The University of Nottingham

UNITED KINGDOM · CHINA · MALAYSIA

School of Biosciences

Exchange Students/Study Abroad

2016-2017

Module Handbook

Please note that all of the information given in this Student Course Handbook was correct at the time of going to press; Schools reserve the right to amend course structures or information and amend, substitute or withdraw modules detailed in this publication. Comments or feedback on the contents of this handbook are welcome, and will be used in the revised edition for 2017-2018. Any comments concerning this publication should be addressed to Kathy Wilson (Programme Manager) at the Sutton Bonington Campus or e-mail Kathy.Wilson@Nottingham.ac.uk.

This handbook is available in alternative formats. Please contact Kathy Wilson by emailing Kathy.Wilson@Nottingham.ac.uk or the Student Services Centre at the Sutton Bonington Campus to request an alternative format.

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Term dates

Autumn Term
Monday 26 September 2016 – Friday 16 December 2016

Spring Term
Monday 16 January 2017 – Friday 7 April 2017

Summer Term
Monday 8 May 2017 – Friday 23 June 2017

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Autumn Semester
Monday 26 September 2016 – Saturday 28 January 2017

Spring Semester
Monday 30 January 2017 – Friday 23 June 2017

Exam dates

Autumn semester
Monday 16 January 2017 to Saturday 28 January 2017 – including Saturday 21 January 2017

Spring semester
Monday 22 May 2017 to Saturday 10 June 2017 – including Saturday 27 May and 3 June 2017

Late summer resits
Monday 21 August 2017 to Wednesday 30 August 2017 – excluding Saturday 26 August 2017

2 Course Handbook

This Manual is designed to give you all the information you need to allow you to progress your studies at Nottingham. It describes the various procedures and practices that are in place which are designed to help you achieve your goals. From time to time these have to be changed to meet new requirements put upon us by the University and changes are also made based on student opinion. Therefore at any time if you have a positive suggestion, which can bring about some improvement in what we do, please bring these to the attention of the Student Guild who are represented on a number of School Committees.

3 The School of Biosciences

The School of Biosciences is part of the Faculty of Science and is based mainly on the Sutton Bonington campus; the BSc/MSci Environmental Science and BSc Environmental Biology degrees are located at the University Park campus.

The School of Biosciences has over 80 academic members of staff, 895 undergraduate students and about 550 research and taught postgraduate students. Academic staff are allotted to one of 5 Divisions which reflect specific areas of teaching and research; Agricultural and Environmental Sciences, Animal Sciences, Food Sciences, Nutritional Sciences and Plant and Crop Sciences.

You can find full and detailed information about the School and its staff on our Website – www.nottingham.ac.uk/Biosciences

4 Advice

One of the first people you will meet is your Personal Tutor. Your Personal Tutor will be a member of academic staff with whom you have regular meetings, sometimes as part of a group. Your Tutor is there to give you help and support in person as well as guidance in academic matters. You should make every effort to establish a good relationship. Your Tutor will provide you with advice and details of your exam performance so it is essential that you discuss your progress, in confidence, with him/her at regular intervals.

Here are a few pieces of free advice; they come from fellow undergraduate students and from academic staff who helped us prepare this document.

- Most lecturers teach at a faster pace than you may be used to from school or college.
- Develop good note taking skills early in your university career.
- Lectures are progressive, i.e. each one builds on the last. Missing lectures is therefore dangerous, as is ignoring things that you didn't fully understand at the time.
- Module Conveners may issue a book list. Check with academic staff and 2nd and 3rd year students which are the most valuable to buy. You may not be able to afford them all. Books on your reading lists can be borrowed from the Libraries.
- You should expect to work outside of class time. This may include reading, rewriting your notes, doing coursework, writing reports, etc.
- Don't be afraid of asking questions in lectures. Lecturers like to know that students are following what they are saying. The question you ask may be exactly what other students were wondering but were afraid to ask. Most lecturers will provide opportunities for questions. You can also ask for help outside of lecture time.

- Don’t be afraid to approach staff for help. Their offices are accessible to you and they have telephones and email. They are busy people but a large part of their work involves dealing with students. Please see “office hours” section for further details of how to make appointments with academic staff.
- Make use of their time, advice, experience and expertise.
- Remember that activities continue after the exams and that you are required to remain at the University until the end of each semester.
- Never hesitate to see the lecturer if you are having difficulty with his / her module or don’t understand why you were given a particular mark
- Handing in coursework late means losing marks. 5% will be lost for every working day late.
- The School has a Learning Community Forum with staff and student representatives from each year. Use this system to make constructive comments about your course.
- If you become ill and have to miss more than a couple of days, or a coursework deadline, or if your performance in an exam is affected, go to see your tutor and complete an Extenuating Circumstances Form and on the website: http://www.nottingham.ac.uk/academicservices/currentstudents/examinations/extenuatingcircumstances.asp
- Missing an exam for any reason is extremely serious and should be avoided if at all possible. Let your Tutor know IMMEDIATELY and complete an extenuating circumstances form available as above.
- Check your email daily and Moodle updates; otherwise you may miss vital information.

5 Student Commitment

Students are expected to access their e-mail accounts regularly as this is the main means of communication. Please do not use any other personal email account which you may have for communication within the University. If you do, you risk losing out on important information

You are required to:

- **Read** this handbook and other documents referred to so that you are clear about the structure of your degree course and what is expected of you.
- **Abide** by University Ordinances, Regulations and other codes of practice (e.g. Computing, Safety etc.).
- Read **notices** placed on official notice boards, these provide an important primary channel of general communication and may advertise such information as re-arrangements to the teaching timetable.

  It is wise to carry a diary in which to note appointments with tutors, module conveners, course diary, etc.

6 Your School and Your Studies

Teaching Staff - Lecturers are responsible for teaching components of modules and for setting and marking assignments and examinations.

Each module has a **Convener** who is responsible for its organisation. At the start of the module, the Convener will issue to each student a document describing its aims, content, objectives, transferable skills, methods of assessment, dates for submission and return of coursework and penalties for late submission. Students will be given coursework turnaround details. S/he will also conduct a feedback exercise at the end of the module to gauge student opinion.

Each course has a **Course Director**, responsible for overseeing its structure and smooth running. The Course Director ensures balance between modules and liaises regularly with other staff to ensure that appropriate teaching and learning are provided. The **Course Directors** are directly responsible to the **Assistant Pro-Vice-Chancellor for Teaching and Learning** for ensuring that all levels of the teaching management structure operate efficiently. They should be notified of any significant problems. **Heads of Division** are ultimately responsible for the services provided by their staff.

The **Assistant Pro-Vice-Chancellor for Teaching and Learning** overseas the organisation and management of teaching across the School.

The **Semester 1 Tutor** is responsible for maintaining a balance of work between the core Semester 1 modules. S/he appoints student representatives and holds meetings at which any matters which students may wish to raise can be discussed. Don’t be afraid to make your views known!

A list of the staff who hold these positions are included in this handbook (see Staff Roles section). Students should feel able to approach any of them with concerns they may have about aspects of their education. Your Personal Tutor can advise you and make the appropriate contacts.

7 Staff Roles

Role In School	**Staff Member**	**Location** *See key at end of table*	**Tel**	**Email @nottingham.ac.uk**
Head of School	Prof Simon Langley-Evans	MB	16139	Simon.langley-evans
Head of Operations	Dr Sarah Johnson	MB	16000	sarah.johnson
PA to Head of School and School Manager (Academic Administration)	Ms Susan Blencowe	MB	16010	susan.blencowe
Sutton Bonington Programme Manager	Ms K J Wilson	Barn	86501	kathy.wilson
Sutton Bonington Manager	Miss Helen Wells	Barn	86504	helen.wells
4-Year Degree Tutor (Euro. Cert.)	Rachel Jessop	BBSB	16162	Rachel.jessop
Marketing Manager	TBC			
Sutton Bonington Programme Administration	Mrs Gill Fox	Barn	86501	gillian.fox
IT Support Officer	Mr Dave Walters	JCG	16511	Dave.walters
U21 Co-ordinator	Rachel Jessop	BBSB	16162	Rachel.jessop
Sutton Bonington Administrator	Mrs E Staves	Barn	86504	elena.staves
Sutton Bonington Senior Administrator	Mrs L Eaves	Barn	86508	linda.eaves

Building Locations

BBSB = Bioenergy and Brewing Science Building
GB = Gateway Building
MB – Main Building
SL = South Lab Building
SO = School Office, Main Building
JCG = James Cameron Gifford Library

Heads of Division	**Name**	**Building** *See key at end of table*	**Tel**	**Email @nottingham.ac.uk**
Animal Sciences	Prof P Garnsworthy	SL	16065	phil.garnsworthy
Agricultural and Environmental Sciences	Prof S Mooney	GB	16257	Sacha.mooney
Food Sciences	Prof Tim Foster	FS	16246	Tim.foster
Nutritional Sciences	Prof Andy Salter	NL	16120	Andy.salter
Plant and Crop Sciences	Prof M Holdsworth	PCS	16323	mike.holdsworth

Key Roles	**Name**	**Building**	**Tel**	**Email @nottingham.ac.uk**
Warden Bonington Hall	Dr Ian Hardy	SL	16052	ian.hardy
Senior Tutors	Prof Martin Luck Dr Liz Bailey	SL	16309 16255	martin.luck liz.bailey
Semester 1 Tutor	Dr Kevin Pyke	PCS	13216	kevin.pyke
Exam. Officer	Dr Matthew Elmes	NL	16183	matthew.j.elmes
Biosciences Director of Learning and Teaching	Dr Fiona McCullough	NL	16118	fiona.mccullough
Study Abroad Coordinator	Dr Marcus Alcocer	NL	16103	Marcus.alcocer
Malaysia School Coordinator	Dr Marcus Alcocer	NL	16103	Marcus.alcocer
Global Programmes Officer (U21/University-wide, Erasmus)	Mrs Rachel Jessop	BBSB	16162	Rachel.Jessop
School Placement Team	Dr Judith Wayte Mrs Rachel Jessop	BioB	16171 16162	judith.wayte Rachel.jessop

Building Locations

BioB = Bioenergy Building
FS = Food Sciences
GB = Gateway Building
NL – North Lab
PCS= Plant and Crop Sciences
SL = South Lab Building

Course Directors	**Name**	**Building** *See key at end of table*	**Tel**	**Email @nottingham.ac.uk**
Agriculture Agricultural and Crop Science Agricultural and Environmental Science Agricultural and Livestock International Agricultural Science	Prof P Wilson	SL	16075	paul.wilson
Animal Science	Dr D Sweetman	SL	16019	Dylan.sweetman
Applied Biology & Biotechnology	Dr Nagamani Bora (Mani)	PCS	TBC	Nagamani.Bora
Environmental Biology	Dr Ruth Blunt	Gateway Building, SB, or B47, Life Sciences, UP	16288	Ruth.blunt
Environmental Science	Dr Ruth Blunt	Gateway Building, SB, or B47, Life Sciences, UP	16288	Ruth.blunt
Food Science & Nutrition and Food Science	Dr D Gray	FS	16147	david.gray
Microbiology	Dr J Hobman	FS	16166	Jon.hobman
Master of Nutrition and Dietetics	Dr F McCullough	NL	16118	fiona.mccullough
Nutrition	Dr P Jethwa	NL	16604	preeti.jethwa
Plant Science	Dr Kevin Pyke	PCS	13216	Kevin.pyke

Building Locations

FS= Food Sciences Building
GB = Gateway Building
NL = North Lab Building
PCS= Plant and Crop Sciences
SL = South Lab Building

8 Academic Staff and Locations

Name	Room	Telephone Number	Divisions *
Dr R Alberio	B223, South Laboratory Building	0115 951 6304	AS
Dr M Alcocer	49E, 2nd Floor, North Laboratory Bldg	0115 951 6103	NS
Dr R Anand-Ivell	B216, South Laboratory Building	0115 951 6298	AS
Mrs A Avery	49D, North Laboratory Building	0115 951 6238	NS
Dr E Bailey	C21, The Gateway Building	0115 951 6255	AES
Dr M Bell	B228, South Laboratory Building	0115 951 6056	AES
Ms M Benlloch Tinoco	A18 Biosciences. Main Building	0115 951 6146	MB
Prof M J Bennett	C06, Plant Sciences Building	0115 951 3255	PCS
Dr A Bishopp	A15, Plant Sciences Building	0115 951 6108	PCS
Dr R Blunt	B47, Life Sciences Building **or** C18 Gateway Building	0115 951 3238	AES
Dr N Bora	B06, Bioenergy and Brewing Science Bldg	0115 951 6011	PCS
Dr J Brameld	43, 1st Floor, North Laboratory Bldg	0115 951 6133	NS
Prof M Broadley	A05, Plant Sciences Building	0115 951 6382	PCS
Dr K Brown	B30a, Food Science Building	0115 951 6509	FS
Dr N Chapman	306, South Laboratory Building	0115 951 6082	PCS
Dr L Coneyworth	58, 2nd Floor, North Laboratory Bldg	0115 951 6124	NS
Prof I F Connerton	B28, Food Sciences Building	0115 951 6119	FS
Dr D Cook	C04, Bioenergy and Brewing Science Bldg	0115 951 6245	FS
Prof N Crout	C19, The Gateway Building	0115 951 6253	AES
Prof C E R Dodd	B30, Food Science Building	0115 951 6163	FS
Dr S Egan	C21 School of Veterinary Medicine and Science	0115 951 6659	VS
Dr M Elmes	53, 2nd Floor, North Laboratory Bldg	0115 951 6183	NS
Dr I Fisk	A28, FS Building	0115 951 6037	FS
Dr R Ford	C03, Bioenergy and Brewing Science Bldg	0115 951 6685	FS
Prof T Foster	B29, FS Building	0115 951 6246	FS
Dr M J Foulkes	312, South Laboratory Building	0115 951 6024	PCS
Dr R G Fray	C33, Plant Sciences Building	0115 951 6371	PCS
Dr A P French	C08a, Plant Sciences Building	0115 951 6108	PCS
Prof P C Garnsworthy	B203, South Laboratory Building	0115 951 6065	AS
Dr Z Gonzalez-Carranza	C11, Plant Sciences Building	0115 951 6335	PCS
Dr N Graham	C30, Plant Sciences Building	0115 951 6681	PCS
Dr D Gray	A29, FS Building	0115 951 6147	FS
Dr D Greetham	A20 Food Science	0115 951 6578	FS
Prof S E Harding	A15, The Limes	0115 951 6148	FS
Dr I Hardy	C26, The Gateway Building	0115 951 6052	AES
Dr J Harris	C18, Vet School	0115 951 6316	AS
Dr K Harris-Adams	C311, South Laboratory Building	0115 951 6066	AES
Dr P J Hill	B21, FS Building	0115 951 6169	FS
Dr J L Hobman	B22, FS Building	0115 951 6166	FS
Prof M J Holdsworth	301B, South Laboratory Building	0115 951 6046	PCS

Dr P Jethwa	55, North Laboratory Building	0115 951 6604	NS
Miss J Kearns	30, 1st floor, North Laboratory Bldg	0115 951 6756	NS
Prof I P King	C21, Plant Sciences Building	0115 951 6372	PCS
Dr J King	C26, Plant Sciences Building	0115 951 3205	PCS
Dr B Lomax	C24, The Gateway Building	0115 951 6258	AES
Prof M R Luck	B207, South Laboratory Building	0115 951 6309	AS
Dr S Lydon	C08, Plant Sciences Building	0115 951 6289	PCS
Dr J Majewicz	37, 1st floor, North Laboratory Building	0115 951 6106	NS
Dr G Mann	B208, South Laboratory Building	0115 951 6326	AS
Dr J Margerison	B209 South Laboratory Building	0115 951 6301	AS
Dr S Mayes	301C, South Laboratory Building	0115 951 8062	PCS
Dr F McCullough	26,1st Floor, North Laboratory Building	0115 951 6118	NS
Dr K Mellits	B26, FS Building	0115 951 6172	FS
Dr K M Millar	B67, Vet School	0115 951 6303	AS
Prof S Mooney	C31, The Gateway Building	0115 951 6257	AES
Dr E H Murchie	301C, South Laboratory Building	0115 951 6082	PCS
Dr A Murton	49H, 2nd Floor, North Laboratory Building	0115 823 6592	NS
Dr T Parr	53A, 2nd Floor, North Laboratory Bldg	0115 951 6128	NS
Miss J Pearce	49G, 2nd Floor, North Laboratory Bldg	0115 951 6105	NS
Dr C Powell	C02, Bioenergy and Brewing Science Bldg	0115 951 6191	FS
Dr S Price	CO8 Bioenergy and Brewing Science Bldg	0115 951 6742	FS
Dr K Pyke	C09, Plant Sciences Building	0115 951 3216	PCS
Dr D Quain	C08 BABS	0115 951 6160	FS
Dr C Raaff	26 North Laboratory Bldg	0115 951 6121	NS
Dr S Ramsden	308, South Laboratory Building	0115 951 6078	AES
Dr R Ray	303, South Laboratory Building	0115 951 6094	PCS
Dr C E D Rees	B23, FS Building	0115 951 6167	FS
Prof K Ritz	C22 Gateway Building	0115 951 6288	AES
Dr T P Robbins	C27, Plant Sciences Building	0115 951 6329	PCS
Dr A Rosenthal	A24 Food Sciences	0115 951 6038	FS
Prof A M Salter	32A, 1st Floor, North Laboratory Bldg	0115 951 6120	NS
Dr D Scott	B19, FS Building	0115 951 6221	FS
Prof G Shaw	C29, The Gateway Building	0115 951 3206	AES
Dr C Siettou	C304 South Laboratory Building	0115 951 6306	AES
Prof K D Sinclair	B210, South Laboratory Building	0115 951 6053	AS
Dr M S Sjogersten	C27, The Gateway Building	0115 951 6239	AES
Dr D L Sparkes	330, South Laboratory Building	0115 951 6074	PCS
Dr D Stekel	C20, The Gateway Building	0115 951 6294	AES
Dr C Stevenson	A57, Vet School	0115 951 6055	AS
Dr R Stoger	B232, South Laboratory Building	0115 951 6232	AS
Miss R Stow	40, 1st floor, North Laboratory Bldg	0115 951 6170	NS
Dr A Swali	A20, Ground Floor, FS Bldg	0115 951 6578	FS
Dr R Swarup	C31, Plant Sciences Building	0115 951 6284	PCS
Dr D Sweetman	B234, South Laboratory Building	0115 951 6019	AS

Dr J A Swift	57a, Second Floor, North Lab	0115 951 6178	NS
Dr R Tarlington	School of Veterinary Medicine and Science	0115 951 6273	VS
Dr M Taylor	52, 2nd Floor, North Laboratory Bldg	0115 95 16104	NS
Dr A Waterfall	B224, South Laboratory Building	0115 951 6307	AS
Dr S Welham	24, North Laboratory Building	0115 951 6129	NS
Dr D Wells	C07, Plant Sciences Building	0115 951 6108	PCS
Dr H West	C28, The Gateway Building	0115 951 6268	AES
Mrs E Weston	A22, FS Building	0115 951 6146	FS
Dr G White	B227, South Laboratory Building	0115 951 6068	AS
Dr K Whitehead	28A, 1st Floor, North Laboratory Bldg	0115 951 6136	NS
Prof P Wilson	332, South Laboratory Building	0115 951 6075	AES
Prof Z A Wilson	A03, Plant Sciences Building	0115 951 3235	PCS
Prof J Wiseman	B205, South Laboratory Building	0115 951 6054	AS
Dr B Wolf	A27, Ground Floor, FS Bldg	0115 951 6134	FS
Dr S Young	C25, The Gateway Building	0115 951 6256	AES

***Divisional codes**

AES Agricultural & Environmental Sciences
AS Animal Sciences
BBS Bioenergy and Brewing Science Bldg
FS Food Sciences
MB Main Building
NS Nutritional Science
PCS Plant and Crop Sciences
VS School of Veterinary Medicine and Science

9 Course Structure, Organisation and Choosing Your Modules

The Academic Year

The academic year at Nottingham is based on 2 semesters (autumn and spring) spread over three terms.

The following definitions might be helpful to you:

- **Credits** indicate a quantity of assessed learning. They contribute to a cumulative indication of modules which a student has completed. One credit equates to approximately 10 hours of study.
- A **Module** is a specified programme of study which is self-contained and attracts a specified number of credits. Examinations are held at the end of most modules. A ten credit module accounts for approximately 100 hours of your time, of which usually no more than 40 hours will be spent in the lecture room or laboratory
- A **Course of Study** is a set of modules satisfying the requirements for a particular degree and attracting 320 credits for an Ordinary Bachelor degree and 360 credits for an Honours degree.

• The levels in a course of study leading to an Honours degree are as follows

• Year 1 (120 credits)	Level 1
• Year 2 (120 credits)	Level 2
• Year 3 (120 credits)	Level 3

And for a Master of Nutrition and Dietetics or MSci degree

• Year 4 (120 credits)	Level 4

Credits achieved in Year 1 are for progression purposes only and will not contribute to the final degree classification.

- A **semester** is a division of the academic year. It consists of twelve weeks of teaching, coursework and revision, plus two (Autumn Semester) or four (Spring Semester) weeks of assessment and consultation.
  Note: Although each academic year is divided for teaching purposes into two semesters, there is still a three-term pattern of attendance, with breaks at Christmas, Easter and during the summer.
- A **year** is period of study consisting of an Autumn Semester followed by a Spring Semester. **Assessment** may be by means of written examination papers, oral examinations or coursework. Progression and/or degree classification are based on the outcome of the assessment.
- A **mark** module a numerical indication of the quality of the assessed work completed by a student in each. Marks awarded are subject to the approval of the Board of Examiners and are ratified by an External Examiner.

Choosing optional modules*

At module advisory days you will be asked to complete a module registration form that details your chosen optional modules for ALL PERIODS, i.e. for modules totalling 120 credits. All entries must include the module code. **All optional choices must be approved and signed by your Course Director.** You will have an opportunity at the beginning of the Autumn/Spring Semesters (the "Two week change of mind period") to make adjustments to your choices for that semester; you will also need to check that there are no timetable clashes.

Your choice of modules must normally total 60 credits per semester, and in any event not less than **50 credits** or more than **70 credits** per semester. To determine how a Full Year module contributes to the number of credits in a given semester, check the semester credit split for that module in the Module Catalogue modulecatalogue.nottingham.ac.uk/Nottingham

IT IS YOUR RESPONSIBILITY to see that your combination of modules accords with the Regulations for your course and teaching timetable. **Failure to do so could prevent you from progressing to the next year of the course or from graduating.**
Once you have chosen your optional modules and they have been approved, IT IS YOUR **RESPONSIBILITY** to ensure that you read the Declaration, sign the form and hand it to School Office staff. After that date changes to Full Year and Autumn Semester choices will not be allowed. **Failure to hand in the form by the date displayed may lead to incorrect examination entries and records.**

**There are some courses in Year 1 where there are no optional modules; however this information is useful for Years 2 and 3.*

Modules outside Biosciences

If you wish to register for an optional module from outside the School of Biosciences, you should write the module details on your Module Entry Form and obtain a signature in the "Agreed" box from the School that offers the module, as confirmation that the offering School accepts your registration (or email and provide email confirmation).

A complete list of modules within the University can be found in the Catalogue of Modules at modulecatalogue.nottingham.ac.uk/Nottingham

10 Timetable Information

Academic Year 2016-2017 Week Pattern for the UK CAMPUS

Teaching starts Thursday 29 September 2016 (if your modules are taught on either a Thursday or Friday)

Syllabus Plus Timetable Week	Teaching Week	Week Commencing	Comments
1	1	26/09/2016	*Registration/Induction*
2	2	03/10/2016	Autumn Semester
3	3	10/10/2016	Autumn Semester
4	4	17/10/2016	Autumn Semester
5	5	24/10/2016	Autumn Semester
6	6	31/10/2016	Autumn Semester
7	7	07/11/2016	Autumn Semester
8	8	14/11/2016	Autumn Semester
9	9	21/11/2016	Autumn Semester
10	10	28/11/2016	Autumn Semester
11	11	05/12/2016	Autumn Semester
12	12	12/12/2016	*term finishes Friday 16/12/16*
13	Vacation	19/12/2016	Christmas
14	Vacation	26/12/2016	Christmas
15	Vacation	02/01/2017	Christmas
16	Vacation	09/01/2017	Christmas
17	Assessment	16/01/2017	Assessment
18	Assessment	23/01/2017	Assessment
19	1	30/01/2017	Spring Semester
20	2	06/02/2017	Spring Semester
21	3	13/02/2017	Spring Semester
22	4	20/02/2017	Spring Semester
23	5	27/02/2017	Spring Semester
24	6	06/03/2017	Spring Semester
25	7	13/03/2017	Spring Semester
26	8	20/03/2017	Spring Semester
27	9	27/03/2017	Spring Semester
28	10	03/04/2017	Spring Semester (ends 07/04//17)
29	Vacation	10/04/2017	Easter (Good Friday 14/04/17)
30	Vacation	17/04/2017	Easter (Easter Monday 17/04/17)
31	Vacation	24/04/2017	Easter
32	Vacation	01/05/2017	Easter
33	11	08/05/2017	Spring Semester
34	12	15/05/2017	Revision/Assessment
35	Assessment	22/05/2017	Assessment
36	Assessment	29/05/2017	Assessment
37	Assessment	05/06/2017	Assessment
38	-	12/06/2017	-
39	-	19/06/2017	*term finishes Friday 23/06/17*
40		26/06/2017	
41		03/07/2017	
42		10/07/2017	
43		17/07/2017	
44		24/07/2017	
45		31/07/2017	
46		07/08/2017	
47		14/08/2017	
48	Assessment	21/08/2017	Re-sit Period

49	Assessment	28/08/2017	Re-sit Period
50		04/09/2017	
51		11/09/2017	
52		18/09/2017	

11 Teaching Methods

Lectures

Throughout your university career, you will find that lectures are the most common method of teaching. It is most important for you to ensure that you have a set of good clear notes based on the lectures **and** your own reading. As you progress through the second and third years of your degree, you will be expected to do increasing amounts of reading; it is therefore useful to develop your reading skills during your first year. Teaching of some modules is complemented by the use of teaching software.

Hints and tips for making the most effective use of the teaching and learning opportunities available to you are provided in S*tudy Skills Guide* given to all students at the beginning of their first year).

NB books which should be purchased will be identified at the start of teaching - you are advised not to buy any books prior to this unless otherwise indicated in the recommended reading lists at the end of each module synopses.

Practical Classes

Course requirements may require you to take practical classes. These may involve laboratory experiments or observations and analysis of data obtained during the sessions. Practical sessions provide an opportunity to learn and develop additional skills in techniques, observation and analysis. Practical classes also provide an opportunity to extend your knowledge of topics not covered in lectures. For each practical course you will receive a laboratory manual or collection of schedules which will expand on the learning experience of the course.

Some large first year classes are taught simultaneously in adjacent laboratories. Consult the class lists posted on the notice boards to identify the laboratory you will work in. For each practical class, at least one member of academic staff will always be in attendance. S/he will be accompanied by postgraduate students who work as demonstrators. In some cases, technicians may also be present to assist. The teaching team is present in the laboratory to aid your learning experience, so please seek their help as much as you need, and ensure you carry out your work safely, with no harm to yourself or other students. Practical classes provide a valuable opportunity for you to get to know the academic staff in a less formal way and for them to help you. These classes frequently provide an excellent opportunity for you to raise questions from the lecture course with the member of staff and deal with problems you may have.

For all practical classes, you **MUST WEAR** a suitable full-length laboratory coat, which must be buttoned at all times. You will be given a lab coat and safety glasses during Week 1 and advised about any other items you need to purchase. You **MUST** also **WEAR** safety glasses at all times unless advised to the contrary by an academic member of staff.

Safe working and good laboratory practices are essential in the laboratory environment and all laboratory exercises must be formally assessed under the regulations of COSSH. Details of these assessments are noted in the laboratory manual or schedule to draw your attention to specific hazards and the requirements of safe practice. During the introduction to a practical class, the member of staff in charge will give a verbal statement on safety issues.

Food and drink **MUST NOT** be taken into the laboratory.

Assessed Work

Many modules have an element of student-centred learning, especially in Parts I (Year 2) and II (Year 3) of your course. The work involved in these is assessed and forms part of the overall mark for the module. The proportion of the mark allotted to coursework is identified in each module description. Penalties are applied for late submission of coursework (5% per working day), unless there are extenuating circumstances and appropriate documentation is provided. In general, modules in the School of Bioscience use electronic submission of coursework through Moodle as the means of submission.

IT Training

IT is increasingly important as a basis of learning, communication and the preparation of your work e.g. dissertation, BSc project thesis and laboratory reports. It is important that you develop/improve your IT skills as you progress through your course.

Computer-aided Learning (CAL)

Several modules include computer-based teaching material, quizzes, exercises, simulations. In order to use these, you must be registered on the School of Biosciences Network. You may be assessed on some of these packages while using them or in the form of a conventional write-up. You should be prepared to take notes as you work through material on computers.

12 Assessment, Progression, Compensation and Reassessment

The University Undergraduate Course Regulations apply to all the School's BSc, MSci and MNutr degrees.

The regulations can be found at:
www.nottingham.ac.uk/academicservices/qualitymanual/studyregulations/studyregulationsforundergraduatecourses.aspx

You should note that:

- The pass mark for a module is 40%.
- **Progression and Compensation (BSc)**: You don't need to pass all modules in order to progress to the next stage of your course. Compensation of failed modules can be achieved in the following ways – if you have:
  (a) passed modules worth at least 80 credits and have a weighted average for the stage of at least 40% with no module marks of less than 30%;
  or
  (b) passed modules worth at least 100 credits and have a weighted average for the stage of at least 50%.
  or
  (c) passed modules worth at least 90 credits, have marks of 30% or more in modules worth at least 110* credits, and have a weighted average for the stage of at least 45%.

  Progression and Compensation (MNutr): At the Part I, Part II and Part III stage, no core module can be compensated with the exception of optional modules for which university regulations apply. In addition, students must obtain at least 35% in both the examination and coursework components of these modules, although a mark between 35% and 39% in either the examination or coursework may be compensated by the other component of assessment.

  Progression (MSci): At the end of Part I, students on the MSci degree must achieve an overall average of 55% at first sit in order to progress to Part II.

- **Reassessment:** If you do not reach the criteria for progression at the end of stage of study, you have a right to one re-assessment in each failed module. The form of reassessment is normally the same as for the first sit, with some exceptions (for example some MCQ papers are sometimes replaced with essay-style papers).
  For modules which are assessed by both coursework and exam, the School of Biosciences requires that, if the module has been failed overall, then you must be reassessed in the examination element of that module, even if that component of assessment has been passed.

  In addition, if you have failed the coursework overall (of a module which is assessed by both coursework and examination) you may elect to resubmit remedial coursework. However, if you have passed your coursework overall, you are not entitled to resubmit either the whole coursework or any failed component within your coursework assessments. If you wish to take up the option of remedial coursework, you must make contact with the appropriate module convener (or his/her representative) **within 7 days** of the date of the letter notifying you that you have failed to progress. The module convener will give you a title and submission date for the coursework. Any

remedial coursework must be submitted before the start of the August examination period. However, individual module conveners have the right to set earlier deadlines at the time of setting the coursework.

Please note: for modules which have both an examination and coursework component, it is not possible for you to be reassessed by resubmitting coursework alone; you are required to retake the examination, even if this element of the module has been passed.

This policy allows students to maximise their chances of passing the module after reassessment. In Part I (and Part II [Master of Nutrition]), the ORIGINAL marks are carried forward for degree classification purposes. However, reassessment marks may be considered by the examining boards if the candidate is on the borderline between degree classes.

- **Progression after reassessment**: For progression purposes, the higher or highest of the marks obtained in each module (at first attempt or upon re-assessment) are considered and the progression and compensation regulations applied accordingly.

- **Marking Schemes:** see appendices 1-6.

- **Progression Charts:** see appendix 6 and can be viewed at http://goo.gl/N492mp

- **BSc Degree Candidates**

  Award of an Honours degree is dependent on completion and submission of a final year project.

  When the overall Part I / Part II mark has been computed, it is rounded to provide a single overall integer mark before any degree classification is assigned. Subject to the exception of borderline candidates and those with extenuating circumstances, who may be awarded a higher degree classification, students shall be awarded the class of degree with their overall mark. The classes of honours degree are as follows:-

  - First Class - average of 70%+
  - Second Class (Division 1) - average of 60-69%.
  - Second Class (Division II) - average of 50-59%.
  - Third Class - average of 40-49%.

  The standardised weighting for the stages of a Bachelor degree will be 33/67 for Parts I and II respectively, and the standardised weighting for an Integrated Master's degree (undergraduate) will be 20/40/40 for Parts I, II and III respectively

Borderline Profiling

Classification borderlines will be based on the overall rounded average mark (credit and stage weighted). Borderline overall averages will be as follows:

2:1–1st 68, 69

2:2-2:1 58, 59

3rd-2:2 48, 49

A student should be given the higher class if either of the following criteria are met:
- Half or more of the final stage credits are in the higher class;
- Half or more of the final and penultimate stage credits are in the higher class

Further Reading

Full details of regulations can be viewed on the UoN Quality Manual page at http://goo.gl/qoQPi3

13 Extenuating Circumstances

Policy regarding extensions to coursework on grounds of Extenuating Circumstances, Disability or Specific Learning Difficulties Summary:

1) Extensions to coursework will not normally be given unless the student has a specific recommendation from the School's Extenuating Circumstances Committee, or Academic/Disability Support.
2) Extensions will not normally be given as a result of short-term illness of less than 7 days unless the module convenor agrees this.
3) Students with Academic/Disability referrals allowing the option for coursework extension may arrange for a short extension to coursework submission with the module convener, on the basis of particular circumstances, without the need to apply for extenuating circumstances.
4) Students with approved extenuating circumstances may be granted an extension to coursework submission of usually no more than 21 calendar days.

Full details of the school's implementation of University policy is below. Meeting deadlines is an important part of working life. It is important that students develop time management skills and the ability to meet deadlines before undertaking work placements or entering the workforce on graduation. Coursework deadlines are normally set at the start of the module by the module convenor[1], and clearly stated in module documents/introductory teaching sessions. This gives students the opportunity to identify periods of high workload within each semester and plan their time accordingly. Whilst course teams will try to adapt deadlines to avoid coursework 'hotspots', deadlines are set as appropriate for each individual module and it is the student's responsibility to plan their time accordingly.

Extensions to coursework deadlines can be given in limited circumstances – for example, if students have extenuating circumstances, disability or specific learning difficulties. These are dealt with in the following way.

