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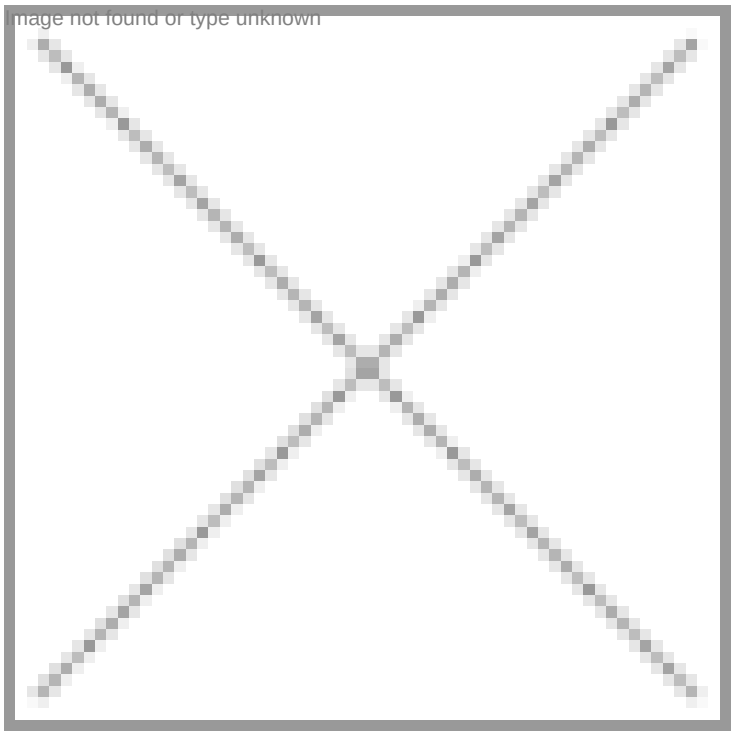
"The University of Leeds ranks among the top ten institutions in the UK"

16 September 2005 | News



"The University of Leeds ranks among the top ten institutions in the UK"

-Prof. Tony Turner, Dean, Faculty of Biological Sciences, University of Leeds

In an interview, Prof. Tony Turner elaborates on the unique features of the undergraduate biotechnology course offered by the university.

What are the unique features/salient characteristics of the biotechnology division?

Our BSc Biotechnology degree course was one of the first such undergraduate degrees to be established in the UK. The major focus of the program is on the biological aspects of the subject, rather than the engineering components.

The intention is to equip students with a broad range of skills that will enable them to undertake further research or to engage in industrial work. There is good support through academic tutorial systems with weekly tutorials in groups of 1-8. There is also a strong practical aspect to the course to develop a range of laboratory skills, and enterprise skills development.

The second year covers a range of topics including Eukaryotic genes: Cloning and expression, Prokaryotic genetics, Prokaryotic metabolism, Essential techniques in biochemistry, Biological membranes and Cell signalling or Medical immunology and Microbial pathogenicity, Microbial functional diversity and Microbial growth.

The third year further builds on these skills through Industrial and environmental microbiology, bioinformatics, applied

genetics, molecular genetics and biotechnology and Advanced topics in Biochemistry. A key feature of the program is the final year research project which may be laboratory, literature or computing and which provides the student with an opportunity to undertake independent research with the support of academic staff in an exciting research environment.

Is any on-job training provided during the course?

In the BSc Biotechnology course there is the option of an industrial placement at the end of year two, generally within the pharmaceutical/biotechnology sector. These placements are on a competitive basis.

Which are the companies/foreign institutions/professional bodies with which the department has linkages?

Students have been placed in a wide range of companies including pharmaceutical (e.g. GlaxoSmithKline, Pfizer, AstraZeneca, biotechnology companies (e.g. Cambridge Antibody, Celltech), food companies (e.g. RHM, Northern Foods, Unilever), and microbiological testing laboratories (e.g. Clariant). Many of these placements are laboratory based but there is significant scope for other types of placement, e.g. Drug Regulatory Affairs, IT support, Quality Assurance, Clinical Science.

How has been the placement record of students pursuing a biotech/bioscience degree? Does the institute offer a campus placement facility?

Yes, the Industrial Placements Tutor advises students wishing to apply for a placement. Students are instructed on preparing a suitable CV and undergo interview practice at the careers center. The student's placement is assessed through the submission of a written report, completion of a skills-based work profile and presentation of work upon return to university. Students are visited by an academic supervisor twice over the course of their placement and regular contact is maintained through e-mail.

