

Biological Sciences

BSc/MBiol Biology

BSc/MBiol Biochemistry

BSc/MBiol Animal Biology

BSc/MBiol Human Biology



We have been awarded accreditation by the Royal Society of Biology



We have recently been awarded accreditation by the Royal Society of Biology for our Biology, Human Biology and Animal Biology BSc. courses. The Royal Society of Biology is the leading professional body for the biological sciences in the United Kingdom.

The areas of good practice which were highlighted by the Royal Society of Biology included:

- ✓ A **positive learning environment** generated by the teaching & technical teams
- ✓ **Research-informed teaching**
- ✓ Providing **excellent pastoral care & academic advice** for students
- ✓ All students have the opportunities to design, project manage and carry out an **independent piece of biological research**; an opportunity that is not available to undergraduates at many other institutions
- ✓ Creating **highly employable graduates** with well-rounded knowledge and skills sets
- ✓ **Transferable skills** embedded into all our programmes, from problem solving, maths and physics, teamwork, creativity and communication skills

Single Honours graduates from these accredited courses will receive one year's free membership of the Royal Society of Biology at Associate level. Through their membership they have excellent opportunities to interact with researchers and industrial partners at events and regional activities. Associates also benefit from discounted rates for further training in the Biosciences and can apply for grants. This will further enhance their competitiveness on their chosen career path.



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Welcome to the Biological Sciences

At the Institute of Science & the Environment, we offer a range of biological courses, from our broad-based Biology award to more specialist awards such as Animal Biology, Human Biology, Biochemistry, Biomedical Sciences, Pharmacology, Forensics & Applied Biology and Human Nutrition.

We offer flexibility with your learning, where students can choose from a range of optional modules to build their degree, to combining awards in the programme to form Joint Honour degrees such as Joint Honours Human Nutrition & Human Biology. If you're not sure what branch of Biology interests you yet, you can switch between awards within the Biological Science programmes in your first and second years to make sure that your degree is right for you.

Some of our Biological Science degrees can also be combined with subjects outside the Biological Sciences programmes, such as Maths, Ecology or Psychology.

The University of Worcester's rapid growth over the last few years has given us the opportunity to invest significantly in our facilities, from a suite of new laboratories to new Bioscience equipment, enabling us to teach the most up-to-date techniques to our students.

We wish you every success for the future and hope that you will join us at the University of Worcester on our Biological Sciences programme.

Lorraine Weaver
Head of Biological Sciences

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Studying the Biological Sciences

Real world impact

With an established reputation for academic excellence, you will benefit from comprehensive course materials delivered by inspiring lecturers in stimulating learning environments. Our courses are backed up by the Institute of Science & the Environment's extensive collaborative research projects jointly undertaken with other universities, private industry and public sector organisations.

Sharing our passion for discovery

We share our passion for discovery to inspire and nurture the scientists of the future. Today's students deserve an increasingly personalised educational experience and we are able to offer flexible courses with a range of modules and teaching experiences designed to help you discover your individual talents. We equip our students for the future, whether you choose to pursue further research or other career paths. Professional and personal development is embedded in our courses, giving you the edge entering the world of work.

Career opportunities

Your time at university is an important investment in your future career potential. The employment prospects for Worcester graduates are excellent—94.9% of our students are in work or further study within six months of graduation. The combination of teaching methods and opportunities for skills development can really help you develop the qualities that today's graduate employers seek.

Explore an area of natural beauty

Our facilities are complemented by our natural surroundings. Worcestershire is an ideal location for scientific study. It has many green spaces, including the nearby Malvern Hills, which are designated a Site of Special Scientific Interest. The Wye River valley, the Forest of Dean and the Cotswolds are all within easy reach, whether for a relaxing day out or to use as areas of study.



Inspired teaching

We are committed to delivering high-quality teaching, which is why our lecturers are not only actively engaged in scientific research, but 93% also have teaching qualifications.

We use a range of learning and teaching methods, from lectures and seminars, to laboratory, computer and field practical classes. One of the strengths of our programme is a strong emphasis on practical activities, linking theory with practice and giving our students a strong skills-base.

In your first year you will also take dedicated study skills sessions to provide you with the skills you need to be successful in your degree and beyond.

We give our students the opportunity to design their final dissertation project from the ground up, planning it in the second year with the support of our specialist staff, and carrying it out in their third year. Students gain a host of relevant scientific and transferable skills, such as project management and communication of their research to others, through this unique and individual experience.

“I really enjoyed being at a smaller university with smaller class sizes, getting the attention of the professors and the support of the University and the staff.”

Tiffany Slater
Biology BSc (Hons)

Integrating our research with teaching

The Biological Science staff are committed to learning and teaching and much of their research is used to inform teaching. We have a passion for our subjects and would like to share this with you! Our relatively small class sizes help us to maintain a friendly and supportive learning environment.

“I believe that the excellent facilities, strong practical based content of the course and the enthusiasm and support that the staff give to students at Worcester gave me all of the skills that were needed to continue my studies as a PhD student.”

Chris Troth
Biology BSc (Hons)



Facilities & Resources

At Worcester, one of the many strengths of our programmes is a strong emphasis on practical learning, supported by excellent facilities and staff.

Biological Skills Development

Students on our Biological Sciences programmes develop a wide-ranging set of subject-specific and transferable practical skills. Unique to our programmes, we provide students with a Technical Skills Passport, recording progression and attainment of practical skill standards over the course of their degree. These passports provide students with evidence of their skills training and development for mock employment interviews in their second year and future graduate employment.

Teaching Laboratories

Within the Institute of Science and the Environment we have seven teaching laboratories, including a state-of-the-art £7m facility, the Charles Darwin laboratory, opened in September 2009 and three refurbished and extended laboratories opened in September 2015.

There is also a suite of student research laboratories in which students can work on their final-year Independent Study. In addition, instrument rooms housing specialist laboratory analytical equipment such as spectrophotometers, Gas Chromatograph UV/ IR spectrophotometers and atomic absorption spectrometers. These new facilities are establishing the University's status as one of the best learning environments in the UK.

“The University houses cutting-edge lab facilities, produces consistently high-quality research practical classes to help hone your own research skills and offers a diverse range of modules tailored to your own interests.”

