

# Trends and Challenges in Chemical Engineering Education

UK (AND UCL) PERSPECTIVE Eva Sorensen



**Chemical Engineering in the UK** 





33 departments offer chemical & biochemical engineering

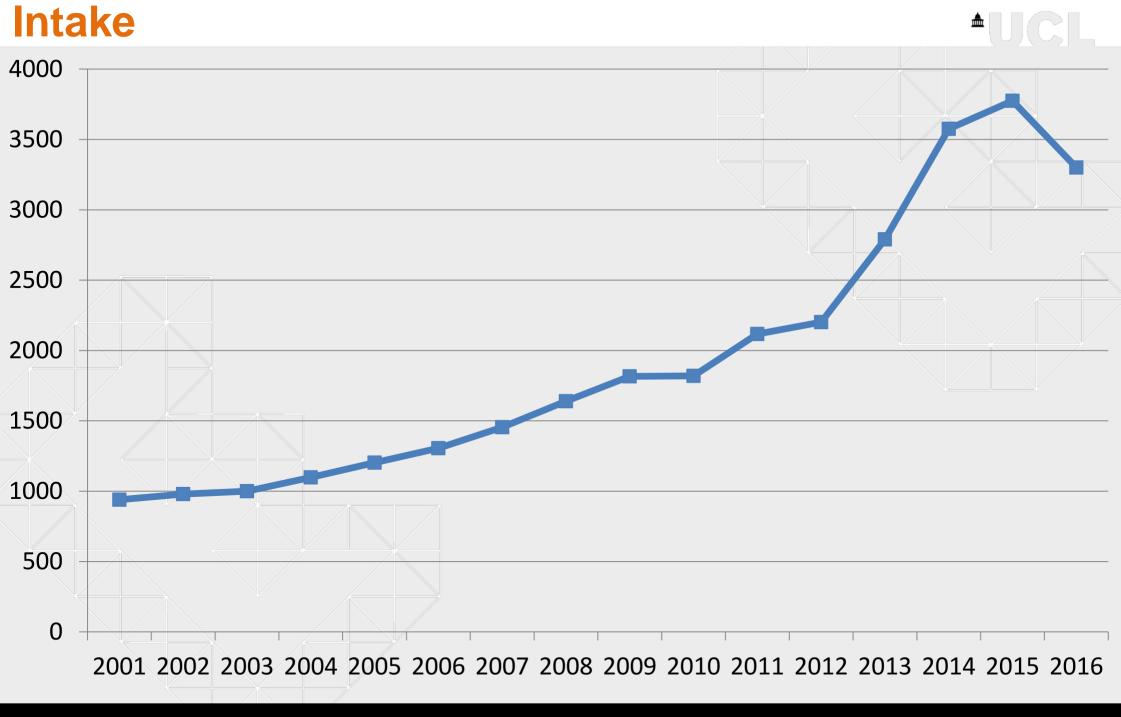
301 courses: BEng (3 yrs) & MEng (4 yrs)