Without exception our students have performed very well on placement; an industrial placement is particularly advantageous to students in their final year studies and career progression.

Can you elaborate on the spinouts from the biotech department of your university?

There are a number of spinout companies that have been established from the Faculty of Biological Sciences including Applied Enzyme Technology (applications of enzyme systems for analytical and biosensor applications), Syntopix Ltd (development of novel therapeutics for dermatological diseases), Identi-Tree Ltd (identification of species of trees from their DNA profiles) and Photopharmica (photodynamic therapy to kill diseased tissue or unwanted bacteria).

The University also has its own magazine insight to highlight Knowledge Transfer activities and advances in Leeds.

Rolly Dureha

PG Education in the UK is Focused Yet Flexible

Europe's first genetically modified food product, a GM tomato, was developed in the UK at the Nottingham University and Zeneca Seeds way back in 1996. BioSciences research and education, specifically in modern developing fields like biotechnology, has been a high priority area in the UK.

The UK offers very focused and specialized biotechnology courses at the postgraduate and PhD level. Most of the postgraduate programs are either research degrees or taught courses. Typically, a full time MSc program lasts for a year leading to a degree in biotech or related specialized areas. The courses are designed in such a way that either a student can deepen his/her knowledge gained from their first degree or a student could convert his/her expertise to another field of study. There are many institutions of repute offering a Masters course in biotechnology. These include the University of Essex,

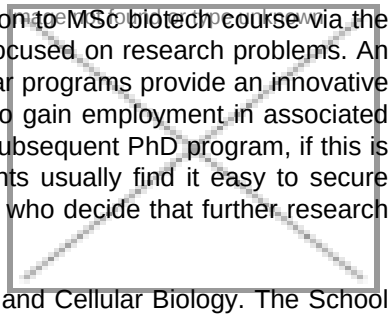
Imperial College London, Lancaster University, University of Sheffield and University of Abertay Dundee.

The advantages

The study courses offered by most of the institutions are very structured and focused but at the same time carry a lot of inbuilt flexibility. For example, along with a Masters degree many universities also offer diploma and certificated short-course training programs in the same specialization. All the masters programs involve classes and seminars leading to a dissertation while certificates and diplomas are similar but without the dissertation.

A good example are the courses offered by the University of Birmingham which is one of the oldest universities in the UK and is also high up in the research arena. The BioSciences school of the university offers masters degree, diploma and certificated short-course training in applied genetics. The masters degree runs for 12 months, wherein the first eight months are divided into two semesters followed by a four-month research project. The school offers a diploma course in the same subject which consists of the two taught semesters of the masters course, and lasts for 25 weeks. The taught modules within each semester are designed to be self-contained and are also available as independent short courses. These diploma and short courses are designed to provide in-service, refresher or introductory training for those already in the industry. Hence according to the need, a student can choose from the options available.

Another unique option offered in the UK is the Research Master's (MRes) course. In addition to MSc biotech course via the taught option, some universities offer a Research Master's (MRes) course, which is more focused on research problems. An MRes degree comprises a year of intensive training and research experience. Such one-year programs provide an innovative mix of the appropriate theoretical background with research experience for those wishing to gain employment in associated research fields. A significant advantage of this course is that it provides a 'flying start' to a subsequent PhD program, if this is the chosen career path, ensuring completion within three years. In addition, MRes students usually find it easy to secure funded PhD posts and an exit point after one year with a recognized qualification for those who decide that further research training is not for them.



The School of BioSciences, University of Birmingham offers an MRes degree in Molecular and Cellular Biology. The School has an international reputation as a center of excellence in this area. This program is designed to prepare students for a career in research in molecular and cellular biology and its applications. Similarly the University of Essex also offers a one-year full time MSc and MRes degree in Biotechnology. Essex University is recognized as a leading academic institution in the UK and ranked tenth nationally for research standards and seventh for teaching quality.

Many universities also provide a flexible time frame to complete the course. In addition, to the full time one-year course program, a two-year part time option is also available if the student so chooses.