Michael Mosley

Human Biology BSc (Hons)



Fieldtrips

There are numerous opportunities to undertake fieldwork as part of our courses, including optional residential field courses to Provence in the South of France and to South Africa. The flexibility of our courses also allows you to get involved in many half- or full-day trips to sites of regional and national importance in our wildlife-related modules. The University of Worcester is in close proximity to the Malvern Hills Area of Outstanding Natural Beauty (AONB) and less than an hour's drive from the Cotswold and Shropshire AONBs, allowing us to incorporate these important places for wildlife into our learning experiences. Our students also benefit from our close links to the Worcestershire Wildlife Trusts and their exceptional set of local reserves conserving important habitats and wildlife.

We have a range of fieldwork equipment, including mapping and survey grade GPS equipment, laser scanners and geophysical and hydrological equipment for ecological studies. In addition, we have a range of unmanned aerial vehicles (UAVs) and photographic equipment to take broad-scale measurements of the environment.



Personal equipment

There are some pieces of equipment you will need to provide which you will keep and use over the course of your degree. These include:

- ✓ A suitable Laboratory coat - there will be an opportunity to purchase one during induction week
- ✓ A calculator - preferably with basic statistical functions
- ✓ Appropriate fieldwork clothing; including waterproof jacket and trousers, wellington boots/walking boots and warm clothing including hat and gloves—depending on module choice



Employability

We're proud of our graduates and their outstanding employment record. 94.9% of our graduates go into work or further education within six months of graduating.

Skills development

All of our courses are very 'hands on' so you will be able to gain good practical skills and experience to enhance your employability. Practical skills are developed through laboratory work, local field trips, residential fieldwork and computer work, work experience and career planning.

You will also develop a wide range of transferable skills including written and oral communication skills, report writing, essays, data manipulation and analysis, fieldwork, laboratory work, computing skills, research techniques, teamwork and independent learning.

Gaining work experience

All undergraduates on Biological Science courses are encouraged to acquire relevant work experience alongside their studies. Some current students are undertaking volunteer work. The University has a Careers Advisory Services accessible by all students. For more information please visit their website at: www.worcester.ac.uk/careers

Careers opportunities

The course prepares you for a number of degree paths including scientific researcher within government, industry or medical institutions, nature conservation, a range of public sector work or a teaching career. Many of our students go on to further study through Masters or PhD degrees. See our Graduate Destinations section to find out what some of our recent graduates have gone on to do.

Module choice if you plan to progress to teaching

For some careers, a first degree is insufficient. For example, teaching requires a postgraduate qualification (PGCE). For students wishing to progress to a PGCE following their first degree we recommend that you follow the BSc Biology Award and take some Environmental Science or Biochemistry modules as optional modules. This will enable you to obtain a broad range of biologically related skills, along with a strong background in chemistry required for secondary level teaching.



Graduate destinations

Our courses prepare you to embark upon a range of graduate career paths, from scientific research, to teaching and industrial and public sector work.

Many of our graduates, enthused with the experience of carrying out research-informed practical classes and designing their own independent research project in their final year, choose to go on to Masters and PhD study.

Tiffany Slater, Biology BSc (Hons)

“The intimate learning environment at the University of Worcester allowed me the full support I needed to realise my full academic potential as an undergraduate. Aside from the brilliant professors, I enjoyed designing my final year project on a subject that I found most interesting. My time at the university gave me the lab skills and confidence that I needed to pursue my goals following graduation. I am now a PhD student at University College Cork, researching the preservation potential of pigmentation and keratin in fossil feathers.”



Michael Mosley, Human Biology BSc (Hons)

“During my final year at Worcester I successfully secured a highly competitive, fully funded, British Heart Foundation PhD studentship in Translational Health Sciences at the University of Bristol.

The real gem of Worcester resides in the patience and support provided by the academic staff. Their expertise and continual guidance helped develop the broad range of intellectual and practical skills required to perform to the highest standards in the real world. I am in no doubt whatsoever that without all their help I wouldn't be in the position I am today.”

Emily Morris, Biochemistry BSc (Hons)

“I now work in a clinical research organisation as a Clinical Systems Designer. The role allows me to see another side of clinical research before I hopefully start a PhD—however, I could make a very promising career here. It has allowed me to make good money and utilise skills and knowledge I acquired during my degree. I could not have got to where I am now without my Biochemistry degree.”



Supporting your learning

The University of Worcester has an Equal Opportunities Policy, together with equality schemes and action plans promoting equality in relation to race, disability, gender, age and sexual orientation. Progress in implementation is monitored by the Equality and Diversity Committee. The Disability and Dyslexia Service within Student Services provides specialist support on a one to one basis. The Institute also runs a unique Personal Demonstrator scheme to give specialist support to disabled students during practical work.

The following activities and documents have been put in place to provide support for all undergraduate students studying the Biological Sciences within the Institute of Science and the Environment:

Induction Programme

Biological Sciences students attend a week of Induction events at the start of the academic year. The programme for this may vary slightly from one year to the next, but involves inductions to the course and their personal academic tutors, introduction to key student ICT resources, the Student Online Environment (SOLE) and Blackboard, and social events to meet fellow students and staff. We teach sessions on core study skills as part of an extended induction programme linked to a mandatory module, allowing us to teach students these essential skills when they are needed rather than all at the beginning of the course.

“If it wasn’t for the support of the University and the staff and the time they have spent with me I wouldn’t have stayed as motivated and competitive as I have for the last three years .”

Tiffany Slater
Biology BSc (Hons)

Personal Academic Tutors

All students have a personal academic tutor who guides the process of Personal Development Planning (PDP) and offers general support. At Level 4 there is a full programme of meetings with particular emphasis on literacy skills and Personal Development Planning. In Levels 5 and 6, this individual support and guidance is continued and there remains an emphasis on personal development planning throughout the student’s course. At all levels, a key objective will be the application of the idea of ‘feed forward’; students gather feedback from the previous year/semester and review it with a tutor and/or peer group.

A particular focus of the academic tutor is to encourage Personal Development Planning so that students receive structured support in order to develop:

- ✓ Awareness of their own strengths and weaknesses
- ✓ A clear vision of what they want to achieve through HE study
- ✓ Greater understanding of how study in Biological Sciences at the University of Worcester can help them towards their goals
- ✓ Responsibility for their choices in modules, work and social life
- ✓ A reflective approach to all feedback they receive on their work
- ✓ A sense and a record of progression and achievement in their development of subject and generic skills and attributes.

The academic tutor will also respond to student requests for support and help with problems which affect academic work.