- Extensions to coursework will not be given to students unless they have a specific recommendation from Academic/Disability Support, the School's Extenuating Circumstances (ECs) committee or the module convenor (see below).
- Students with specific recommendations from Academic/Disability Support may request one extension in advance of the deadline, giving justification for why they need it. Students should not expect to be offered an extension, and it is acceptable for the Module Convenor not to allow one, if it is not possible within the module structure – for example, if the work is subject to a very tight marking turn-around period, such as laboratory practical write-ups. In these circumstances, students should be given notice in advance of the deadline that no extensions can be allowed. If the module convenor feels that an extension is appropriate, the following extension lengths, which have been endorsed by Academic Support, will be followed:

Length of Coursework	**Extension**
Up to 2,500 words (or equivalent)	Maximum of 2 calendar days
2,500- 5,000 words (or equivalent)	2-4 calendar days
Final Year Dissertation	Maximum of 5 calendar days

[1] Where this guidance refers to "module convenor" this can also be taken to include coursework marker/other academic contributor to the module where this person is not the module convenor.

Any further extension would normally only be given on the basis of approved extenuating circumstances.

Any unapproved late submissions will have marks deducted as outlined in the Quality Manual (5% for each working day).

Students who submit coursework late as a result of illness or other circumstances lasting more than 7 days should discuss this with the module convenor or their personal tutor and should submit an EC form in advance of the submission deadline and evidence within 7 days of the submission deadline. If evidence is not available at the time that the form is submitted, it can be submitted within 14 days of the EC form submission. This documentation will be considered via the normal EC process (see: http://www.nottingham.ac.uk/academicservices/qualitymanual/assessmentandawards/extenuating-circumstances-policy-and-procedures.aspx

- If ECs are accepted, an extension to the submission will be agreed and any marks that have been deducted for late submission will be reinstated.

Any extension (within a teaching semester) for students with ECs will not normally be for more than 21 calendar days, to ensure that all coursework is submitted prior to the coursework return date. Any submission after the return date will not be accepted but a student may be given a first sit opportunity if they have approved ECs.

14 Plagiarism and Paraphrasing

Plagiarism and Paraphrasing

This section is also covered in the Study Skills book. It draws upon information available at the following University Web sources together with guidance from staff in the School of Biosciences. **As work is now submitted electronically through Turnitin, be aware the plagiarism is readily-detected**.

USEFUL ADVICE FOR STUDENTS

One good method to avoid plagiarism is to make notes from material you have read and construct your essay / report, in your own words, from these notes. It is tempting (and easy) to copy and paste, but this is unacceptable and constitutes an academic misconduct. It is also poor practice to construct a draft by copying and pasting material from multiple sources, with the intention of then paraphrasing the resulting document. Apart from the fact that the end-product may be disjointed, the paraphrasing is often incomplete and the work submitted may contain elements of plagiarised material. It is, however, acceptable to include relevant figures and tables from published work, as long as you acknowledge their source by citing the primary reference for them.

To make a specific point, there may be rare occasions when you have may to quote an author verbatim; this is acceptable if you put the quotation in inverted commas and give the source, but you should have a good reason why you can't put the material in your own words.

USEFUL WEBSITES

Academic integrity and plagiarism
http://www.nottingham.ac.uk/studyingeffectively/writing/plagiarism/index.aspx

Quality Manual
http://www.nottingham.ac.uk/academicservices/qualitymanual/assessmentandawards/academic-misconduct.aspx

Studying Effectively
http://www.nottingham.ac.uk/studyingeffectively/home.aspx

DEFINITION OF AN ACADEMIC MISCONDUCT

Any activity or behaviour by a student which may give that student, or another student, an unpermitted academic advantage in a summative assessment is considered to be an act of academic misconduct and unacceptable in a scholarly community. Such action(s) will be considered under the University's Regulations on Academic Misconduct and this may lead to a penalty being imposed

DEFINITION OF PLAGIARISM

The following definition of plagiarism appears in the University Quality Manual:

Plagiarism: representing another person's work or ideas as one's own, for example by failing to follow convention in acknowledging sources, use of quotation marks etc. This includes the unauthorised use of one student's work by another student and the commissioning, purchase and submission of a piece of work, in part or whole, as the student's own.

Note: A proof-reader may be used to ensure that the meaning of the author is not misrepresented due to the quality and standard of English used, unless a School/Department policy specifically prohibits this. Where permitted, a proof-reader may identify spelling and basic grammar errors. Inaccuracies in academic content should not be corrected nor should the structure of the piece of work be changed; doing so may result in a charge of plagiarism.

Work in any year of study which is not undertaken in an Examination Room under the supervision of an invigilator (such as dissertations, essays, project work, experiments, observations, specimen collecting and other similar work), but which is nevertheless required work forming part of the degree, diploma or certificate assessment, must be the student's own and must not contain plagiarised material.

Possible **penalties** for an academic misconduct including plagiarism are:

a) No marks to be awarded in relation to the specific material which is the subject of the act constituting an academic misconduct (thus leading to a reduced overall mark for the piece of course work, dissertation, examination question or examination script in which the specific material appears)

b) Award a mark of zero for the entire piece of course work, dissertation, examination question or examination script in which the academic misconduct has occurred

c) Award a mark of zero for the entire module in which the academic misconduct has occurred

d) Award a mark of zero for all the assessments in the semester (even where this will lead to a reduction in degree class). In the case of year-long modules, this penalty may affect both semesters

e) Award a mark of zero for the whole year (even where this will lead to a reduction in degree class)

f) Require the student to take reassessments (as a result of being awarded zero marks) in the following session before being allowed to progress or complete their course

g) require the student to register with the University and enrol on modules in which they need to take reassessments (as a result of being awarded zero marks) in the following session before being allowed to progress or complete their course

h) Terminate the student's course

i) Withdraw the award of a degree or other qualification from, and issue an amended transcript to, a former student of the University

j) Full details of possible School and University penalties can be found at: www.nottingham.ac.uk/academicservices/qualitymanual/assessment/academic-misconduct.aspx

ACADEMIC MISCONDUCT

Any activity or behaviour by a student which may give that student, or another student, an unpermitted academic advantage in a summative assessment is considered to be an act of academic misconduct and unacceptable in a scholarly community. Such action(s) will be

considered under the University's Regulations on Academic Misconduct and this may lead to a penalty being imposed.

Here is a range of cheating behaviours:

1. False citation (i.e. attributing work to the wrong source)
2. Plagiarism
3. Using unauthorised sources or notes in examinations or tests
4. Dishonestly obtaining material or information prior to examinations
5. Copying from other students
6. Permitting other students to copy your work
7. Soliciting work from others (e.g. individuals, 'editors' or essay banks etc)
8. Submitting your own previously assessed work without acknowledgement (auto plagiarism)

Unauthorised Collaboration, or Collusion, occurs where:
Collusion: cooperation in order to gain an unpermitted advantage. This may occur where students have consciously collaborated on a piece of work, in part or whole, and passed it off as their own individual efforts or where one student has authorised another to use their work, in part or whole, and to submit it as their own.
Note: Legitimate input from University tutors or approved readers or scribes is not considered to be collusion.

Fabrication may take various forms but is essentially concerned with manufacturing aspects of the work produced. For example, the insertion of made-up information, data, sources, quotes, anecdotes or analysis would all amount to fabrication

Recycling or unauthorised, multiple submissions.

The multiple submission by a student of their own material is not, in itself, considered as academic misconduct. Submission of material that has been submitted on a previous occasion for a different summative assessment is, however, unlikely to be academically appropriate. The merit of such material will therefore be a matter of academic judgement and it may attract fewer (or no) marks than would have been the case if it had not been assessed previously

Note:
Plagiarism is regarded as a serious academic misconduct by the University and will be penalised accordingly. Plagiarism can be easily identified by entering suspect passages into search engines. Specialist search engines (e.g. Turnitin) are available to check all submitted work against previously published sources, including coursework submitted by students in the current or previous years. The School of Biosciences uses Turnitin to assist academic staff detect plagiarism; students are required to submit all coursework in electronic form to facilitate automatic on-line detection of plagiarism.

All BSc Research Projects must be submitted electronically to be checked by Turnitin along with the necessary hard copies (see Guidelines for BSc Research Projects).

If a student is required to attend an Academic Misconduct interview within the School for any suspected academic misconduct his/her tutor will be informed of this, together with the Head of School (or nominee), module convenor (or nominee) and the School Manager for Academic Administration (or nominee.

GUIDANCE TO HELP YOU AVOID COMMITTING PLAGIARISM

1. You are allowed to use information from other people's work provided you acknowledge the source. This can apply to a statement, Table or Figure. The best way of doing this for Tables and Figures is to add: "After Smith (1988)" or "Modified from Smith (1988)", and include the reference in your reference list.

2. If you are discussing something somebody else has said, you can say, for example: Smith (1987) claimed that coral reefs in the Pacific were damaged by high temperatures in 1975. Or: It has been claimed that high temperatures in 1975 damaged coral reefs in the Pacific (Smith, 1975).

3. It is rarely necessary to quote previous work directly and you should try to avoid doing this. If quotation is unavoidable, you should put the passage in quotation marks, e.g. Smith (1980) described the outcome of unprecedented high temperatures on coral reefs as: "A disaster for the marine communities in the coastal regions of the Indo-Pacific", and then stated that: "The phenomenon appears to be due to unprecedented high temperatures".

For information on paraphrasing see 8 and 9 below.

4. Authors should be cited in text either as: Smith (1975), Smith and Allen (1978), Allen (1987, 1989), or as (Smith, 1975; Smith and Allen, 1978; Allen 1987, 1989). Note that these are in chronological, not alphabetic order. When more than two authors are quoted, this should be in the form Allen *et al*. (1993) in the text, but the reference given in your reference list should contain the names of all the authors. Do not use numerically cited or ordered references.

5. In your "References" or "Literature cited" section, the following style (authors, date, title, journal, volume number, page numbers; called the "Harvard" style) should be used and references should be listed alphabetically.

Provided you are consistent, you may also use any other accepted style - see journals in the library – unless instructed otherwise by the member of staff setting the coursework.

Smith, A. J. and Allen, N. B. (1986). Temperatures and coral reefs. *Journal of the Marine Biological Association* 86: 101-123.

Smith, A. J., Jones, K. L. and Allen, N. B. (1988). Death of corals due to high temperatures. *Thermal Biology* 27: 19-34.

If the source is only available electronically or is being published "ahead of print", give the DOI number in your reference.
Some electronic journals do not use page number

6. For books, the following style (author, title underlined or in italics, publisher, place of publication) applies:

Allen, N. B. (1992). *Coral Reef Biology*. Blackwells, London.

7. For chapters in edited volumes, the following style (author, date, title of chapter, title of book underlined or in italics, editors, page numbers, publisher, place of publication) applies:

Smith, A. J. (1987). Temperature and bleaching in corals. In: *Coral Reef Biology* (N. B. Allen and C. K. Hodges, eds.), pp. 65-90. Clumber Press, New York.

8. **Paraphrasing**, i.e. verbatim or almost verbatim restatement of a passage is a form of plagiarism frequently used in essays and dissertations. The following is paraphrased from C. H. Gordon, P. Simmons and G. Wynn (date unknown). *Plagiarism - What It Is And How To Avoid It*. University of British Columbia.

Students often ask "How much do I have to change a sentence to be sure I'm not plagiarising?" If you have to ask, you are probably about to commit plagiarism! There is no set number of words that you need to change or add to make a passage your own – the originality must come from the development and expression of your own ideas.

Original work demands original thought. You should try and separate your ideas from those of others. If you use another author's conclusions then acknowledge them. If you come to the same conclusions as another author you should still acknowledge them. Once a piece of work is complete, look at each part and ask yourself if the ideas expressed are entirely your own, and whether the general language or choice of words is your own. If the answer to either is "no" the work should be credited to the original author

9. Examples.

9.1 Original

From Smith (1992):
The author has found that corals respond to high temperatures by expelling their zooxanthellae. This causes them to go white, a phenomenon known as "bleaching." Such corals soon become covered in algae, which makes it difficult for new coral planulae to settle and start a new colony (Davies, 1980). The phenomenon of bleaching is similar to the effect of a crown-of-thorns starfish (*Acanthaster planci*) attack where the polyps are digested by enzymes secreted onto the colony surface (Brown, 1990). As Jones (1972) found, *A. planci* poses a severe threat to corals in the Indo-Pacific. The recent occurrence of high numbers of these starfish on reefs has been correlated to run-off from land which contains high levels of plant nutrients (Jones, 1986). The subsequent increase in the number of algae apparently enhances the survival of the filter-feeding larvae of the starfish.

To include this text verbatim in your own work, *without* placing the entire paragraph in quotation marks and acknowledging Smith (1992) (see 3 above) would constitute plagiarism.

9.2 Paraphrased version

Paraphrased from Smith (1992):
Smith (1992) has found that corals respond to high temperatures by expelling their zooxanthellae. This phenomenon, known as "bleaching", causes them to go white. Such corals quickly become covered in algae and this makes it difficult for new coral planulae to settle and begin developing a new colony (Davies, 1980). Bleaching is similar to the effect of a crown-of-thorns starfish (*Acanthaster planci*) attack. Brown (1990) note that this is where the polyps are digested by enzymes secreted onto the colony surface. Jones (1972) found that *A. planci* may be a severe threat to corals in the Indo-Pacific. Recently high numbers of these starfish on reefs has been correlated to run-off from land with high levels of plant nutrients (Jones, 1986). The increase in the number of algae apparently enhances the survival of the filter-feeding larvae of the starfish.

To include this text in your own work, even *with* the initial acknowledgment Smith (1992) would constitute plagiarism since it reads as if only the first sentence is taken from Smith, and the rest of the references (Davies, Brown and Jones) have been sourced and read by you and that the development and expression of the text is your own original work.

9.3 Unacknowledged version (i.e. submitting this as if it were your own thoughts or work)

The presence of high numbers of crown-of-thorns starfish (*Acanthaster planci*) on reefs has been connected to run-off from land containing high levels of plant nutrients. This causes an increase in the number of algae which results in better survival of the filter-feeding larvae of the starfish. The starfish kills corals by secreting digestive enzymes onto their surfaces. *A. planci* poses a severe threat to corals in the Indo-Pacific and their effect is similar to that caused by "bleaching", a phenomenon caused by high temperatures which results in zooxanthellae being expelled. Subsequently the dead corals become covered in algae which makes it difficult for a new colony to start.

To include this text verbatim in your own work, would constitute plagiarism since there is no acknowledgment of Smith (1992).

9.4 Acceptable version (based on information from Smith, reading the cited references yourself and drawing upon other work)

Smith (1992) quoted Jones (1972, 1986) in suggesting that the crown-of-thorns starfish poses a threat to corals in the Indo-Pacific, and that their recent upsurge may be due to an increase in plant food levels caused by an input of nutrients from land. Brown (1990) found that these multi-armed starfish killed corals by everting their stomachs onto the coral colony surface and secreting an enzyme to digest the tissues externally. The resulting "bleaching" effect is similar to that which occurs when corals are exposed to high temperatures and the zooxanthellae are expelled (Smith, 1992). Davies (1980) found that the settlement of algae on the colony surface made it difficult for new coral larvae to settle and, although fish often grazed the algae continually, he found they could not keep these under control. Recent studies have shown that plagues of crown-of-thorns starfish may be a natural phenomenon, as the fossilised remains of previous outbreaks have been found in rocks millions of years old (Cromer, 1994).

To present your work like this would not constitute plagiarism.

Note that all the references and authors used in this document with the exception of Gordon *et al*. are fictitious.

PLEASE CONSULT YOUR TUTOR IF YOU ARE STILL IN DOUBT ABOUT PLAGIARISM

15 Personal Academic Development

Several mechanisms are available throughout your studies to help you achieve the goals outlined in the previous section. The way in which you use them will depend on your own needs and circumstances. By the time you graduate, you will have acquired a set of resources, some electronic and some in other formats, which you can use as the basis for promoting yourself and your achievements.

There are three main goals:

- to provide you and the School with complete documentation of your academic record and performance so that your progress can be monitored while you are at the University
- to define and document the minimum level of pastoral care which the School will provide for you, including academic and personal support
- to encourage you to reflect upon your progress at regular intervals and record self-evaluations in relation to your academic work, leisure interests and general skills.

Personal Tutor

You will be allocated a personal tutor when you first register in the School. Details of how the tutorial system works are given in the *Study Skills booklet.* Your tutor may teach modules that relate to your degree programme or may come from a separate area within the School.

It is worth remembering that members of academic staff have several roles besides teaching and tutoring. They are actively engaged in research, which probably involves supervision of research students and postdoctoral researchers, and also have various administrative functions vital for the smooth running of the School.

You can expect your tutor to support you in the following ways:

- take an interest in your academic progress, check on your well-being from time to time, and offer you opportunities to discuss matters of concern. Provide you with your examination marks at the end of each semester and help you to reflect on the feedback you receive.
- be available to discuss your choice of modules
- in the event of illness and absence for other justifiable reasons, your tutor should be informed of the circumstances. S/he will also be made aware of any lapses in your attendance at classes which give cause for concern.
- provide a personal reference for you, for example to obtain vacation work or when you seek employment after graduation. This is a good reason for making effective use of meetings and establishing a sound working relationship. A supportive referee needs to have good information and will try to set your academic qualities and achievements in a wider context.

Meetings with your tutor may be scheduled or take place less formally at the request of either of you. During the first semester, scheduled meetings will occur as part of D21BG1. During

the rest of your course, the University requires that you meet your tutor at least three times per year. This will normally include meetings at the start and end of each semester, the latter being when you receive your module results and discuss your progression. However, this is a minimum and you would be wise to have more frequent contact.

Make use of all these opportunities. Check your email every day and be sure to respond to requests for meetings, either scheduled or informal. Apart from being discourteous, missing a meeting may mean losing out on vital information or decisions.
If for any reason you wish to change your tutor, you should make your request to the Senior Tutor or through the Student Service Centre.

Confidentiality and Records

Your tutor will respect the confidential nature of your conversations. If at any time s/he judges that it would be in your best interests to inform other members of School or University staff, s/he will advise you of this and suggest how this can best be achieved. Your tutor will always seek your agreement before involving anyone else and will discuss with you when, to whom and how any sensitive information might be conveyed.

It is advisable to make a short record of all personal tutorials or other meetings. The record may take whatever form you wish, ranging from a brief note (perhaps simply recording the date of the conversation) or general summary, to something more detailed. You should not write down anything you would not want other tutors to read, although it may be important to signal the existence of personal or confidential matters affecting your work. Your tutor can help you by suggesting appropriate wording.

16 Academic Tutoring

Academic tutoring is the support which the school provides to students in addition to formal teaching. It is complementary to the University's central support services and pastoral care provision.

The objectives of Academic Tutoring are to:

- Help you acquire the necessary study skills to pursue your studies successfully.
- Address problems of lack of knowledge and understanding of the subject.
- Address any problems with aspects of a module or your studies in general.
- Provide you with an overview of your academic progress at module and programme level.
- Assist you in making academic choices e.g. module enrolments, programme pathways.
- Provide assessment feedback to help you improve your future performance.
- Contribute to the acquisition of key employability skills.
- Assist and encourage you to gain employment or continue your education after you graduate.

The School takes its responsibility for academic tutoring very seriously and provides the following to ensure that you are properly supported:

- One-to-one meetings with your personal tutor for personal development, pastoral support and guidance (e.g. on module choices).
- Meetings with course directors for module guidance, either informally or at module enrolment days.
- Tutorials/seminars within modules comprising your degree programme.
- Provision of specific credit-bearing academic tutoring and study skills modules D21BG1: Biosciences Tutorials (Academic Development) and Foundation and, C11BE1 Dissertation in Environmental Science and also through skills embedded in other academic modules including project and dissertation modules.
- Drop-in support sessions for mathematics and statistics.
- Written feedback on assessments including;
    - individual written or verbal feedback on coursework and mark allocation based on a transparent marking scheme,
    - generic feedback one week after exam results,
    - constructive comments provided by markers through individual appointments with module conveners
    - students' evaluation forms collated from students' comments, available through Moodle.
- Student led-seminars.
- Peer support groups, including mentoring.
- 'Office hours' system for appointments with module coordinators/tutors.
- A flexible and comprehensive virtual learning environment (Moodle).
- Links to central support services e.g. Academic Support, the Counselling Service and the Student Services Centre.
- Assistance and guidance on academic administrative matters through the school office.
- Encouragement to make use of central on-line study skills resources e.g. 'Study Skills' www.nottingham.ac.uk/studyingeffectively
- Assistance with personal support or guidance from the School Senior Tutors**.**

School of Biosciences Tutoring Statement

The full Biosciences tutoring statement can be found in appendix 8 and at http://goo.gl/dPpFjU Students are encouraged to read the statement.

17 Attendance Monitoring

Students must attend all teaching activities necessary for the pursuit of their studies, undertake all associated assessments and attend meetings and other activities as required by their School or the University. Where students face difficulty in attending sessions or undertaking assessments and examinations, it is their responsibility to inform their School of this fact and to provide a satisfactory explanation. Please see http://www.nottingham.ac.uk/academicservices/qualitymanual/registrationattendanceandstudy/regulations-governing-attendance-and-engagement.aspx for further details on attendance regulations at the University.

Two weeks is considered a significant period of absence and students are encouraged to consider interrupting their studies if they will miss this length of time. See for further details on voluntary interruption of studies.

The School will consider all extenuating circumstances relevant to attendance and engagement with a student's studies. Students should make the School aware of any extenuating circumstances as soon as possible to ensure full support can be provided and any alternative arrangements such as coursework extensions can be applied within the approved timescales. See the Quality Manual http://goo.gl/yX4aTC or further details on extenuating circumstances.

Individual Schools and Departments have systems in place to monitor attendance during the academic year. Example includes taking registers in lectures, monitoring coursework submission and tutorial attendance, etc. Unauthorised absences are reported to Academic Services and recorded as appropriate. Where students are absent without authorisation, to the point that it is not possible to continue with the course, Academic Services will write to the student stating that they will be deemed to have withdrawn from the University and their student record will be amended to show that they have withdrawn.

Students who are identified to be poorly engaging with their studies or poorly attending teaching activities will be asked to meet with the Student Experience and Support Officer or their Personal Tutor.

Where required the University will report non-attendance and poor attendance to appropriate authorities including the UK Border Agency and Student Finance.

18 Complaints and Appeals Procedures

Details of the University's Complaints and Appeals Procedure can be found at: www.nottingham.ac.uk/academicservices/qualitymanual/complaintsandappeals/academicappealpolicyandprocedure.aspx

The procedure regarding a complaint concerning your course is that in the first instance you should contact the lecturer concerned. If the matter cannot be resolved, the next points of contact would be:

- Module Convener
- Course Director
- Teaching Manager
- Head of Division
- Head of School
- Student Year Representative (names are on the Learning Community Forum notice board together with the Module Convener)

Students are encouraged to involve their Personal Tutors at any stage, whether the matter of concern is of an academic or personal nature. Students also have the right to bring matters of concern before Learning Community Forum.

19 Channels of Communication

Dissemination of information is an on-going process during the academic year; this will come from both the School Office and academic staff. We use several ways to give out information.

- **Email -** Email is the normal means of communication to individuals or class groups; your tutor and module conveners will email regularly and it is also a good way for you to contact academic staff. However, this and other media should not detract from personal meetings, which are necessary for the communication of several matters including the conveyance and discussion of examination.

- **Moodle** - Moodle is the online learning environment across the University. The resource allows you to access lecture notes, find links to external learning resources, access self-test exercises and assessments, participate in online learning activities, submit assignments and collaborate on group projects. You can log in using your University username and password the day after you have completed your registration online. w: moodle.nottingham.ac.uk

- **The Student Portal -** The Portal is a central part of the University's communication system for staff and students. Make sure you have access to it at: https://goo.gl/dFwTwP

- **Social Media -** The University of Nottingham uses the latest technology to bring Nottingham to life and to ensure that you can experience and interact with the University community at any time, see: www.nottingham.ac.uk/connect/nottinghamconnect.aspx

- **Blue Castle website -** students can view their marks, progression status and final award information electronically at: https://goo.gl/txm85c

20 Students/Staff Consultation

The courses you are taking have evolved over a number of years and incorporate many features arising from student feedback and evaluation. Each department has its own procedures for allowing students to participate in the evaluation and future development of courses.

Broadly, two channels exist:

- feedback evaluations which enable you to comment on the content, style and objectives of modules; we urge you to take the time and effort to complete these so you and future students can play a role in improving our teaching

- The Learning Community Forum (LCF) consists of course representatives of undergraduate students and teaching staff who discuss a wide range of academic and non-academic matters. Anyone who has comments, criticisms or suggestions that they wish to be discussed should contact one of the representatives, whose names will be notified to you during the first semester. Minutes of the Learning Community Forum will be made available electronically.

- The Student Guild also elects student representatives to the School Board and other School committees. If you want to influence academic procedures in the School and University on behalf of your fellow students, you must join the Guild first.

21 Students' Access to Academic Staff policy'

Appointments for meetings with staff should be requested by students by email or in person (by phone or office notice board). Requests by email can be made at any time. Staff should respond to such requests by email within two working days (both during term and outside term-time). Staff are not obliged to send their responses outside of normal working hours, nor during official University holidays, nor when on vacation. They should put out-of-office messages on their emails during vacations and respond within two working days upon return.

Following a request, appointments should be arranged with the student at a mutually convenient time, normally to be held within three working days of the request.

Once an appointment has been made, both the staff member and the student are expected to honour the appointment. Should either be unable to attend they should email to cancel prior to the meeting.

Staff have the option of restricting their availability to students to particular days or times of day (other than in emergencies). In this case, they will communicate their preferred availability to their tutees and to other students they see on a regular basis.

22 Quality Assurance

The primary aim of the University of Nottingham is to sustain and improve the high quality of its provision as one of the leading research-led universities in the United Kingdom. It is also committed to providing a learning environment of the highest quality for students, in which first class teaching is underpinned by excellent research. The School of Biosciences endeavours to maintain these goals in the Biosciences, where relevant in collaboration with other schools, in the following ways:-

- by recruiting motivated students with a proven record of high level of learning;
- by providing a broad education across the discipline;
- enabling the development of an analytical and critical appreciation of scientific ideas and problem solving;
- providing a learning experience enriched by an active research environment;
- enabling the development of independent learning and skills for a wide range of careers within and outside the biological sciences;
- to ensure that students receive appropriate support and guidance in their academic development and career planning;
- to identify and support the academic and pastoral needs of individual students;
- to provide a flexible, effective and adequately resourced learning environment, and
- to maintain and improve teaching and learning through effective management structures in line with the University Quality Manual.

As part of an ongoing process of improving quality, some of our teaching facilities have been recently refurbished and modernised. We look to our students to help us maintain these areas in good condition for the benefit of future generation.

23 Coursework and Examination Feedback

Feedback is provided in three main forms on i) assessed coursework, ii) examination performance and iii) general aspects of each module. In addition to individual marks given for assessed coursework in each module, you will receive an overall module mark and the end of each semester and a full set of module marks will be made available to you through Blue Castle (https://bluecastle.nottingham.ac.uk). Your module marks are confidential and not shown to other students. Individual mark components (e.g. coursework marks) are also confidential; the only exception to this is when you receive a mark for a piece of 'group work' in which all members of your group receive the same mark. The sections below provide further details about feedback.

Coursework Feedback

Coursework feedback is normally provided through written comments on your work. For many pieces of coursework, a cover sheet will be returned with your work to explain the mark received and give advice on how your work could be improved. For other pieces of non-examination assessed work, it may not be feasible to provide written comments on your work, for example, a group oral presentation; in such cases, feedback may be provided verbally or by email. Feedback for other assessed work e.g. laboratory practicals, may be provided in other ways as appropriate to the assignment set. Whilst the manner by which you receive coursework may vary depending on the type of coursework set, the purpose of the feedback is to provide a mark for the work together with constructive comments to help improve your performance in future assignments. If you wish to discuss your performance in any assessed work, you should contact the module convenor.

Module convenors will set a deadline by which you must submit coursework and a date when you can expect to receive feedback on your work. This information will be provided when the module convenor sets the piece of work. In normal circumstances, marked coursework and associated feedback should be returned to students within 21 days of the published submission deadline, i.e. students submitting work before the published deadline should not have an expectation that early submission will result in earlier return of work. See detailswww.nottingham.ac.uk/academicservices/qualitymanual/assessmentandawards/feedback-to-students.aspx

Examination Feedback

After each examination period, general examination feedback from each module will be posted on Moodle. This will include: i) feedback on examination questions where students' performance could be improved, ii) suggested strategies for improving performance in those questions and iii) general comments about examination technique. Students wishing to discuss their examination performance should contact the relevant module convenor(s)

General Feedback

A copy of the Module Report Form, which is a summary of the discussion/feedback with students at the end of each module, can be found within a folder for the module in Moodle. This feedback sheet is used by module convenors to identify which areas of the module students felt worked well, and others that could be improved; in the latter case, the module convenor will make appropriate academic adjustments to the module for the following academic session. The areas of feedback covered by the module report form follow the headings detailed in the Module Report Form.

The University's Quality Manual provides information on good practice for feedback on assessed work and what you can expect to receive as a student at the University of Nottingham – see http://goo.gl/DI1Gqo

24 Student Services/departments

24.1 Student Services Centre

The Student Services Centre can provide you with information and support throughout your student life. They are approachable, knowledgeable and most of all they are there to help. Student Services Centres are based at Sutton Bonington, University Park, QMC and Jubilee Campuses. Further details of support services to be given to you on arrival.

24.2 Libraries

The James Cameron-Gifford Library on SB Campus, together with Hallward Library (at UP), George Green Library (UP) and the Medical School Library (QMC and Derby) provide information on all subject areas covered by the School, plus study areas and computing facilities. The on-line catalogue (NUsearch) enables you to search for material held at all branches of The University of Nottingham library. Material from the other campuses can be obtained swiftly for you through the intersite delivery service. During Semester 1 you should attend an introductory lecture provided by the library's Teaching and Learning Support Team. This will be followed up by a tutorial providing an introduction to key resources and discussion on the critical interpretation of published materials as part of the Academic Development and Employability module.

Learning these basic information retrieval and evaluation skills is essential - you will need them for essays and projects throughout your course. As you progress, more specialised studies are undertaken and you must become familiar with the experimental data published in various journals. Acquaintance with published research provides the foundation for most final year research projects. You should not forget to read the more popular scientific press such as *New Scientist* or *Scientific American*, as well as those appropriate to your discipline.

The James Cameron-Gifford Library at Sutton Bonington has over 100 reading places, including quiet areas, bookable/non-bookable study rooms and a number of PCs (see below); it links with several of the Computer Rooms. The Library stock has been developed to support teaching and research in the Schools of Biosciences and Veterinary Medicine, and the library service also provides access to a wide range of databases, electronic journals, and e-books.

Your University Card is also used as a Library borrower's card, and is required for entry to the libraries at University Park campus.

The James Cameron-Gifford Library is open
Monday to Friday 8.00 am 9.45 pm

Saturday 9.00 am - 4.45 pm
Sunday 9.30 am - 4.45 pm

The library is open 24/7 during exam periods. More information can be found on our website at: www.nottingham.ac.uk/library

24.3 IT facilities

Help and advice

Advice and information for new users of the IT facilities can be found on the University web pages – go to www.nottingham.ac.uk and search for 'Student Essentials'. Several on-line guides can be found, and many of them are available as hard copy booklets in the libraries.

Getting online

Your username and password will get you access to most of the services you will need during your time at the University. Make sure you set a strong password and *never* share your password with someone else. The University will *never* ask you to reveal your password, and you should be suspicious of any request to tell someone your password.
Be sure to check your University email regularly, otherwise you may miss important information.

Computer rooms

There are a number of Information Services (IS) computer rooms on the Sutton Bonington campus which can be used by students, but some are also used for teaching classes. Please look out for notices stating times when the rooms are unavailable due to teaching bookings

There is a large (120 seat) computer room in the Gateway building (room A07); and smaller rooms in the Main Building (rooms B05, B08, B09, and B10). Further computers are available in the James Cameron Gifford Library, including some with large screens for collaborative or group work.

All IS Computer Room computers are set up in an identical manner, with the same selection of software installed or available (Windows, Microsoft Office, EndNote, PDF Creator; and a range of statistical, graphical and course-related software applications).

Computer loans

The JCG library counter offers a short-term laptop and tablet loan service, with loans restricted to use within the Library and Learning Hub areas only.
Students may also make use of the Information Services Laptop Loan service, where longer-term loan periods are possible. This service operates from an office at University Park (Pope Building).

The Portal; and Virtual Learning Environment

The **Portal** (linked from the University's home page) is the main point of access for students, through which you can access most of the services you will need. From the Portal you can connect to your email service, module information, Library services, timetables, and other essential information. You can also connect to **Moodle**, which is the University's Virtual Learning Environment (VLE), and is where you will find course information, module documents, lecture notes, reading lists, assignments, etc.

Saving your files and backing up your data

It is the responsibility of each student to save their work safely and securely! Each student has 4GB of personal file storage available on the University's networked servers. This is

available as the 'Home Drive' from any IS Computer Room computer, as well as via the web at files.nottingham.ac.uk.

Never save your work onto the hard drive of Computer Room computers – files will be deleted when you log off! Save files to the Home Drive or to an external device.

Any work done on your *own* computer should be backed up – either onto *at least* one external hard drive or onto one of a number of cloud storage options available widely.

Printing

Students can print from any IS computer to the University Print Service. Printing is held in a queue and can be printed off and collected at Print Service printers which are situated close to all IS computer rooms and in the libraries.

You can also print from your home computer, laptop or mobile device using the Mobile Print Service. Simply email your document to mobileprint@nottingham.ac.uk

Wireless

Good wireless coverage on the **eduroam** service should be available in all of the main teaching and social areas of the campus, and in some outdoor areas. In the halls of residence the wireless service is provided by the Hall management companies.

24.4 Accessibility

Teams supporting students with study support, disabilities, specific learning difficulties and long term health conditions are located in the Student Services Centre (SSC), in The Barn on Sutton Bonington Campus, in the Portland Building on University Park, and will be available on all of our other teaching sites.

We can assist with queries regarding:

- Support in making the transition to University, admissions and registration
- Liaison with your School or department about any impact your condition may have on the study elements of your course OR: assessments in relation to disability and dyslexia and recommendations to academic staff about reasonable adjustments in the learning, teaching and assessment environments
- access to alternative formats such as Braille and large print
- residential accommodation – adapted study bedrooms
- accessible transport around and between our Nottingham campuses
- applying for Disabled Students' Allowances
- access to alternative formats such as Braille and large print
- access to specialist technology in libraries
- liaison with libraries for enhanced services such as extended loans
- timetabling arrangements

The Accessibility Team also provides support for students who wish to develop their strategies for academic writing and time management.