# Applications (chemical/process/energy eng.)

2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016





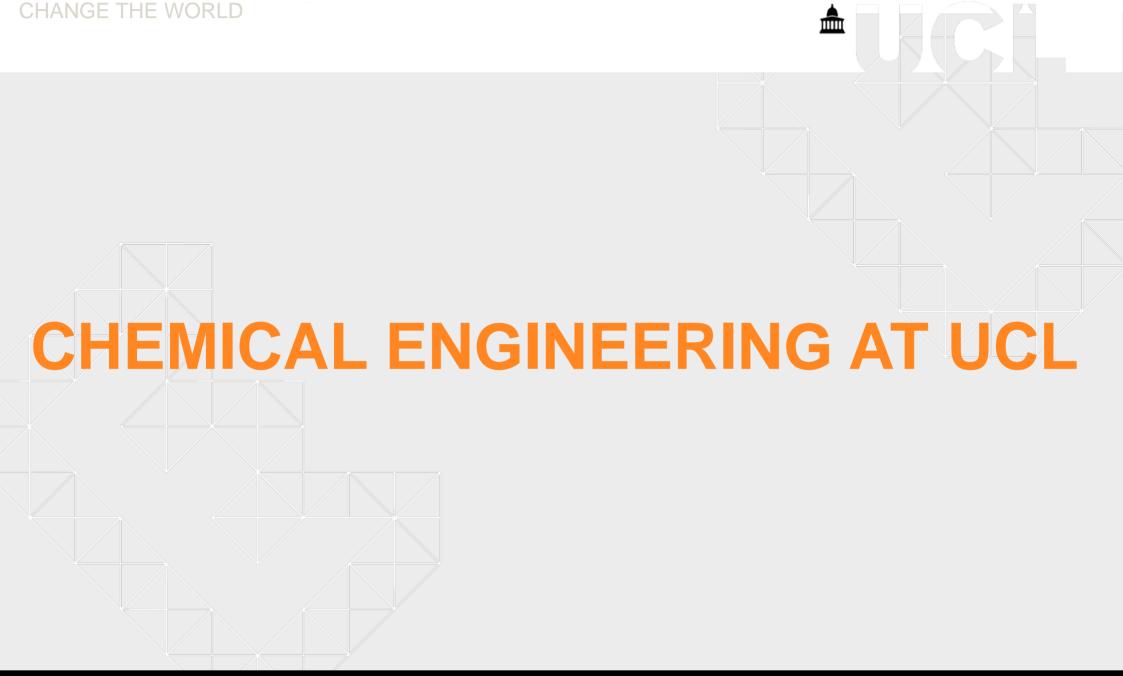


# **Graduate jobs (2016)**

| ▲ |  |
|---|--|
|   |  |

| Types of work  |     | First degree |  |
|--|-----|--------------|--|
|  | No. | % of total   |  |
| Managers   |     | 3.7%         |  |
| Health professionals   |     | 0.4%         |  |
| Education professionals                                      |     | 1.5%         |  |
| Legal, social and welfare professionals                      |     | 1.1%         |  |
| Science professionals  |     | 3.3%         |  |
| Engineering and building professionals                       |     | 45.5%        |  |
| Information technology professionals                         | 35  | 4.5%         |  |
| Business, HR and finance professionals                       |     | 14.3%        |  |
| Marketing, PR and sales professionals                        | 25  | 3.5%         |  |
| Arts, design and media professionals                         | 5   | 0.5%         |  |
| Other professionals, associate professionals and technicians |     | 5.6%         |  |
| Childcare, health and education occupations                  | 5   | 0.8%         |  |
| Clerical, secretarial and numericals clerks                  | 20  | 2.7%         |  |
| Retail, catering and bar staff                               |     | 8.5%         |  |
| Other occupations  |     | 4.1%         |  |
| Unknown occupations  |     | 0.0%         |  |
| Total from survey  |     |              |  |
| Total first degree grads                                     |     |              |  |







#### **UCL's Connected Curriculum**

Connected Curriculum is an institution-wide initiative, its main aim is to ensure that all UCL students are able to participate in research at all levels of their programme of study, in line with the UCL 2034 strategy.

The strategy defines the relationship between students' learning and their participation in research.

Students
connect with
each other,
across phases
and with alumni

Students learn to produce outputs - assessments directed at an audience Students connect with staff and their world-leading research

01

Learning through research & enquiry

Students connect academic learning with workplace learning A throughline of research activity is built into each programme

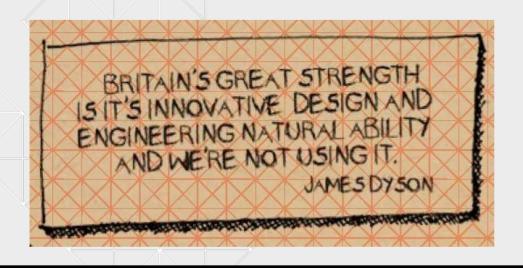
Students make connections across subjects and out to the world

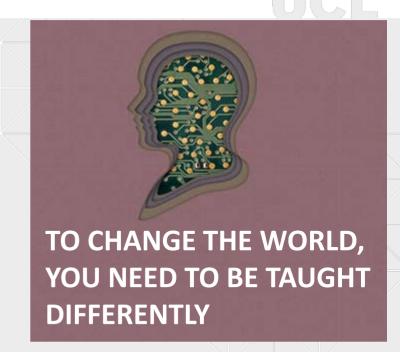
03



## **UCL Engineering Vision**

- "At UCL Engineering we take bright, thoughtful, creative people and give them the knowledge, skills, and experience they need to engineer a better world.
- We teach them to think, make, model, design, analyse, challenge, and innovate, and then let them practice what they've learned by tackling engaging projects that address real-world problems."









## **Integrated Engineering Programme (IEP)**

From the very first day of the first term, students come together to work in cross-disciplinary teams to tackle ambitious real world problems based on our research, and to develop the crucial technical and team working skills required by industry and academia.

This is a key part of the integrated engineering experience and builds on our pioneering use of scenario-based teaching





#### **General module structure**





# Student-led e-learning 30 hrs over 10 weeks



Lectures & Tutorials
32 hrs over 8/10 weeks





**Experimentation** *4 hrs* 

Computation 4 hrs







Y1 & Y2 Scenarios

Fundamental principles
Design & Innovation
Health, Safety & Sustainability
Team working & Presentation skills





#### **Chemical Engineering Programme** TERM 1 TERM 2 **Engineering Challenges** Transport Phenomena I YEAR 1 Design & Professional Skills I Thermodynamics Scenario 1 Mathematical Modelling & Analysis **Physical Chemistry** Scenario 2 Introduction to Chemical Engineering Computational Modelling & Analysis Design & Professional Skills II Design & Professional Skills II YEAR 2 Mathematical Modelling & Analysis II Mathematical Modelling & Analysis II Scenario 5 Scenario 3 Engineering Experimentation Particulate Systems & Sep. Processes II Chemical Reaction Engineering Scenario 6 Scenario 4 Process Heat Transfer Process Design Principles Separation Processes I Minor I How to Change **Process Design Project** Process Design Project YEAR 3 Process Dynamics & Control Transport Phenomena II Chemical Reaction Engineering II Adv. Safety & Loss Prevention Minor II Minor III KEY: **IEP** Research Project YEAR 4 Research Project Core Core w/Lab Process Systems Engng. & Design Elective Design Elective Elective Lab Research Elective Elective 11 Elective

## **Chemical Engineering Scenarios**









ENERGY



**PHARMA** 













**Process Plant** 

Natural Gas Transportation and Liquefaction

**Air Separation** 

Biofuels

"Hidden heroes" - Instrumentation

Practical

Pharma Formulation Development



# TO CHANGE THE WORLD, YOU NEED TO BE TAUGHT DIFFERENTLY.