Course structure

The masters course in biotechnology provides basic and advanced knowledge together with hands-on experience in modern biotechnology and practical insights into current commercial applications. Like the one-year program, MSc Biotechnology program offered by the University of Abertay Dundee involves two semesters of taught modules followed by a semester of project work. The core themes in the course include molecular biology, bioinformatics, applications of biotechnology in the industrial context, analytical biotechnology, and structural and functional bioinformatics; optional specialist areas includes plant, animal cell or yeast biotechnology, genome structure and function, or microbial interactions; plus a research project, with two routes available: the first involves specialized research in an external research institute or biotechnology company as preparation for future research; the second offers practical skills and problem-solving experience in a broad range of cellular and molecular biological, analytical and data-processing systems.

Some universities offer specialized training in an identified branch. For example, the Agricultural Sciences department of the Imperial College London, which is a top-flight college for all levels of study and a part of the University of London group of institutions, offers an MRes in Plant Biotechnology. The core program is a nine-month period of two projects focusing on plant genetic engineering; plant development; plant molecular biology; molecular markers; membrane biophysics; proteomics; plant biochemistry; plant microbe interactions; transcriptomics; bioinformatics. Imperial College also offers PG courses in Biochemical Research, Bioinformatics, Structural Biology, Advanced Methods in Taxonomy and Biodiversity and Applied Biological Sciences (with options in Applied Entomology, Biological Control, Forest Protection and Conservation, Plant Pathology and Nematology). They normally lead to the MSc degree of the University of London and to the Diploma of the Imperial College (DIC).

Similarly the Institute of Environmental and Natural Sciences, Lancaster University offers an MSc/PgDip in Environmental and Plant Biotechnology. The core modules of the course include advanced techniques in recombinant DNA technology;

computing support for scientific research; plant and microbial biotechnology; plant responses to stress; resource acquisition by plants; scientific writing; statistical methods in scientific research; strategies for plant improvement; options: biological impacts of air pollution and climate change; electron microscopy: a practical introduction; molecular techniques in environmental research. In addition, the university also offers a one-year MSc course by Research in Plant Science and Biomedicine.

The School of Biomolecular Sciences, Liverpool John Moores University, offers an MSc degree in Industrial Biotechnology. The course includes fermentation technology, microbial technology and gene manipulation, recombinant DNA technology, animal cell technology, instrumentation and control for fermentation, protein engineering and molecular modeling, business and management of new technology, project, professional training.

The National University of Ireland, Galway (NUI, Galway) offers a full-time 12-month MSc Biotechnology course. The course consists two inter-related elements: (i) lectures and tutorials and (ii) a four-month individual research project. The course consists of science modules (the investigative, preparative and analytical scientific techniques that are the foundations of biotechnology), business modules (Introduction to business with regard to the implementation of scientific processes and applications in commercial and industrial settings), Introduction to Biotechnology (Training in biotechnology topics and skills).

After completion of the course, a high number of students go on to gain employment within their chosen field, or are able to secure good PhD opportunities. Career development is seen as a crucial part of postgraduate education in most of the universities.

Infrastructure facilities

Most of the big universities rank high in the research arena and are doing cutting edge studies in the biotech domain. Illustrating this point is the Biological Sciences Department of the University of Essex, where the majority of work is of national excellence, with international quality research spread throughout, for example in plant biology, microbiology and molecular medicine. The department gained a research rating of four in the 2001 HEFCE national Research Assessment Exercise, which is the major scrutiny procedure for objective evaluation of university research in the UK.

Both teaching and research are undertaken in well-found laboratories and funding from the European and UK government research programs and from industry helps enable the laboratories to have state-of-the-art equipment and facilities. The core facilities at the department include cell and tissue culture suites, bio-imaging instrumentation, advance spectrometry equipment, controlled plant growth facilities and a purpose-built sports science laboratory complex. The department has just opened a new laboratory extension including a sophisticated greenhouse facility.

The Imperial College London, a recognized center of excellence, receives one of the highest levels of funding in the UK. Much of its work is multidisciplinary and involves collaborative work with institutions in Europe and the developing countries. There are also many joint projects with private firms and government research organizations.

The Lancaster Environment Centre, a partnership between Lancaster University and the Natural Environment Research Council's (NERC) Centre for Ecology and Hydrology has created one of the largest groups of researchers of its kind in Europe. Nearly 300 researchers and teachers from disciplines across the natural, applied, social and management sciences combine to provide a unique multidisciplinary insight into causes, impacts and solutions for many of the world's major environmental problems. The facilities provided by the generous investment in sophisticated controlled environment facilities, specialized laboratories and cutting-edge equipment allows the integrative studies of terrestrial, aquatic and atmospheric systems.