The Accessibility Team have online study resources which relate to almost all of the areas you cover in the guide, see
http://www.nottingham.ac.uk/studentservices/supportforyourstudies/academicsupport/studyresources/index.aspx

If you would like to contact us please phone the Student Services Centre on
(0115) 74 86500
e: disability-support@nottingham.ac.uk
dyslexia-support@nottingham.ac.uk

The University of Nottingham ACCESS Centre (UNAC), in the Student Services Centre, provides assessments for students who have applied for Disabled Students' Allowances.

Student Welfare Manager

The School also has a dedicated Student Welfare Manager, who provides a point of reference, advice and guidance for members of staff and students in the School about student disability issues and student support. The Welfare Manager is part of a large cross campus team of Student Welfare support managers and officers that meets regularly to share information and good practice. The Welfare Manager in Biosciences works closely with the Accessibility Team in working to ensure that all students are supported and advised appropriately and that there is equality of opportunity for all.

If you have any requirements or concerns talk in the first instance to your Welfare Manager – or contact your personal tutor.

School Welfare Manager

The Welfare Manager for the School of Biosciences is located in the Main Building. You will be meet your Welfare Manager during your induction and will be given further details on your arrival at university.

25 Health, Safety & Security

- The research buildings are open to students from 08:30am until 18:00pm, Monday to Friday, except public holidays and University holidays. If for any reason you have to be in the building outside if these times, you must be supervised by an academic member of staff.
- There are lifts available in all teaching buildings for use by disabled students. The other use of the lifts is for movement of goods, and should not be used for other purposes.
- The School has its own Safety Handbook which is available on the web at http://goo.gl/fg8fCF

Fire

- Fire alarms in the teaching buildings are tested at a regular time (eg Wednesday at 10 am in the Main Building). In the event of fire in the building the alarm will sound continuously. In the event of this the lecturer in charge of your class will organise evacuation of the building to the relevant assembly point. Fire exits are clearly sign-posted. Re-entry into the building after a fire alarm is given by the Fire Monitor.

Safety

- Safety in the building, especially in the Laboratories is paramount. See further reference to this matter under 'Practical Classes'
- Practical classes are continuously supervised by an academic member of staff with the support of demonstrators and occasionally technicians. You should not enter a laboratory until a member of staff arrives.
- Suitable protective clothing must be worn for laboratory classes (see 'Practical Work').
- Defined procedures must be followed for the disposal of certain types of laboratory waste, such as syringes and syringe needles, broken glass, organic solvents and microbial cultures. Instruction on the correct disposal of these and other items will be given in practical classes.
- Safety in Fieldwork. Field Course safety information and the Code of Practice for students can be found at: http://goo.gl/IBS6EF

Accidents & First Aid

- For minor injuries, first aid boxes are available in all laboratories and certain offices. In such situations it is likely you can deal with such injury yourself.
- Where an injury is more serious a qualified 'First Aider' should be called. Names of First Aiders are listed on the School's web pages.

- If a 'First Aider' is not available or if further treatment is required, you will be taken to the Cripps Health Centre or A&E at Queens Medical Centre in extreme situations.
- All accidents, whatever their severity, must be reported on an accident report form available from the member of staff taking the class at the time of the accident and will supervise completion of the form.

Food & Drinks

- On no account should food and/or drink be taken into a laboratory, lecture theatre or computing rooms.

26 Module Registration

Module Registration takes place at the Sutton Bonington Campus three times per year. Usually: September, December and April.

This is an opportunity for students to choose their modules for the next academic session before the teaching timetable is scheduled. The choices that you make will help the scheduling of module activities to avoid, where ever possible, clashes in the timetable.

While it is not possible to guarantee that all optional choices can be scheduled clash-free, it is important that we gather as much information as possible on what students would like to study in advance of creating the timetable.

Please follow the procedure below to choose the modules you are most interested in.

- Check your websites, emails and the notice boards in our School for information on how pre-registration module enrolment is operated in your School - arrangements will vary. You should check details of schools' advice sessions.
- If appropriate, Module Entry Forms will be available from your School or Department from the start of the summer term. Your compulsory module enrolments for the next year of your programme will be pre-printed on the form.
- Read the guidelines on the reverse of your Module Entry Form about which module choices you should be making now.
- For guidance on which modules to choose you can look at your provisional 2016-2017 programme of study or ask your Personal Tutuor for guidance.
- Consult the Module Catalogue for provisional 2016-2017 information about the available modules and their content.
- **Complete your Module Entry Form and return it to your home School no later than the deadline given**.

Please note that all module enrolments must be agreed both by the offering School (*for modules taken outside of your home School or Department*) and your home School or Department for them to be valid

New International Office regulations (2015) dictates that students must register for at least 30-40 credits in their Home School. Students can register for subsidiary modules from across other Schools (no restriction on the number of Schools for subsidiary modules). More details will be given during your week one programme.

If you have queries, contact your Course Director for help.

26.1 Capped Modules

Do you know what a capped module is and how to select them?

A capped module is a module capped at a certain number of places and is allocated on-line on a first come first served basis.

CAPPED MODULE – You will need permission from the module convenor to take this module unless it is compulsory for your course

Please note that all capped module enrolments must be agreed both by the Module Convenor and your home School or Department for them to be valid.

26.2 Module Contents

Module Code	Module Title	Module Convenor	Department	Period	Capped	Page No.
C111E1	Global Environmental Processes	Dr EH Bailey	Agricultural and Environmental Sciences	Autumn		58
C112P1	Plant Science	Dr K Pyke	Plant and Crop Sciences Division	Spring		59
C123E3	Soil Science	Dr S Young	Agricultural and Environmental Sciences	Autumn		96
C124E0	Soil and Water	Prof S Mooney	Agricultural and Environmental Sciences	Spring	**Yes**	98
C13569	Fundamental and Applied Aspects of Plant Genetic Manipulation	Dr Tim Robbins	Plant and Crop Sciences Division	Autumn		158
C135E9	Computer Modelling in Science: Applications	Dr D Stekel	Agricultural and Environmental Sciences	Autumn		160
C135P2	Molecular Plant Pathology	Prof M Dickinson	Plant and Crop Sciences Division	Autumn		161
C135P3	Basic Introduction to Omic Technologies	Prof Z Wilson	Plant and Crop Sciences	Autumn		162
C136E6	Environmental Microbiology	Dr H West	Agricultural and Environmental Sciences	Spring		163
C136E7	Environmental pollutants: behaviour, fate and remediation.	Prof G Shaw Dr S Young	Environmental pollutants: behaviour, fate and remediation.	Spring		164
D211A3	Agricultural Business in the Global Economy	Dr C Siettou	Agricultural and Environmental Sciences	Autumn		61
D211E5	The Ecology of Natural and Managed Ecosystems	Dr R Blunt/ Dr H West	Agricultural and Environmental Sciences	Spring		63
D211F3	The Biosciences and Global Food Security	Dr K Pyke	Plant and Crop Sciences Division	Autumn		65
D211F4	Food Commodities and Primary Processing	Miss M Benlloch Tinoco	Division of Food Sciences	Autumn		66
D212A1	Grassland Management	Dr Matt Bell	Agricultural and Environmental Sciences	Spring		70
D212A2	Contemporary Agricultural Systems	Dr Matt Bell	Agricultural and Environmental Sciences	Spring		72

D212A3	Integrated Agri-Food Markets and Marketing	Miss Keely Harris Adams	Agricultural and Environmental Sciences	Spring		74
D212E4	Environmental Science & Society	Dr R Blunt	Agricultural and Environmental Sciences	Full Year		76
D212F7	Bacterial Physiology	Dr C Rees	Division of Food Sciences	Spring	**Yes**	77
D212F9	Physiology for Food Scientists	Dr A Waterfall	Division of Food Sciences	Spring		79
D212P5	Plant Science Research Tutorials	Dr K Pyke	Plant and Crop Sciences Division	Autumn		80
D212Z5	Introductory Physiology	Dr Alan Waterfall	Division of Animal Sciences	Spring		81
D21BF1	Food Materials and Ingredients	Dr D Gray	Division of Food Sciences	Full year		83
D21BF3	Microbes and You	Dr J Hobman	Division of Food Sciences	Full year		85
D21BF7	The Physiology of Microbes	Dr Cath Rees	Division of Food Sciences	Full year		87
D21BN1	Introduction to Nutrition	Dr LJ Coneyworth	Division of Nutritional Sciences	Full Year		90
D21BN2	Biochemistry – The Building Blocks of Life	Dr M Elmes	Division of Nutritional Sciences	Full Year		92
D223A6	Economic Analysis for Agricultural Sciences	Dr C Siettou	Agricultural and Environmental Sciences	Autumn		100
D223A8	Physiology of Electrically Excitable Tissues	Dr J Harris	Division of Animal Sciences	Autumn	**Yes**	102
D223A9	Agri-Business Enterprise and Innovation	Dr Matt Bell	Agricultural and Environmental Sciences	Autumn		104
D223F6	Bacterial Biological Diversity	Prof C Dodd	Division of Food Sciences	Autumn		106
D223F7	Virology	Dr K Mellits	Division of Food Sciences	Autumn	**Yes**	108
D223F0	Manufacture of Food (40 credit)	Dr B Wolf Miss M Benlloch Tinoco	Division of Food Sciences	Autumn	**Yes**	109
D223N0	Global Issues in Nutrition	Dr L Coneyworth	Division of Nutritional Sciences	Autumn	**Yes**	113
D223N6	Principles of Immunology	Dr M Alcocer	Division of Nutritional Sciences	Autumn		114

D223N8	Principles of Animal Nutrition	Dr Jean Margerison	Division of Nutritional Sciences	Spring		116
D223NA	Nutritional Regulation, Physiology and Endocrinology	Dr P Jethwa	Division of Nutritional Sciences	Autumn		117
D223P0	Molecular Biology and the Dynamic Cell	Dr K Pyke Dr R Swarup	Plant and Crop Sciences Division	Autumn		119
D223P9	Applied plant physiology: from cell to crop	Erik Murchie / Debbie Sparkes	Plant and Crop Sciences Division	Autumn		121
D223Z7	Reproductive Physiology	Dr G Mann	Division of Animal Sciences	Autumn	**Yes**	123
D224A1	Applied Agricultural and Food Marketing	Miss Keely Harris-Adams	Agricultural and Environmental Sciences	Spring		125
D224A4	Enterprise Management Challenge	Dr S Ramsden & Dr R Ray	Agricultural and Environmental Sciences	Spring		127
D224A6	Endocrine Control Systems	Prof M Luck	Division of Animal Sciences	Spring		129
D224A7	Practical Policy Making	Dr C Siettou	Agricultural and Environmental Sciences	Spring		133
D224A8	Human and Technological Resource Management	Prof P Wilson	Agricultural and Environmental Sciences	Spring		135
D224E4	Computer Modelling in Science: Introduction	Dr D Stekel	Agricultural and Environmental Sciences	Spring		137
D224F9	Analysis of Bacterial Gene Expression	Dr P Hill	Division of Food Sciences	Spring	**Yes**	139
D224F0	Food Product Case Studies	Emma Weston Dr A Rasmussen	Division of Food Sciences	Spring		141
D224FA	Microbial Mechanisms of Food Borne Disease (20 credit)	Prof C Dodd	Division of Food Sciences	Spring	**Yes**	143
D224FB	Food Safety and Legislation (10 credit)	Dr N Doherty	Division of Food Sciences	Spring		145
D224G1	Professional Skills for Bioscientists	Dr D Sweetman Mrs E Weston	Plant and Crop Sciences Division	Spring		146
D224N0	Nutrition, Metabolism and Disease	Prof A Salter	Division of Nutritional Sciences	Spring		147
D224NB	Practical Techniques in Human Nutrition	Dr S Welham	Division of Nutritional Sciences	Spring		149

D224P7	Plant Pests and Diseases	Dr I Hardy Dr R Blunt	Plant and Crop Sciences Division	Spring		150
D224P8	Molecular Pharming and Biotechnology	Rupert Fray	Plant and Crop Sciences Division	Spring		152
D224Z6	Principles of Animal Health and Disease	Dr R Tarlington Dr S Egan	Veterinary Medicine & Science	Spring	**Yes**	154
D22GFS	Global Food Security: UNMC Summer School	Prof P Wilson	Agricultural and Environmental Sciences	Intensive Block		155
D235A4	Rural Business Management	Dr S Ramsden	Agricultural and Environmental Sciences	Autumn		166
D235A8	Companion Animal Science	Dr G White	Division of Animal Sciences	Autumn		168
D235F1	The Microflora of Foods	Prof C Dodd	Division of Food Sciences	Autumn	**Yes**	170
D235F5	Molecular Microbiology and Biotechnology	Dr P Hill	Division of Food Sciences	Autumn		173
D235F7	Physical Chemistry of Modules	Prof S Harding	Division of Food Sciences	Autumn		175
D235F8	Personal and Professional Development for Food Scientists	Dr J Wayte Mrs E Weston	Division of Food Sciences	Autumn	**FULL**	177
D235FR	Trends in Food Research	Dr D Gray	Division of Food Sciences	Autumn		179
D235P2	Plant Cell Signalling	Dr A Bishopp	Plant and Crop Sciences Division	Autumn		182
D235P6	Plants and the Light Environment	Dr K Pyke	Plant and Crop Sciences Division	Autumn		184
D235Z1	Biotechnology in Animal Physiology	Dr R Alberio	Division of Animal Sciences	Autumn		186
D235Z5	Applied Bioethics 1: Animals, Biotechnology and Society	Dr K Millar	Division of Animal Sciences	Autumn		188
D235Z7	Coordinated Physiological Functions	Dr C Stevenson	Division of Animal Sciences	Autumn	**Yes**	189
D236A2	Management Consultancy	Miss K Harris-Adams	Agricultural and Environmental Sciences	Spring		191
D236A3	Current Issues in Crop Science	Dr MJ Foulkes	Agricultural and Environmental Sciences	Spring		193
D236A8	Field Crops Cereals	Dr MJ Foulkes	Agricultural and Environmental Sciences	Spring		195

D236F5	Rapid Methods in Microbial Analysis	Dr J Hobman	Division of Food Sciences	Spring		197
D236F6	Microbial Fermentation	Dr J Hobman	Division of Food Sciences	Spring		199
D236M1	Virology and Cellular Microbiology	Dr K Mellits	Division of Food Sciences	Spring		201
D236P3	Plant Disease Control	Dr R Ray	Plant and Crop Sciences Division	Spring		202
D236P4	Sex, Flowers and Biotechnology	Prof Z Wilson	Plant and Crop Sciences Division	Spring		204
D236P7	Plants and the Soil Environment	Prof M Broadley	Plant and Crop Sciences Division	Spring		206
D236Z4	Systems Neurophysiology	Dr J Harris	Division of Animal Sciences	Spring		208
D236Z5	Reproduction and Fertility	Dr G Mann	Division of Animal Sciences	Spring	**Yes**	210
D236Z6	Applied Bioethics 2: Sustainable Food Production, Biotechnology and the Environment	Dr K Millar	Division of Animal Sciences	Spring		212
D236Z8	Epigenetics and development	Dr D Sweetman	Division of Animal Sciences	Spring		213
D236Z9	Principles of Animal Health and Disease 2	Dr S Egan	Veterinary Medicine & Science	Spring		214
D23BA1	Livestock Production Science	Prof P Garnsworthy	Division of Animal Sciences	Full Year		215
D23BA7	Genetic Improvement of Crop Plants	Dr S Mayes	Agricultural and Environmental Sciences	Full Year		217
D23BN1	Nutrition and the Health of Populations	Ms Jo Pearce	Division of Nutritional Sciences	Full Year		219
D23BN2	Animal Nutrition	Dr J Brameld	Division of Nutritional Sciences	Full Year		221
D23BN3	Molecular Nutrition	Dr T Parr	Division of Nutritional Sciences	Full Year		223
D23PRO	Research Project	Dr A Swali	Division of Food Sciences	Full Year		225

26.3 Modules

YEAR 1 MODULES

C111E1 Global Environmental Processes

Module Convenor: Dr Liz Bailey-EHBliz.bailey@nottingham.ac.uk

Module Details: A 20 credit Autumn Semester Module

Pre-requisite(s): Normal entry requirements for School of Biosciences

Expected Number of Students Taking Module: 70

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The unifying theme of this module is biogeochemical cycling - the production, distribution and cycling of materials on the Earth and their availability to, and use by, biological organisms. The introduction covers the history of the universe, from the big bang to the evolution of the Earth's surface environment, via formation of galaxies, stars, elements and the solar system. Then we describe the major global systems and their circulations as they are today - solids (plate tectonics, formation and erosion of crustal rocks), liquids (oceans, temperature and salinity gradients) and gases (atmosphere, weather and climate). In the final section we examine the major materials - including carbon, nitrogen, sulphur, oxygen and metals - and their budgets and cycles; and the interactions between biological and physical/chemical processes on a global scale.

Assessment:
Exam 100% - One 2 hour computer based examination paper.

Aims: To give students a general understanding of the physical, chemical and biological development of the Earth since the start of the Universe, and of the cyclical movement of the major materials such as carbon and nitrogen between biological and non-biological forms.

Learning Outcomes:
- Ability to describe the origin and formation of the chemical elements, solar system, solid Earth, atmosphere and oceans.
- An understanding of the structure and circulation of the solid Earth, its oceans and atmosphere.
- Understanding of the chemical cycles of key chemical elements.
- An understanding of the origin of life and how life survives on Earth.

Recommended Reading: Earth System Science. M.C. Jacobson, R.J. Charlson, H.Rodhe, and G.H Oreans. Academic Press 2000

C112P1 Plant Science

Module Convener: Dr Kevin Pyke kevin.pyke@nottingham.ac.uk

Module Details: Level 1 Spring Semester 10 credits.

Expected Number of Students Taking Module: 150

Target Students: Primarily available for students taking a degree in Biology, Biotechnology Environmental Science or Environmental Biology.

Availability to Exchange Students: Yes provided they email module convenor first

Pre-requisite modules or other requirements: A level in Biology and Chemistry preferred

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lectures will cover a variety of topics on modern plant science including plant morphology, photosynthesis and water movement, flowering and seed development biology, plant pathology, plant genetic transformation and the central role of the model organism *Arabidopsis thaliana* in plant science research. The module also has three practical sessions relating to the lecture material.

Example:

Week	SUBJECT	LECTURER
1	Plant Evolution and Plant Structure	KP
2	Photosynthesis	KP/RF
3	Flowering	ZW
4	Seed Development and Fruit ripening	KP
5	Water relations of plants	KP
6	Plants and Nutrients	MB
7	Plant Pathology	Matt D
8	Arabidopsis and Plant Tissue culture	RS/MD
9	Practical 1	ZW/PC/KP/NG
10	Practical 2	ZW/PC/KP/NG
11	Practical 3	ZW/PC/KP/NG

Staff: KP – Kevin Pyke; RF – Rupert Fray; ZW – Zoe Wilson; MB – Martin Broadley; Matt D – Matt Dickinson; PC – Peter Crittenden; RS – Ranjan Swarup

Assessment:

Exam 1	75%	1 hour 30 mins examination
Coursework 1	25%	Coursework essay - 1000 words

Module Amendments introduced this session: Some changes to teaching personnel.

Module Aims: To provide an introduction to the biology and importance of plants. Lectures will focus on plant form and function, highlighting the ways that genetics and studies on the model plant, *Arabidopsis,* have added to our understanding. Emphasis will also be placed on the ways plants adapt to their surroundings and the potential for use of biotechnology in plant improvement.

Learning outcomes: On successful completion of the module, students will be able to:

1. Describe the process of plant evolution and place the Angiosperms in the context of different types of plants.
2. Discuss the cellular structure of plants, in particular seeds, leaves, flowers and roots and demonstrate an understanding of how these multicellular tissues are constructed.
3. Appreciate the importance of model plants such as Arabidopsis in the development of modern plant biology and demonstrate knowledge of how this plant's attributes have been exploited.
4. Recognise the importance of plant nutrition and the interaction with pathogens are crucial to plant growth and production
5. Develop professional skills in scientific information retrieval and to work safely in a laboratory situation.

Recommended reading:

Main Text:
Campbell NA, Reece JB and Mitchell LG (2011) Biology 9th International Edition

Secondary texts:
Raven Biology of Plants, Evert RF and Eichorn SE (2012)

All course material including PowerPoint lectures will be available on the web.

Lecturers on this course are members of the Plant and Crop Sciences Division, School of Biosciences, Sutton Bonington (www.nottingham.ac.uk/biosciences/plantcrop/index.html)

D211A3 Agricultural Business in the Global Economy

Module Convenor: Dr Christina Siettou Christina.siettou@nottingham.ac.uk

Module Details: Level 1 Autumn Semester, 20 credits

Expected Number of Students Taking Module: 20

Target Students: For students studying BSc integrated Agricultural Business Management, BSc Agriculture and related subjects and Exchange students.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module provides an overview integrating agricultural business within the context of the global economy. Fundamental concepts of global economic and market drivers are introduced via a series of lectures, with these concepts being further developed by computer aided learning sessions which enable students to undertake opportunity enabled learning. Students will undertake directed student centred learning, enabling them to place information from lectures and computer aided learning sessions within the context of Agri-business.

Timetable: Typically three one-hour timetabled sessions per week, and can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme:

Week	Subject	Format
	Introduction to Agriculture and the Economy	Lecture
	Presentation and discussion of how global events affect individual agricultural businesses	Workshop
2	Exploring the concepts of Demand and Supply – Part 1	Lecture
	Class Discussion – Exploring useful Agricultural website	Workshop
3	Exploring the concepts of Demand and Supply – Part 2	Lecture
	Class discussion on relevant media articles	Workshop
	Exercises on microeconomic elements – part 1	Tutorial
4	The Global Economic Environment	Lecture
	Class discussion on relevant media article	Workshop
	Exercises on microeconomic elements – Part 2	Tutorial
5	Comparative Advantages, Competitiveness and Trade	Lecture
	Interactive workshop	Workshop
	Exercises on macroeconomic elements – Part 1	Tutorial
6	Guest lecturer	Lecture
	Exercises on macroeconomic elements – Part 2	Tutorial
7	Contemporary Global and Agricultural Issues: The Environment	Lecture
	Interactive workshop	Workshop
8	Contemporary Global and Agricultural Issues: Consumer Issues and Ethics	Lecture
	Interactive workshop	Workshop

	In class short essay writing on Contemporary Global Agricultural Issues	Tutorial
9	Business visit	Practical
10	Presentations	Lecture
11	Revision session	Lecture

Staff: CS: Christina Siettou, KHA: Keely Harris-Adams

Coursework: Global Economy Assignment. Drawing upon data sources students will undertake an assessment of the impact of global economy drivers on Agricultural Businesses

Assessment: One 2-hour examination (60%); Global Economy Assignment (40%)

Aims: The module will integrate agricultural business within the context of the global economy. Fundamental concepts of global economic and market drivers are introduced via a series of lectures, with these concepts being further developed by computer aided learning sessions which will enable students to undertake opportunity-enabled learning. Subjects covered include: agriculture within the global economy, supply and demand for agricultural commodities, trade, trade organisations, exchange rates, interest rates and the importance of these drivers within Agricultural business contexts.

Learning outcomes: On successful completion of the module, students will be able to:

- Demonstrate the importance of integrating microeconomic and macroeconomic understanding and knowledge within successful Agri-Business Management.
- Illustrate how global economic drivers impact upon decision making within the Agricultural Business environment.
- Analyse information from a range of sources to present information to aid business-related decision making.

D211E5 The Ecology of Natural and Managed Ecosystems

Module Convenors: Dr R Blunt ruth.blunt@nottingham.ac.uk Dr ICW Hardy ian.hardy@nottingham.ac.uk, Dr H West Helen.west@nottingham.ac.uk

Module Details: Level 1, Spring semester, 20 Credits

Pre-requisite(s): Normal entry requirements for School of Biosciences.

Expected Number of Students Taking Module: 65

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module introduces the principles of ecology at a first year level. The module covers: Evolutionary aspects of ecology. Organisms and their environment: physical, chemical and biotic factors limiting species distribution; capture and utilization of resources by organisms; the niche concept; life cycles and dispersal. Population Ecology: intraspecific and interspecific competition; predation; parasitism and mutualism. Community Ecology: diversity and stability of communities; patterns of species richness; the concept of a climax community; energy flow and nutrient cycling. The module explores definitions of biodiversity and explores the value of biodiversity through different ethical frameworks. The loss of species and habitats is discussed with particular reference to semi natural and managed habitats such as woodland, hedgerows, meadows, and agricultural land.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: (Provisional)
Introduction to the module, The Nature of Ecology
Trophic Levels and Food Webs
4 Lab Practical
Energy Inputs and Agricultural Systems- Sustainable agriculture
Plant Ecology
Genetics and Niche Theory
Populations and Demography
Practical: Population Models
Behavioural Ecology
Ethics and Ecology
Habitat Loss Biodiversity and Conservation

Assessment:
Exam 100% 2 hour exam – Rogo

Aims: Educational Aims: To give students a general understanding of the interactions of organisms with one another and with the physical and chemical environment. Students will learn about different levels from the biosphere to the population and learn how an understanding of ecology can help us manage our environment.

Learning Outcomes: Knowledge and Understanding - to learn of 1) Ecology and its component sub-disciplines. Intellectual Skills - the ability to 1) Critically analyze and interpret information and data 2) Derive and analyze material from a range of sources. Practical/Professional Skills - the ability to 1) Invertebrate identification 2) Work safely in the

laboratory. Transferable/Key Skills - the ability to 1) Communicate via poster 2) Team working 3) Find relevant information in the library and the web 4) Time management.

Recommended Reading:

Cotgreave P & Forseth I (2002) Introductory Ecology, Blackwell Science (**course book**)
Townsend C R, Harper J L & Begon M (2002) Essentials of Ecology, Blackwell Science
Beeby H (1993) Applying Ecology, Chapman Hall Krebs C (1987) Ecology, Harper & Row
Krebs JR & Davies NB An introduction to Behavioural Ecology, 3rd Edn. , Blackwell Science
Krebs JR & Davies NB (1997) Behavioural Ecology, 4th Edn., Blackwell Science
Stiling G (1996) Ecology: Theories & Application, Prentice Hall, Plus appropriate Journals

Additional Key literature will be suggested during the lecture course.

D211F3 The Biosciences and Global Food Security

Module Convenor: Dr Kevin Pyke kevin.pyke@nottingham.ac.uk

Module Details: Level 1, Autumn Semester, 10 Credits

Expected Number of Students Taking Module: 250

Target Students Most first year students studying taking degrees in the School of Biosciences including, Nutrition, Biotechnology, and Food science, Animal Sciences, Plant Sciences,.

Availability to Exchange Students: Yes provided they email module convenor first

Pre-requisite(s): Normal entry requirements for School of Biosciences.

Summary of Content – The module will define global food security as a concept and then examine various aspects thereof, including plant growth, evolution of crop crops, agriculture and crop production, agricultural systems and animal production, the food industry and sustainable nutrition.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Assessment details There will be several pieces of assessment including a practical questionnaire to be filled in after the practical session, an online assessment for a self-study session (30 minutes), a multiple choice test in week 8 of the module covering all taught material up till then (one hour, 50 questions) and a final exam which will be performed online using ROGO (one hour)

- Practical questionnaire (3 pages) – 500 words 10%
- An online assessment for a self-study session (30 minutes) – 10%
- MCQ test –one hour – 50 questions - 10%
- ROGO exam - one hour (70%)

Aims: To provide first year students with an overview of the issues of global food security and show them the level of complexity that exist in different parts of the food generation system, from plant and crop growth, agricultural systems, generating food stuffs and the environmental effects this process entails and sustainable nutrition.

Learning outcomes: On successful completion of the module, students will be able to:

- Review new technologies used to combat global food security.
- Describe the impact agriculture and food production has on the environment.
- Describe the challenges being faced in global food production in relation to your subject area.
- Develop professional skills to work safely in a laboratory situation.

D211F4 Food Commodities and Primary Processing

Module Convenor: Miss Maria Benlloch Tinoco maria.benlochtinoco@nottingham.ac.uk

Module Details: Level 1, Autumn Semester, 10 Credits

Expected Number of Students taking module – 40

Target Students – Food Science' and 'Nutrition and Food Science' students

Availability to Exchange Students: Yes provided they email module convenor first

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

MODULE OUTLINE: Food commodities can be defined as: 'raw materials consumed directly or used to manufacture food products'. The major food commodities we shall study are cereals, oilseeds, fruit and vegetables, tea, coffee, cocoa, herbs and spices, sugar, meat, fish, eggs and milk. Having described the chemical composition of the commodity, strategies employed to store and/or prepare the material for food manufacturing operations will be covered. A common theme, which runs through this module, is quality. What is quality and how can it be defined for each commodity? How does it develop then deteriorate? What methods (chemical, physical or biochemical) can be employed to control quality and slow down deterioration? Each commodity will be dealt with individually but principles which link different commodities will be emphasised. There will also be lectures on the global trade of food commodities in terms of economics/markets, and in terms of trade justice.

CONTENT
1. Food Commodities

Cereals
Over 5% of the entire land surface of the world is covered with cereals. They are a staple of most diets. In the course we will look at the structure and composition of different grains and review how they are best stored. For wheats we will also look at how they are milled to turn them into a major food commodity, wheat flour.

Milk
A detailed account of milk constituents and their physical distribution is given. The chemistry of milk fat globules, casein micelles, lactose and whey proteins is dealt with. This lecture course is completed with an account of the methods used to treat milk prior to human consumption e.g. pasteurisation, sterilisation and homogenisation. Spray drying of milk to yield milk powder is also covered in outline.

Meat and Fish
Fresh foods and associated products make up the greatest part of an average food bill in the UK. In the lectures an understanding of how live muscle becomes meat will be given and the key quality attributes will be discussed. Red meat will be contrasted with poultry, fish and meat analogues.

Eggs
Eggs are a versatile commodity, not only as a nutrient-rich food, but also as a functional ingredient in a wide range of food products. Although fresh eggs are often sold 'locally', there is a significant global trade in liquid and dried eggs.

Oilseeds/fruits and Oil Extraction/Refining
The major global oil commodity crops will be introduced, with an emphasis on oilseed rape, sunflower seed, soya and palm fruit). Industrial methods used to extract oil and to refine it will be explained. The steps taken at different stages of the process to secure high oil quality will be identified.

Fruit and Vegetables
The major and minor constituents of fruit and vegetables (e.g. water, polysaccharides, vitamins, metal cations, organic acids) are highlighted with reference to their nutritional importance. The modern methods used to preserve perishable crops stem from an understanding of postharvest physiology, biochemistry, molecular biology and genetics. These changes are described in some detail, from the difference between a climacteric and non-climacteric fruit to ethylene biosynthesis and the biochemical changes during fruit ripening.

Tea, Coffee, Cocoa and Sugar
Tea, coffee, cocoa, and sugar are commodities that have been traded globally for hundreds of years. Primary processing of tea, coffee and cocoa maximises the flavour and colour potential of the raw materials. Enzymic browning, and non-enzymic browning reactions will be covered. Sugar (sucrose) is produced to very high purity specifications but at very low costs. Methods for sugar extraction and purification must therefore be simple, cheap and effective. The key principles used in sugar production are discussed to show the underlying science as well as the other factors (safety, economics etc.) that shape the choice of methods for sugar processing.

Herbs and Spices
In addition to the global nature of herb and spice production, key aroma/flavour compounds present in herbs and spices (particularly terpenoids) will be identified. Methods used to extract essential oils will be outlined as will the chemical synthesis of 'nature identical' methanol.

2. Global Trade

Economics of Commodity Trade

A review of the trends in commodity markets provides the basis for an investigation of the two principal issues of interest in primary commodity trade, namely price instability and price decline. We review the explanations for, and implications of, these features with particular reference to producers in developing countries.

Fairtrade
The Fairtrade Foundation is the independent non-profit organisation that licenses use of the FAIRTRADE Mark on products in the UK in accordance with internationally agreed Fairtrade standards. Their vision is of a world in which justice and sustainable development are at the heart of trade structures and practices so that everyone, through their work, can maintain a decent and dignified livelihood and develop their full potential.

ASSESSMENT
Formative – feedback will be given for the group presentation designed to encourage active learning (see 'learning and teaching' section above) Summative

Exam (100%) - One 1.5 hour 60-question multiple-choice examination. The MCQ paper is not available on-line, but sample questions are presented in the pre-exam tutorial.

Guidelines for Student Group Presentations

You will be part of a group of about five students who will be tasked to give one group presentation as part of the module's timetabled slots; each week a different group will present. The topic will be based on the previous week's food commodity category (e.g. milk or oilseeds or cereal or fruit and vegetables etc.).

Purpose of Presentation:

1. Develop presentation skills in an informal/non-assessed environment
2. Expand the knowledge of the class of a particular commodity category
3. Promote team working/a team spirit early on in your degree course.

The presentation will be 15-20 minutes long; each individual will be expected to make a 3-minute contribution as part of the team.

Structure of the Presentation:

Address the following 5 questions (one per student)

1. Geographical location of production of the main commodities in this category (current and historical, and main varieties/breeds); and the site of primary processing (i.e. country of origin or country of destination).
2. Form and manner of storing and transporting the main commodities and the principles employed to preserve material quality (e.g. low temperature, or modified atmosphere packaging…)
3. Routine QC tests of the main raw materials (in its raw or primary processed state) in this category. Explain the basic chemical/physical principles of the test(s)
4. Main applications/markets for this category of commodities
5. Some interesting history about this category of commodities

N.B. A lecturer may provide more specific guidelines for this exercise, e.g. a particular food commodity to focus on

Lecture Programme: Autumn Lecture programme is provisional and more detailed information will be given to you in the first session.