Information & Learning Services

Information and Learning Services (ILS) supports students and staff using library, IT and media services. ILS is based in The Hive, Europe's first joint university and public library and provides books, journals, online resources, IT and study spaces. Further information on ILS services can be found at: www.worc.ac.uk/ils

The Hive

Opened by Her Majesty the Queen in 2012, The Hive is an exceptional £60 million facility that has dramatically increased the learning resources, technology, study and social spaces available to University of Worcester students. With over a quarter of a million books and 12 miles of archive collections, The Hive is no ordinary library. The Hive is open from 8.30am to 10pm every day, excluding bank holidays.

Books and Journals

The Hive has an extensive collection of books and journals related to Biological Sciences programmes. Print-based journals are increasingly being made available online with a number of titles only available in this format. Resources Online provide students with access to their library record, the library catalogue and a range of online resources and full text journal articles.

Computers

There are 250 PCs in The Hive, located on all floors and the building is fully wireless. Computers can be pre-booked through the students' SOLE page. There are plenty of workstations with power points and WiFi access, so you can also use your own laptop. Additional 24-hour PC rooms are available in the Pierson Study and Guidance Centre at the St John's as well as the City Campus.

Support and Advice

Academic Liaison Librarians provide both formal and informal teaching sessions and workshops on information literacy, the valuable set of skills which enables students to search for, retrieve and organise information electively and ethically. Librarians also provide advice on the selection of resources and staff the enquiry service. They are available to help individuals or groups of students at any time during the course with regards to finding information or using ILS. A dedicated student enquiry desk is available at The Hive.



Students as partners

We work closely with our students, providing opportunities for them to enrich their degree course and their employability skills.

Course Representatives

The University of Worcester are committed to ensuring that students have opportunities to engage and influence their academic experience at all levels. Each course typically has two student Course Representatives, representing students' views from course level through to the Board of Governors. Working with staff and students at all levels, they make a positive contribution, influencing the quality of the learning experience for all our students.

“I have been elected as a Course Rep for my Biology BSc course, which means that I take issues concerning students and raise them at departmental meetings—it’s great that we have a way to voice our opinions.”

Amanda Townsend
Biology BSc (Hons) student

Personal Demonstrators

In each practical class we have a number of lecturers and technical staff to help students; however, some students need additional one-on-one support, which we provide with our Personal Demonstrator scheme. We interview and train students in the second and third years of their degree to act as Personal Demonstrators, giving them an additional source of income and extra skills to enhance their CVs.

Students As Partners Scheme

The students as partners scheme offers an opportunity for students to work with lecturers in the development of their own course whilst being paid. Projects that students have been involved in include the production of video resources demonstrating laboratory techniques, the development of computer practical sessions to illustrate the function of molecules in an interactive way and the analysis of the efficacy of using mobile phone technology for interaction in lectures.

Vacation Research Studentships

Our vacation research assistant studentships provide undergraduates and recent graduates with 'hands-on' experience of working on an existing research project over the summer vacation, enabling them to gain insight into a research career, as well as enhancing their CV.

“I am hoping to pursue a career in conservation; this project has given me the opportunity to experience of the combination of fieldwork, data collection and providing practical conservation management recommendations to partner organisations.”

Hope Moran

Animal Biology BSc (Hons) & Vacation Research Student



Environment & Sustainability

nus

Responsible Futures

Accredited institution

We take our sustainability responsibilities seriously and have achieved high recognition as a result.

- ✓ Ranked 5th out of 150 in the UK's greenest universities in the 2016 People & Planet University League.
- ✓ The first English University to achieve EcoCampus Platinum status in June 2010, and the second to gain ISO14001:2015 for all of our campuses.
- ✓ We achieved Responsible Futures accreditation from the NUS for our whole institution approach to social responsibility and sustainability.
- ✓ We have been Green Gown finalists in 8 categories over the last 3 years and winners for our bike loan scheme in 2014. The Green Gown Awards, run by the Environmental Association for Universities and Colleges (EAUC) recognise exceptional sustainability initiatives being undertaken in universities and colleges across the UK.
- ✓ International Green Apple Award winners for Environmental best practice 2017 for two of our projects: a city council and University recycling collaboration and Go Green Week initiative.
- ✓ We have been accredited with FairTrade status since 2008.
- ✓ Since 2007, the university has had an Environmental Management System (EMS) EcoCampus, to provide a framework for managing our environmental responsibilities efficiently in a way that is integrated into all our operations.



Bike loan scheme

Our bike loan scheme aims to promote cycling and reduce car use. For an annual fee of £20, you can hire a bike from any 24/7 University reception. In 2014, after being shortlisted for a record six categories in the 2014 Green Gown Awards, the University of Worcester was awarded the top prize in the facilities and services class for our cycle loan scheme. The scheme works together with a social enterprise where young people with learning disabilities can develop practical skills and increase their self-esteem by maintaining the loan bikes and managing the campus bike shop.

Course structure

The Biological Sciences programmes have three levels:

Level 4 = Year 1

Level 5 = Year 2

Level 6 = Year 3

At each level there are mandatory core modules along with optional modules, which allow you to tailor your degree to your specific interests and goals.

How does the modular degree programme work?

Our modular programme of study enables you to construct a pathway that reflects your own interests and career aspirations. A strong practical emphasis runs throughout all modules. Subject content is taught using active learning, problem-based learning and traditional approaches.

In the first year there are specific core modules for each award. In the second year, you will build on the theoretical and practical base established in the first year. In the third year you can specialise by selecting appropriate modules and completing an independent study on a topic derived from your own interests or associated with a tutor's research programme.

Modules that run during one semester of an academic year are generally 15 credit modules. Some modules are double (30 credit) modules running in both semesters 1 and 2 of the year. These allow for the development of skills and for intensive study of subjects particularly important to your chosen award. The third year Independent Study is also worth 30 credits.

Biological Science degree combinations

Our degrees are designed to be flexible, allowing you to specialise or keep your interests wider if you prefer.

The various awards are available in full and part-time modes. Students may study a subject as a single honours pathway where 120 credits in their chosen subject/award in year 1 (level 4). Students may also combine two subjects from different areas; for the Joint Honours Pathway students take two subjects approximately equally weighted and for the Major/Minor Honours Pathway the subjects are approx. 75%:25%. Students can take both of their subjects in the Biological Sciences e.g. Human Biology and Human Nutrition. Biology can be combined with courses outside the Biological Sciences areas but not those within it. Forensic and Applied Biology, Biochemistry, Biomedical Sciences and Pharmacology are Single Honours courses only and cannot be combined with any other subject.



"My degree pathway is specialised in Human Biology, however, the modular degree programme at the University of Worcester provided me with the opportunity to study a wide variety of modules including plant biology, nutrition and microbiology. This was great as it meant I could tailor my degree to my interests, it also gave me the flexibility to change direction whilst I was discovering new areas of interest."

