used in regenerative medicine manufacturing pathways.

### Synopsis:

This module will introduce engineering students to the fundamental biologic properties and manufacturing requirements for regenerative medicines for 21st Century healthcare.

It will begin with the fundamental biology that underpins human cells and then explore the way in which they can be harvested, expanded, differentiated and then delivered to the patient for regenerative medicine applications.

Technology platforms that are used for each of the key unit operations in regenerative medicines manufacture will be considered and technology gaps in the manufacturing space, such as reliable in-process analysis and control tools, will be identified and discussed.

Cell expansion technologies will be considered in terms of requirements for different types of therapy requiring different doses. Cost of goods case study will be used to determine technoeconomic feasibility of different cell expansion platforms.

Downstream processing including cell purification and concentration processes will be considered theoretically via lectures and case study.

### Method of delivery:

The course is timetabled for 40 hours of contact time for the 10 weeks of term 2. This includes industry case studies that will link core teaching of fundamental biology underpinning regenerative medicine to real world examples of the manufacturing challenges for stem cells.

### Assessment:

Examination (2hr written exam) 60%
Coursework (2 written coursework) 30%
Mid-term test 10%