Month	Subject	Lecture	Short Break	Lecture
September 28th	**Module Introduction (DG)**	**Oilseeds (DG)**		**Oil Extraction and Refining (DG)**
October 5th	***Student Presentations: Oilseeds***	**Cereal Grains (EW & SM)**		**Cereal Milling (EW & SM)**
12th	***Cereals***	**Milk Composition (DG)**		**Milk Processing (DG)**
19th	***Milk***	**Herbs, Spices and Salt (NY)**		**Essential Oil Extraction (NY)**
26th	***Herbs and Spices***	**Eggs (MBT)**		**Nuts/Pulses/Beans/Legumes (MBT)**
November 2nd	***Nuts/Pulses/Beans/Legumes***	**Fruit and Vegetables**		**Fruit Ripening (GBS)**

		(MBT)		
9th	***Fruits and Vegetables***	**Tea (DG)**		**Cocoa (DG)**
16th	***Tea and Cocoa***	**Meat (TP)**		**Fish (TP)**
23rd	***Meat and Fish***	**Coffee (IF)**		**Sugar (IF)**
30th	***Coffee and Sugar***	**Economics of Commodity Trading (CS)**		**Fairtrade (To Be Confirmed)**
December 7th	**Pre-Exam Tutorial (DG)**			

Venue: B12 Main Building

CS - Christina Siettou (Agricultural Sciences)
DG – David Gray (Food Sciences)
EW – Emma Weston (Food Sciences)
GBS – Graham Seymour (Plant Sciences)
IF – Ian Fisk (Food Sciences)
MBT - Maria Benlloch Tinoco (Food Sciences)
NY – Nicole Yang (Food Sciences)
SM – Sam Miller (Campden BRI)
TP – Tim Parr (Nutritional Sciences)

Aims: The principal aim of this module is to teach students about the composition of a wide range of food commodities, and how they are handled/treated/processed immediately after production. This will equip students with knowledge about the quality of food commodity materials and how they are traded within the global food supply chain. This module, which is information –rich, will be delivered through lectures. Students will be involved in some active learning: a different small group each week for 20 – 30 minutes, will address the questions 'where on the planet is particular food commodity produced, what primary handling/processing steps are taken after harvest/slaughter, how is the commodity transported, and what countries are the major customers?'

LEARNING OBJECTIVES

1. Recall the chemical composition and physical structure of major food commodities.
2. Locate geographical regions of food commodity production
3. Articulate the properties of a broad range of food commodities that determine their quality
4. Describe the rudiments of post-harvest/slaughter handling, or primary processing, designed to retain quality during storage/transport

D212A1 Grassland Management

Module Convener: Dr Matt Bell matthew.bell@nottingham.ac.uk

Lecturers: Dr Stephen Ramsden, Prof Paul Wilson.

Module Details: Level 1 Spring Semester, 10 credits.

Expected Number of Students Taking Module: 40

Target Students: Students registered on BSc Agriculture, Agricultural and Crop Science, Plant Science, Animal Science, Biotechnology, Environmental Biology degrees and Exchange students.

Summary of Content: This module is delivered through e-learning, supported by tutorials and farm visits and covers the morphology and physiology of forage grass species, identification of grass species, grassland systems in the UK and worldwide and conservation of grass (hay/silage). The module will consider grassland management within mixed farming systems and specific requirements for environmental stewardship schemes.

Week	Subject
1	Introduction to the module and course work
2	Student centred learning
3	Student centred learning
4	Grass physiology practical
5	Student centred learning
6	Pasture budget tutorials
7	Student centred learning
8	Student centred learning
9	Student centred learning
10	Student centred learning
11	Farm visit

Timetable: Typically two one-hour timetabled sessions per week, twenty-three lectures, regular tutorials/examples classes, and forty hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Coursework: On-line test on grass morphology; written report on farm visit

Assessment:
Exam 1 50% 1 hour exam
Coursework 1 20% Online test
Coursework 2 30% Farm visit report. 1500 words.

Aims: To provide students with an appreciation of the different grassland management systems employed throughout the world.
- To provide students with an understanding of grass morphology and physiology.
- To develop skills in the use of keys to identify plant species.
- To encourage students to develop self-study skills early in their University careers.

Learning outcomes: On successful completion of the module, students will be able to:
- Identify the key structures of a grass plant.
- Describe the mechanisms of grass growth, production and utilisation and how these are influenced by management practices.

- Discuss the latest developments in grassland management and the policy issues associated with them.
- Calculate a pasture budget

Recommended Reading:

Finch, HJS, Samuel, AM and Lane, GPF (2002) *Lockhart and Wiseman's crop husbandry; including grassland*. (8th edition). Woodhead, Cambridge.
Hopkins, A (2000) Grass: its production and utilization. (3rd edition). Blackwell Science, Oxford. Frame, J and Laidlaw, S (2011) Improved grassland management. Crowwood Press.

D212A2 Contemporary Agricultural Systems

Module Convenor; Dr Matthew Bell matthew.bell@nottingham.ac.uk

Lecturer: Prof Paul Wilson (PW); Dr Stephen Ramsden (SR); Dr Michael Davies (MD); Keely Harris-Adams (KHA); Dr Scott Young (SY), Dr Helen West (HW)

Module Details: A level 1 module taught in the Spring Semester at Sutton Bonington. The module consists of an overview lecture followed by farm visits and student centred learning based on four farm research reports. 10 credits

Expected Number of Students Taking Module: 60

Target Students: For students studying Agriculture and related subjects

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module provides an overview of practical agricultural systems within commercial UK farm contexts. Fundamental concepts of agricultural systems and techniques are introduced via a series of on-farm visits and explanations, with these concepts being further developed by student centred learning, placing the information gained from the visits in the context of contemporary markets, policies and research findings.

Lecture Programme:
Week 1: Introduction: Farm Business Systems - core concepts
Week 2: Business
Week 3: Dairy
Week 4: Waste and Bioenergy
Week 5: Soils
Week 8: Fruit and Vegetables
Sheep 9: Sheep
Week 11: Agri-environmental interactions

Non Lecture Programme:
Please note that the order of the programme may change. Topics may vary depending on the issues affecting the agricultural industry in any one year.

Week 3: Dairy

Week 4: Waste and Bioenergy
Week 5: Soils
Week 6: Arable Production
Week 7: Labour and Machinery
Week 8: Week 9: Sheep
Week 10: Mixed System visit
Week 11: Agri-environmental interactions

Coursework: Coursework will count for 100% of the overall mark for this Module and consists of four 'Farm Research Reports' (maximum 1000 words). The reports will follow, although not necessarily be restricted to, four of the farm visits. The reports will test students' ability to place the information gained from the visits in the context of contemporary markets, policies and research findings.

Assessment:

Coursework 1	50	Farm System Report: Calculations, production of tables and 1000 words text
Coursework 2	50	Farm System Report: Calculations, production of tables and 1000 words text

Aims: The module aims to provide an overview of practical agricultural systems within commercial UK farm contexts. A range of fundamental concepts of agricultural systems and techniques are introduced via a series of on-farm visits and explanations. The topics of the visit may vary dependent upon the issues affecting the agricultural industry in any one year, but example topics covered include the following: dairy production, arable production, soils, agri-environment interactions, labour and machinery management, farm business systems, water and waste management, mixed farming systems. Students will further develop the concepts introduced via directed student centred learning, including integration of current research findings, leading to the production of four assessed reports.

Learning outcomes: On successful completion of the module, students will be able to:
1) Demonstrate and understanding of contemporary issues facing agriculture within the context of farm systems, enterprises and resource implications. 2) Use appropriate terminology to communicate issues and evidence-base proposals to agricultural and associated professionals3) Analyse information from a range of sources and apply this information to an agricultural systems context.

Intellectual Skills:
1) Evaluate the importance of individual aspects of agricultural practice with the context of an individual enterprise or activity and across the farm as a business system. 2) Develop approaches to integrating introductory material across a range of subjects 3) Assess the motivations and drivers for decisions made within a contemporary agricultural context.

Practical/Professional Skills:
1) Ability to interact and engage with professionals and practitioners in the agricultural industry 2) Understanding of the terminology used within different aspects of agricultural practice. 3) Place knowledge gained from research into a practical application and context.

Transferable/Key Skills:
1) Appraise the relevance of key information to a range of familiar and unfamiliar contexts 2) Present information from a wide range of sources in a professional manner 3) Generate the confidence to engage with professionals in the industry in order to develop one's own understanding of a particular subject 4) Develop a skill set of terminology and practical knowledge that will be essential for a future career in agriculture and agricultural professional practice. 5) To listen to people 6) To evaluate the relevance of research results to contemporary agriculture.

Recommended Reading: Nix, J. (2015). Farm Management Pocketbook 2016, The Andersons Centre. Library location: S561.N4. Soffe, R.J. (2003). Primrose McConnell's The Agricultural Notebook, Twentieth Edition, Oxford: Blackwell Science.

D212A3 Integrated Agri-Food Markets and Marketing

Module Convenor: Miss Keely Harris-Adams keely.Harris-adams@nottingham.ac.uk

Module Details: level 1 spring semester, 20 credits

Expected Number of Students Taking Module: 10

Target Students: For students studying BSc Integrated Agricultural Business Management, BSc Agriculture and related subjects

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module provides an overview of agri-food markets and marketing within the context of agri-business management. Fundamental concepts of agri-food markets and marketing techniques are introduced via a series of lectures, with these concepts being further developed by computer aided learning sessions which enable students to undertake opportunity enabled learning. Students will undertake directed student centred learning, enabling them to place information from lectures and computer aided learning sessions within the context of agri-business.

Timetable: Typically one four-hour timetabled session per week: eight lectures, nine workshops, and five computer-aided tutorials. The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional timetable:

Week	SUBJECT	LECTURER
1	Introduction to Concepts in Integrated Agri- Food Marketing Workshop: Application of marketing tools	Keely Harris-Adams
2	Supply and demand trends and drivers Workshop: Trends in agricultural commodities Tutorial: Computer Aided Learning	Keely Harris-Adams
3	The food consumer Workshop: application of marketing tools Tutorial: Computer Aided Learning	Keely Harris-Adams
4	Agri-food chains: Value and supply Workshop: Products and markets Tutorial: Computer Aided Learning	Keely Harris-Adams
5	Guest lecture: Food retailing and sourcing	tbc
6	Contemporary Integrated Agri-Food Marketing Issues (1) Workshop: Consumer trust Tutorial: Computer Aided Learning	Keely Harris-Adams

7	Regulations, quality and traceability Workshop: Regulations and the food consumer Tutorial: Computer Aided Learning	Keely Harris-Adams
8	Workshop: Marketing in the dragon's den	Keely Harris-Adams
9	Contemporary Integrated Agri-Food Marketing Issues (2) Workshop: More contemporary issues Tutorial: Computer Aided Learning	Keely Harris-Adams
10	Business Visit	Keely Harris-Adams
11	Optional revision session	Keely Harris-Adams

Coursework: Market Assignment. Drawing upon data sources students will undertake a Market assessment with an Agri-Food Context

Assessment: One 2-hour examination (60%); Market Assignment - 1500 words (40%)

Aims: The module aims to provide an overview of agri-food markets and marketing within the context of agri-business. Fundamental concepts of these markets and marketing techniques are introduced via a series of lectures, with these concepts being further developed by computer aided learning sessions which will enable students to undertake opportunity enabled learning. Subjects covered include: food and non-food markets including biofuel; demand trends; value and supply in agri-food chains; market structure and power; food retailing and sourcing; regulations, quality and traceability; consumer understanding; green marketing.

Learning Outcomes: On successful completion of the module, students will be able to:

- Demonstrate the importance of applying agri-food market information and agri-food marketing management approaches to agricultural, food marketing and agri-business firms and organisations.
- Illustrate the contributions of marketing approaches to the successful development of products, brands and firms.
- Analyse information from a range of sources to present information to aid business-related decision making.

D212E4 Environmental Science and Society

Module Convenor: Dr Ruth Blunt ruth.blunt@nottingham.ac.uk

Module Details: level 1, Full Year, 20 credits

Expected Number of Students taking module - 60

Target Students – Environmental Science Undergraduate Students.

Availability to Exchange Students: Yes provided they email module convenor first

Further Activity Detail: Including Lectures, Group Activity Sessions, Self-Directed Learning, Workshops, Group Presentation Session.

Summary of Content: This module introduces students to the role and limitations of environmental science within the context practical environmental decision making. The themes covered are illustrated through a series of environmental case studies (e.g. genetic engineering in agriculture, climate change, wild species conservation, fishery management, sea dumping, use of models, radiation protection).

Timetable: Typically two one-hour timetabled sessions per week twenty-three lectures, regular tutorials/examples classes, forty hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Assessment:
1.5 hour online Rogo examination (50%)
Written assignment (1000 words) (25%)
Group poster presentation (25%)

Aims: To introduce students to the role and limitations of environmental science within the context practical environmental decision making. At the end of this module students should have a basic understanding of: (1) general scientific methods (2) the limits and assumptions of science and (3) the social context of science based decision making.

Learning Outcomes: On successful completion of this module, students will be able to:
- Discuss the role, limitations and assumptions of science within the context of environmental decision making
- Discuss the social context and ethical considerations of environmental decision making

D212F7 Bacterial Physiology

Module Convenor: Dr C Rees cath.rees@nottingham.ac.uk

Lecturer: Dr P Hill.

Module Details: Level 1, Spring Semester, 10 credits

Pre-requisite(s): D211P1 Genes and Cells: 1 or equivalent

Note: This module is a pre-requisite for the modules D223F7 Virology, D224FA Microbial Mechanisms of Food Borne Disease, and D224F9 Analysis of Bacterial Gene Expression in Year 2. This module cannot be used as a pre-requisite unless students attend 75% of the practicals and achieve a pass mark in the practical element of the course (50 % of the module mark based on 4 short laboratory reports).

Number of places: 40

Target Students: BSc in Food Science, Nutrition and Food Science and students Malaysia Campus.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Principles of bacterial structure and nutrition covering the diverse ways by which bacteria obtain energy. Practical and theoretical elements of bacterial growth, and knowledge of bacterial adaption, including motility, sporulation and regulation of genes by alternative sigma factors. Strategies that bacteria have evolved to allow them to occupy selected environmental niches with additional information on the relevance of this to food. Special emphasis on the handling and presentation of data from microbiological experiments. Twenty x one-hour lectures at approximately two per week throughout the semester; four 3-hour practicals and four 1-hour practicals (results and subculture sessions) held in alternate weeks.

Timetable: Four hours per week to include practicals and tutorials. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: More detailed information will be given to you in the first session.

Topic 1	Bacterial cell structures Bacterial growth & protein synthesis
Topic 2	Anaerobic & Aerobic metabolism Selective & diagnostic culturing
Topic 3	Developmental processes: Bacterial spores
Topic 4	Adaptation: pH & Osmoregulation Membranes & transport systems Stationary phase & stress adaptation Temperature stress Bacterial Motility & Chemotaxis
Topic 5	Biocides & Disinfection
Topic 6	Food Preservation
Topic 7	Data analysis &
Topic 7	Microscopy
Topic 8	Sterile technique and viable count

Non-Lecture Programme: Three x 2.5 hr practicals, five x 1 hr practicals; 1hr open book test.

Coursework: 4 practical reports.

Assessment: Examination (40%) MCQ paper - 1 hour, 4 short laboratory reports (50%), and one open book Test (10%) -1 hour.

Aims: The major aim is to provide basic knowledge of bacterial cell structures and growth and to reveal the mechanisms that allow bacteria to respond to their environment. This will form a foundation upon which much of the higher level microbiology courses are based. Students will also be taught how to handle data commonly used in microbiological experimentation and be given training in the basic practical methods required for all microbiological laboratory work.

Learning Outcomes:

- Principles of microbial nutrition covering the diverse processes by which bacteria obtain energy.
- Practical and theoretical elements of microbial growth and knowledge of bacterial cells structures.
- Strategies microorganisms have evolved to allow them to occupy selected environmental niches, including motility, sporulation and regulation of genes by alternative sigma factors, with additional information on the relevance of these to food.

The students will gain: Knowledge and understanding i. knowledge of the ways microorgansims have adapted to growth under various environmental conditions. ii. an understanding of experimental approaches to investigating microbial populations. iii an insight into the relationship between microbial physiology and food preservation techniques. b Intellectual skills ii. an understanding of experimental approaches to investigating microbial populations. c Professional practical skills iv. ability to process and present data from microbiological experimentation v. basic training in sterile technique, culture and identification of microbes. d Transferable (key) skills iv. ability to process and present data from microbiological experimentation v. basic training in sterile technique.

Recommended background reading:

Brock, Biology of Microorganisms
Instant Notes in Microbiology, Nicklin etal.
Practical Skills in Biomolecular Sciences, Reed et al

D212F9 Physiology for Food Scientists

Module Convenor: Dr Alan Waterfall alan.waterfall@nottingham.ac.uk

Module Details: level 1 spring semester, 10 credits

Expected Number of Students taking module - 30

Target Students – D610 Food Science

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module introduces the major physiological systems that could have an impact of how food scientists approach wider issues. Specific focus will be made on the digestive, renal, cardiovascular, respiratory and endocrine systems; as well as investigating the sensory systems and practically assessing sensory food perception.

Assessment:

Exam 1	100%	ROGO based examination – 1 hour

Aims: This module deals with the major physiological systems which are essential for life. The aim is provide students with basic information on form and function within the digestive, renal, cardiovascular, respiratory, reproductive and endocrine systems. In each case the gross structures and functions of the major organs will be outlined, and the functions of individual cell types will be described in the context of each system as a whole.

The sensory systems will also be investigated in theory and practically assessed in an investigation of sensory perceptions of food

Learning Outcomes:

- Describe the major structures and function of some of the major physiological systems; respiratory; cardiovascular; renal; reproductive and digestive systems at the cellular, organ and organism levels
- Describe how different systems are interdependent and communicate with each other.
- Explain how different systems assimilate nutrients and remove waste products.
- Report on the impact of different foods on the sensory system.

D212P5 - Plant Science Research Tutorials

Module Convener: Dr. Kevin Pyke, Plant and Crop Sciences, School of Biosciences, kevin.pyke@nottingham.ac.uk

Module Details: Level 1 Autumn Semester 10 credits.

Expected Number of Students Taking Module: 15

Target Students: Students taking degree in Plant Sciences and students taking degree in Agriculture and Crop Sciences

Availability to Exchange Students: Yes provided they email module convenor first

Pre-requisite(s): Taking degree in Plant Sciences or Agriculture and Crop Sciences

Summary of Content – Each weekly session will be with a different academic and their research group, from the Plant and crop Sciences Division, who will explain and demonstrate their research to this particular cohort of students. This would also enable postgraduate students to talk to first year undergraduates about their work and for these students to gain a detailed understanding of the research areas and dynamics of the division to which they are related for their degree. It would also facilitate interaction between these students and academic staff who do not teach normally in the first year and hence improve staff interaction with these students in choosing modules in the second and third year and final year projects.

Assessment details: A 2000 word report submitted at the end of the module about a specific area of plant science research and how it may benefit our understanding of plant biology and how such knowledge may benefit society in the short and long term.

Aims: To explain and demonstrate to students the research taking place in the Plant and Crop Sciences Division and to enable students to familiarise themselves with the cohort of plant and crop science academic staff and learn about their cutting edge research.

Learning outcomes: On successful completion of the module, students will be able to:
1. Recognise the breadth of plant science research areas within the Plant and Crop sciences division
2. Appreciate how the research of different groups relates to the needs of society in improving and understanding plant function.
3. Develop an understanding of how research groups function in terms of their hierarchy of Principle Investigator, post-doc, postgraduate student and undergraduate student.
4. Demonstrate knowledge and synthesis of research literature of a chosen topic related to plant science research.

D212Z5 - Introductory Physiology

Module Convenor: Dr Alan Waterfall alan.waterfall@nottingham.ac.uk

Module Details: Level 1 spring semester, 20 credits

Note: This module is a pre-requisite for Year 2 module Physiology of Excitable Tissues.

Expected Number of Students Taking Module: 200

Target Students: Biosciences

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module will introduce the major physiological systems including the central nervous system, the respiratory system, the cardiovascular system, the renal system and the digestive system. In each case the gross structures and functions of the major organs will be outlined, and the functions of individual cell types will be described in the context of each system as a whole. Regulatory pathways, which integrate internal physiological responses with external influences will be investigated; basic principles of cell communication will be discussed in the context of cell-specific responses to developmental signals and environmental stresses. The topics covered will refer to genes, proteins and membranes, transport of molecules across membranes, nerve signalling and biorhythms. Examples from across the animal kingdom will be presented.

Timetable (provisional): This will consist of 2 lectures per week (5hrs) and 4(2 repeats) practical class (8hrs). The timetable can be viewed at www.nottingham.ac.uk/timetable

Teaching Programme (provisional):

Homeostasis	1 lecture (Dr Carl Stevenson)
Endocrine system	1 lecture (Dr Carl Stevenson, Prof Martin Luck)
Cellular communication	1 lecture (Dr Reinhard Stoger)
Cellular responses	2 lectures (Dr Dylan Sweetman, Dr Reinhard Stoger)
Nervous system	3 lectures (Dr John Harris, Dr Alan Waterfall)
Autonomic nervous system	1 practical repeated once (Dr John Harris, Dr Alan Waterfall)
Cardiovascular system	2 lectures (Dr Alan Waterfall)
Respiratory system	2 lectures (Dr Reinhard Stoger)
Renal system	2 lectures (Dr Simon Welham)
Digestive system	2 lectures (Dr Simon Welham)
Pharmacology	1 Lecture (Dr TBC)
Reproductive system	1 lecture (Dr Ravinder Anand-Ivell)

Stem cell/developmental physiology 1 lecture (Dr Ramiro Alberio, Dr Dylan Sweetman

Teaching Staff: Dr Reinhard Stoger, Dr John Harris, Dr Carl Stevenson, Dr Alan Waterfall, Dr Simon Welham, Dr Ravinder Anand-Ivell, Dr Ramiro Alberio, Dr Dylan Sweetman.

Assessment:
Exam 75% 2 hour examination
Coursework 1 25% MCQ questionnaire (60 questions) based on the lab practical

Aims: This module deals with the major physiological systems which are essential for life. The aim is provide students with basic information on form and function within the central nervous system, respiratory system, cardiovascular system, renal system and digestive system. In each case the gross structures and functions of the major organs will be outlined, and the functions of individual cell types will be described in the context of each system as a whole. This module will deal with animals from a functional standpoint including their reactions to the internal and external environments, reproduction and development. The aim of the course is to investigate how multilevel physiological processes ranging from environmental down to molecular, mediate organism function.

Learning outcomes: On successful completion of this module, students will be able to:

- Name the major anatomical structures of the major organs systems
  Identify the function of the major organ systems at the cellular, organ and organism levels
- Identify the basic rules of pharmacology and drug receptor interactions
- Recognise the interdependence of major physiological systems
- Identify the basic principles of cell communication
- Recognise cell-specific responses to developmental signals and environmental stresses.

D21BF1 - Food Materials and Ingredient

Module Convenor: Dr David Gray david.gray@nottingham.ac.uk,

Module Details: A level 1, 20 credit module taught in the Spring and Autumn Semester at Sutton Bonington and assessed by the end of the spring semester. The module consists of lectures, practical classes and student centered learning

Pre-requisite(s)*:* None

Note: This module is a pre-requisite for D223F0 Manufacture of Food (40 credit), and D224FO Food Product Case Studies

Expected Number of Students Taking Module: 50

Target Students: Honours students studying 'Food Science' or 'Nutrition and Food Science'.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Food materials can be raw, or in the form of manufactured food products. During processing, the material properties of the food are altered; this directly affects the quality of the food product in terms of, for example, its colour, flavour and texture. This module introduces you to properties of these materials (raw and processed), with a particular focus on the chemical and physical nature of carbohydrates, proteins and lipids; the details of food processing/engineering is covered later in the semester 3 module entitled 'Manufacture of Food' (D223F0). Practical classes will support lectures where the properties of food materials can be observed at first hand; analytical methods will be learnt so that particular properties of the food materials can be measured. In addition to these formal classes, there is an opportunity in small teams to compose a poster that explains the properties of the ingredients listed on the label of a specific product.

Timetable: Typically three and half hours of teaching/practicals per week with appropriate breaks: 39 hours of lectures, 18 hours of practicals, 6 hours of tutorials, 4 hours timetabled for poster preparation, 3 hours to present poster to industry. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: This Lecture programme is provisional and more detailed information will be given to you in the first session.

Semester 1

- Module Introduction
- Why study Food Materials?
- Food Labels and Units of Concentration
- Units and Calculations
- Properties of Water
- Ash Measurement
- pH and Buffers
- Practical: Physical-Chemical Attributes of Foods
- Amino Acids & Protein Functionality
- Lipids and emulsions
- Sugars & Complex carbohydrates
- Practical: Parallel Sessions: Cooking Meets Science 1
- Colour and Spectroscopy
- Practical: Colour and Spectroscopy
- Tutorial: Calculations

Semester 2

- Preservatives & Lipid Oxidation
- Modification of Oils and Fats
- Practical: Edible Fats
- Tutorial: Edible Fats
- Starch and Thickeners
- Practical: Starch
- Viscosity
- Emulsifiers
- Practical: Cooking Meets Science 2
- Interactive Food Label Exercise

Assessment Details:
Exam 1 40% Examination (2 hours)
Report 20% Practical Report (1000 words)
In-Class Test 40%
Assessment details to be confirmed at that start of the module

Aims:
• learn about the basic chemical and physical nature of the materials that make up foods.
• understand the different techniques employed to measure the composition and certain functional properties of food materials
• appreciate the changes occurring to food materials during processing, and to become familiar with some of the methods used to measure the changes that determine the quality of the food product and begin to develop the ability to interpret food labels and appreciate the functional properties of listed ingredients

Learning Outcomes: On successful completion of the module, students will be able to:
1. From a chemical and physical perspective, describe and explain the structure and functional properties of food materials and ingredients.
2. Select from a range of quantitative methods used to measure food composition, and justify your choice
3. Interpret and present qualitative and quantitative data

D21BF3 Microbes and You

Module Convenor: Dr Jon Hobman jon.hobman@nottingham.ac.uk

Module Details: Level 1, autumn and Spring Semesters, 20

Credits

Pre-requisite(s): None

Co-requisite(s): D211P1 Genes and Cells: 1**;** D21BN2 Biochemistry – The Building Blocks of Life

Expected Number of Students Taking Module: 65

Target Students: Compulsory for Year 1 Microbiology degree students. Available to Biotechnology and Students from other Schools.

Availability to Exchange Students: Yes provided they email module convenor first and only available to Exchange Students if relevant to year 1.

Summary of Content: A historical and contemporary perspective on how microbes interact with humans, animals, plants and other organisms; how microbes influence environmental processes, and how microbial products contribute to healthcare, food production, and manufacturing. The module will examine the current challenges facing the world human population, and potential microbial solutions to these problems. It will address the influence of technological developments, and scientific understanding of microbes and the public perception of them.

Key themes: 1) The module will examine human interactions with microbes, beneficial interactions, virulence and pathogenesis, probiotics, host factors in infection, bacteriophages and the flora of the human gut. 2) Commercial products produced from microbes and the use of biotechnology, and genetically modified foods. 3) Nutrient cycles, biodegradation and bioremediation. 4) Microbial systematics and symbiosis in other organisms. 5) Eukaryotic microbiology, 6) Yeasts and fungi

Assessment:

Coursework 1	40	1500 word essay.
Coursework 2	20	15 minute student PowerPoint presentation
Exam 1	40	1.5 hour exam. Students to answer 6/9 questions in spring.

Aims: The aim of this module is to introduce students to the core concepts and understanding of, the relationship between Microbes and humans. It aims to encourage within a taught framework of knowledge and understanding of these relationships, the development of core transferrable skills in oral, presentational and written communication. The coursework is aimed to encourage reflective and self-motivated learning, through the acquisition of information, and construction of a balanced reasoned argument towards answering a question. The tutorial aspect will encourage active participation and self-directed learning.

Learning outcomes: On successful completion of this module students will be able to:
(1) Comprehend the terminology and nomenclature used in microbiology to appreciate and express their knowledge of the subject area.
(2) Explain the diverse range of essential information, major concepts, principles and theories associated with specialist disciplines within Microbiology.

(3) Collect and integrate several lines of evidence and apply them in a balanced manner to support an argument.
(4) Apply subject knowledge and understanding to address problems, and effectively communicate these in written and verbal forms.

D21BF7 The Physiology of Microbes

Module Convenor: Dr C Rees cath.rees@nottingham.ac.uk

Lecturers: Dr P Hill, Dr C Powell

Module Detail: Level 1, Full Year new module, 20 credits

Co-requisite(s): D211P1 Genes and Cells: 1 and D212P3 Applied genetics: 2 (or equivalents)

Note: This module is a pre-requisite for the modules C52304 Medical Microbiology, D223F6 Bacterial Biological Diversity, D223F7 Virology, D224F9 Analysis of Bacterial Gene Expression, D224FA Microbial Mechanisms of Food Borne Disease and the Microbiology option within D224G1 Professional Skills for Bioscientists.

This module cannot be used as a pre-requisite unless students attend 75% of the practicals and achieve a pass mark in the practical element of the course (45 % of the module mark based on 4 short laboratory reports).

Number of places: 60

Availability to Exchange Students: Yes provided they email module convenor first

Target Students: BSc Microbiology, BSc Biotechnology and other related biological sciences

Summary of Content: The module will introduce students to the principles of bacterial and yeast cell structure and nutrition, covering the diverse ways by which these microbes obtain energy. The module will cover both practical and theoretical elements of microbial growth and survival, including the processes of adaption and strategies that they have evolved to allow them to occupy selected environmental niches. Special emphasis is placed on the growth and identification of microbes and analysis data from microbiological experiments. Twenty x one-hour lectures at approximately two per week throughout the semester; five 3-hour practicals and five 1-hour practicals (results and subculture sessions) held in alternate weeks.

Timetable: Four hours per week to include practicals, lectures and tutorials. Some topics will be delivered by E-learning materials which students can access in non-timetabled sessions. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: More detailed information will be given to you in the first session.

Topic 1	Yeast cell structure and function
Topic 2	Yeast cell growth and replication
Topic 3	Bacterial cell structure and function,
Topic 4	Bacterial growth, DNA replication, cell division and protein synthesis
Topic 5	Anaerobic & Aerobic metabolism in yeast and bacteria
Topic 6	Developmental processes and survival: Bacterial spores
Topic 7	Mechanisms of adaptation:

	Membranes & transport systems; pH homeostasis & Osmoregulation Stationary phase & stress adaptation including temperature stress Different mechanisms of bacterial motility and control of movement (Chemotaxis)
Topic 8	Inactivation of microbes using biocides for cleaning and disinfection and inactivation of microbes using antibiotics
Topic 9	Control of microbial growth in food
Topic 10	Culture methods, Selective & diagnostic agar and identification of microbes
Topic 11	Data analysis & presentation of microbial growth data
Topic 12	Microscopy including fixed and live samples
Topic 13	Sterile technique and determining viable count by serial dilution

Non-Lecture Programme: Three x 2.5 hr practicals, five x 1hr practicals; 1hr open book test.

Coursework: 4 practical reports; one graph plotting exercise; one open book test/exam practice session.

Assessment: Examination (40%) MCQ paper – 1.5 hour, 4 short laboratory reports (45%), one graph plotting exercise (10%) and one open book Test (5%) -1 hour.

Aims: To provide students with knowledge of yeast and bacterial cell structures and growth which will form a foundation upon which much of the higher level microbiology courses are based. In addition students will be introduced to the concepts of homeostasis in single cells and the adaptations required to achieve this when the external environment changes. This underpin this students will be introduced to the adaptations that single cells can undertake, such as motility and chemotaxis, sporulation and other responses to environments through changes in patterns of gene expression. Students will be taught how culture and identify microbes and how to process data commonly used in microbiological experimentation. Students will be trained in the basic practical methods required for all microbiological laboratory work.

Learning Outcomes: On successful completion of this module students will be able to:

- Principles of microbial nutrition covering the diverse processes by which yeast and bacteria obtain energy.
- Practical and theoretical elements of microbial growth and knowledge of yeast and bacterial cells structures.
- Strategies microorganisms have evolved to allow them to occupy selected environmental niches, including motility, sporulation and adaptive gene regulation.

In addition students will gain experience of:

- Experimental approaches to investigating microbial populations.
- Processing and presenting data from microbiological experiments
- Basic sterile technique, cell culture and methods used to identify microbes.

Recommended background reading: Brock, Biology of Microorganisms**,** Instant Notes in Microbiology, Nicklin etal. Practical Skills in Biomolecular Sciences, Reed et al

D21BN1 Introduction to Nutrition

Module Convenor: Dr L Coneyworth lisa.coneyworth@nottingham.ac.uk

Module Details: Level 1 autumn and spring semesters, 20 credits

Note: This module is a pre-requisite for D224N0 Nutrition, Metabolism and Disease, & D223N8 Principles of Animal Nutrition

Expected Number of Students Taking Module: 180

Target Students: Students studying Master of Nutrition (B401), BSc Nutrition (B400), Nutritional Biochemistry (C770), Nutrition and Food Science (B4D6) and Animal Science (D320).

Availability to Exchange Students: Yes provided they email module convenor first.

Summary of Content: This module aims to provide a comprehensive introduction to the key concepts in the field of Nutrition, including macronutrients, energy metabolism, vitamins and minerals. The role of nutrition in human disease will be introduced in the context of major public health issues (coronary heart disease, cancer, obesity and diabetes). Animal-specific content will include ruminant and comparative animal nutrition and animal product quality. Key academic and transferable skills will also be taught in lectures and tutorials, with a particular emphasis on evidence-based approach to nutrition.

Timetable: Typically one two hour timetabled session per week. Twenty two lectures. Further Activity Detail: One computer practical (4 hours) will take place during the Autumn semester, to introduce online resources. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: This lecture programme is provisional and more detailed information will be given to you in the first session.

Week	SUBJECT
AUTUMN	
1	Introduction to Module Dietary Reference Values
2	Macronutrients - Protein
3	Macronutrients – Carbohydrates
4	Macronutrients – Lipids
5	Energetics
6	Energetics
7	Vitamins 1
8	Vitamins 2
9	Minerals 1
10	Minerals 2
11	Revision session

Teaching Staff:
Dr Lisa Coneyworth (LC, module convenor), Dr Preeti Jethwa (PJ), Miss Joanne Pearce (JP)

Week	SUBJECT
SPRING	
19	Introduction and Public Health Nutrition
20	Food Labelling & Pre/pro-biotics
21	Functional Foods
22	Obesity & cancer (human)
23	Equine and companion animal nutrition (animal)
24	Diabetes (human)
25	Comparative nutrition & ruminant nutrition (animal)
26	Coronary Heart Disease (human)
31	Product quality (animal)
32	Revision session
33	Coursework 1

Teaching Staff:
DR Lisa Coneyworth (LC) Prof Simon Langley-Evans (SLE), Dr Matthew Elmes (ME), Dr J Brameld (JB), Dr Marcos Alcocer (MA), Prof A Salter (AS), Dr Tim Parr (TP), Miss Joanne Pearce (JP)

Coursework: Online assessment of taught content at the end of the Spring semester (1 hour)

Assessment:
Exam 1 70% 2 hour online 'short answer' exam (**Autumn**)
Inclass Exam 1
(Written) 30% In-course online assessment of 1hr duration at the end of **spring**

Aims: On successful completion of the module, students will be able to:
1) To provide a sufficiently comprehensive basis in nutritional science, both for students preparing to specialise in Nutrition and those preparing for other specialisations.
2) To emphasise the scientific, evidence-based approach to nutrition and illustrate the quantitative nature of nutrition science.
3) To extend these ideas into applications specific to animal and human nutrition and highlight the differences and similarities between the two disciplines.