Michelle Ager

BSc Human Biology (Hons)

"I really enjoy studying on a joint honours degree. I feel it has broadened the avenues that I could go down in the future. What I like about Worcester, is that there is a wealth of countryside surrounding the city, which provides many interesting field trips."

Becky Hilton

BSc Animal Biology & Ecology (Hons)

"I was never too sure about which field of Biology I wanted to specialise in and so I chose to study the broad Biology degree offered at the University of Worcester as I could select from a wide range of different modules to study. The combination of ecology and environmental topics along with the more cell and genetic-based topics provide an interesting and refreshing mix and has helped me to identify which field I would like to study further"

Rebecca Molland

BSc Biology (Hons)

BSc Biology (Hons)

UCAS Code:
C100

Biology is one of the most actively changing subjects in the sciences, with biologists constantly seeking solutions to the many challenges that shape our world.

At Worcester we engage with Biology at every level, from the molecular through to whole organisms and beyond to their relationships with each other and the wider environment.

In your first year you will develop a good understanding of living organisms and how they work. In Years 2 and 3 the modules become more specialised and the range of optional modules enables you to select those in which you are most interested or which will be most useful for your chosen career pathway. A strong practical emphasis runs throughout the course, which allows you to develop additional skills important for future employment.

In your final year you will undertake an Independent Study, which is a double module and allows you to carry out a piece of original research of your design. This part of the course was highly commended by the Royal Society of Biology during our rigorous accreditation, giving students the opportunity to develop desirable skills in independent project management and research. The second year module Project and Career Development in Year 2 helps you to design this project with tutor support. Past topics have included extraction and amplification of ancient DNA, examining the morphological and molecular relationships of early bullhead sharks using fossils and phylogenetics, determining how light affects the vision and behaviour of jumping spiders during hunting, and the antibacterial effects of domestic canine saliva against two potential pathogens.

“The BSc Biology degree is a really good mixture of lab, field and academic work. I am particularly interested in genetics and microbiology, but the Environmental Science module was one of my favourites.”

Amanda Townsend
BSc Biology (Hons) student



BSc Biology Module structure

Optional (free choice) module

*Subject to timetabling

Level 4	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 1200 Animal Diversity	
BIOS 1201 Cell Biology	
ENVS 1100 Introduction to Ecology	BIOS 1210 Comparative Animal Physiology
Option	Option
<p><u>Options include:</u> BIOS 1009 Introduction to Nutrition in Human; BIOS 1102 Introduction to Forensic Biology; BIOS 1205 Introduction to Biological Chemistry; BIOS 1203 Health & Disease; ENVS 1102 Basis of Biological Surveying; ARCH 1105 Human Origins; SUST 1001 Introduction to Sustainability; LANG Language Centre</p>	

Level 5	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 2200 Project & Career Development	
BIOS 2201 Molecular & Cellular Biology or BIOS 2202 Molecular Genetics & Conservation	
Option	BIOS 2040 Plant Biology
Option	Option
<p><u>Options include:</u> BIOS 2003 Work experience; BIOS 2010 Animal Behaviour; BIOS 2024 Infectious Agents & Allergens; BIOS 2104 Human Genetics; BIOS 2105 Medical Forensic Science; BIOS 2106 Human Systems Physiology; BIOS2107 Applied Human Metabolism; BIOS 2103 Animal Senses & Survival; BIOS 2302 Invertebrate Biology; BIOS 2023 Microbiology; ENVS 2104 Ecology of Fresh Waters; ENVS 2303 Field Techniques & Identification Skills</p>	

Level 6	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 3002 Independent Study (or BIOS 3001 as an independent study module carried out over one semester)	
BIOS 3041 Plant Development & Physiology	Option
Option	Option
Option	Option
<p><u>Options include:</u> BIOS 3003 Work experience (cannot be taken if BIOS 2003 was chosen at Level 5); BIOS 3010 Mammalian Reproduction; BIOS 3012 Animal Movement; BIOS 3052 Forensic DNA Analysis; BIOS 3106 Pharmacology; BIOS 3109 Genomics & Bioinformatics; BIOS 3110 Animal Welfare & Ethics; BIOS 3111 Extension module; BIOS 3112 Parasitology; BIOS 3113 The Biochemistry of Cancer; BIOS 3053 Bioindicators of Crime Reporting; ENVS 3100 Residential Ecology Field Trip (Provence); ENVS 3107 Zoo-based Conservation; ENVS 3117 International Biology Field Trip (South Africa)</p>	

BSc Biochemistry (Hons)

UCAS Code:
C700

Discover the molecular machinery that lies at the heart of the cell and drives all living organisms.

The BSc Biochemistry course provides a fascinating insight into the mechanics of life and the molecules that enable cells to grow, divide and become complex living organisms. The course is taught by a team of experienced lecturers with a passion for the subject reflected in their continuing research in biochemistry and molecular genetics.

By studying Biochemistry at the University of Worcester you will find yourself in a friendly, supportive and inspirational environment where we encourage you to achieve your full academic and personal potential. Our specialist equipment and our new laboratory facilities provide a stimulating environment in which to learn. All the modules that you take mix theory with practice enabling you to gain the hands on experience that will help you progress in a career in biochemical sciences.

In your first year you will study a wide range of subjects which will enable you to develop a comprehensive appreciation of biochemistry. In Years 2 and 3 the subjects you take become more specialised and the modular scheme enables you to tailor your course to the areas of biochemistry that you find most interesting. The modules reflect the diversity of the subject and explore such areas as molecular genetics, protein structure and function, immunology, microbiology and the molecular biology of cancer. The range of subjects will allow you to choose a wide variety of career pathways after your degree.

In your final year you will also have the opportunity of undertaking your own research project on a topic that interests you as part of your Independent Study or Biosciences Research Project. Past topics relating to Biochemistry have included association of matrix metalloproteinase genes with asthma, studying cellular interactions of oncoproteins, Regulation of Hedgehog Signalling by the potential protein interaction of Myc- Binding Protein (Mycbp) and suppressor of Fused (Sufu) and A putative peroxiredoxin role for the human cytosolic branched-chain aminotransferase.