New areas

The UK boasts of a mature biotechnology industry. Keeping this in view, universities have been developing new subjects as comprehensive modules suiting the requirements of the industry. For example, the Law faculty of the University of Sheffield offers a twelve-month MA Degree in Biotechnological Law and Ethics. Launched in 1994, this was probably the first course of its kind to deal with the ethical and legal issues raised by developments in human, animal and plant biotechnology. In this course the students are provided with expert information about current and likely future developments in biotechnology and its regulation and also receive grounding in law and ethics. The course has a flexible structure with the compulsory subjects being moral theory, developments in biotechnology, regulation of biotechnology, intellectual property and biotechnology, research ethics; plus four options from: artificial organs, genetics, obstetrics, plant and food technology, forensic techniques, transplantation. Law and Ethics in Biotechnology is an important area of research at Sheffield and the university has a Center of Excellence carrying out focused research in this subject.

MBA biotechnology is also a relatively new stream offered by the UK universities. The program is designed specifically for bioscience graduates who wish to enhance their skills in the business world of biotechnology and includes management modules in the areas of marketing, human resources, entrepreneurship, business strategies and accountancy and finance. The Abertay University offers a one-year course in MBA biotechnology. The course covers topical areas of modern biotechnology including molecular biology, bioinformatics, industrial biotechnology and the course culminates in an MBA dissertation dealing with issues confronting bio-business and commercial biotechnology. Similarly, the Kingston University offers MSc course in Biomedical Science with Management Studies, which is suitable for those who wish to study selected topics in biomedical science combined with the fundamentals of management theory. Such a course prepares a student for seeking management positions within the biomedical sciences area. Bioinformatics is another area in which many universities offer PG diplomas and MSc
degrees.

Similarly some universities offer course programs in the related area of biomedical sciences. For instance, the Kingston University offers Biomedical Science PG certificate and Diploma/MSc in cellular pathology, haematology and medical microbiology. These MSc courses are suitable for both professional biomedical scientists and for those who wish to pursue a research career via a PhD. The university also provides an option of completing the MSc degree by research. The degree involves investigation and evaluation of an approved research topic and the presentation of a dissertation. The school of mathematics of the Kingston University offers an MSc Degree in Clinical data management. This part-time course addresses the specific needs of those responsible for the handling of the data collected during clinical trials and provides a "flying start" to the newcomers to the industry.

Research training

The research degrees are usually two-three years long providing MPhil or PhD qualifications. They allow a student to conduct investigations into their own topic of choice and are of use in jobs where there are high levels of research and development.

Most of the universities offer research training at MPhil or PhD levels in various areas of research depending on the areas in which they specialize - Molecular Cell Biology, Molecular Microbiology, Molecular Pathobiology, Organismal and Environmental Biology, Plant Genetics and Cell Biology, Structural Biology and many others. Generally the universities offer an option to students who have performed well in their MSc degree research project to continue their research for a PhD and so complete the MSc and PhD training in three years. The MPhil degrees are two-year courses either run independently or in association with other universities. For instance, the institute of Biotechnology, University of Cambridge, offers research degrees in Biotechnology. Cambridge University is world-famous for the quality of its research and its scores in the 2001 Research Assessment Exercise confirmed its leading position. The university offers a comprehensive structured 3-4 year PhD program in Biotechnology encompassing safety induction, literature reviews, viva voce examinations, reports, posters, seminars, web pages, entrepreneurship courses and thesis preparation sessions, and comprehensive IT training. The MPhil in Biotechnology offers a one-year research degree, examined by thesis and oral only.

How to apply

Unlike applying for a first degree, there is no central admissions system for postgraduate courses in the UK. The student has to apply directly to the educational institution concerned and each one will have a slightly different application procedure. There is, however, a generic form that is accepted by most institutions, which is available at the local British Council office.

Most institutions normally require an equivalent to a British first degree in a relevant subject for entry to a postgraduate diploma or masters degree. The personal statement and references with the application form are very important in the admission process.

For research courses, institutions will look for an outstanding academic record. Student will have to submit a research proposal and have a good masters degree.

There are no deadlines for most postgraduate courses in the UK. However, a few institutions may have application deadlines. So it is best to confirm this from their website or prospectus.

Rolly Dureha