Learning outcomes: On successful completion of the module, students will be able to:
1) Describe the role of essential nutrients (macro and micro) in mammals
2) Describe the basic principles underlying nutritional energetics
3) Recognise comparative aspects of nutrition between species

In addition, students focussing on animal nutrition will be able to:
4) Describe the role of nutrition in producing high quality animal products for human consumption

In addition, students focussing on human nutrition will be able to:
5) Describe the influence of diet on the prevention of disease

D21BN2 Biochemistry–The Building Blocks of Life

Module Convenor: Dr Matt Elmes matthew.elmes@nottingham.ac.uk

Lecturers: Dr Matt Elmes (ME); Dr Marcos Alcocer (MA) ; Prof Andy Salter (AS); Dr Andy Murton (AM); Dr Simon Welham (SM); Dr Ranjan Swarup (RS); Dr Kevin Pyke (KP).

Module Details: Level 1 Autumn and Spring semesters, 20 credits

Expected Number of Students Taking Module: 250

Target Students: All School of Biosciences students in year 1

Availability to Exchange Students: Yes provided they email module convenor first

Note: This module is a pre-requisite for D224N0 Nutrition, Metabolism and Disease, D223F0 Manufacture of Food (40 credit), D223N8 Principles of Animal Nutrition, D224A6 Endocrine Control Systems & D224G1 Professional Skills for Bioscientists

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Summary of Content: This module introduces - proteins, carbohydrates, lipids and nucleic acids. The structure and properties of these will be examined in relation to their function. Topics covered include proteins as structural elements and enzymes, lipids as components of cell membranes, carbohydrates as energy stores and nucleic acids as genetic information and genetic engineering. The process of protein synthesis in prokaryotes will be outlined. The nutritional roles of amino acids, carbohydrates and fats will also be considered briefly. The major metabolic pathways in the cell responsible for energy production (respiration) and biosynthesis of cellular components, including the major pathways of carbohydrate and lipid metabolism along with some aspects of thermodynamics will be covered. Photosynthesis and pathways responsible for the assimilation of nitrogen in plants and eventually animals, will be covered along with general nucleic acid metabolism. In addition general mechanisms for the control of cellular metabolism will also be discussed. The practical sessions are designed to introduce students to several key biochemical techniques. In the first semester this will introduce students to the use of spectroscopy and demonstrate two major separation techniques - chromatography and electrophoresis. The practical sessions in the second semester are designed to introduce the concept of sub-cellular fractionation, enzyme assays and metabolite quantification.

Lecture Programme (provisional):

Week	Subject	Lecturers
2	Nucleic acids - structure	ME
3	Nucleic acids – Properties and Applications	AM
4	Amino acids and protein structure	MA
5	Practical	ME, MA,
6	Practical	AM, ME
7	Practical	MA, AM
8	Protein synthesis	SW
9	Amino acid metabolism	MA
10	Nucleotide synthesis and metabolism	MA
11	Nucleotide synthesis and metabolism	MA
12	Enzymes	SW
19	Bioenergetics and Respiration	ME, RS

20	Bioenergetics and photosynthesis	ME, KP
21	Bioenergetics	ME
22	Practical	ME, MA,
23	Practical	AM, ME
24	Practical	MA, AM
25	Carbohydrates and lipids-structure	ME, AS,
26	Carbohydrates and lipids-structure	ME, AS
31	Carbohydrates and lipids -functions	ME, AS
32	Metabolic control	ME

Teaching Staff: Dr Matt Elmes (ME); Dr Marcos Alcocer (MA); Prof Andy Salter (AS); Dr Andy Murton (AM); Dr Simon Welham (SM); Dr Ranjan Swarup (RS); Dr Kevin Pyke (KP).

Coursework: One MCQ based online test and a practical report.

Assessment:

Exam 1	40%	1.5 hour MCQ exam
Coursework 1	20%	MCQ moodle assessment
Coursework 2	40%	Practical Write up in Spring

Aims: The aim of this module is to introduce students to the basic structure, properties and functions of the four key biological macromolecules namely- nucleic acids, proteins, carbohydrates and lipids. It also aims to introduce the basic metabolic pathways occurring in cells, such as respiration, photosynthesis and the biosynthetic pathways for the key macromolecules. In particular:
1. To provide a basis for the understanding of biochemical processes in living organisms.
2. To provide students with a basic understanding of the structure and key properties of all four major macromolecules.
3. To demonstrate to students how these properties are essential for the biological functions of the macromolecules.
4. To provide students with a basic understanding of the major biochemical pathways in cells and their control.
5. To demonstrate to students how these pathways are essential for the cell.
6. To demonstrate several key biochemical techniques for the separation and analysis of macromolecules and measurement of metabolic processes.

Learning Outcomes:

Knowledge and Understanding – to learn of:
The structure, properties and functions of proteins, nucleic acids, lipids and carbohydrates.
Handle kinetic data and understand molarityUnderstand the basic principles of key techniques such as electrophoresis and spectrophotometry.
The major metabolic pathways such as respiration, photosynthesis, lipid and protein biosynthesis.
Bioenergetics and the role of energy in metabolism.
Understand the basic principles of key techniques used to study metabolism such as enzyme assays.

Intellectual Skills – the ability to:

Analyse simple experimental data.
Handle simple mathematical concepts relevant to the biological sciences, such as molarity, calibration curves and kinetics.

Practical Skills – the ability to:

Accurately operate simple laboratory equipment, such as pipettes.
Collect and record data.
Work safely in the laboratory.

Transferable/key skills – the ability to:

Communicate experimental results clearly and concisely in a written form.
Work productively as an individual and as part of a team.
Manage time efficiently.

YEAR 2 MODULES

C123E3 Soil Science

Module Convener: Dr S Young scott.young@nottingham.ac.uk

Lecturers: Dr Helen West (HW), Prof Sacha Mooney (SM).

Module Details: Level 2, Autumn Semester, 10 credits.

Pre-requisites: No pre-requisites.
This is an introductory course, which is a pre-requisite for (C124E0) Soil and Water Science

Expected Number of Students Taking Module: 90

Target Students: (F900) BSc Environmental Science; (F750) MSci in Environmental Science; (C150) BSc Environmental Biology; (D400) Agriculture; (DF47) BSc Agriculture and Environmental Science; (D409) Agriculture and Crop Science.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This is an introductory course which provides a basic understanding of the nature and properties of soil and the application of soil chemistry, biology and physics to land management and environmental science. Broadly, the topics covered include: soil formation; clay mineralogy; soil organic matter (microbiology and chemistry); soil texture and structure; characteristic soil reactions (acidity, redox); the major and minor plant nutrients (chemistry and microbiology); soil fauna and flora; water relations (irrigation and drainage).

Lecture Programme:

Week Topic

1 Introduction to course (SY); soil clays: mineralogy and function (SY)
2 Soil organic matter (SY); Major soil nutrients – nitrogen (SY)
3 Major soil nutrients – phosphate and potassium (SY); Soil acidity (SY)
4 Redox reactions in soils (SY); Soil trace elements (SY)
5 Introduction to life in the soil (HW); Soil biological processes I (HW).
6 Soil biological processes II (HW); Soil bioremediation and reclamation (HW)
7 Soil texture (SJM); Soil structure (SJM).
8 Soil water content (SJM); Soil water potential (SJM).
9 Soil aeration (SJM); Soil water movement (SJM)
10 Soil erosion (SM); soil compaction (SJM); Course appraisal (SY)
11 Reading week.

Assessment:
Exam 1 100% 2-hour multiple choice exam with 100 short questions requiring single choice from 4 options

Aims: To provide an understanding of the physical, chemical and biological properties of soils and terrestrial processes. To provide training in the practical interpretation of soil information for land management purposes. At the end of the module, the students should (i) possess quantitative knowledge of the magnitude of common soil parameters; (ii) have a clear understanding of the inter-relationship of soil processes; (iii) be able to offer pragmatic advice on soil management to environmental and agronomic managers.

Learning Outcomes: On successful completion of this module, students will be able to:

- Discuss the composition and origins of soil geo-colloids and humus and their roles in soil as a medium for plant growth.
- Explain the processes governing nutrient transformations and dynamics in soils.
- Describe the role of soil texture and structure in governing soil physical processes.
- Demonstrate understanding of soil water relations and water movement in soils.
- Outline the nature of soil flora and fauna and their dependency on soil conditions.
- Discuss the functions of soil biota in soil as a medium for plant growth.

Recommended Reading:

Rowell, D.L. 1994. *Soil Science; Methods and Applications*. Longman, UK.
Ashman, M.R. and Puri, G. 2002. Essential Soil Science. Blackwell Publishing, UK.
Note: All lectures are provided as PowerPoint files within the Blackboard VLE.

C124E0 Soil and Water Science

Module Convenor: Professor Sacha Mooney sacha.mooney@nottingham.ac.uk,

Lecturers: Dr Scott Young, Dr Liz Bailey

Module Details: Level 2 Spring semester, 20 Credits

This module is capped at 60 - You will need permission from the module convener to take this module unless it is a core module for your course

Pre-requisites: C123E3 Soil Science, C111E1 Global Environmental Processes, C111E5 Environmental Geoscience

Target Students: BSc (Hons) Environmental Science and Environmental Biology - Availability to Exchange Students - **BUT Not applicable for year 1**. Please email the module convenor.

Summary of Content: An advanced study of the physical and chemical processes that govern the behaviour and interaction of soil and fresh water systems. The module includes the study of: 1) The Hydrologic Cycle, the mechanisms controlling the movement and storage of water, into, through and within soils including infiltration and runoff, sustainable management of soils. 2) The processes that govern the movement of solutes and colloidal material. 3) Surface and sub-surface waters – chemistry of precipitation, rivers and lakes including impact of biological organisms on lake chemistry, major and trace element geochemistry of surface and sub-surface waters, controls on their composition, recharge, weathering rates and solubility of aquifer rocks, water bearing properties of common rock types.

Timetable: Typically one four-hour timetabled session per week: twenty lectures, regular tutorials/examples classes, forty hours student led studies and revision. Two assessed practicals run in the afternoon of weeks 3 and 8. The timetable can be viewed at www.nottingham.ac.uk/timetable

Example Lecture Programme
2016 -17 Spring

Module Name	**Soil & Water Science**	**Module Code**	**C124E0**

Week	Date	Duration		Subject	Format	Rm No	Staff
		From	To				
1	28 Jan	09.00	13.00	The Hydrological Cycle	Lecture	Physics C04	SM&EB
2	4 Feb	09.00	13.00	Soil Water Potential	Lecture	Physics C04	SM
3	11 Feb	09.00	13.00	Soil Water Flow Processes*	Lecture	Physics C04	SM
4	18 Feb	09.00	13.00	Sustainable Soil Management	Lecture	Physics C04	SM
5	25 Feb	09.00	13.00	Geo-colloids & Salinity	Lecture	Physics C04	SY
6	3 Mar	09.00	13.00	Adsorption	Lecture	Physics C04	EB&SY
7	10 Mar	09.00	13.00	Reduction and Oxidation	Lecture	Physics C04	SY&EB
8	17 Mar	09.00	13.00	Solubility 1*	Lecture	Physics C04	EB&SY
9	21 Apr	09.00	13.00	Solubility 2	Lecture	Physics C04	SY&EB

10	28 Apr	09.00	13.00	Diffusion & Kinetics	Lecture	Physics C04	EB&SY
11	5 May	09.00	13.00	Assessment Review	Lecture	Physics C04	ALL

Assessment:
Exam 1 70% 2 hrs (Rogo)
Coursework 1 30% 2 x 1000 word laboratory style reports

Aims: The aim of the module is to provide a sound understanding of important physical and chemical processes that take place within soils and fresh water systems. This includes provide a basis for the understanding of more applied aspects of the behaviour of these systems (e.g. plant-soil interactions, pollution and its remediation).

Learning outcomes: On successful completion of this module, students will develop:
1. Specific knowledge of the physical processes that govern the behaviour of soil and water systems including an understanding of the physical processes controlling water retention and flow through soils and the underlying geology.
2. Specific knowledge concerning the chemical processes that occur within soil and water systems including an understanding of the major physico-chemical processes that generate waters of different chemistries at or near the Earth's surface.
3. Quantitative knowledge on how to appropriately interpret physical and chemical data relating to soil and water systems.
4. Wider knowledge and understanding of the key principles concerning the sustainable management of soil and water systems.

Recommended Reading:
Bohn, H., McNeal, B and O'Conner, G. 1985. Soil Chemistry. John Wiley & Sons, New York. Hillel, D. (1998) Environmental soil physics, Academic Press, California. Langmuir, D. 1997. Aqueous Environmental Geochemistry. Prentice Hall, New Jersey. Marshall, T.J., Holmes, J.W., & Rose, V. (1999). Soil Physics. Cambridge University Press, Cambridge.

D223A6 Economic Analysis for Agricultural and Environmental Sciences

Module Convenor: Dr Christina Siettou Christina.Siettou@nottingham.ac.uk

Module Contributor: Dr Stephen Ramsden (SR) Stephen.ramsden@nottingham.ac.uk

Module details: A Level 2, 10 credit module taught in the Autumn Semester at Sutton Bonington. The module consists of lectures, computer-aided-learning, tutorials and a farm visit.

Pre-requisites: Successful completion of a year one course within the School of Biosciences.

Expected Number of Students Taking Module: 35

Target Students: Students interested in management and economics in Agricultural and Environmental Sciences.

Availability to Exchange Students: Yes provided they email module convenor first

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Summary of Content: The module theme is the application of economic ideas to problems of concern to Agricultural and Environmental Scientists. Demand analysis is used to explain how changes in prices and incomes affect consumer purchasing decisions; marginal analysis is used to show how inputs and outputs can be allocated profitably and supply analysis is used to show how prices and technology influence production. Supply and demand are combined to show how market prices are determined and the idea of an `efficient market' is introduced and contrasted with `market failure'. Emphasis is placed on two problems arising from market failure - nitrate pollution and low farm incomes - and the arguments for government intervention to correct market failures are discussed with reference to the Common Agricultural Policy (CAP). Current and potential future CAP support mechanisms and their impact on arable and animal production are then described. Using CAL, business planning techniques are introduced to analyse the impact of the above market and policy environment on business performance (profitability_ and stability (cash flows and balance sheets). Practical applications of the ideas introduced in the module are considered in relation to a local farm through a field visit.

Lecture Programme:

Week 1	Introduction and aims of the module, methods of teaching, procedures for module evaluation and student feedback. *Lecture 1. Demand for Agricultural Products*
Week 3 Lecture 2:	*Agricultural Production*
Week 4 Lecture 3:	*From Production to Supply*
Week 5 Lecture 4:	*The Market Solution and the Role of Government*
Week 6 Lecture 5:	*The Common Agricultural Policy: Past, Present and Future*
Week 7 *Lecture 6:*	*Guest Lecture - Economic Adviser from Defra. How and why economic analysis is important to agriculture and agricultural policy*
Week 9 Lecture 7:	*How can we apply Economics to Business? Profit and Gross Margins*
Week 10 Lecture 8:	*Planning for Stability – Balance Sheets and Cash Flows*

Non-Lecture Programme:
The module is supported by a programme of post-lecture tutorials, Computer-Aided-Learning (CAL) and a Farm Visit.

Coursework: Coursework accounts for 25% of the overall mark for this module. Coursework consists of a report in which students calculate production, environmental and short run and long run profitability impacts of decisions relating to agricultural fertilisers

Assessment: Exam 75% 1 hour 30 mins. Coursework 25% essay - 1500 words

Aims: The module aims to equip students with an understanding of economic ideas and principles and to show how these can be used to explain a range of economic problems of interest to Agricultural Scientists.

Learning outcomes: On successful completion of the module, students will be able to:

- Explain the concepts of demand, supply and market efficiency within an agricultural context
- Appreciate the concept of marginality and apply this to agricultural and environmental decision making problems
- Identify why and where markets may fail, with particular reference to agricultural pollution
- Recognise and appraise arguments for government intervention in agriculture
- Demonstrate understanding of the historical development of the Common Agricultural Policy within the context of market failure
- Understand and differentiate between the core business management measures: profit, gross margin, cash flow and balance sheet

Recommended Reading: Nix, J. (2015). Farm Management Pocket book (46th Edition), The Andersons Centre. Hill, B. (2006). An introduction to Economics – Concepts for students of Agriculture and the Rural sector. (Third Edition) Wollingford: CABI.

D223A8 Physiology of Electrically Excitable Tissues

Module Convenor: Dr J Harris john.harris@nottingham.ac.uk)

Other staff: Dr A Waterfall, Dr Carl Stevenson

Module Details: Level 2 Autumn semester, 20 Credit

Pre-requisites: D212Z5 Introductory Physiology

Module capped at 87 - You will need permission from the module convener to take this module unless it is a core module for your course

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module considers the physiology and pharmacology of systems involving the principal electrically excitable tissues in the body i.e. the nervous system, muscles and cardiovascular system. Lecture and practical content will include: • Membrane structure and permeability • The membrane potential and action potentials • The neuromuscular junction and properties of skeletal muscle • Sensory and motor systems • Touch, nociception and pain • Neurotransmitters, receptors and drugs • Learning and memory • The cortex and higher function • The anatomy of the heart • Electrical conductivity in the heart and its measurement • Blood pressure and its measurement

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Module introduction
2 Ion Channels
3 G-Protein Coupled Receptors
4 Membrane Potential
5 Action Potentials
6 The Neuromuscular Junction
7 Properties of Skeletal Muscle
8 Motor Systems
9 Sensory Systems
10 The Somatosensory System
11 Nociception
12 Neurotransmitters, Receptors & Drugs
13 Excitatory & Inhibitory Amino-acid Neurotransmitters
14 Learning & Memory
15 The Cortex & Higher Function
16 Autonomic Nervous System Pharmacology
17 Excitability of Cardiac Muscle
18 Blood Pressure
19 Module Review and Exam Advice

Practical Class Programme: Practical class programme is provisional and more detailed information will be given to you in the first session.

1 The Neuromuscular System I (data collection)
2 The Neuromuscular System II (data analysis, formative assessment of graphs)
3 The Somatosensory System I (data collection)

4 The Somatosensory System II (data analysis, submission of graph as part of Coursework 1; see below)
5 Pharmacology I (data collection)
6 Pharmacology II (data analysis, submission of graph as part of Coursework 1; see below)
7 Heart Dissection
8 The Electrocardiogram (data collection, analysis, submission of graph as part of Coursework 2; see below)
9 Blood Pressure (data collection, analysis, submission of graph as part of Coursework 2; see below)

Assessment Details:

Exam 1	60%	Exam
Coursework 1	20%	3 Rogo assessments (20 marks each) based on analysis of data collected during the neuromuscular, somatosensory and pharmacology practical classes and underlying physiological mechanisms. Submission of graphs based on data collected during somatosensory and pharmacology practical classes (20 marks each).
Coursework 2	20%	Submission of graphs and statistical analyses produced from ECG and blood pressure data collected during these practical classes (30 marks each) together with completion of an associated on-line Rogo assessment (40 marks).

Aims: The module is intended to provide a solid grounding in the biophysical aspects of excitable cell function, hence the module initially aims to expand students understanding of the physiology and pharmacology of the nervous system, then subsequently introduces students to the integrative actions of the nervous system by looking at excitable systems it controls/modulates (i.e. muscles including cardiac tissue). The module achieves this through a number of practical classes which build on lecture content in this and earlier modules (D212Z5 Introductory Physiology); these aim to teach students to collect, analyse and present real data from the neuromuscular, somatosensory and cardiovascular systems as well as how to perform a quantitative pharmacological investigation.

Learning Outcomes: On successful completion of this module, students will be able to: • Explain how excitability is generated and conducted in nervous and muscular tissues hence the processes of action potential conduction, synaptic transmission and muscle contraction (including the heart) • Discuss examples of afferent, efferent and interneuronal anatomy within the nervous system hence the involvement of these neurones in sensation, motor responses and higher brain function • Describe the pharmacology of neurotransmitters and their receptors hence how function can be altered by drug administration or diseases • Produce graphs of physiological data obtained in a practical setting • Discuss experimental data incorporating knowledge acquired in lectures or via further reading in the subject area

D223A9 Agri-Business Enterprise and Innovation

Module Convenor: Dr M Bell Matt.Bell@nottingham.ac.uk, other staff, guest lecturers.

Module Details: Level 2, Autumn semester, 20 Credits

Pre-requisites: None.

Co-requisites: None.

Expected Number of Students Taking Module: 20

Target Students: For students studying BSc integrated Agricultural Business Management, BSc Agriculture and related subjects

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module aims to equip students with an understanding of the nature of innovation and how innovation can add value and contribute to agri-business success and growth. We will focus on three innovative approaches: technological (e.g. new technologies that affect agricultural inputs and outputs); entrepreneurial (e.g. business start ups); and green marketing (e.g. added value through use of social and environmental data). You will learn how to use knowledge exchange principles; how to protect intellectual property through patents and other methods, and how legal and planning issues affect innovation. Innovation opportunities will be considered in relation to contemporary issues, including changing household structure and demand, global markets, sustainable intensification, green energy, alternative land uses, diversification and 'big data'. You'll build on the skills developed in this module further in the final year 'Innovation Incubator' module, where you'll develop your own business idea.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional timetable:

Week	*SUBJECT*	*LECTURER*
1	Introduction, *The history and economics of innovation in agriculture*	SJR
2	*Knowledge Transfer, Knowledge Exchange – market, policy and social opportunities for innovative practice in agriculture*	SJR
3	*Innovation 1: Technology*	TBA
4	Student led seminar: capturing the benefits of technological innovations	
5	*Innovation 2: Entrepreneurship*	Guest Lecturer
6	Business Visit – *The entrepreneur*	
7	*Innovation 3: Green marketing and adding value*	TBA
8	Student led seminar: capturing the benefits of marketing innovations	
9	*Legal frameworks and protecting the value of innovation: patents and brands*	Guest Lecturer
10	*Using 'big data' innovatively*	TBA
11	Student presentations: Capturing the benefits of innovation – business plans	

Coursework: Assignment (100%) Capturing the benefits of innovation - 2000 words.

Aims: The module aims to equip students with an understanding of the nature of innovation and how innovation can add value and contribute to agri-business success and growth. We will focus on three innovative approaches: technological (e.g. new technologies that affect agricultural inputs and outputs); entrepreneurial (e.g. business start ups); and green marketing (e.g. added value through use of social and environmental data). You will learn how to use knowledge exchange principles; how to protect intellectual property through patents and other methods, and how legal and planning issues affect innovation. Innovation opportunities will be considered in relation to contemporary issues, including changing household structure and demand, global markets, sustainable intensification, green energy, alternative land uses and diversification. You'll build on the skills developed in this module further in the final year 'Innovation Incubator' module, where you'll develop your own business idea.

Learning outcomes: On successful completion of the module, students will be able to:

- Demonstrate an understanding of the historical contribution of innovation to agricultural businesses.
- Demonstrate an understanding of different approaches to innovation, focussing on technological and entrepreneurial innovation
- Place this understanding within a range of contemporary market, policy and social opportunities
- Illustrate how innovation and entrepreneurship enhance business success and growth.

D223F6 Bacterial Biological Diversity

Module Convenor: Prof C.E.R. Dodd Christine.dodd@nottingham.ac.uk

Lecturer: Dr. D. Scott; Dr K. Brown

Module Details: Level 2, Autumn semester, 10 credits

Pre-requisites: D211P1 Genes and Cells I

Availability to Exchange Students: Yes provided they email module convenor first

Expected Number of Students Taking Module: 40

Target Students: Compulsory for students taking Honours degree in Microbiology. Optional for students taking Honours degree in Applied Biology and Biotechnology.

Availability to Exchange Students: Yes

Summary of Content: This module is designed to provide an understanding of the extent of prokaryote biological diversity. Following introductory lectures on microbial taxonomy and classification, students will undertake two student-centred exercises. The first will be the production of an essay on a chosen organism covering its taxonomy, biology and ecology. The second will be a group exercise to design a web site including the material collated for the essay. This will be presented to class members in a short group presentation. The web pages will be accessible by other students to aid student centred learning of other topics, which will be an essential element for the final examination. Examination will be by a preset essay topic.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Indicative Timetable for module

Lecture Programme: Approximately 7h of lectures within the first 3 weeks of the Semester

Non-Lecture Programme: Four hours of tutorials throughout the Semester.

Indicative Timetable for module

Week 1
3h formal teaching

Introduction to the module	CERD
Classical bacterial taxonomy	CERD
Effect of plasmids on bacterial taxonomy	CERD

Week 2
2h formal teaching

Numerical taxonomy	CERD
Chemosystematics: cell walls and membranes	CERD
1h student centred learning – draft essay	

Week 3
3h formal teaching

Chemosstematics: proteins and metabolic by-products	CERD
Chemosystematics: nuclear acids	CERD
I h class tutorial - Essay writing skills & Website exercise	CERD

Week 6
Essay submission

Week7 Computer rooms
3 h class tutorial Web-site workshop DS &KB

Week 8
3 h student centred work Group web-site meeting

Week 9
3 h student centred work Group web-site meeting

Week 10
3h Web site presentations CERD & DS & KB

Week 11
3 h student-centred learning based on web-sites

Week 12
3 h student-centred learning based on web-sites

Exam essay title released.

Practical assessment: There is no laboratory element to this module

Course assignment: The first exercise will be the production of an essay on a chosen organism covering its taxonomy, biology and ecology. The second exercise will be a group exercise to design a web site including the material collated for the essay which will be presented to other students in a short group presentation. The web pages will be accessible by other students to aid student centred learning of other topics, which will be an essential element for the final examination.

Assessment: Exam 1 50% 1 hour essay with a pre-set title; the web sites are a source material for this. Coursework 1 30% Essay - 2000 words. Coursework 2 20% Group web site -group exercise of up to 4 people who use their essay data to construct a web site. No set length.

Aims: There are three main aims: to give students a broader knowledge of bacterial biology; to provide training in literature searches on a defined topic and production of written synopses; to provide web design skills.

Learning outcomes: On successful completion of this module students will be able to:
1 Comprehend the terminology and nomenclature used in microbial systematics and its underlying basis.
2 Critically analyse microbiological information derived from a variety of sources associated with specialist disciplines including physiology, interaction with the environment, genetics, molecular biology and biotechnology.
3 Synthesise and summarise information drawn from various sources to address a specific question and present this in a new format.
4 Work productively as an individual or as part of a team.

Recommended background reading: Brock, Biology of Microorganisms, 13th Edition

D223F7 Virology

Module Convenor: Dr Ken Mellits ken.mellits@nottingham.ac.uk

Capped Module at 45 - You will need permission from the module convenor to take this module unless it is compulsory for your course

Module Details: The module will provide an introduction to viruses and their interactions with their hosts (bacteria, plants and animals including humans). The structure of viruses, their significance including pathogenesis and molecular biology will be discussed. 10 credits

Pre-requisite module or other requirements: D211P1 Genetics and Cell biology

Note: This module is a pre-requisite for D236M1 Virology & Cellular Microbiology for module in Part 2 (Final Year)

Target Students: Compulsory for students reading degrees in Food Microbiology and Microbiology. Optional for students reading Animal Sciences, Biotechnology, Food Science and Plant Sciences.

Availability to Exchange Students: But ONLY by emailing the module convenor for permission first.

Summary of Content: The module will provide an introduction to viruses and their interactions with their hosts (bacteria, plants and animals including humans). The structure of viruses, their significance including pathogenesis and molecular biology will be discussed.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecturers:

Kristelle Brown	Brian Thomson
Ken Mellits	Matt Dickinson
Will Irving	Jon Ball
Cath Rees	

Coursework: 30% of the module mark will be awarded for coursework, which includes a 1000 word essay and a short group presentation.

Assessment: Rest of assessment is: 20% based on a laboratory report which amounts to a 300 word essay, and 50% for a 1.5 hour examination.

Aims: To provide a basic understanding of viruses, their diversity, interaction with their hosts and pathogenesis.

Learning outcomes: On successful completion of the module students will be able to:

- Describe viruses and their diversity, and the mechanism by which they invade cells and cause disease.
- Acquire, practical techniques associated with studying viruses, including but not limited to the ability to acquire, interpret, plot and critically analyse virological data and information
- Acquire basic Presentation skills including the ability to ask and respond to questions, in a group context.

Recommended reading: Fields Virology Third addition pt 1 and 2.

D223F0 Manufacture of Food (*40 credit module*)

Module Convenors: Dr Bettina Wolf Bettina.wolf@nottingham.ac.uk and Miss Maria Benlloch Tinoco maria.benllochtinoco@nottingham.ac.uk

Module Contributors: Dr David Cook, Dr David Gray, Dr N Doherty.

Capped Module at 30 - You will need permission from the module convenor to take this module unless it is compulsory for your course

Module Details: A level 2, 40 credit module taught in the Autumn Semester at Sutton Bonington. The module consists of lectures, tutorials including in small groups and small group practicals.

Pre-requisites: D21BF1 Food Materials and Ingredients**;** D211F4 Food Commodities and Primary Processing

Target students: Honours students studying 'Food Science' or 'Nutrition and Food Science' with or without certificate in European studies.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Food manufacturing is addressed from three major perspectives in this module: main ingredients or raw materials, processing steps and quality of the final product as detailed below.

- Ingredients: Food structuring ingredients; physical interactions and chemical reactions during conversion from ingredient to food product.
- Processing: Fundaments and design of key processing and preservation techniques; operations involved in the manufacture process of a range of food products; key processing parameters and their impact on the properties of the product.
- Final product: Quality and shelf – life/ post – processing changes.

Timetable: Three ½ days of contact time per week are typical. Sessions include lectures (typically scheduled for 1 or 2 hours), practical/student centred activities in the Teaching Laboratory or the Food Processing Facility (3 – 4 hours each), tutorials (1 hour typically) and a classroom based student centred learning activity (2 hours). The lecture programme includes contributions by external lecturers. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

Topic	Type		Subtopic	Time (h)
Canned foods	Lecture	1	Introduction	1
		2	Thermal processing 1	1
		3	Thermal processing 2	1
		4	Heat transfer	1
		5	Designing retort processes	1
	Tutorial	1	Thermal processing	1
		2	Designing retort processes	1
	Practical	1	Can temperatures	1
Milk & milk products	Lecture	1	Introduction	1
		2	Cheese	2

		3	Yoghurt & Butter	2
		4	Ice Cream	2
	Practical	1	Manufacture of soft cheeses	3
Cereals & cereal products	Lecture	1	Introduction	1
		2	Bread	2
		3	Cakes & Biscuits	2
		4	Extruded starchy foods 1	2
		5	Extruded starchy foods 2	2
		6	Enzymic processing of starch	1
	Tutorial	1	Baked starchy foods	1
	Practical	1	Manufacture of baked starchy foods	3
Confectionary	Lecture	1	Chocolate	2
		2	Sugar confectionary	2
	Practical	1	Manufacture of confectionary	3
Hydrocolloid ingredients	Lecture	1	Polysaccharide structure	1
		2	Protein gelation	1
		3	Gelatine and industrial polysaccharides	1
		4	Application in emulsion based products	1
	Practical	1	Hydrocolloids	3
Brewing & Cider & RTD	Lecture	1	Brewing 1	2
		2	Brewing 2	2
		3	Cider & RTD	2
		4	Distilling	2
Meat & Meat products	Lecture	1	Intrinsic properties of meat	2
		2	Processing, Preservation and Packaging	2
	Practical	1	Sausages	4
Other and other foods	Lecture	1	Module introduction & Why study Manufacture of Food?	2
		2		
		3	Fat spreads	1
		4	Revision session	2
		5	Future of foods	1
		6	Ready to eat	2
	Practical /Scl	1	Introduction	1
		2	Practical slot 1/3	4
		3	Practical slot 2/3	4
		4	Practical slot 3/3	4
		5	Group presentation	3
	Scl	1	Food manufacture scenarios	2
Essential processes &	Lecture	1	Comminution	2
		2	Heat exchangers	1

processing equipment	3	Pipe flow	2
	4	Pumps and vessels	2
	5	Freezing	1
	6	Dehydration	2
	7	Microwave processing	1

Assessment:

Report	35%	Practical project write-up (2000 words). Staged submission: Introduction (25% of final report mark) followed by revised Introduction, Materials & Methods, Results & Discussion, Conclusions (75% of final report mark)
Viva voce	25%	20 minute Viva: Demonstrate an understanding of and the ability to link science based concepts learnt during the lectures and practical sessions
Presentation	15%	Group presentation on the practical prior to submission of the practical project write-up
Inclass Exam (Written)	25%	90 minute - In – class test: Open book calculations

Aims: To learn about the manufacturing of a wide range of industrially manufactured food products from the ingredients used to the final packaged food, with an emphasis on key physical and chemical properties, during and after processing, and on the underpinning scientific principles that can be applied to a number of food manufacturing systems.

Learning outcomes: On successful completion of the module, students will be able to:
1) Formulate a preservation process for a given food.
2) Explain the conversion process of milk, grains and meat to food and drink products.
3) Justify ingredients and processing steps to impart a desired food microstructure.
4) Solve a practical food manufacturing team challenge based on research, analysis and reformatting of information.

Recommended background reading:

- Singh, R. Paul. Introduction to food engineering / R. Paul Singh, Dennis R. Heldman. 4th ed. Burlington, Mass. London : Academic Press, c2009. **Note:** Also look out for other editions and e-book.
- Fellows, P. (Peter), 1953- Food processing technology : principles and practice / P. Fellows. 2nd ed. Boca Raton, Fla. : CRC Press ; Cambridge : Woodhead, 2000. **Note:** Also look out for other editions.
- Food chemistry / edited by Owen R. Fennema. 3rd ed. New York : M. Dekker, 1996
- Toledo, Romeo T. Fundamentals of food process engineering / Romeo T. Toledo. 2nd ed. New York : Van Nostrand Reinhold, 1991. **Note:** Also look out for other editions.
- Atkins, P. W. (Peter William), 1940- Elements of physical chemistry / Peter Atkins, Julio De Paula. 5th ed. Oxford : Oxford University Press, c2009. **Note:** Also look out for other editions.
- Tucker, G (2011) Essentials of Thermal Processing, Greg Tucker and Susan Featherstone Wiley Blackwell: Oxford.
- Improving the thermal processing of foods/edited by Phillip Richardson. (2004) CRC Press: Cambridge. **Note:** Also look out for other editions and e-book
- Hersom, A.C. (1980) Canned foods: thermal processing and microbiology/A.C Hersom, E.D. Hulland. 7th Ed. Edinburgh: Livingstone.
- Tamime and Robinson's yoghurt: science and technology/edited by A.Y Tamime and R.K Robinson (2007) 3rd Ed. CRC: Cambridge: Woodhead. **Note:** Also look out for e-book.