BSc Biochemistry Module structure

Optional (free choice)
module

Level 4	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 1201 Cell Biology	
BIOS 1212 Introduction to Biological Chemistry & Genetics	
Option	BIOS 1010 Introduction to Human Anatomy & Physiology
Option	Option
<p><u>Options include:</u> BIOS 1203 Health & Disease; BIOS 1009 Introduction to Nutrition in Humans; BIOS 1210 Comparative Animal Physiology; BIOS 1100 Introduction to Sustainability; LANG Language Centre; SUST1001 Introduction to Sustainability</p>	

Level 5	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 2200 Project & Career Development	
BIOS 2201 Molecular & Cellular Biology	
BIOS 2111 Protein Structure & Function	BIOS 2110 Immunology
Option	Option
<p><u>Options include:</u> BIOS 2003 Work experience; BIOS 2023 Microbiology; BIOS 2040 Plant Biology; BIOS 2104 Human Genetics; BIOS 2106 Human Systems Physiology</p>	

Level 6	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 3002 Independent Study (or BIOS 3001 as an independent study module carried out over one semester)	
BIOS 3115 Metabolic Biochemistry	BIOS 3116 Clinical Biochemistry
Option	BIOS 3113 The Biochemistry of Cancer
Option	Option
<p><u>Options include:</u> BIOS 3003 Work experience; BIOS 3010 Mammalian Reproduction; BIOS 3041 Plant Development & Physiology; BIOS 3106 Pharmacology; BIOS 3109 Genomics & Bioinformatics; BIOS 3111 Extension module; BIOS 3114 Research Methods & Research Project</p>	

*Subject to timetabling

BSc Animal Biology (Hons)

From the phenomenon of evolution to our curiosity regarding animal behaviour, we have always found ourselves enthralled by the wonders of the animal kingdom.

Animal Biology explores this fascinating realm, from the functioning of a single cell to the processes that control reproduction and survival in complex organisms. At Worcester, Animal Biology has a strong practical emphasis, reflecting the discipline's increasing importance to our understanding of some of the major challenges facing society today, from the environmental and global agriculture to international economic dynamics. This applied approach also gives you the opportunity to develop a range of skills and expertise invaluable in future employment.

In the first year, the modules allow you to develop a comprehensive understanding of the key elements of Animal Biology. In Years 2 and 3 the subjects become more specialised and our modular scheme allows you to focus on the aspects of animal life which you find most interesting, ranging from genomics through to animal physiology and behaviour.

In your final year you will undertake an Independent Study on a subject of your choice, having been well prepared for this by the Project and Career Development module in Year 2. Past studies have included topics such as bird movements across woodland transition zones in winter, the effectiveness of predator odours as rodent repellents, and the factors influencing the migration of the common toad.

Fieldwork is an important part of your learning experience at Worcester in all years, from half- to full-day trips to optional residential field courses.

“I am so grateful for the people and support I have received from Worcester even years after graduating!”

Victoria Gehrke

BSc Animal Biology & Ecology (Hons)



BSc Animal Biology Module structure

Level 4	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 1200 Animal Diversity	
BIOS 1201 Cell Biology	
ENVS 1100 Introduction to Ecology	BIOS 1210 Comparative Animal Physiology
Option	Option
<p><u>Options include:</u> ENVS 1102 Basis of Biological Surveying (highly recommended); BIOS 1205 Introduction to Biological Chemistry; BIOS 1203 Health & Disease; ARCH 1105 Human Origins; SUST 1001 Introduction to Sustainability; LANG Language Centre;</p>	
Level 5	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 2200 Project & Career Development	
BIOS 2201 Molecular Genetics & Conservation	
Option	Option
Option	Option
<p><u>Options include:</u> BIOS 2003 Work experience; BIOS 2010 Animal Behaviour; BIOS 2023 Microbiology; BIOS 2024 Infectious Agents & Allergens; BIOS 2103 Animal Senses & Survival; BIOS 2302 Invertebrate Biology; BIOS 2302 Field techniques & identification skills; ENVS 2104 Ecology of Fresh Waters</p>	
Level 6	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 3002 Independent Study (or BIOS 3001 as an independent study module carried out over one semester)	
BIOS 3107 Physiological Ecology	BIOS 3014 Behavioural Ecology
Option	Option
Option	Option
<p><u>Options include:</u> BIOS 3003 Work experience (cannot be taken if BIOS 2003 has been chosen at Level 5); BIOS 3010 Mammalian Reproduction; BIOS 3012 Animal Movement; BIOS 3109 Genomics & Bioinformatics; BIOS 3110 Animal Welfare & Ethics; BIOS 3112 Parasitology; ENVS 3107 Zoo-based Conservation; ENVS 3100 Residential Ecology Field Trip (Provence); ENVS 3117 International Biology Field Trip (South Africa)</p>	

BSc Human Biology

(Hons)

We are living through an age of unprecedented scientific discovery, with the mapping of the human genome and the potential of stem cell research revolutionising our understanding of how our bodies work. By studying Human Biology at Worcester, you can help shape this future.

As a Human Biologist, you will be able to develop a wide range of intellectual, practical and social skills which are much in demand by employers, from primary research skills, communication skills and technical skills such as the use of DNA technology. Our graduates go on to career paths in research, in clinical and research laboratories, such as with the Wellcome Trust Sanger Institute, and into post-graduate medicine.

In your first year you will develop a comprehensive understanding of the structure and functions of living organisms. In Years 2 and 3 the modules become more specialised. Subjects central to Human Biology such as Cell Biology are delivered in double modules to allow for suitable development of the subject and for the delivery of important subject specific and generic skills.

In your final year you will undertake an Independent Study, which is a double module and must demonstrate original data. The Independent Study will have designed in the Project and Career Development module in Year 2. Past topics have included amplification of ancient human DNA, the relationship between the ACTN3 gene, 577 SNP allele variations and speed/strength performance phenotypes, the effect of televised sport on blood pressure and heart rate, and the antimicrobial effects of curry spices.

“I started off doing the broad Biology BSc, but I changed my pathway as I discovered which areas I found particularly interesting. That’s the amazing thing about the course you study so many diverse topics, from genetics to microbiology, but you still study in depth, with a strong practical element.”