- Clarke C (2004) The science of ice cream. Cambridge: RSC.
- Lawrie, R. A (2006) Lawrie's meat science. 7th Ed.Cambridge: Woodhead. **Note:** Also look out for e-book.
- Processed meats: improving safety, nutrition and quality/edited by J.P. Kerry and J.F. Kerry. (2011) Oxford: Woodhead. **Note:** Also look out for e-book.
- Stauffer, C.E (1996) Fats and Oils. St. Paul, Minn: Eagen Press
- Mohos, Ferenc A. (2010) Confectionery and chocolate engineering: principles and applications. Oxford: Wiley Blackwell.
- Industrial chocolate manufacture and used/edited by Stephen T Beckett. (2009). 4th Ed. Chichester: Wiley- Blackwell.
- Bamforth, Charles W (2009) Beer: tap into the art and science of brewing. 3rd Ed. Oxford; New York: Oxford University Press.

D223N0 Global Issues in Nutrition

Module Convenor: Dr LJ Coneyworth lisa.coneyworth@nottingham.ac.uk

Module Details: Level 2, autumn semester, 20 credits

Pre-requisites: D21BN1 Introduction to Nutrition
D21BN2 Biochemistry – the Building Blocks of Life

Capped Module at 75 - You will need permission from the module convenor to take this module unless it is compulsory for your course

Target Students: Students studying Master of Nutrition (B401), BSc Nutrition (B400). Also, Capped for students enrolled on Master of Nutrition (B401) and BSc Nutrition (B400). Module content and delivery is specifically designed for students enrolled on these courses. Mode of delivery and assessment methods also prohibits additional students enrolling on the module.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Throughout this module the student's problem solving skills will be developed while enhancing their knowledge on key topics in nutrition for example Global Food Security, tackling the obesity epidemic, positive impacts on consumer behaviour.

Every two weeks students will receive a lecture from a different academic introducing the case study topic to be investigated. In groups students will gather relevant information from various research sources, synthesis data and present in appropriate formats. As well as developing a number of skills and knowledge essential for working in the professional sector, students will be expected to use knowledge that is has been and is currently being delivered in other modules to apply to the set case studies.

The development of these skills are not only essential for developing a successful career but are utilised in the assessment in the final year of your degree.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Module Activities:

Lecture	5 weeks	1 per fortnight	2 hours (5 sessions)
Workshop	11 weeks	2 per week	2 hours

Assessment:
Coursework 1 100% - 4000 word (or equivalent) case study portfolio and presentation

Aims: This module aims to develop learners knowledge in current key issues that are bring faced in nutrition while developing students problem solving and other professional skills.

Learning Outcomes: On successful completion of this module, students will be able to:

- Apply relevant knowledge, gained from earlier modules and acquired during the activity, to assist in problem solving tasks.
- Compile and analyse appropriate data to be applied to the case study.
- Propose and evaluate a range of possible explanations for each scenario that emerges.
- Develop and demonstrate a range of professional competencies through interaction with team members in a time limited environment.

D223N6 Principles of Immunology

Module Convenor: Dr Marcos Alcocer Marcus.alcocer@nottingham.ac.uk,

Lecturers: Prof M Luck, Professor D Hannant (Special Professor) and invited external lecturers

Module Details: Level 2, autumn semester, 10 credits

Pre-requisite: D21BN2 Biochemistry–The Building Blocks of Life

Availability to Exchange Students: Yes provided they email module convenor first

Expected Number of Students Taking Module: 180

Target Students: All home and international students with an interest in animal and human biology

Summary of Content: The module will concentrate on: The innate immune system; the adaptive immune system; MHC and antigen presentation; antibodies and antibody responses; immune-techniques; regulation of the immune responses; effector mechanisms of immune responses; immunity to infection; immunology of reproduction; and immune-deficiencies.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: The lecture timetable is provisional. Details will be provided at the beginning of the module. Topics to be covered will include:

1 The innate immune system
2 The adaptive immune system
3 The response to injury
4 MHC and antigen presentation
5 Antibodies and Antibody responses
6 Immunological techniques
7 Regulation of the immune responses
8 Effector mechanisms of immune responses
9 Vaccination and immunity to infection
10 Immunology of reproduction

Coursework: Coursework 1: a MCQ on-line exam.

Assessment: Exam, 70%, 1.5hour. Coursework 1, 30%

Aims: The module aims at introducing the students to: basic concepts of cellular and molecular immunology; current immune-techniques; modern concepts of immune-deficiency and hypersensitivities.

Learning Outcomes: On successful completion of the module students will be able to:

- Describe the main characteristics and features of the innate and adaptive immune system, their functions and how they relate to each other.
- Discuss the main events of the immune response when the body is infected by intra and extracellular parasites, essential components of many diseases.
- Analyse results from classical immune techniques that will help the reading and comprehension of scientific publications.
- Integrate the immune mechanisms and discuss current topics of animal and human diseases

Recommended background reading: Reading lists are provided by each staff member teaching in the module.

D223N8 Principles of Animal Nutrition

Module Convenor: Dr Jean Margerison jean.margerison@nottingham.ac.uk

Lecturers: Dr J Brameld, Dr M Elmes, Dr Tim Parr

Module Details: Level 2, spring semester, 10 credits

Pre-requisites: D21BN1 Introduction to Nutrition
D21BN2 Biochemistry – The Building Blocks of Life

Note: This module is a pre-requisite for D23BN2 Animal Nutrition and D23BN3 Molecular Nutrition modules in Part 2 (Final Year)

Expected Number of Students Taking Module: 50

Target Students: All students with an interest in animal nutrition.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Dietary feed intake, energy, protein, water, macro and micro-nutrient requirements. Application of feed analysis and databases. Nutritional energetics and protein metabolism. Energy, protein and amino acid nutrition. Regulation of appetite and energy expenditure. Future nutrition based challenges.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: The lecture timetable is provisional. Details will be provided at the beginning of the module. Topics to be covered will include:

1 Measuring nutrient content and energy in food (lectures)
2 Amino acid and Protein nutrition (lectures)
3 Regulation of Energy balance (lectures)
4 Energy models and calculations (lectures/ workshop)
5 Determining future nutritional challenges of the world (lectures and seminar)

Assessment: Exam 1 50% 1.5hour. Coursework 1 50%

Aims: To explain and illustrate the knowledge required to understand nutrition at an advanced level with 1) specific reference to Diet formulation and analysis, including Nutritional Energetics and Protein Nutrition. 2) To consider energy requirements of animals in different physiological/pathological states. 3) To consider protein and amino acid requirements of animals. 4) To understand the factors involved in regulating appetite and energy expenditure. 5) To understand the future nutritional challenges of the world.

Learning Outcomes: On successful completion of this module, students will be able to: • Describe principles underlying animal nutrition, energy and protein metabolism, and relate this knowledge to feed intake, energy, protein, water and mineral requirements of animals • Explain the regulation of energy balance and appetite • Evaluate the influence of dietary protein quality for ruminant and non-ruminant species • Discuss the principles of diet formulation and application of feed analysis and databases.

Recommended background reading: Reading lists are provided by each staff member teaching in the module

D223NA Nutritional Regulation, Physiology and Endocrinology

Module Convenor: Dr P Jethwa Preeti.jethwa@nottingham.ac.uk

Module Details: Level 2, autumn semester, 20 credits

Pre-requisites: D21BN1 Introduction to Nutrition
D21BN2 Biochemistry – The Building Blocks of Life

Expected Number of Students Taking Module: 105

Target Students: Students studying Master of Nutrition (B401), BSc Nutrition (B400) and BSc Food Sciences (D610) Food and Nutrition degrees (B4D6)

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The physiology and regulation of the main endocrine systems, and its relation to diet, dietary energy and nutritional energetics and regulation of appetite and energy expenditure.

Timetable: Typically two 4 -hour timetabled sessions per week plus 100 student self-directed learning studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Module introduction
2 Introduction to Endocrinology (PJ
3 Thyroid hormones (PJ)
4 Insulin, Glucose, glucagon (various)
5 Glucocorticoids and the adrenal axis (TP)
6 Growth hormone/IGF axis (JB)
7 Methods in Endocrinology (various)
8 Integration of metabolism (AS)
9 Energetics (PJ)
10 Energy requirements (JP)
11 Appetite regulation (PJ)
12 Malnutrition (JP)

Module Activities:

Activity	Number of Weeks	Number of sessions	Duration of a session
Lecture	11 weeks	2 per week	2 hours
Workshop	11 weeks	2 per week	1 hour

Assessment:

Exam 1	50	2 hour exam
Coursework 1	50	2000 word (or equivalent) report

Aims: This module aims to develop learners the principles of nutrition from dietary assessment and food analysis through to how the body utilises the diets nutrients in energetics throughout the human lifespan and in different pathological states. The physiological systems that control homeostasis and metabolism will also be investigated, as well as examining how the body regulates various physiological responses to food, regulating appetite and energy expenditure.

Learning Outcomes: On successful completion of this module, students will be able to:

- Describe principles underlying nutrition energetics and relate this knowledge to energy requirements in humans
- Explain the regulation of energy balance and appetite
- Evaluate dietary needs of an individual using dietary assessment tools
- Discuss the principles food analysis
- Describe key endocrine systems and the regulation of nutrient metabolism

Recommended background reading:

- Endocrine Physiology by Patricia E Molina, McGraw-Hill Education, ISBN 0071796770
- Human Endocrinology by Paul R Gard, Taylor & Francis, ISBN 978074840655
- We also recommend the use of primary research papers specific ones will be provided during the sessions.

D223P0 Molecular Biology and the Dynamic Cell

Joint Module Convenors: Kevin Pyke (KP) kevin.pyke@nottingham.ac.uk and Ranjan Swarup (RS) ranjan.swarup@nottingham.ac.uk

Module Details: Level 2 Autumn semester, 20 Credit

Expected Number of Students Taking Module: 70

Target Students: Biosciences and Life Sciences students.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: A detailed study of the core molecular processes that enable cells to function such as DNA biochemistry, gene expression, protein synthesis and degradation. These sessions will complement lectures on basic eukaryotic cell biology covering a range of organelles and cell structures including the nucleus, plastids, mitochondria, endoplasmic reticulum, Golgi bodies and secretion together with a consideration of cell differentiation.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional timetable

Week		*SUBJECT*
1	Session 1	An overview of the Cell and its nucleus (Nucleus) (KP)
	Session2	Chromosome packaging, DNA replication and molecular basis of evolution (RS)
2	Session 3	RNA Synthesis, processing and export (RS) Protein synthesis, antibiotics, abnormal protein folding and human diseases (RS)
	Session 4	Regulation of Gene Expression I: Molecular switches, motifs, transcriptional activators, repressors, enhancers and insulators
3	Session 5	Regulation of Gene Expression II: Targeted Protein Degradation (ZW) Regulation of Gene Expression III: micro RNA, snRNA, siRNA and artificial microRNA (RF)
	Session 6	Methods of investigating Gene Expression including an overview of gene chips and new generation sequencing (RS/ZW)
4	Session 7	Practical: Immuno detection (RS)
	Session 8	Practical: in situ Immunolocalisation and Confocal demo (RS+KP)
5	Session 9	Regulation of Gene Expression IV: Long non protein coding RNA (RS) Epigenetics: DNA methylation, imprinting and chromatin remodelling (DS)
	Session 10	Mitochondrion, plastids (KP) Extra nuclear genomes: the plastid and mitochondria (KP)
6	Session 11	The cytoskeleton I: IFs and MTs (KP) The cytoskeleton II: MFs and motors (KP)
	Session 12	The endo membrane system I: ER and import (KP) The endo membrane system II: Golgi and export (KP)
7	Session 13	Mitosis and Chromosome movement (KP) The Cell cycle - CDK's, cyclins and checkpoints (KP)
	Session 14	Cell Differentiation (KP/RS) Programmed Cell Death

8	Session 15	The endomembrane system-Secretion and uptake (KP+RS)
	Session 16	Practical (Vesicle trafficking and cell differentiation) (KP)
9	Session 15	Coursework poster session (ALL)
	Session 16	Coursework poster session (ALL)
10	Session 19	20. Cell in a multicellular context covering cell to cell interactions and mechanisms of long and short distance signalling-Part I (animals) (DS)
	Session 20	21. Cell in a multicellular context covering cell to cell interactions and mechanisms of long and short distance signalling-Part II (plants) (RS)
11	Session 21	Poster Feedback, Examination Guidance and tutorial (KP+RS)
	Session 22	Tutorial (KP+RS)

KP-Kevin Pyke; RS-Ranjan Swarup; ZW-Zoe Wilson; RF-Rupert Fray; DS-Dylan Sweetman

Coursework: Two pieces of coursework: one poster and one Lab report and questionnaire.

Assessment:

Exam 1 (60%)	2 hour examination
Coursework 1 (15%)	Poster
Coursework 2 (25%)	Practical report and questionnaire (2000 words)

Aims: This module aims to teach students about the basic molecular processes that underpin the function of eukaryotic cells and to describe how different organelles within the cell function, with an emphasis on the dynamic nature of cell biology.

Learning Outcomes: On successful completion of the module, students will be able to: 1. Explain the mechanisms of key molecular processes taking place within cells associated with DNA, RNA and protein synthesis 2. Distinguish different molecular mechanisms regulating gene expression within cells, 3. Demonstrate knowledge and understanding of the molecular and cellular components of Eukaryotic cells and their function and how cellular components are integrated into cellular function. 4. Appreciate the use of modern imaging technology and marker molecules in elucidating cellular function and recognise the highly dynamic nature of rapidity of cellular function. 5. Demonstrate intellectual skills to evaluate critically molecular and cell biology research papers 6. Develop professional skills in scientific information retrieval and to work safely in a laboratory situation.

D223P9 Applied Plant Physiology: from cell to crop

Module Convenors: Drs Erik Murchie (EM) Erik.murchie@nottingham.ac.uk. Debbie Sparkes (DS) Debbie.sparkes@nottingham.ac.uk

Other teaching staff: Dr Kevin Pyke (KP), Dr Rupert Fray (RF), Dr Neil Graham (NG)

Module Details: Level 2 Autumn semester, 20 Credit

Pre-requisites: D211F3: The Biosciences and Global Food security, C112P1: Plant Science or equivalent.

Expected Number of Students Taking Module: 70

Target Students: Students in the Schools of Biosciences and Life Sciences.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module provides a comprehensive understanding of plant physiology with an applied context from the molecular level to the field. There is an emphasis on the mechanisms that plants use to capture and utilise physical resources i.e. solar energy, water and nutrients. The module examines the physiological basis of resource capture and utilisation in growth and development, physical aspects of the plant environment incorporating key processes (photosynthesis, respiration, uptake and transpiration of water, the uptake and role of mineral nutrients). This physiological understanding will be applied in an agricultural context to consider major crop species in the UK and worldwide, and how cropping is affected by soil type. Limitations to resource capture by crops, and how growers overcome these, will be considered in relation to integrated crop management. The module also considers contemporary issues and future developments in agronomy and the role of the agronomist in successful crop management.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional timetable. All lectures unless stated otherwise

Week	*SUBJECT*	*LECTURER*
1	-Photosynthesis: organelle structure and function - Major crop species	KP DS
2	-Photosynthesis: how chloroplasts work - Practical: Major Crop Species	KP,RF DS
3	-Photosynthesis: diversity and ecology - Soils and Cropping Systems	KP,EM DS
4	-How crops capture and 'convert' solar energy to yield - Weed biology	EM DS
5	-Weed management - Practical: weed competition and nutrients	DS DS/NG
6	- Environmental physiology of plants and crops: temperature, photosynthesis, respiration and stress - Practical: photosynthesis	EM EM?RF
7	-How does water move through plants? - Practical: water and photosynthesis (TBC)	EM EM
8	-Stomata: structure and function of a small but globally significant plant organ -Root traits for water and nutrient uptake	EM DS/TBC
9	-Water use efficiency of crops -Group work on conservation agriculture	EM DS

10	-Plant nutrients, uptake and functions	NG
	- Mixed species cropping	TBC
11	- Nutrient, transport, assimilation and use in crops -	NG DS/EM

Coursework: 40 %. A written report (1500 words) related to the practical sessions.

Assessment: Exam 1 60 %. Short questions and answers on module material using computers running Rogo software. This is timetabled and will take place in an IT lab.

Aims: The module is designed to introduce the key processes by which individual plants and plant communities capture and use physical resources i.e. light, water and nutrients, and provides an understanding of the physical and chemical processes and key biological processes involved. This is placed into an applied setting by considering agricultural examples and crop management strategies. By the end of the module, the student should understand not only the individual mechanisms, but also appreciate the importance of their integration into crop processes and the relevance of this to contemporary environmental and agricultural issues.

Learning outcomes: On successful completion of this module, students will be able to:

- Describe the physical resources available for plant growth and development
- Explain how soil type and climate affect crop choice
- Explain the physiological mechanisms by which plants capture physical resources and convert them to growth
- Discuss the abiotic and biotic limitations to plant and crop productivity by resource availability and use
- Analyse data accurately and critically and write a referenced scientific report.
- Devise integrated crop management strategies

D223Z7 Reproductive Physiology

Module Convenor: Dr George Mann george.mann@nottingham.ac.uk

Module Contributors: Prof Martin Luck, Dr Ravinder Anand Ivell, Dr D Sweetman

Capped module at 100 - You will need permission from the module convenor to take this module unless it is compulsory for your course

Module Details: Level 2 Autumn semester, 10 credit

Pre-requisites: D212Z5 Introductory Physiology or equivalent

Note: This module is a pre-requisite for D236Z5 Reproduction and Fertility module in Part 2 (Final Year)

Availability to Exchange Students: Yes provided they email module convenor first

Target Students: D320 Animal Science and available to Life Sciences and exchange Students subject to appropriate background

Summary of Content: Mammalian reproduction deals with reproduction in male and female mammals, including physiological control, cyclicity and reproductive efficiency. Practical classes examine the functional morphology of male and female tracts in various species. Avian reproduction deals with the principal features of avian physiology and reproduction in domestic fowl, emphasising the nutritional and metabolic challenges associated with commercial rates of egg lay. Lactational physiology considers the development of mammary tissue, the biochemistry of milk synthesis, the endocrine control of milk secretion, and the metabolic correlates of lactation in dairy ruminants.

Timetable: Typically three one-hour timetabled lecture sessions or one two to four hour practical session per week. The timetable can be viewed at www.nottingham.ac.uk/timetable

1	Male Mammals 1	Lecture
2	Male Mammals 2	Lecture
3	Male Anatomy	Practical
4	Female Mammals 1	Lecture
5	Female Mammals 2	Lecture
6	Embryology & Development	Lecture
7	Female Anatomy	Practical
8	Avian 1	Lecture
9	Avian 2	Lecture
10	Avian Anatomy	Practical
11	Avian Anatomy	Practical

Coursework: Multiple choice questionnaire following each practical session: 3 sessions.

Assessment: Exam (70%) 1 hour 30 minutes exam. Coursework (30%) – 3 multiple choice questionnaires (20 questions) of 10% each completed at the end of each practical class

Aims: To introduce students to the physiology and regulation of male and female mammalian reproduction, lactational physiology and the control of avian reproduction.

Learning outcomes: Knowledge and understanding. Be familar with the anatomy of the male and female mammalian reproductive systems. Understand the endocrine regulation of

reproduction and gamete production. Be able to give examples of how reproductive processes are modulated by the environment. Understand the concept of oestrous cycle control and manipulation. Be familar with common terminology associated with reproductive physiology and technology. Have a sound understanding of the physiology of the domestic fowl as it relates to egg production and comparative aspects with mammals. Know the location, structure and principles that underly lactation and its wide-ranging impact of the life of mammals. Intellectual Skills . Be able to relate information about specific parts of the reproductive system to the general principles of function which they illustrate. Be able to retrieve, evaluate and integrate information from a range of sources. Critical appraisal of normal reproductive function in common species. Understand complex ideas and relate them to specific problems or questions. Practical Skills. Observe and record observations. Work safely in the laboratory. Transferable Skills. Work productively and analytically as an individual and be able to contribute to team analysis of a problem. Use of available resources to access the primary literature.

Recommended background reading: Essential Reproduction by Martin H Johnson

D224A1 Applied Agricultural and Food Marketing

Module Convenor: Miss Keely Harris-Adams(KHA) Keely.Harris-Adams@nottingham.ac.uk

Lecturers: Miss Keely Harris-Adams; External Speakers as appropriate

Expected Number of Students Taking Module: 40

Target Students: Students interested in Agriculture and Food marketing.

Availability to Exchange Students: Yes provided they email module convenor first

Module Details: A level 2 module taught in the Spring Semester at Sutton Bonington. The module consists of lectures, tutorials, team case-study work and a visit to an organisation involved in agricultural and food marketing. 10 credits

Pre-requisites: Successful completion of a year one course within the School of Biosciences.

Summary of Content: An introduction to marketing and its importance in agricultural and food production. Core marketing theories and tools are examined and applied. Students will learn how and why to identify market segments, and how to target and position products for these markets. They can then consider the marketing mix - what to produce, what price to charge, promotion decisions, and where to place the product. There will be a particular focus on agricultural and food markets. Students will learn the characteristics of agricultural markets and what this means for marketing agricultural and food products.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme:
Week 1: Introduction. Understanding and applying the marketing concept
Week 2: Marketing tools: PESTLE and SWOT
Week 3: Products and services. The Marketing Mix: Price and promotion
Week 4: The Marketing Mix: Product and place. Other marketing theories
Week 5: No lecture
Week 6: Guest lecture – e.g. Global and UK consumer Markets
Week 7: Relationship marketing
Week 8: Marketing in agri-food
Week 9: Guest lecture – e.g. supply chains
Week 10: No lecture
Week 11: No lecture
Week 12: No lecture

Non Lecture Programme:
Week 1: Tutorial: Evaluating Markets
Week 2: Introduction to Case Study: What is a marketing plan. Team-building session Tutorial: Applying marketing tools.
Week 3: Tutorial: promotional tools. Case Study workshop
Week 4: Tutorial: The marketing mix
Week 5: Case study workshop
Week 6: Case Study work
Week 7: Case Study work
Week 8: Marketing decisions for agri-food businesses
Week 9: Case Study work
Week 10: Field trip to agri-food business
Week 11: Student team presentations
Week 12: Feedback and module review session

Coursework: Coursework will count for 100% of the overall mark for this Module. Within teams of similar interest, you are required to prepare a marketing plan for an agricultural and food marketing business of your choice. There will be four elements to the case study. Part 1 will be your research and analysis of the market data. This will form the basis of your team's marketing plan, which you are required to produce and write up as a group report (Part 2) and give as a presentation to the rest of the class (Part 3). You must also submit an individual analysis of how your team's marketing plan has addressed one or more of the issues particular to agri-food marketing (Part 4).

Assessment: Coursework 80% Group report: assessed on written report (2500 words), individual analysis (1000 words) and Group oral presentation (15%)

Aims: The module aims to teach students the importance of a marketing-orientated approach to successful rural and food business management and in doing so, to emphasise the wider role that marketing plays in meeting the wants of food consumers. Practical applications of marketing to business management will be emphasised through case studies and through the involvement of marketing staff and a field visit to businesses with an active marketing-orientated approach.

Learning Outcomes: On successful completion of the module, students will be able to:

- Demonstrate the importance of applying marketing management approaches to agricultural and food marketing firms and organisations
- Illustrate the relative contributions of marketing theory to the development of products, brands and firms
- Using team-based approaches, analyse information from a range of sources to present logical conclusions and business-related recommendations

Recommended Reading: Jobber, D. and Ellis-Chadwick, F. (2013). *Principles and practice of marketing* (7th edition). Maidenhead: McGraw-Hill. Kohls, R.L. and Uhl, J.N. (1998). *Marketing of Agricultural Products* (8th edition). New York: Macmillan.

D224A4 Enterprise Management Challenge

Module Convenors: Dr Stephen Ramsden (Convenor) (SR) Stephen.ramsden@nottingham.ac.uk Dr Rumiana Ray (Convenor) (RR) Rumiana.ray@nottingham.ac.uk

Module Details: Level 2 module taught in the Spring Semester at Sutton Bonington-10credits

Expected Number of Students Taking Module: 20

Target Students: For students studying Agriculture and related subjects in Year 2.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module introduces students to a choice of crop or livestock management decision making in practice through team-based activity. Working in small teams, supported by teaching staff and industry consultants, students will be responsible for making management (science and business) decisions relating to the production of crops or livestock, as for commercial purposes. The management inputs and decisions made will be implemented by technical staff, thus in effect students studying this module combine the roles of a professional consultant and farm manager. Each team will document the decisions they make and this will provide material for module assessment. The module assessment also incorporates the extent to which the management decisions made throughout the module constitute a professional understanding and approach to agricultural management.

Activity Detail: Six 2-hour formal lectures; three 1-hour formal field site visits; three informal field observation visits by students; one team tutorial per team, student-centred learning, incorporating "field time" 40 hours.

Timetable: Typically two one-hour timetabled sessions per week: six lectures, regular tutorials/examples classes, forty hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Assessment Details:
Coursework 1 30% Individual field diary - 500 words
Coursework 2 50% Individual Report - 1500 words
Coursework 3 20% Team Research Assessment – in field *viva* of all team members

Aims: The module aims to introduce students to agricultural management decision making in practice through team-based activity. The integration of learning across disciplines (Science, Business and Economics) will be a key aim of this module. Working in small teams, and supported by teaching staff, students will be responsible for making management (science and business) decisions relating to the production of a crop enterprise or a livestock enterprise, based on University Farm, as for commercial purposes. The management inputs and decisions made will be implemented by technical staff, thus in effect students studying this module combine the roles of a professional agronomist and farm manager. Each team will document the decisions they make and this will provide material for module assessment. The module assessment also incorporates the extent to which the management decisions made throughout the module constitute a professional understanding and approach to agricultural management.

Learning Outcomes: On successful completion of the module, students will be able to:
- Recognise the importance of biological, environmental and commercial elements of agricultural production
- Understand the options available for managing nutrient supply and disease (crops or livestock), including knowledge of standard terminology
- Apply techniques for assessing profitability and managing risk
- Develop appropriate decision making skills in relation to the use of inputs and prices
- Interact and engage with professionals in the industry
- Place knowledge gained from research into practical application and context

Recommended background reading:

Nix, J. (2015). Farm Management Pocketbook 2016 (46th Edition), The Andersons Centre.
Burdon, J.J. & Leather, S.R. (1990). *Pests, Pathogens and Plant Communities*, Blackwell.
Lucas, J.A. (1998). *Plant Pathology and Plant Pathogens* (3rd edition), Blackwell.
Parry, D. (1990). *Plant Pathology in Agriculture*, Cambridge University Press.
Frame, J. and Laidlaw, A.S. (2011). *Improved grassland management*, Ramsbury: Crowood Press.

D224A6 Endocrine Control Systems

Module Convenor: Prof Martin Luck martin.luck@nottingham.ac.uk

Module Details: Level 2, spring semester, 20 credits

Pre-requisites: Successful completion of the Qualifying Year of a School of Biosciences degree or equivalent

Expected Number of Students taking module 60

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content:

- An overview of hormonal systems, the basic principles of hormone action and the role of hormones in homeostasis
- Endocrine regulation of blood calcium and glucose concentrations
- Links between hormonal axes and the central nervous system, and the control of major physiological systems
- Growth factors and cell cycle control
- Mechanisms of hormone synthesis, receptor interaction and cellular action
- Understanding hormone evolution
- Other specialist topics (may include chronobiology, endocrine disruptors, veterinary endocrinology)

Timetable: Lectures (available time not yet known); guest lectures (3h); journal club group work and presentation (3hr prep plus 15 min presentation); Revision workshop (2h). Examination (2h; 80%). The timetable can be viewed at www.nottingham.ac.uk/timetable

Module Activities Lectures; guest lectures; journal club group work and presentation; revision workshop.

Lecture Programme (*provisional*):

Wk	From	To	Subject	Format	Staff
			Typical Content		
19	9.00	10.00	**Introduction and basic concepts 1**	Lecture	MRL
	10.00	11.00	**Introduction and basic concepts 2**	Lecture	MRL
	11.00	12.00	**Central control and axes 1**	Lecture	RAI
	12.00	13.00	**Central control and axes 2**	Lecture	RAI
20	9.00	10.00	**Energy & survival 1**	Lecture	MRL
	10.00	11.00	**Energy & survival 2**	Lecture	MRL
	11.00	12.00	**Calcium and bone 1**	Lecture	MRL
	12.00	13.00	**Calcium and bone 2**	Lecture	MRL

21	9.00	10.00	**Pulsatility and regulation 1**	Lecture	RAI
	10.00	11.00	**Pulsatility and regulation 2**	Lecture	RAI
	11.00	12.00	**Stress and the adrenal gland 1**	Lecture	RAI
	12.00	13.00	**Stress and the adrenal gland 2**	Lecture	RAI
22	9.00	10.00	**Salt & water 1**	Lecture	MRL
	10.00	11.00	**Salt & water 2**	Lecture	MRL
	11.00	12.00	**Thyroid and metabolism 1**	Lecture	MRL
	12.00	13.00	**Thyroid and metabolism 2**	Lecture	MRL
23	9.00	10.00	**Veterinary Endocrinology**	Guest lecture	BM
	10.00	11.00			
	11.00	12.00	**Biological Clocks**	Guest lecture	FE
	12.00	13.00			
24	9.00	10.00	**How protein hormones work 1**	Lecture	MRL
	10.00	11.00	**How protein hormones work 2**	Lecture	MRL
	11.00	12.00	**How to make steroids 1**	Lecture	MRL
	12.00	13.00	**How to make steroids 2**	Lecture	MRL
25	9.00	10.00	**How steroid hormones work 1**	Lecture	RAI
	10.00	11.00	**How steroid hormones work 2**	Lecture	RAI
	11.00	12.00	**Growth Factors and the cell cycle 1**	Lecture	RS
	12.00	13.00	**Growth Factors and the cell cycle 2**	Lecture	RS
26	9.00	10.00	**Revision workshop** [Attendance is compulsory and a register will be taken]	Group work	MRL
	10.00	11.00	Set Journal Clubs		RAI
	11.00	12.00	***[Time to discuss journal clubs]***		
	12.00	13.00			
31	9.00	10.00	**Prostaglandins 1**	Lecture	MRL
	10.00	11.00	**Prostaglandins 2**	Lecture	MRL
	11.00	12.00	**Recent research in endocrinology 1**	Lecture	RAI

	12.00	13.00	**Recent research in endocrinology 2**	Lecture	RAI
32	9.00	10.00	**Hormone Evolution 1**	Lecture	MRL
	10.00	11.00	**Hormone Evolution 2**	Lecture	MRL
	11.00	12.00	***[Time to finish Journal Clubs]***		
	12.00	13.00			
33	9.00	10.00	**Journal Clubs**	Student presenta-tions	MRL RAI
	10.00	11.00			
	11.00	12.00	**Module review**		MRL RAI

Coursework	**Setting date**	**Submission date**	**Marks returned**
Journal Club [group mark] (20%)	March 2017	*Title*: March 2017 *Abstract*: April 2017 *Presentation*: May 2017	Fri May 2017 (or very soon after)

Contributors: Martin Luck (MRL), Ravinder Anand-Ivell (RAI), Reinhard Stoeger (RS), Fran Ebling (FE), Brin McNeill (BM)

Assessment details: Examination (2h; 80%), Journal Club (20%)

Aims:

1. To introduce students to the physiology and biochemistry of the mammalian endocrine system and to the endocrine control of homeostasis and metabolism.
2. To extend this basic understanding into a more comprehensive and detailed appreciation of theoretical and applied aspects of endocrinology.
3. To give students the intellectual tools with which to understand, assess and critically evaluate continuing developments in endocrine science.

Learning outcomes: On successful completion of this module a student should be able to:

1. use information about the structure and biochemistry of hormonally active molecules as a heuristic tool for understanding endocrine physiology.
2. describe how the endocrine system regulates calcium and glucose concentrations in the blood.
3. describe how the central nervous system interacts with the main endocrine axes, and how these axes regulate major physiological and metabolic systems.
4. give an account, with suitable examples, of how the main groups of hormones and growth factors interact with and change the functions of their target cells.
5. explain the principal intracellular mechanisms by which a range of hormones are synthesised and secreted.

6. make a critical evaluation of information on the likely evolution of hormones, hormone groups and hormone systems.
7. explain the relationships between cellular and molecular aspects of hormonal function and the wider contexts of hormone action (for example, related to clinical applications, environmental pollution, and biological diversity).
8. anticipate the likely response of the endocrine system to a range of common challenges to homeostasis; identify, in simple histological sections, the main functional tissues and cells of the major endocrine organs.
9. read, understand and evaluate the content of a contemporary research paper within the general field of endocrine science; be able, as part of a small team, to present this information publically and respond to questions about the content.

D224A7 Practical Policy Making

Module Convenor: Dr C Siettou christina.siettou@nottingham.ac.uk, other staff, guest lecturers.

Module details: A Level 2, 10 credit module taught in the Spring Semester.

Expected Number of Students Taking Module: 20

Target Students: For students studying BSc integrated Agricultural Business Management, BSc Agriculture and related subjects

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Within the Practical Policy Making module, you'll develop your understanding of how and why policies relating to agriculture, the environment and food are developed, in addition to gaining a valuable insight into how to influence policy. The module will be delivered via a series of lectures from, or visits to, stakeholders which may include Defra, the National Farmers Union (NFU), agri-businesses within the input supply chain and food retailers.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional timetable

Week	*SUBJECT*	*LECTURER*
1	Introduction to Agri-Env. Policy Making	CS
2	Policy Design and Decisions Computer Aided Learning (1)	CS
3	Guest Lecturer	tbc
4	Guest Lecturer	tbc
5	Participants in Agri-Env. Policy Making Computer Aided Learning (2)	CS
6	Guest Lecturer	tbc
7	Guest Lecturer	tbc
8	Policy Implementation: Successes and Challenges Computer Aided Learning (3)	CS
9	Guest Lecturer/or Stakeholder visit	tbc
10	Agri-Env. Policy Making: An Overview	CS

Coursework: Policy Making Assignment. Drawing upon module information and data sources students will undertake an assessment of the impact of changes in policy on Agri-Businesses or an Agri-Business.