Jade Osborne
BSc Human Biology (Hons) student



BSc Human Biology Module structure

Level 4	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 1201 Cell Biology	
BIOS 1203 Health & Disease	
Option	BIOS 1010 Human Anatomy & Physiology
Option	Option
<p><u>Options include:</u> BIOS 1009 Introduction to Nutrition; BIOS 1102 Introduction to Forensic Biology; BIOS 1200 Animal Diversity (30 credits over both semesters); BIOS 1205 Introduction to Biological Chemistry; BIOS 1210 Comparative Animal Physiology; ARCH 1105 Human Origins; SUST 1001 Introduction to Sustainability; LANG Language Centre</p>	

Level 5	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 2106 Human Systems Physiology	
BIOS 2200 Project & Career Development	
Option	BIOS 2104 Human Genetics
Option	Option
<p><u>Options include:</u> BIOS 2003 Work experience; BIOS 2023 Microbiology; BIOS 2024 Infectious Agents & Allergens; BIOS 2100 Molecular Genetics; BIOS 2105 Medical Forensic Science; BIOS 2107 Applied Human Metabolism; BIOS 2201 Molecular & Cellular Biology</p>	

Level 6	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 3002 Independent Study (or BIOS 3001 as an independent study module carried out over one semester)	
BIOS 3107 Human Systems Physiology II	
BIOS 3010 Mammalian Reproduction	Option
Option	Option
<p><u>Options include:</u> BIOS 3003 Work experience (cannot be taken if BIOS 2003 has been chosen at Level 5); BIOS 3012 Animal Movement; BIOS 3052 Forensic DNA Analysis; BIOS 3053 Biological Indicators for Crime Reporting; BIOS 3106 Pharmacology; BIOS 3109 Genomics & Bioinformatics; BIOS 3112 Parasitology; BIOS 3113 The Biochemistry of Cancer</p>	

Admissions policy

The University aims to be accessible; it is committed to widening participation and encouraging diversity in the student population. The Institute of Science and the Environment works closely with central student support services, including the Admissions Office, the Equal Opportunities Centre and the International Centre, to support students from a variety of backgrounds. We actively encourage and welcome people from the widest range of economic and cultural backgrounds, and value the contribution of mature learners.

Entry requirements for Biology BSc, Animal Biology BSc and Human Biology BSc

96 UCAS Tariff points MUST include A level Biology and A level in another science, maths or statistics.

104 UCAS Tariff points MUST include A level Biology

Other qualifications will be taken into account when considering your application, typical BTEC entry would be DMM.

If your qualifications are not listed, please contact the Admissions Office for advice on 01905 855111 or email admissions@worc.ac.uk for advice.

Further information about the UCAS Tariff can be obtained from <http://www.ucas.com/>

Entry requirements for Biochemistry BSc

96 UCAS Tariff points MUST include A level Chemistry, Biology and another science, maths or statistics.

104 UCAS Tariff points MUST include A level Chemistry and Biology

Other qualifications will be taken into account when considering your application, typical BTEC entry would be DMM.

If your qualifications are not listed, please contact the Admissions Office for advice on 01905 855111 or email admissions@worc.ac.uk for advice.

Further information about the UCAS Tariff can be obtained from <http://www.ucas.com/>

The University will also consider applications from candidates holding qualifications outside the UCAS Tariff, including those awarded by professional bodies and overseas qualifications (including the European Baccalaureate).

This Institution is committed to ensuring that disabled people, including those with specific learning difficulties and/or mental health difficulties are treated fairly. Reasonable adjustments to provision will be made to ensure that disabled students and other disabled people are not disadvantaged. Please contact the Admissions Office for advice.

Mature Students

University of Worcester values diversity in its student body and students over the age of 21 are very welcome. If you fulfil the standard entry requirements as detailed above, please apply through UCAS.

Students with few or no formal qualifications are asked to contact the Admissions Office (01905 855111) with details of their age, any work they have undertaken, including caring or organised voluntary work, and any other relevant experience and/or qualifications gained since leaving school. An advisory interview will be arranged to discuss possible options. These options include an Access course or Foundation Year at a local Further Education College or an Exploratory Essay and interview, where appropriate.



Integrated Masters

MBiol Biochemistry (C7C2)

MBiol Biology (C1C1)

MBiol Animal Biology (C1C3)

MBiol Human Biology (CC11)



Many of our Biological Science awards are also available as four-year integrated masters courses aimed at developing the skills needs for a career in pure or applied research (e.g. PhD study or working in industry).

It is becoming increasingly difficult for graduates to obtain PhD positions with only a BSc degree. Graduates with an Integrated Masters degree would have significant additional research expertise that would enable them to progress straight to an MPhil/PhD position. There is an increasing need for graduates in the UK economy as skilled researchers for UK PLC. Such graduates have much to offer within the general area of applied biological research but also, critically, to drive forward the innovation that is vital for the UK economy.

For the first three years you will follow the same modules as students on the BSc courses, which offer excellent practical hands-on experience in these areas. During the 4th (masters) year you will undertake a very research oriented programme which will take full advantage of the academic and commercial research expertise within the department. Each year four modules offer a diet of techniques tailored to your particular area of study. The programme offers the unique opportunity to gain experience in approaches to applied commercial research in our Charles Darwin research facilities. You will have the option to move to one of our three year BSc programmes should the need arise.

Our integrated masters programmes may be for you if you want to:-

- ✓ Learn more about the latest technologies that are driving pure and applied biosciences research
- ✓ Learn about Biological Sciences research and its importance and application to solve problems encountered in industry.
- ✓ Gain extensive practical experience and knowledge by working with academic and technical experts
- ✓ Obtain a valuable postgraduate qualification
- ✓ Enhance your chances when applying for scientific jobs or a PhD degree

Entry qualifications are the same as those given for the BSc courses on page 23.

Integrated Masters module structure (Level 7)

For the first three years you will follow the same modules as students on the relevant BSc (Hons) course, which provide a fantastic knowledge and skills base for your research-orientated Masters year.

In their final year, students undertake a project related to their discipline and to one of the biologically-related research areas in the Institute of Science & the Environment. In the first semester, students gain additional training and experience in research methods relevant to their specialism, and gain valuable insights into applied and commercial research with our integrated Commercial Scientific Services Team.