Assessment: Policy Making Assignment (100%) – 1500 words

Aims: The module aims to develop understanding of how and why policies relating to agriculture, the environment and food are developed, in addition to providing a valuable insight into how to influence policy. The module will be delivered via a series of lectures from, or visits to, stakeholders which may include Defra, the National Farmers Union (NFU), agri-businesses within the input supply chain and food retailers. Subjects covered will vary from year to year to capture contemporary issues in the agri-food-environment arena, but are likely to include issues such as: Common Agricultural Policy, Sustainability, Rural Development, Carbon and Water footprints in food retailing.

Learning outcomes: On successful completion of the module, students will be able to:

- Demonstrate the importance of the policy environment to Agri-Businesses.
- Illustrate how Agri-Business stakeholders influence policy making across a range of geographical and agri-food-environment contexts.
- Analyse quantitative and qualitative information from a range of sources to present information to develop, influence or analyse agri-business related policies.

D224A8 Human and Technological Resource Management

Module Convenor: Prof P Wilson paul.wilson@nottingham.ac.uk, other staff, guest lecturers.

Module details: A Level 2, 20 credit module taught in the Spring Semester.

Expected Number of Students Taking Module: 20

Availability to Exchange Students: Yes provided they email module convenor first

Target Students: For students studying BSc integrated Agricultural Business Management, BSc Agriculture and related subjects

Summary of Content: Both human and technological resources are at the heart of many successful agri-businesses. Drawing upon both academic and industrial agri-business expertise, in this module you will examine theories and practices to inspire people, manage change and implement different leadership approaches to achieve business success. You will analyse the role of current and potential technological developments within agri-business contexts and explore the trade-offs and challenges from drawing upon people and/or technology in agri-businesses.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional timetable

Week	*SUBJECT*	*LECTURER*
1	Introduction to Human and Technological Resource Management Computer Aided Learning (1)	PW Guest Lecturer
2	Economics of Human and Technological Resource Management in Agri-Businesses Computer Aided Learning (2)	PW
3	Theory and Application of Human Resource Management Tutorial (1)	PW
4	Theory and Application of Technological Resource Management Tutorial (2)	PW
5	Inspiring People and Managing Change Computer Aided Learning (3)	Guest Lecturer
6	Business Visit (1)	tbc
7	Technological Developments – Risk and Rewards Computer Aided Learning (4)	Guest Lecturer
8	Business Visit (2)	tbc
9	Contemporary and International Perspectives on Human and Technological Resource Management Tutorial (3)	PW / Guest lecturer
10	Agri-Business Case Studies Tutorial (4)	Guest Lectures

Coursework: Resource Management Assignment (40%) 1000 words.

Assessment: One 2-hour examination (60%); Resource Management Assignment (40%)

Aims: The module aims to develop understanding of human and technological resource management within the context of agri-business management. Drawing upon both academic and agri-business industrial expertise, the module examines theories and practices to inspire people, manage change and implement different leadership approaches to achieve business success. The roles of current and potential technological developments within agri-business contexts are considered together with the trade-offs and challenges from drawing upon people and/or technology in agri-businesses.

Learning outcomes: On successful completion of the module, students will be able to:

- Demonstrate how theories of human and technological resource management can be applied to agri-business contexts.
- Illustrate how agri-businesses successfully manage human and technological resource management within contemporary market, policy and regulatory environments, drawing upon case studies of inspiring and innovative human and technological resource management.
- Analyse information from a range of sources to develop proposals for the successful management of both human and technological resources.

D224E4 Computer Modelling in Science: Introduction (UP)

Module Convenor: Dr Dov Stekel dov.stekel@nottingham.ac.uk

Module Details: Level 2 Spring semester, 20 credits

Prerequisites: Level 3 students who have already taken C135E9 will not be admitted to this module.

Co-requisites: None.

Location: University Park Campus

Expected Number of Students Taking Module: 60

Target Students: All School of Biosciences students, Natural Sciences students and Ningbo 2+2
Environmental Sciences students (based in Geography).

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Modern biological and environmental science includes the study of complex systems and large data sets, including imaging data. This necessitates the use of computer models and analyses in order to understand these systems. This module contains an introduction to computer programming and modelling techniques that are used in the biological and environmental sciences. Specifically, it contains: (i) An introduction to computer programming and algorithms, using the Python programming language. (ii) An introduction the construction of mathematical models for biological and environmental systems using difference and differential equations, with a particular emphasis on population dynamics, and the use of computing to simulate, analyze these models and fit these models to data. Throughout the module, the focus will be on relevant examples and applications, e.g. environmental pollution, growth of microbial populations, disease epidemics, or computer manipulation of images of plants, animals or the natural environment. The module will be assessed by a patchwork assessment consisting of write-ups of assignments from during the semester.

Timetable: The first week of term is a two hour session, followed by 9 four hour sessions. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: All teaching will be mixed mode (lecture/computer practical) in computer rooms. Lecture programme is provisional and more detailed information will be given to you in the first session.

1. Module introduction (Stekel)
2. Introduction to Python (French)
3. Programming in Python (French)
4. Python modules: NumPy and MatPlotLib (French)
5. Modelling: difference equations (Martin)
6. Modelling: simple differential equations (Stekel)
7. Modelling: differential equations and SciPy (Stekel)
8. Modelling: multi-dimensional systems (Stekel)
9. Modelling: steady state analysis (Stekel)
10. Model building and workshop (Martin)

Teaching Staff: Dr Sarah Martin (SM), Dr Dov Stekel (DJS), Dr Andrew French (APF)

On-line material: Supporting background material on computing and mathematical concepts (e.g. algorithms, calculus) will be posted on-line with on-line exercises to complete.

Assessment: Patchwork Assessment (100%) consisting of write-up of related assignments from the whole module.

Aims: The aim of this module is to introduce the use of computing programming and modelling in the biological and environmental sciences for model simulation and image processing.

Learning outcomes: A student who successfully completes this module should be able to: (i) Transform a series of instructions specified mathematically or textually into a pseudocode algorithm. (ii) Create or modify simple computer program code in order to carry out a set algorithmic task. (iii) Critically evaluate the use and results of suitable computer algorithms or programs in the context of relevant challenges in the biological or environmental sciences. (iv) Construct a simple mathematical model from a set of biological or environmental processes. (v) Simulate and analyse mathematical models using a computer and appropriate software and/or algorithms. (vii) Critically evaluate a mathematical model and its simulation results in the context of relevant challenges in the biological or environmental sciences.

Recommended Reading: A full reading list will be provided at the outset of the module.

D224F9 Analysis of Bacterial Gene Expression

Module Convenor: Dr P Hill phil.hill@nottingham.ac.uk

Lecturer: Dr CED Rees

Capped module at 30 – You will need permission from the module convenor to take this module unless it is compulsory for your course

Module Details: Level 2, Spring semester, 10 credits

Pre-requisites: Genetics with Specialist Options (D212P3) or equivalent, D211P1 Genetics and Cell Biology, Bacterial Physiology (D212F7; STUDENT MUST HAVE A PASS MARK IN THE PRACTICAL ELEMENT OF THE MODULE) or equivalent

Note: This module is a pre-requisite for D236M1 Virology and Cellular Microbiology module in Part 2 (Final Year)

Target Students: Microbiology, Biotechnology

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The course will cover the major techniques required for analysis of gene expression including methods for gene sequence and transcriptional analysis. An in depth study of vectors and gene constructs will provide and understanding of the different strategies used in creating mutants and identifying gene function in bacteria. The coursework exercises are designed to illustrate the topics covered in the lecture course and will give students experience of experimental design and critical analysis of research data and an introduction to bioinformatics for the analysis of DNA and protein sequences.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: More detailed information will be issued in the first teaching session.

Topic	
1	Introduction to module; review of DNA structure & Gene control
2	Enzymes in molecular biology: PCR; DNA sequencing; Restriction enzymes and mapping
3	Proteomics & reverse genetics
4	Transposons and reporter genes
5	Screening libraries and preparation of genomic DNA
6	Plasmid vectors and conjugation
7	Hybridisation techniques
8	Use of computers for DNA sequence analysis and bioinformatics
9	Phage vectors and transduction
10	mRNA techniques

Non-Lecture Programme: There is one practical and one computer session usually around weeks 8 &9 of the module respectively.

Further Activity Detail: Half a day per week throughout the semester, to include formal lectures and tutorials (44 hours) and practicals distributed evenly throughout the semester. Also, For D224F9 there is one practical and one computer session usually around weeks 8 &9 of the module respectively

Assessment details:

Exam 1	60%	2 hour examination
Coursework 1	30%	Data analysis exercise
Coursework 2	10%	Oral Presentation

Aims: To introduce students to the principles molecular methods of analysis of bacterial gene expression and give experience of the interpretation of data used to map genetic constructs. These provide a platform to allow further study of bacterial molecular genetics and their application in biotechnology in later courses. Student-led short seminars give experience of data analysis and presentation of data.

Learning outcomes: On successful completion of this module, students will be able to:

- Explain the mechanism of bacterial gene expression and the methods used to identify control points at the DNA, RNA and Protein levels.
- Compare the differences between alternative methods for analysing specific macromolecules (e.g. DNA) and assess their appropriateness for particular applications.
- Analyse raw data generated by a number of techniques used for gene analysis and interpret their meaning in context with given background information
- Apply practical experimental procedures to prepare and analyse DNA from bacterial cultures.

Recommended background reading:
Genes (Lewin) or similar texts.
Instant Notes in Molecular biology (Turner, McLennab, Bates & White).
Additional research papers and reviews provided on Moodle.

D224F0 Food Product Case Studies

Module Convenors: Dr Amanda Rasmussen Amanda.ramussen@nottingham.ac.uk
and Mrs Emma Weston emma.weston@nottingham.ac.uk

Module Details: A level 2, 20 credit module taught in the Spring Semester at Sutton Bonington.

Pre-requisite(s): D21BN1 Manufacture of Food; D223FO Manufacture of Food (40 credits)

Expected Number of Students Taking Module: 30

Availability to Exchange Students: Yes provided they email module convenor first

Restriction: Open as a Level 2 Module for Exchange / Study Abroad Students in the Spring Semester dependant on student's previous learning and core numbers in the current year. Student required to be able to study for the whole spring semester.

Summary of Content: Through problem-based learning (PBL) students will develop skills in diagnosing and solving challenges/problems relating to the manufacture, distribution and/or storage of food products. Students will gather relevant information, synthesise an argument, and disseminate a recommendation/solution. No formal lectures given, but the students will be able to refer to their notes from 'Manufacture of Food' taken in semester 3, and they will be given, or directed to, any additional literature that is necessary for the successful completion of the task in the time available.
PBL Definition: 'The learning which results from the process of working towards the understanding of, or resolution of, a problem' - it is not just 'solving problems'. The most powerful learning comes when a student is dealing with uncertainty. Students need to acquire the process skills not just 'content', therefore they all have to participate.

In small teams, students will be given some information about a problem/challenge relating to a food product. Their task is to fully diagnose the problem/challenge and to set about gathering/synthesising relevant information that will allow them to propose an appropriate resolution to the problem. A range of 5 food products will be covered, one product every two weeks, with one full day per week (i.e. 2 full days per product).

Timetable: Typically 1 full day of group activity per week starting at 09:00. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Module introduction (1) & Trial Problem Day 1
2 Module introduction (2) & Trial Problem Day 2
3 Problem 2 Day 1
4 Problem 2 Day 2
5 Problem 3 Day 1
6 Problem 3 Day 2
7 Problem 4 Day 1
8 Problem 4 Day 2
9 Viva Voce 1
10 Viva Voce 2

Coursework: In small groups, students will be given some information about a problem/challenge relating to a food product. Their task is to fully diagnose the problem/challenge and to set about gathering/synthesising relevant information that will allow

them to propose an appropriate resolution to the problem. Trained facilitators with appropriate food science/technology backgrounds will provide an appropriate level of support to assist the learning process, and be involved in assessments.

Task	Assessment Type*	Mark Given	% of Final Mark	Marked Output
Report - Problem 1	Individual	25	25	Marked Output
Report - Problem 2	Individual	25	25	Marked Output
Presentation - Problem 3	Group	20	20	Presentation
Presentation - Problem 4	Group	20	20	Presentation
Viva voce	Individual	10	10	10 minute Viva Voce

Aims:

- Develop problem solving skills
- Promote the application of theoretical knowledge to real problems in the food industry.

Learning Outcomes: On successful completion of this module students will be able to:

- Apply relevant knowledge, gained from earlier modules and acquired during the activity, to assist in problem scoping and solving
- Investigate real scenarios from the food industry demonstrating an appreciation of risk and of any wider business implications within the given scenario.
- Propose and evaluate a range of possible explanations for each scenario that emerges.
- Provide recommendations to resolve the problem
- Interact positively with team members in a time limited environment, by carefully listening, articulating pertinent information and ideas, and taking initiative when necessary.

D224FA Microbial Mechanisms of Food Borne Disease

Module Convenor: Prof Christine Dodd Christine.dodd@nottingham.ac.uk

Lecturers: Dr Kristelle Brown, Professor Ian Connerton, Dr Cath Rees

Module Details: Level 2, spring semester, 20 credits

Prerequisites: D212F7 Microbial Physiology

Capped module at 50 - You will need permission from the module convenor to take this module unless it is compulsory for your course

Target Students: Core for students taking Microbiology, Food Science; optional for students taking Biotechnology. Capped module - registration by agreement with the module convener only.

Availability to Exchange Students - Available where suitable pre-requisite exists.

Summary of Content: This module will cover the characteristics and sources of microbial food-borne pathogens and the mechanisms by which these cause disease. Practicals will provide training in the routine testing procedures used in microbiology laboratories: culture, isolation, enumeration and identification of a range of ACP2 bacterial genera.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Further Activity Detail: Two 1-hour lectures per week for 11 weeks and ten 3-hour practicals. Students must have attended all of the practical sessions for the module to be qualified as competent in safe handling of organisms for level 3 modules for which this module is a prerequisite. The 2h practical test in the laboratory is held in week 11.

Week 1
Introduction to module
Lecture 1 The top ten bacterial pathogens
Lecture 2 Food poisoning statistics
Practical session 1 3h

Week 2
Lecture 3 *Staphylococcus aureus*
Lecture 4 *Bacillus*
Practical session 2 3h

Week 3
Lecture 5 *Salmonella*
Lecture 6 *Salmonella*
Practical session 3 3h

Week 4
Lecture 7 *Vibrio*
Lecture 8 *Yersinia*
Practical session 4 3h

Week 5
Lecture 9 *Escherichia coli* and *Shigella*
Lecture 10 *E. coli*
Practical session 5 3h

Week 6
Lecture *Clostridium*
Lecture *Clostridium*
Practical session 6 3h

Week 7
Lecture *Listeria*
Lecture *Campylobacter*
Practical session 7 3h

Week 8
Lecture Emerging pathogens: *Mycobacterium paratuberculosis*
Lecture Emerging pathogens: *Aeromonas* and *Cronobacter*
Practical session 8 3h

Week 9
Lecture Protozoa in food and water
Lecture Moulds and mycotoxins
Practical session 9 3h

Week 10
Lecture Transfer through the food chain 1
Lecture Transfer through the food chain 2
Practical session 10 3h

Week 11
Lecture Pathogen transfer in Red Meat Production
Lecture Exam revision and module evaluation
Practical exam 2h

Assessment:

Coursework 1 50% Short reports based on laboratory reports for 7 practicals

Exam 1 40% 1/2h examination: two essays. NO MCQ

Coursework 2 10% Laboratory Examination - 2 hour practical examination carried out and written up in the laboratory (2 sides A4 max)

Aims: The major aims are to provide a fundamental understanding of the microorganisms causing food-borne disease and the mechanisms by which they do this and their routes of transmission. A practical training is in a number of core practical methods needed for the safe handling, culture, isolation, enumeration and identification of a range of ACDP2 pathogens.

Learning Outcomes: On successful completion of this module students will be able to:
1) Comprehend the characteristics and routes of transmission of the major food-borne pathogens and the mechanisms by which they cause disease.
2) Apply a range of practical skills in the laboratory including safe handling, culturing and characterisation of microorganisms under ACDP2 conditions.
3) Collect, record and analyse data by making accurate observations and measurements and make reasoned deductions from them.

D224FB Food Safety and Legislation

Module Convenor: Dr Neil Doherty neil.doherty@nottingham.ac.uk

Module Details: Level 2, spring semester, 10 credits

Prerequisites: D21BF1 Food Materials and Ingredients

Corequisites: None.

Expected Number of Students taking module: 75

Target Students: Students studying BSc Nutrition (B400), BSc Food Sciences (D610) and Food and Nutrition degrees (B4D6).

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module will discuss laws relating to the composition, labelling and advertising of food and food products sold for human consumption within the UK and the EU, the responsibilities and liabilities of producer, manufacturers and suppliers of food and food products (for example current changes in food labelling legislation), the minimum legislative standards required in the food industry, the responsibilities and liabilities of the consumer and manufacturer and the role of enforcement officers for food products.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Module Activities:

Activity	Number of	Number of	Duration of a session
Lecture	11 weeks	1 per week	2 hours
Workshop	11 weeks	1 per week	1 hour

Assessment details:

Exam 1	50	1.5 hour exam
Coursework 1	50	1000 word (or equivalent) report

Aims: The aim of this module is to introduce learners to the legislation relating to food. It will enable learners to not only recognise the responsibilities (and liabilities) of those engaged in the production, manufacturer and distribution/supply of food and their related products, but also the legislation that impacts on health attributes and claims for consumer products.

Learning Outcomes: On successful completion of this module, students will be able to:

- Describe how current European and National legislation and guidelines impacts on food and nutritional commodities.
- Outline the general principles and methods associated with determining the efficacy, health attributes, health claims, safety and legal aspects of foods, drinks and supplements.
- Investigate how particular food ingredients (e.g. gluten, nuts, shellfish) can result in adverse physiological reactions and the legislation to inform consumers of food composition.

D224G1 Professional Skills for Bioscientists

Module Convenor: Dr D Sweetman Dylan.sweetman@nottingham.ac.uk

Module Details: Level 2, spring semester and Summative Assessment all at the end of Semester 4, 20 credits

Session availability – All Biosciences Undergraduates with the exception of students studying the following programmes: Food Sciences, Nutrition and Food Sciences, Environmental Science

Pre-requisites:

1. Successful progression from Qualifying Year of studies of a Biosciences Degree (or equivalent)
2. Submission of draft CV as part of Module D21BP1

Expected Number of Students – est 200

Target Students - Biosciences Undergraduate Students

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content The module is divided in to 2 sections. One half will be focussed on the provision of specific material deemed appropriate for each course programme to prepare their students for their Final Year (in most cases this will be the research project).

The other section is centred on delivery of key core professional skills through timetabled lectures and group activities and self-directed learning.

Module Web Links – Moodle

Module Activities – Including Lectures, Group Activity Sessions, Self-Directed Learning, Workshops, Group Presentation Session.

Assessment details

Coursework 1: 100% - 2 coursework outputs
Final Year Preparation Section
2000 word essay or equivalent output appropriate to the specific degree programme - Summative
Mark for the module - 100% weighting
Professional Skills Section
Submission of a Portfolio with prescribed items -
Pass/Fail for Section and Overall Module (non compensatable)

Aims: The aim of the module is to develop and consolidate students professional competencies and abilities as a Bioscientist.

Learning Outcomes:

LO1 Demonstrate an understanding of the research process within your discipline
LO2 Identify possible future career pathways reflecting on learnings and wider experiences
LO3 Demonstrate a range of professional behaviours and competencies associated with your discipline.

D224N0 Nutrition, Metabolism and Disease

Module Convenors: Professor Andrew Salter Andrew.salter@nottingham.ac.uk

Module Contributors: Dr A. Murton, Dr J. Brameld, Dr M. Alcocer, Dr T. Parr

Module Details: Level 2, spring semester, 20 credits

Pre-requisites: Nutritional Regulation, Physiology and Endocrinology (D223NA)

Expected Number of Students taking module - 100

Target Students - BSc Nutrition (B400), BSc Nutrition & Food Science (B4D6), Master of Nutrition & Dietetics (B401)

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content:
Nutrition, Metabolism and Exercise: Changes in metabolism associated with different forms of exercise, current concepts concerning the role of nutrition in enhancing sporting performance.
Obesity: body composition and energy balance, control of food intake and energy expenditure, health and physiological considerations of obesity, treatment of obesity.
Diabetes: history of diabetes, role of insulin in regulating metabolism, impaired glucose tolerance, metabolic syndrome, Type 1 and Type 2 diabetes, diabetic complications, treatment of diabetes.
Liver Disease: Metabolic role of the liver, alcoholic fatty liver disease, non-alcoholic fatty liver disease
Lipoprotein Metabolism: structure and function of lipoproteins, regulation of plasma lipoprotein concentrations, genetic and metabolic basis of the hyperlipidaemias
Cardiovascular Disease: Nature of the atherosclerotic plaque and the biochemical mechanisms underlying its development, cardiovascular disease risk factors, diet and cardiovascular disease
Disorders of Metabolism: consideration of some selected examples of inherited disorders of metabolism and the metabolic rationale for some of the therapies used to alleviate their effects.

Module Web Links – Moodle

Timetable: Typically two 3-hour timetabled sessions per week, fifty-three lectures, four-hour practical (ran three times for different groups), six-hour workshops and eight hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

Week	Subject	Staff
19	**09.30** Introduction to Module **10.00** Integration of Metabolism in Health & Disease	AS
	14.00 Nutrition, Metabolism & Exercise	AM
20	**09.30** Nutrition, Metabolism & Exercise	AM
	14.00 Nutrition, Metabolism & Exercise	AM
21	**09.30** Obesity	JB
	13.30 Anthropometry Practical – Group A	AS
22	**09.30** Obesity	JB

	13.30 Anthropometry Practical – Group B	AS
23	**09.30** Metabolic Syndrome	AS
	13.30 Anthropometry Practical – Group C	AS
24	**09.30** Diabetes	MA
	14.00 Anthropometry Practical –Data Analysis Workshop	AS
25	**09.30** Diabetes	MA
	14.00 Liver Disease	AS
26	**09.30** Lipoprotein Metabolism	AS
	14.00 Lipoprotein Metabolism	AS
31	**09.30** Cardiovascular Disease	AS
	14.00 Cardiovascular Disease	AS
32	**09.30** Disorders of Metabolism	TP
	14.00 Disorders of Metabolism	TP
33	**09.30** Disorders of Metabolism	TP
	14.00 Disorders of Metabolism	TP
34	**09.30** Revision Session	AS

Assessment details
Exam 1 70% 2 hour Examination
Coursework 30% Practical write up

Aims: 1) To provide a basic understanding of the role of nutrition in a variety of physiological and pathological situations 2) To emphasise the interaction between the disciplines of biochemistry and nutrition

Learning Outcomes:
- Recall major factors associated with the metabolism of macronutrients during normal (healthy) metabolism
- Explain changes in macronutrient metabolism associated with common chronic diseases (obesity, diabetes and cardiovascular disease)
- Predict the impact of genetic mutations/polymorphisms on pathways of metabolism and disease outcomes
- Conduct and appraise different methods of assessing body composition.

D224NB Practical Techniques in Human Nutrition

Module Convenor: Dr Simon Welham simon.welham@nottingham.ac.uk

Lecturers: Dr Andrew Murton, Dr Preeti Jethwa, Dr Jon Majewicz

Module Details: Level 2, spring, 10 credits

Capped module at 35 – You will need permission from the module convenor to take this module unless it is compulsory for your course

Target Students: BSc Nutrition (B400). Capped for students enrolled on BSc Nutrition (B400) AS Module content and delivery is specifically designed for students enrolled on this course.

Availability to Exchange Students: Yes provided they email module convenor first

Pre-requisites: D21BN1 Introduction to Nutrition; D212Z7 Introductory Physiology

Summary of Content: This module will cover the theory and practical skills associated with human nutrition, including collecting and analysing exercise physiology data.

Timetable: Typically a combination of lectures, laboratory and computer based practicals. Lectures will generally comprise two one-hour sessions and these will take place in specific weeks. The timetable can be viewed at www.nottingham.ac.uk/timetable

General Programme:

1. Introduction to module, introduction to methods. Journal club session.
2. Laboratory skills.
3. DNA and protein analysis.
4. Diet Diary analysis
5. Urinary Urea assessment
6. Questionnaire construction
7. In Vitro and Non-Human Models
8. Glycaemic Index Measurements
9. Utilisation of nutritional substrates - Indirect calorimetry.
10. Conducting human intervention trials.
11. Analysis of questionnaire results. /Journal club

Assessment Details:
Coursework 1 100% 2000 word (or equivalent) practical portfolio

Aims: The major aims are to provide a fundamental understanding and practical training in a number of core practical methods utilised in nutritional science.

Learning Outcomes: On successful completion of this module, students will be able to:

- Report on the fundamental principles which underpin commonly used methods within Nutrition
- Apply a range of practical techniques and methodologies and work safely within the practical requirements.
- Collect, record and analyse data by making accurate observations and measurements.
- Apply subject knowledge and synthesise understanding to solve practical nutritional problems.

D224P7 Plant Pests and Diseases (UP)

Module Convenors: Dr Ian Hardy ian.hardy@nottingham.ac.uk and Dr Ruth Blunt ruth.blunt@nottingham.ac.uk

Module Details: Level 2, spring semester, 20 credits

Pre-requisites: None.

Co-requisites: None

Expected Number of Students Taking Module: 35

Target Students: Biosciences students studying Agriculture, Agriculture and Crop Science, Environmental Biology, Biotechnology, Plant Science and students in Life Sciences studying Biology

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module is core for agriculture and crop science students and for non-molecular plant science students and is a recommended option for other agriculture and plant science students, biotechnologists, environmental biologists and biologists. It will introduce students to the importance of interactions between plants, microbes and insects. It will explain the importance and the nature of the organisms that are pests and diseases of plants, including population dynamics and epidemiology. It will also explore the main approaches for control and management of pests and diseases, including chemical interventions, resistance breeding in plants and biological control. Lecture material will be complemented by practical sessions, videos, demonstrations and self-study.

Timetable: Typically one three-hour timetabled session per week (four hours in those weeks that include practical sessions): twenty-five lectures, 12 hours practicals/demonstrations. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme is provisional, and more detailed information will be given to you in the first session.

Module Name	**Plant Pests and Disease**	**Module Code**	**D224P7**

N.B (if any): MD = Matt Dickinson; RB = Ruth Blunt; IH = Ian Hardy; NC = Natalie Chapman

Week	Subject	Format	Staff
19	The concept of plant disease Invertebrates as pests	Lectures	MD RB
20	The causes of disease – fungi, bacteria, viruses, nematodes	Lectures	MD
21	The concepts of biotrophy and necrotrophy Plant pathogen diagnostics	Lectures	MD
22	Basic insect morphology, life cycles, identification	Lectures	RB

	Insect reproduction		
23	Insect feeding Practical week 1	Lecture and Practical	RB IH & MD
24	Insects as vectors Practical week 2	Lecture and Practical	RB IH & MD
25	Insect senses & nervous systems Practical week 3	Lecture and Practical	RB IH & MD
26	Insecticides Practical Demonstrations	Lectures	RB
31	Biocontrol Insect monitoring/IPM	Lectures	IH
32	Disease resistance mechanisms, fungicides and biological control	Lectures	NC
33	Termites and bees Module review & revision topics	Lectures	IH IH & MD

Assessment details

Exam 1	70%	Rogo style exam - Two hours
Coursework 1	30%	Self-study exercise - 1000 word advisory leaflet on a specific pest or disease

Aims: This module will explore the nature and importance of plant pests and diseases, the organisms involved, and the approaches used to control them

Learning outcomes: On successful completion of this module, students will be able to:

- Discuss the importance of plant pests and diseases in World agriculture.
- Explain how microbes and insects cause disease of plants.
- Discuss the methods used to control plant pests and diseases.
- Relate practical skills to plant pest and pathogen identification.

D224P8 Molecular Pharming and Biotechnology

Module Convenor: Dr Rupert Fray Rupert.fray@nottingham.ac.uk

Module Details: Level 2, spring semester, 20 credits

Pre-requisites: A suitable range of genetics /molecular biology and/or plant sciences modules

Co-requisites: None

Target Students: Students in the Schools of Biosciences

Availability to Exchange Students: Yes provided they email module convenor first

Expected Number of Students taking module: 50

Summary of Content: Transgenic research and "Synthetic Biology" approaches have the potential to enable plants to be used as "green factories" for the production of novel products. In addition, the creation of genetically modified organisms (GMOs) are having a major impact on modern agriculture. The course will provide theoretical and practical knowledge as to how transgenic organisms are engineered. We will assess the technologies used to generate transgenic plants then describe examples currently being developed for commercial uses. Following this comprehensive briefing on the 'nuts and bolts' of generating GMOs, ethical, commercial and environmental concerns will be debated with invited experts. Alongside genetic modification approaches, production of traditional plant products and their uses in biotechnological industries will also be discussed as will the use of marker assisted breeding techniques.

Timetable: Typically three one-hour timetabled sessions per week: twenty-six lectures, four four hour practicals, one full day site visit, tutorials/examples classes, forty hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Module introduction (RGF); Gene structure and plant transformation (RS)
2 Genome sequencing (GS): RNAi, switching genes off (RGF)
3 Gene disruption technologies (RGF); Coursework guidance tutorial (RGF)
4 Chloroplast transformation (RGF); Commercial development of GM (External)
5 Nutritional improvement (External)
6 Biofuels and feed stocks (GL)
7 EdAntibodies, edible vaccines and medical secondary metabolites (RGF)
8 Using plant viruses (external)
9 ROGO exam
10 Synthetic Biology and the future (RGF)

Assessment:

Exam 1	60%	Two long answer questions in a 1.5 hour exam
Coursework	40%	Short answer open book questions on a selected primary research article related to the practical class. Short answer questions related to the practical sessions

Aims: This module provides a detailed analysis of the applications of technologies for the production of genetically modified organisms (GMOs). It describes how transgenic plant are generated; provides practical examples of commercial products created using GM

technologies; and addresses the regulatory and societal issues raised by GMOs. In addition, various non-GM approaches for crop improvement are also discussed. The course benefits from the input of a range of experts based at Nottingham and other leading UK research organisations.

Learning outcomes: On Successful completion of the module, students will be able to;

- Explain the key technologies and approaches used for generating transgenic.
- Critically analyse and summarise information drawn from a variety of sources, including original published research papers.
- Discuss examples of GM-plant derived novel products
- Compare different methods for regulating the expression of endogenous plant genes.

Recommended background reading:
Plant Biotechnology, The genetic manipulation of plants; Second Edition. **Adrian Slater**, **Nigel Scott**, and **Mark Fowler. Oxford University Press.** ISBN: 9780199282616

Recent research papers that will be indicated and made available via Moodle.

D224Z6 Principles of Animal Health and Disease

Module Convenors: Dr Rachael Tarlington (Vet School) rachael.tarlington@nottingam.ac.uk and Dr Sharon Egan Sharon.egan@nottingham.ac.uk(Vet School)

Module Details: Level 2, Spring Semester, 10 credits

Capped module at 80 – You will need permission from the module convenor/s to take this module unless it is compulsory for your course

Target Students: D320 Animal Science, and available to Exchange Students – subject to appropriate background. Email module convenor first.

Pre-requisite(s): D212Z5 Introductory Physiology

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Summary of Content: The module will introduce physical assessment and laboratory based measurements of animal health and assessment of the major effects of diseases on the body's physiological and immunological systems. The main types of disease will then be systematically discussed in a number of species including poultry, equine, canine, bovine and ovine species.

Assessment Details:

Exam 1	75% MCQ style online Rogo examination	1 Hour
Coursework 1	25% report - 1500 words	

Learning Outcomes: Knowledge and Understanding - To learn (1) The major effects of disease on the body (2) To develop a more detailed understanding the effects of diseases on specific body systems in a range of example species Intellectual Skills - The ability to (1) Be able integrate knowledge of the various body systems into an understanding of the effects of diseases (2) Develop an understanding of how to assess the health status of an animal (3) Be capable of retrieving information from a variety of sources. Practical/Professional Transferable/key skills - The ability to (1) Work effectively as an individual or member of a small team (2) Manage, and organise time effectively and work to deadlines (3) Perform a range of techniques commonly used in laboratory diagnosis, (4) Obtain experience in animal handling techniques.

Aims: To develop an understanding of the basic effects of disease in domesticated and food production animals

D22GFS Global Food Security: UNMC Summer School

Module Convenor: Prof Paul Wilson (interim convenor) paul.wilson@nottingham.ac.uk , Dr Sue Azam-Ali (UNMC convenor) susan.azamali@nottingham.edu.my,

Lecturer: UNMC, Prof Andrew Salter.

Module Details: Level 2, intensive block, 10 credits.

Availability to Exchange Students: Yes provided they email module convenor first

Aims: The module provides an overview of Global Food Security (GFS) issues of contemporary and future relevance to students seeking a career in GFS-related subjects. The module aims to provide students with knowledge of global agricultural and food production and trade, nutritional impacts of diet and food choice, environmental consequences of food production, and mechanisms for reducing food waste throughout local and global food chains. The module also aims to place subject-specific (e.g. agriculture, environment, nutrition) topics within a Malaysian or Asian context.

Draft Timetable: Subject to Change

Day/date	Itinerary
Saturday 28th June	Arrival and transfer to UNMC Airport pickup for overseas students Accommodation check in
Sunday 29th June	Orientation day Arrival of local students at UNMC
Monday 30th June	Introduction -Classroom session 1
Tuesday 1st July	Classroom session 2
Wednesday 2nd July	Field visit
Thursday 3rd July	Field visit
Friday 4th July	Classroom session 3
Saturday and Sunday	Weekend free
Monday 7th July	GFS
Tuesday 8th July	GFS
Wednesday 9th July	Field visit
Thursday 10th July	Classroom session 4
Friday 11th July	Classroom session 5 End of school –farewell dinner

Teaching Staff: Dr Sue Azam-Ali (SAA), Prof. Andrew Salter (AMS).

Coursework:
Coursework 1: Presentation (30%); Coursework 2: Report (70%) 1500 words

Aims: The module provides an overview of Global Food Security (GFS) issues of contemporary and future relevance to students seeking a career in GFS-related subjects. The module aims to provide students with knowledge of global agricultural and food production and trade, nutritional impacts of diet and food choice, environmental consequences of food production, and mechanisms for reducing food waste throughout local and global food chains. The module also aims to place subject-specific (e.g. agriculture, environment, nutrition) topics within a Malaysian or Asian context.