Level 7 (Masters Year)	
Semester 1 (Autumn)	Semester 2 (Spring)
BIOS 4001 Research Methods (30 credits)	BIOS 4003/4/5/6 Integrated Masters Dissertation (45 credits)
BIOS 4003/4/5/6 Integrated Masters Dissertation (15 credits)	
BIOS 4002 Applied & Commercial Research (30 credits)	

BIOS 4001 Research Methods

This module provides flexible support and training to the Integrated Masters Dissertation project, allowing you to tailor your degree to your chosen specialism. Here are just a few examples of the research methods training we can offer you:

- ✓ Physical techniques such as Mass Spectrometry, Atomic Absorption technology and gas chromatography
- ✓ Technologies employed in clinical testing of blood and urine
- ✓ Immunochemical techniques, including the production and testing of monoclonal antibodies.
- ✓ Analysis of big data sets such as animal or meteorological datasets using our High Performance Computing Facility
- ✓ DNA fingerprinting for criminal investigation, population studies and paternity analysis.
- ✓ Advanced protein handling techniques, including over-expression in *E. coli* and purification using a range of preparative methods.
- ✓ Advanced bioinformatics & genomics
- ✓ Advanced microscopy and imaging including the use of fluorescence and inverted microscopy.
- ✓ Advanced field identification skills for animals and plants.
- ✓ Population monitoring and analysis for animal populations, including freshwater invertebrates and mammal camera trapping.
- ✓ Animal and plant tissue culture methods
- ✓ Plant genetic engineering techniques
- ✓ Use of remote sensing, GPS and GIS technologies for spatial or meteorological modelling.
- ✓ Image capture and analysis using Unmanned Aerial Vehicles (UAVs)
- ✓ Air sampling technologies including land-based and UAV-linked methods
- ✓ Water sampling and monitoring techniques
- ✓ Animal and plant tissue culture methods

BIOS 4002 Applied & Commercial Research

This unique module offers students valuable insights, training and experience of applied and commercial research.

Our Commercial Scientific Services Team, in partnership with the Business School, will teach students the skills they need to develop scientific methods transferable to the commercial world. The module will cover business planning, entrepreneurship, project management and accreditation, while giving students the opportunity to develop a business model in groups. According to the degree subject specialism, topics may include clinical trials, product testing, microbiological testing and forensics.

Commercial Scientific Services

With over ten years' experience in bespoke commercial scientific testing, we provide services that businesses need. We are an integrated group of scientific experts within the academic research team at the University of Worcester. Our work includes a range of commercial testing and research either offered as standardised procedures or as a research platform working with the client to develop bespoke products.

We work with local, national and sometimes international businesses and manufacturers, specialising in:

- ✓ Product testing, such as testing commercial products for allergen reduction.
- ✓ Pollen monitoring via morphological identification and ELISA assay.
- ✓ Antibody production for diagnostic systems.
- ✓ Multiplex assay development for species identification using antibody or oligonucleotide probes.
- ✓ DNA analysis using qPCR.
- ✓ Allergen research

We conduct routine test work, including particulate monitoring, allergen level testing, routine assays for fungal spore, pollen and house mite dust, microbiological monitoring, and GCMS assessment on extracted air samples.

We have a range of laboratories for microbiology, molecular prep and diagnostics, processing, and molecular work. We also have an environmental test chamber; this is used for a variety of research and commercial work, such as product testing and clinical trials.



BIOS 4003/4/5/6 Integrated Masters Dissertation

Students will undertake a project related to their discipline linked to one of our Biological Science research areas in the Institute of Science & the Environment. The project can be lab- or field-based, involve pure, applied or commercial research and could also take place at a commercial or voluntary organisation.

On the following pages there is information on four of our research groups at the Institute of Science & Environment, so you can see what exciting research fields you can get involved in!

Supporting student research

Many of our students aim to go into scientific research. In addition to the training integral to their degree programme, we also help them to apply for external funding for their own research projects.

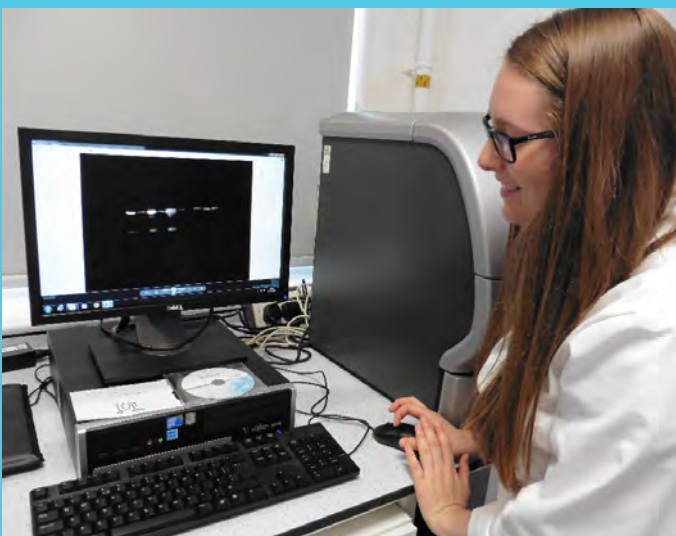
Kayleigh Cruickshank

Kayleigh was awarded a **Biochemical Society Summer Vacation Studentship** with Dr Amy Cherry at the University of Worcester to study the Hedgehog signalling pathway components and proteins associated with Acute Myeloid Leukaemia.

You can read about what was involved in her studentship in her blog:
<http://kayleighcruickshank.blogspot.co.uk/>

Tiffany Slater

Tiffany was awarded a **Palaeontological Association Undergraduate Research Bursary** to study the relationships of early bullhead sharks with Dr Kate Ashbrook at the University of Worcester and Professor Jürgen Kriwet at the University of Vienna. Tiffany travelled to Austria and Germany to collect data from specimens housed in the University of Vienna and Museum für Naturkunde Berlin. Her research led to the description of a new species of bullhead shark, which was published by the Paleontological Association.



Aerobiology Research

We produce and supply the pollen forecasts for the UK in conjunction with the Met Office in our specialist research unit situated in the Charles Darwin Research Laboratories.

We carry out research, teaching and commercial activities from aerobiology to agriculture, atmospheric sciences and microbiology. Our topics of research include airborne pollen, fungal spores and chemicals, as well as crop pathogens and plant diseases.

We have been producing pollen forecasts at the University of Worcester for more than two decades in partnership with the Met Office, which has led to our research specialisms in hay fever (allergic rhinitis) and other allergic responses. Such research has informed allergy control product testing, giving our work commercial impact. The products we test are designed to remove or weaken the effects of allergens, helping allergy sufferers to relieve their symptoms in their own homes.



The research conducted here is supported by the University of Worcester, UK Research Councils (BBSRC and NERC) and the European Union. Our research continues to improve the quality of life for hayfever sufferers and improve crop protection against plant diseases. We have also translated our high-level research into practice, through advising governmental boards and the daily pollen forecasts.

Our undergraduate and postgraduate opportunities enable our students and researchers to explore real world biological problems in society. We use modern technology, such as controlled environment chambers, novel detection technology and a high performance computing facility for environmental simulation to carry out world-leading research and deliver high-quality teaching in Biological Sciences.



Professor Carsten Skjøth

Professor Skjøth's research focusses around aeroallergens and agricultural air quality. The main research questions are related to the exchange between atmosphere and the vegetation/surface and how meteorology affects this exchange and later the concentration of the species in the atmosphere. The studies species includes pollen (e.g. birch, grasses, ragweed) fungal spores (e.g. *Alternaria* and *Cladosporium*), pathogens and air pollutants, especially ammonia. The research is typically carried out by combining ground based observations (e.g. pollen, fungal spores or ammonia) with mathematical models and data obtained through remote sensing and drones.

Ecology & Environmental Research

The Ecology & Environmental Research Group (EERG) focuses on two complementary research themes: Wildlife Management and the delivery of Ecosystem Services within the farmed landscape.

As a group, we develop research programmes that not only bring about significant environmental benefits, but also benefits that have cultural, economic and societal impact. This is achieved through engagement with local and national stakeholders and the promotion of knowledge exchange.

Wildlife Management

This research theme is focused on the conservation and management of species and their interactions with the environment, including a number of research strands: 1) habitat and species management for conservation; 2) management of problematic species and their impacts; and 3) the use and development of eDNA techniques for species detection and monitoring.

Ecosystem Service Delivery

Agricultural intensification has been highly effective at increasing food production, but this has been coupled with land use change and the loss of semi-natural habitat. Consequently, there is now an imbalance in the ecosystem services required to support production. For example, due to habitat loss within agricultural landscapes, farmers are becoming increasingly reliant on the use of managed pollinators (including honey bees, solitary bees, and bumblebees) and Plant Protection Products (PPPs) to increase yields. However, these approaches are not deemed sustainable as they fail to address the underlying drivers of change. We aim to develop evidence-based solutions to support agricultural production.

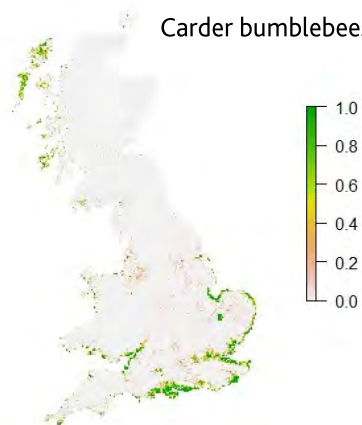
Camera-trapping Wild boar in the Forest of Dean



Alice Mockford, a PhD student studying ecosystem service delivery in Spanish orange groves.



Predicted distribution of Shril Carder bumblebees



Bumblebee populations have declined dramatically in the UK, with two species going extinct since 1940. Dr Kate Ashbrook's research, in collaboration with the Bumblebee Conservation Trust, focuses on using statistical modelling to develop evidence-based conservation management strategies to protect and conserve our most threatened species.

Biomedical Research

We aim to promote multi-disciplinary Biomedical Science research, fostering collaborations between staff, students and local organisations to address the major health issues of our time.

Building sustainable societies through research into disease prevention, medical treatments and diagnostics, lies at the heart of the Worcester Biomedical Research Group ethos. We aim to achieve this goal through basic and translational Biomedical Research with a particular focus on cancer, cardiovascular disease and neurodegeneration.



From left to right: Mr James Hillier (PhD student), Dr Alex Wadley, Dr Steve Coles and Dr Allain Bueno.

Neurodegeneration

Dr Allain Bueno's research aims to understand the complex cellular processes that lead to the development of neurodegeneration such as Alzheimer's disease. Through greater understanding of how nutrition affects important cellular components, such as membrane lipid composition and how this contributes to neuronal cell function and survival, we hope to improve Alzheimer's disease prevention and treatment.

Cancer research

Dr Steve Coles' and Dr Amy Cherry's research focuses on the biochemical mechanisms underpinning cancers, from the role of metabolic enzymes to the molecular basis of regulation in the signalling pathways causing this cancer. Greater understanding of these mechanisms can lead to the discovery of new and more effective treatment strategies for cancer.



Acute Myeloid Leukaemia is an aggressive blood cancer caused by the proliferation of immature myeloid cells. Dr Steve Coles' research focuses on the role of the immune system in the treatment of this cancer, specifically how Natural Killer Cells kill cancerous cells and what biochemical mechanisms they may use to resist being killed.



Ellen Joyce, a PhD student in the Biomedical Research Group, studies molecular pathways in neurodegeneration.



Dr Amy Cherry's research focuses on the role of protein structure in disease. She studies proteins involved in the hedgehog signalling pathway which send messages to cells, telling them to grow and divide. When these proteins are overactive they can cause many types of cancer and can be used as targets for the development of anticancer treatments.

Pedagogical Research

The University of Worcester aims to provide high-quality and inclusive teaching. Our research focuses on developing novel ways to engage learners as they progress through their degree.

Our commitment to high-quality teaching and supporting activities was highly commended by the Royal Society for Biology during the rigorous process of receiving accreditation. From the development of the Technical Skills Passport, enhancing graduate employability to mandatory one-to-one Personal Academic Tutorials, giving each student individual support and guidance, our pedagogic research aims to improve learners' engagement with their studies.

Our pedagogic research has also revolutionised how we teach first-year students in the Biological Sciences; we provide an extended induction so that learners are taught study skills as and when they require them through the first year of their degree. Our teaching incorporates the latest developments in Technology-Enhanced Learning, integrating technology into the classroom to assess students' understanding and provide feedback. We also use an online platform for sharing learning materials, which incorporates online activities, allowing learning to be undertaken at a time, location and at the pace of our students' choosing.

Bioinformatics brings together Biology, Mathematics and Computer Science, to analyse and interpret biological data, producing some of the most exciting scientific discoveries in the last decade. To engage A-Level students, we developed an e-book for teaching evolution using some of the tools of this fast-paced research area.

One of the leading undergraduate textbooks for Biological Science students, 'Research methods for the Biosciences' was written by several of our institute staff, led by Dr Debbie Holmes. Developed from their extensive teaching experience of undergraduate teaching in research project design and statistical methods, it is now in its third edition with Oxford University Press.

We also aim to encourage children and adults from all backgrounds in engaging with STEM subjects. As an institute, many of our staff are STEM Ambassadors, engaging young people with interactive STEM activities around Worcestershire and beyond. This has included developing a science-themed play which tours schools and colleges, enhancing participation in science.

We were successfully awarded accreditation for our Biological Science degrees in June 2017.



Notes... 

Notes... 



worcester.ac.uk

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Twitter: [@UoWBiology](https://twitter.com/UoWBiology)

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