Learning Outcomes:
- Illustrate a range of contemporary and future issues and considerations in relation to global food security.
- Apply approaches to integrating material across a range of subjects

- Demonstrate a skill set of terminology and practical knowledge that will be essential for a future career in Global Food Security related-disciplines, presenting information from a wide range of sources in a professional manner.

YEAR 3 MODULES

C13569 Fundamental and Applied Aspects of Plant Genetic Manipulation

Module Convenor: Dr Tim Robbins tim.robbins@nottingham.ac.uk

Lecturers: Prof J. Dunwell, Dr H Jones

Total credits: 10

Module Details: Level 3, Autumn Semester,

Availability to Exchange Students: Yes provided they email module convenor first

Module Aims: Lectures and discussion groups will cover the latest, innovative techniques and approaches to genetic engineering in higher plants. These will be presented against a background of a continuing need for plant improvement in the key areas of agriculture, horticulture and forestry. This will include the use of tissue culture systems and cell fusion technology to study plant and somatic cell hybridisation. Detailed consideration will also be given to the development of plant transformation systems including those based on *Agrobacterium* - mediated gene delivery, direct DNA uptake into protoplasts, micro-injection and biolistics. Current uses of molecular biology in crop improvement will be discussed.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Synopses of Lectures (provisional at time of printing). The order of lectures may vary with availability of lecturers

Week 1
Course introduction: general overview, aims and objectives, module structure and organisation. Transformation in plants. Agrobacterium-induced plant tumours. Crown gall disease. Agrobacterium tumefaciens as the causative agent; physiology of crown gall tumours; opines; A. rhizogenes as the causative agent of hairy root disease; culture of transformed roots; plant regeneration; morphology and physiology of transgenic plants. Molecular biology of crown gall disease; Ti and Ri plasmids; T-DNA inserts in crown galls; copy number; mutagenesis of T-DNA (GWL)

Week 2
Cloning of genes. PCR, RT-PCR, iPCR, plasmid vectors, cassettes. lambda vectors, library screeningTL and TR-DNA genes; T-DNA borders; bacterial plant interaction, acetosyringone, T strand generation, T-DNA transfer from bacteria to plants; Nuclear import of T-strand; role of chromosomal and plasmid virulence genes (GWL)

Week 3
Ti plasmid as a gene vector; reporter genes; chimaeric genes; dis-armed co-integrate Ti vectors; binary vectors. Experimental systems for introducing genes into plants - explants, protoplasts; leaf disc transformation; direct DNA uptake; PEG; electroporation; electrophoresis; micro-injection; biolistics.

Introduction of agronomically useful genes into plants - herbicide, viral, fungal, insect resistances; flower and fruit-specific genes. Merits and limitations of gene delivery methods for plant improvement. (GWL)

Week 4
Theory and application of cereal transformation
Plasticity, totipotency and cereal tissue culture; Pros & cons of different DNA-delivery methods; Germ line (*in planta*) methods for cereal transformation; Target genes/traits for transgenic cereals; Design of transformation cassettes, promoters; Plastid transformation in cereals (HDJ)

Week 5
Somatic hybridisation as an alternative for genetic transformation; principles, protoplast fusion and the history of protoplast fusion, spontaneous fusion, induced chemical fusion and electrofusion of protoplasts; the need for selection systems for somatic hybrids. (MRD)

Week 6
Selection strategies: tumourous cell lines, differential growth systems, single heterokaryon isolation, nitrate reductase deficient mutants, (gametosomatic hybridisation), albino mutants, light sensitive mutants, antimetabolites and resistance mutants, double mutants, morphological markers. (MRD)

Week 7
Selection strategies: use of transgenic cells, electroporation, regeneration pathways. Features of somatic hybrids, phenotypes, fertility, characterisation, asymmetric fusion products, cytoplasmic manipulation, and general uses of somatic hybridisation. (MRD)

Week 8
Applications of GM technologies Physical and biological containment of GM crops; Applications of GM crops to pharmaceuticals and biofuels.
IP & patents; hybrid varieties; patentable technologies, transformation methods, introduced sequences, sequence data; International perspectives; Development of GM; IP and industry structure; (JMD)

Week 9
Research Paper Reviews (Coursework)
Working in small groups, students will choose one course-related publication (in the form of a reprint given out earlier) and then present a short (assessed) overview. The talk should be for 10 minutes plus 5 minutes for discussion. Students also prepare a one A4 page abstract of the paper/talk (submitted in Week 8) which will then be copied and distributed (for information) to the other members of the class (see later for details of assessment). (MRD & GWL)

Week 10 General discussion (MRD & GWL)

Coursework: Students will be required to prepare a short dissertation style essay (2000 words maximum) on a topic related, in the broadest sense, to the themes of the taught part of the course. Individual choice of topic will be from a list of 30 titles given out in Week 2. Contact and guidance with individual staff will form part of this exercise. Students are expected to devote 3 hours per week (Weeks 1-10) to the preparation of their dissertation to be completed by the final lecture period (Week 11).

Students will also give a group presentation of a research paper supplied to them.

Assessment:

Exam 1 60% 2 hour exam

Coursework 1 10% Group Presentation/review of a selected research paper

Coursework 2 30% Dissertation/essay - 2000 words

Learning Outcomes: On successful completion of the module, students will be able to:

- Compare the strengths and weaknesses of different technologies for producing transgenic plants
- Explain the methods for production of somatic hybrids
- Analyse the extent to which the above technologies are now being applied and how they might be applied in future
- Explain the above in several different oral, visual and written media, alone or in groups

Recommended Reading: References will be given in association with lectures. These will also underpin the coursework element of this module.

C135E9 Computer Modelling in Science: Applications

Module Convenor: Dr Dov Stekel dov.sketel@nottingham.ac.uk

Module Details: Level 3, Autumn Semester, 20 credits

Pre-requisites: D224E4 is recommended but not essential. If you have taken neither D224E4 nor maths A-level, please contact the module convenor.

Expected Number of Students Taking Module: 40

Target Students: All School of Biosciences and Natural Sciences students and Ningbo 2+2 Environmental Sciences students (based in Geography).

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The use of computer-based models has become widespread in the biological and environmental sciences. This module contains the development and application of models in the context of biological and environmental sciences. Fundamental methods (e.g. model building, solution of differential equations, steady state analysis, fitting models to data, use of empirical models) are introduced and applied to a number of example applications. The examples include pollutant transfer and fate, population dynamics, protein synthesis, molecular switches and epidemics of humans and animals. Practical work is undertaken using modelling software to illustrate key aspects of the module. The module is designed for students with relatively little mathematical or computing experience or confidence and is an ideal opportunity to develop a knowledge of applying mathematical skills in an environmental science context.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Assessment:

Practical	100%	Patchwork Assessment

Aims: The aim of this module is to show the range of techniques for computer-based models applied to the biological and environmental sciences using suitable important examples

Learning Outcomes: A student who has successfully completed this module should be able to:
(i) Understand and articulate the relevance of computer-based mathematical models to a range of applications in the biological and environmental sciences.
(ii) Construct a simple model from a description of the processes in a biological or environmental system.
(iii) Simulate simple and complex models using appropriate computer software.
(iv) Use appropriate computer software to fit simple models to data.
(v) Critically evaluate a model and its simulation results in the context of the environmental and biological science underpinning the model.
(vi) Write appropriate computer programs to carry out image processing for biological and environmental images.

Reading List: To be given to students at the beginning of the module.

C135P2 Molecular Plant Pathology

Module Convenor: Professor Matthew Dickinson matthew.dickinson@nottingham.ac.uk

Module Details: A level 3 course taught in the Autumn Semester, University Park. 10 credits

Pre-requisite(s): D224P7 (Plant Pests and Diseases)

Expected Number of Students Taking Module: 80

Target Students: Unrestricted

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module will cover the molecular techniques being used to develop an understanding of plant/pathogen interactions. It will then cover the molecular biology of plant pathogens, how these cause disease, and the mechanisms used by plants to defend themselves against such pathogens.

Timetable: Typically one two-hour timetabled session per week: twenty-two hours of lectures/tutorials, seventy-eight hours of student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Introduction and Bacterial diseases I (MD)
2 Bacterial diseases continued (MD)
3 Plant viruses (MD)
4 Fungal diseases (John Lucas)
5 Fungal genetics (MD) and Fungal sex (Paul Dyer)
6 Resistance genes (MD)
7 Signalling in disease resistance and Systemic resistance
8 Tutorial sessions
9. Tutorial sessions
10. Tutorial sessions
11. Module review and revision session

Assessment: Exam 1 100% 2 hour examination.

Aims: This module will explore the modern molecular techniques being used to investigate plant/microbe interactions and will examine the way in which pathogens cause disease and the means by which plants defend themselves.

Learning outcomes: On successful completion of this module, students will be able to:

- Describe the current models for how plant pathogens cause disease.
- Relate knowledge of pathogens to how plants defend themselves against disease.
- Explain the molecular basis of plant pathogen interactions.
- Evaluate and critically assess recent research in plant pathogen interactions.

Recommended background reading:

Dickinson M (2003) Molecular Plant Pathology BIOS Scientific Publishers.

Lecturers will provide information on the best reviews and primary sources for the information that they cover in their lectures as the module progresses.

C135P3 Basic Introduction to Omic Technologies

Module Convenors: Prof Zoe A Wilson zoe.wilson@nottingham.ac.uk

Total Credits: Level 3 Autumn Semester, 10 credits

Co-requisite(s): None.

Pre-requisite(s): A suitable range of plant science and/or genetic/bioinformatic modules in previous semesters.

Expected Number of Students Taking Module: 30

Target Students: Available to JYA/Erasmus students.

Module Details: Over the past few years major developments have been made regarding the study of genomes. Sequencing programmes now mean that the complete DNA sequence is now known for many species. Such information is revealing the high degree of similarity and conservation between different species and organisms, which in turn is revolutionising the way in which gene function analysis is carried out. An extensive range of post-genomic technologies have been established based on this information and these are revolutionising the analysis that is possible.

This module will provide a basic overview of recent research in the field of "omics" with emphasis on genomics, proteomics and metabolomics. Case studies will be presented detailing how different approaches have been used to study genomes and how such developments are influencing the way genetic analysis and biotechnological improvement can be made. Particular emphasis will be paid to the importance of bioinformatics and IT in the study of genomes and the commercial biotechnological applications of gene isolation. Hands-on experience of these approaches will be provided via problem-based lab and computer training sessions.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Assessment Details:

Exam 1 50% 1.5-hour written examination (2 questions from 4)

Coursework 1 35% Transcriptomic analysis exercise - assessed

Coursework 2 15% Group presentation (15 - 20 mins)

Aims and Objectives: To introduce the student to the fields of genomics, transcriptomics, metabolomics, proteomics and bioinformatics. Particular focus will be the use and application of bioinformatics for understanding of the functional roles of genes, metabolites and proteins and how they can be analysed using a variety of new technologies e.g. Deep Sequencing, proteomics, mass spectrometry, transcriptomics.

Learning Outcomes: On successful completion of this module, students will be able:-
1) To demonstrate knowledge and understanding of the fundamental principles and practices that underpin genomics, proteomics and metabolomics, and their biotechnological applications. 2) To evaluate current research in -omics and related biotechnological disciplines. 3) To acquire substantial quantities of information systematically and process it selectively and effectively. 4) To discriminate between the different approaches and techniques used in the genomics, proteomics and metabolomics 5) To develop ideas and opinions through the use of information from a wide variety of sources. 6) To communicate effectively knowledge of different -omic technologies and their applications.

C136E6 Environmental Biotechnology

Module Convenor: Dr H West Helen.west@nottingham.ac.uk

Module Details: Level 3, Spring semester, 10 credits at University Park

Pre-requisites: Completed Part 1 year in Environmental Science, Environmental Biology or Biology

Expected Number of Students Taking Module: 40

Target Students: BSc Environmental Science, BSc Environmental Biology, BSc Biology, BSc Biotechnology

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module provides training inenvironmental biotechnology, with particular emphasis on the interaction between microorganisms and the environment. The main topics covered will be wastewater treatment, bioremediation of organic and inorganic pollutants, microbes as indicators of risk factors in the environment, microbes in agriculture (biocontrol and biofertilisers) and the role of microorganisms in bioenergy production.. Each topic will be introduced by a formal lecture followed by workshops during which students will study the topics in greater detail through problem-based learning techniques facilitated by the Convenor and by independent research. Knowledge and understanding of the lecture material will be assessed by Rogo examination and students will present the problem based exercises and case studies within an individual portfolio during the final week of the module.
Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Further Activity Details:
Activities may take place every teaching week of the Semester or only in specified weeks. It is usually specified above if an activity only takes place in some weeks of a Semester. 36 hours of lectures and facilitated workshops

Assessment Details:
Exam 1 30% 1.5 hour examination

Coursework1 70% Portfolio presentation of case studies and problem based exercises

Aims: To provide students with a sound understanding of microbial ecology, the role of microbes in natural processes and their application in waste water treatment and bioremediation processes.

Learning Outcomes: Knowledge and understanding of: - The way microbes interact with the environment - The applied effects of microbes on the environment and on human activity and welfare. Intellectual Skills - the ability to - Critically analyse and interpret published information and data - Understand complex ideas and relate them to specific problems or questions. Professional Skills - the ability to - Work safely in the laboratory and to assess related safety issues Undertake appropriate experimental design and statistical analysis Transferable Skills - the ability to - Work productively with others - Communicate effectively by oral presentation - Manage and manipulate numerical data

C136E7 Environmental pollutants: fate, impact and remediation.

Module Convenors: Dr Scott Young (SY; Convenor) scott.young@nottingham.ac.uk, Prof George Shaw (GS; Convenor) George.shaw@nottingham.ac.uk

Module Details: Level 3, Spring semester, 20 credits at University Park

Pre-requisites: C123E3 Soil Science (or equivalent)

Expected Number of Students Taking Module: 70

Target Students: F900, F750, C150, F759, FG07, FG08

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module is concerned with the behaviour and effects of pollutants in terrestrial and aquatic environments and how their impacts can be ameliorated and managed. The focus is on both the scientific understanding of environmental pollutants and on the intervention strategies currently available. Topics covered include study of the common water and soil pollutants: heavy metal contamination of land; radionuclide behaviour in the environment; persistent organic contaminants and pesticides; nitrate pollution of groundwater; pollution of surface waters by agriculture; eutrophication of lakes; acidification of soils and freshwaters; biological monitoring of rivers; ecotoxicology and environmental epidemiology; quantitative risk assessment; land reclamation, including landfill sites.

Module Activities - Combination of lectures, formative tutorials, field visit and associated laboratory work and demonstrations.

Assessment details - Rogo examination (70%, 1 x 2 hours), 2 summative assessments (15% each)

Summative exercise 1. This activity will be based on a half day field visit to Bagworth Heath, Leicestershire. Small groups will carry out several field sampling exercises or demonstrations, on a rotational basis. Data will either be collected directly by the students or will be provided from demonstrations. A 1,000 word report will be written by the students using these data.

Summative exercise 2. This activity is based on extensive geochemical data previously collected over several years at an old lead mine in Clough Wood, Derbyshire. Several geochemical topics will be addressed including an assessment of mining activities on environmental health, geochemical associations, evidence of agricultural impact in stream water etc. A 1,000 word consultancy-style report will be written by the students using these data.

Aims – The aims of the module are to present: a. current scientific understanding of the fate, impact and remediation of environmental pollutants; b. techniques employed in their study; c. methods currently available to manage and mitigate their impact. At the end of the module the students will be able to (i) understand and explain the underlying mechanisms involved in the major problems of terrestrial and aquatic pollution; (ii) make rational decisions regarding remediation of polluted environments; (iii) give relevant advice to managers, planners and other decision makers.

Learning Outcomes - On successful completion of this module, students will be able to:

- Outline the nature and origins of the major environmental pollutants and place these in the context of past and present human activities.
- Discuss and distinguish between the specific behaviour of a range of organic and inorganic contaminants in the terrestrial and aquatic environments.
- Discuss current knowledge gaps in pollutant transformations and dynamics in the environment.
- Make a quantitative risk assessment of environmental contamination and critically appraise current approaches to modelling risk.
- Demonstrate understanding of current waste disposal and management issues.
- Critically compare current and past approaches to contaminated land restoration and management.

D235A4 Rural Business Management

Module Convenor: Dr Steve Ramsden Stephen.ramsden@nottingham.ac.uk

Lecturer: Mr Jon Clatworthy

Module Details: A level 2, 10 credit module taught in the Autumn Semester at Sutton Bonington. The module consists of lectures, a practical class, team case-study work and interviews and farm visits.

Pre-requisites: D223A6 Economic Analysis for Agricultural and Environmental Sciences

Expected Number of Students Taking Module: 20

Target Students: For students interested in Business Management.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module is concerned with the application of management principles to the modern rural business. This will involve - the construction and interpretation of business accounts (profit and loss, cash flow, balance sheet) - business planning and budgeting - investment appraisal techniques - labour and machinery management - forms of business organization - taxation. The module emphasises involvement in a 'real-life' case study, with input from staff actively involved in finance and agricultural business management. Students, working in teams, will be interviewed by and complete both written and verbal presentations to these staff in a formal manner.

Timetable: Typically two one-hour timetabled sessions per week (Monday mornings from 9 am): twenty-three lectures, regular tutorials/examples classes, forty hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

Lecture Programme:
1 Management thinking and the market environment
2 Management Accounting 1: How do I know whether my plans will make a profit?
3 Management Accounting 2: What are the effects of my plans on cash flow and capital?
4 Management Accounting 3: Further budgeting techniques
5 Investment Appraisal
6 Labour and machinery planning and management
7 Managing risk in the rural business

Non Lecture Programme:
Tutorials
Advanced Budgeting using spreadsheets
Introduction to the Case Study
Practicals
CAL - Advanced Budgeting for profit
CAL - Advanced Budgeting for profit, cash flow and capital
Group Work
Teamwork and meetings with academic staff - 1
Farm visit
Teamwork and meetings with academic staff - 2
Teamwork and meetings with Barclays Bank

Teamwork and meetings with academic staff - 3
Team working and student meetings

Case Study Presentations

Assessment Details:

Exam 1	50%	1.5 hour exam
Coursework 1	50%	Team-based report (2000 words), interview and presentation

Aims: The module aims to develop students' knowledge of business management principles and to provide them with an opportunity to apply these principles to the type of problems facing rural businesses at the present time. Students will also learn and practice the teamwork, time management and data analysis skills which are vital when working in business. Staff involved in the management and financing of rural businesses will provide students with an insight into how business works and will provide feedback on student reports and presentations.

Learning Outcomes: Knowledge and Understanding - to learn (1) How to appraise the stability and performance of a rural business (2) The business management principles and planning techniques necessary for improving business stability and performance (3) To gain understanding of how to present business plans in a successful manner.
Intellectual Skills the ability to (1) Collect and integrate several lines of evidence and apply them in a balanced manner to support an argument (2) Apply subject knowledge and understanding to address familiar and unfamiliar problems (3) Critically analyse, synthesise and summarise information drawn from various sources, including published research papers and reports.
Practical/Professional Skills - the ability to (1) Collect and record data
Transferable/key skills - the ability to (1) Communicate effectively to a variety of audiences in written, verbal and visual forms, making appropriate acknowledgement of the work of others (2) Work productively as an individual or as part of a team (3) Manage and organise time efficiently and work to deadlines by using flexible and effective approaches to study (4) Process, analyse and present data using a variety of methods (5) Selective use the internet and other electronic means for communication and as a source of information

Recommended Reading:
Warren, M.F. (1998). *Financial Management for Farmers and Rural Managers (fourth edition).* Cheltenham: Stanley Thornes (Publishers) Ltd.
Nix, J. (2015). *Farm Management Pocketbook, forty sixth edition (2016).* The Andersons Centre.
Turner, M. and Taylor, M. (1998) *Applied Farm Management*, (second edition). Oxford: Blackwell Science.

D235A8 Companion Animal Science

Module Convenor: Dr Gavin White gavin.white@nottingham.ac.uk

Module Contributors: Professor D Hannant and Dr Gavin White (University of Nottingham) Dr H Masey O'Neil and Dr J Lowe (External Special Lecturers)

Module Details: Level 3, Autumn Semester 5; 10 credits module taught at the Sutton Bonington Campus.

Pre-requisites: D223A7 Applied Animal Science

Expected Number of Students Taking module: 50

Target Students: Students in the School of Biosciences.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Scientific principles governing nutrition, health and welfare of major companion species: cats, dogs, horses, rabbits, zoo animals / exotics.

Timetable: Typically two one-hour timetabled sessions per week: twenty-three lectures, regular tutorials/examples classes, forty hours student led studies and revision. The timetable can also be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

Week	***SUBJECT***
2	Equine
3	Equine
4	Equine
5	Equine
6	Zoo animal nutrition
7	Visit to Twycross Zoo
8	Rabbits,
9	Pet Food Industry; dogs
10	Role of pets in society; cats
11	Pocket animals
12	Group Presentations
13-16	Vacation
17-18	January Assessment

Teaching Staff: Dr Gavin White**,** Dr Helen Masey-O'Neil (HMO'N), Prof Duncan Hannant (DH) Dr John Lowe (JL)

Coursework: One essay 1500 words, group presentation

Assessment: 60 % exam (one 2-hour paper), 40% course work (30% 1 essay 1500 words, 10% group presentation).

Aims: Study of scientific basis of physiology, nutrition, health, welfare and management of the major companion animal species. The interactions between nutrition, health and longevity within the broad area of 'clinical nutrition'. Appreciation of the problems arising from maintaining animals in captivity, policies governing zoo animal / exotics in terms of intervention strategies in all these scientific issues.

Learning Outcomes: On successful completion of this module, students will be able to:

- Explain the fundamental, cross-disciplinary principles and practices that underpin companion and zoo animal nutrition
- Evaluate current research and advanced scholarship in the fields of companion and zoo animal nutrition
- Describe the social interactions between humans and companion animals
- Assess the importance of animal health and immunology

Recommended background reading:

- Clinical Nutrition of the Dog and Cat (in the library) JW Simpson, RS Anderson and PJ Markwell,
  Blackwell Scientific Publications, 1993
- The Dog: Its Behaviour, Nutrition and Health (in the library) Linda P Case, Blackwell Publishing, 2005
- The Waltham Book of Clinical Nutrition of the Dog & Cat (in the library) JM Willis & KW Simpson, Pergamon, 1994
- The Nutrition of the Rabbit (in the library) C DeBlas and J Wiseman, CABI Publishing, 2010

Equine:

- Equine Nutrition and Feeding - Frape, Blackwell
- Nutritional Physiology of the Horse - Ellis and Hill, NUP
- Advances in Equine Nutrition - Pagan, NUP
- Nutrient Requirements of Horses - NRC; http://nrc88.nas.edu/nrh/

D235F1 The Microflora of Foods

Module Convenor: Prof CER Dodd christine.dodd@nottingham.ac.uk

Total Credits: 20

Level: 3 Autumn Semester

Capped module at 50 – You will need permission from the module convenor to take this module unless it is compulsory for your course.

Pre-requisite(s): D224FA Microbial Mechanisms of Food Borne Disease (20 credit) or equivalent

Late registration for this module is not possible as coursework is submitted in the first two weeks.

Target Students: Compulsory for Food Science. Required choice option for students reading for degrees in Microbiology; optional for Nutrition, and Biotechnology.

Availability to Exchange Students: Yes provided they email module convenor first

Module Details: The intrinsic and extrinsic factors which affect the growth of micro-organisms in foods will be considered. The impact of food structure and microflora will also be discussed. The limitations of these parameters for predicting the growth of micro-organisms will be considered together with commercially available predictive models and alternative safety assurance approaches HACCP. The micro-organisms associated with spoilage and the physical changes which occur in a food will be outlined. The microbial profiles of particular foods, including dairy products, fish and red meat, will be described and the changes that occur in the microflora during spoilage will be considered in relation to storage parameters. Practicals will cover methods for isolating and identifying micro-organisms from foods and will evaluate the limitations of these procedures.

Timetable: Lecture and practical contents:
The timetable can be viewed at www.nottingham.ac.uk/timetable. The final timetable will be given out at the first session. An indicative timetable is given below

Week 1
10.00-13.00 Introduction to the module
Examining microbial growth in foods 1: factors controlling growth Examining microbial growth in foods 2: predictive modelling
14.00-16.00 Canning practical 1

Week 2
10.00-12.00 Examining microbial growth in foods 3: enrichment procedures

Examining microbial growth in foods 4: *in situ* detection 12.00-13.00*Salmonella* isolation: practical 1 - enrichment procedures 14.00-16.00 Canning practical 2

Week 3
10.00- 12.00 Spoilage The microflora of specific foods: meat and poultry I
12.00-13.00 Canning practical 3
14.00-16.00 *Salmonella* isolation: practical 2 - selection of isolates

Week 4
10.00-11.00 Practical
11.00-13.00 *Campylobacter* The microflora of specific foods: meat and poultry II
14.00-16.00 *Salmonella* isolation: practical 3 - characterisation of isolates

Week 5
10.00-13.00 The microflora of specific foods: fish and shell fish *Clostridium botulinum* and food borne botulism. Prof Mike Peck (Institute of Food Research - Norwich)
14.00-16.00 Discussion group on *Salmonella* isolation
Introduction to *Listeria* practical

Week 6
10.00-11.00 The microflora of specific foods: dairy products
11.00-13.00 *Campylobacter*: practical 1
14.00-16.00 Submission of *Listeria* protocol

Week 7
10.00-13.00 Campylobacter: practical 2
14.00-16.00 *Listeria isolation: practical 1 – isolation from cheeses*

Week 8
10.00-13.00 The microflora of specific foods: bakery products The microflora of specific foods: miscellaneous
14.00-16.00 *Listeria* isolation: practical 2 - selection of presumptives

Week 9
9.00-13.00 Competitive microflora. Dr. Tim Aldsworth (Coventry University) Food structure and microbial growth. Dr Sharon Johnson (DSTL)
14.00-16.00 Listeria isolation: practical 3 – confirmatory tests

Week 10
10.00 -13.00 HACCP: an introduction
Group exercise on HACCP
14.00-16.00 *Listeria* isolation: practical 4 - final identification

Week 11
10.00- 11.00 Bacterial suicide - a new hypothesis.
1.00-13.00 Discussion group on *Campylobacter* and *Listeria* practicals Seminar on past examination papers and module evaluation

Lecture Programme: Available on 1st day of module

Non Lecture Programme: Available on 1st day of module

Coursework: Course work constitutes 50% of the marks for the semester. This is broken down as:

Canning practical report	25%
Continuous assessment exercises:	
Canning practical summary	5%
Campylobacter identification results	5%
Listeria isolation protocol (group exercise)	15%

Assessment Details:

Exam 1	50%	3 hour exam - compulsory data evaluation based on practicals; 3 short answer questions: 1 essay
Coursework 1	25%	Practical report written as report to industry - 2000 words
Coursework 2	5%	Group (2 people) practical report - summary of findings after 1 week (2 sides A4 max 500 words per student)

Coursework 3	5%	Group (2 people) practical report - tabulation of results and brief commentary written by pair working together (2 sides A4 max; 500 words per student)
Coursework 4	15%	Group (4 people) practical report - summary of protocol developed in practical sessions and of written instructions issued to technician (1000 words per student)

Learning Outcomes: On successful completion of this module students will be able to:
1) Comprehend the underlying principles of the factors which control microbial growth and their relevance in foods
2) Relate the microbial composition of major food materials with the impact of food composition, storage and processing.
3) Apply a range of practical techniques and methodologies for isolation and characterisation of specific bacteria
4) Design, carry out and evaluate appropriate tests or experiments to address fundamental microbiological problems in the food industry
5) Collect, record and analyse data by making accurate observations and measurements and use appropriate methods for presentation.

Recommended Reading: M ft Adams and M O Moss (1995) *Food Microbiology* J M Jay *Modern Food Microbiology* Fourth Edition Collins, Lyne and Grange *Collins and Lyne's Microbiological Methods* Seventh

D235F5 Molecular Microbiology and Biotechnolgy

Module Convenor: Dr P Hill phil.hill@nottingham.ac.uk,

Lecturers: Dr C Rees, Prof I Connerton, Prof D Archer, Dr K Mellits

Module Details: Level 3, Autumn Semester, 20 credits

Pre-requisite(s): D212F7 Microbial Physiology or equivalent.

Students who have not taken this module may be allowed to register if they can demonstrate the essential prerequisite laboratory skills.

Number of Places: 30

Target Students: Optional for BSc Biotechnology, BSc Microbiology

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module begins with a review of DNA structure, gene transcription and protein synthesis and will then review gene cloning, protein expression vectors and protein analysis. Advanced aspects of protein expression, stability and secretion are then introduced followed by the application of gene engineering to the biotechnology industry. Finally the practical classes provide some experience of detailed planning and execution of practical molecular bacteriology and give experience of protein over-expression in bacterial and macromolecular separation/analysis. The coursework exercise gives training in manuscript preparation.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: More detailed information will be given in the first session.

Topic
1 Bacterial/gene transcription and translation
2 Cloning in expression vectors
3 Protein analysis and macromolecular separation
4 Protein structure and protein folding
5 Protein stability and gene fusions
6 Protein secretion
7 Expression in eukaryotic systems
8 Protein engineering and biotechnology
9 Post-translational modification
10 Regulatory constraints and patents

Non-Lecture Programme: 1 day per week throughout the semester to include formal lectures (approx 33 h) together with 6 x 4h practical classes during the semester (approx 24 h) and 5 x 2h seminars.

Assessment:

Exam 1	65%	3 hour examination
Coursework 1	5%	Tutorial presentation
Coursework	30%	Lab planning exercise - 2 page summary of seminar material plus calculations. Lab report - written in style of research manuscript; 4000 word limit but no minimum length

Aims: To enable students to comprehend the opportunities that protein engineering provides in applied microbiology and to appreciate some of the practical limitations associated with technology. Students will gain a detailed understanding of prokaryotic protein expression and

examples of its application to biotechnology. Practical classes and seminars will provide an insight into the necessary constraints and practicalities of experimental design and execution. The major coursework assignment introduces students to the rigour required for writing scientific papers.

Learning Outcomes: On successful completion of this module, students will be able to;
Explain advanced aspects of protein synthesis in bacteria and how bacteria are used to produce recombinant proteins.
Compare the differences between using bacteria or eukaryotic cells for producing recombinant proteins.
Evaluate the most appropriate techniques used for preparation and purification of a particular given protein.
Design and implement practical experimental procedures for protein expression and purification.
Prepare scientific manuscripts based on laboratory data appropriate for publication.

RECOMMENDED READING LIST:

- Instant notes molecular biology / P.C. Turner ... [et al.], 2nd ed. Bios, 2000.
- Lesk, Arthur M. Introduction to protein science : architecture, function, and genomics / Arthur M. Lesk, 2nd ed. Oxford University Press, 2010.
- Price, Nicholas C. Exploring proteins : a student's guide to experimental skills and methods / Nicholas C. Price and Jacqueline Nairn. Oxford University Press, 2009.
- Practical skills in biomolecular sciences / Rob Reed ... [et al.], 3rd ed. Pearson Education, 2007
- Chemistry for the Biosciences: the essential concepts / Jonathan Crowe ... [et al.], Oxford University Press, 2006

Recommended background reading: Genes VII (onwards) Lewin Instant Notes in Molecular Biology. Turner et al. Introduction to Protein Architecture, Lesk.

D235F7 Physical Chemistry of Molecules

Module Convenor: Professor S E Harding Stephen.harding@nottingham.ac.uk

Lecturers: Prof T J Foster (TJF), Dr G Morris (GM) and Dr B Wolf (BW)

Module Details: Level 3, Autumn Semester, 10 credits

Expected Number of Students Taking Module: 20

Target Students: School of Biosciences, School of Biomedical Science students.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Basic relationships; dilute solutions of small molecules (perfect and real gases; ideal solutions; concentration; vapour pressure; Raoult's law; Henry's law; freezing point depression; boiling point elevation; osmotic pressure). Solution thermodynamics (1st law: enthalpy entropy and free energy; 2nd law: water as a solvent; ideal solution from a thermodynamic viewpoint; chemical potential; non-ideality); physical chemistry of macromolecules (sizes and shapes of proteins and polysaccharides; macromolecular concentration measurement; macromolecular non-ideality; macromolecular heterogeneity and molecular weight averages; macromolecular flexibility; analytical ultracentrifugation for measuring shape and molecular weight; colloidal properties of macromolecules; phase transition phenomena).

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: The lecture programme below will cover the following: Macromolecules, Basic thermodynamics, water, dilute solutions of small molecules. concentration and measurement, osmotic pressure and non-ideality, molecular weight and averages, polydispersity, polydispersity ratio conformation and flexibility, analytical ultracentrifugation for measuring shape and molecular weight; colloidal properties of macromolecules; phase transition phenomena.

Programme:
Module Introduction (SEH)
Basic Physical Biochemistry Lecture 1 (SEH)
Basic Physical Biochemistry Lecture 2 (SEH)
Basic Physical Biochemistry Lecture 3 (SEH)
Basic Physical Biochemistry Lecture 4 (SEH)
Basic Physical Biochemistry Lecture 5 (SEH)
Basic Physical Biochemistry Lecture 6 (SEH)
Basic Physical Biochemistry Lecture 7 (SEH)
Basic Physical Biochemistry Lecture 8 (SEH)
Basic Physical Biochemistry Lecture 9 (SEH)
Basic Physical Biochemistry Lecture 10 (SEH)
Basic Physical Biochemistry Lecture 11 (SEH)
Concentration measurement demonstration (GM)
Basic Colloidal Science Lecture 1 (TJF)
Basic Colloid Science Lecture 2 (TJF)
Foaming and emulsification (TJF)
Analytical Ultracentrifugation and demonstration (SEH/GM)
Phase Separation Phenomena in foods (BW
Revision/ Course Feedback

Assessment:

Exam 1	80%	1.5 hour exam.

Coursework 1 20% Assessed questions (calculations) based on 2 practical demonstrations.

Aims: The module will be directed at providing the students with a firm understanding of the basic physical chemistry behind the properties of biomolecules - properties which underpin their behaviour in vivo and their technology and some of the techniques used to characterise their size.

Learning Outcomes: Knowledge and understanding of:
(1) The fundamental, cross - disciplinary principles and practises that underpin biomolecular properties and its multi-various biotechnological applications with focus on food.
(2) A range of key, specialist information primarily focussed on biomolecular properties.
(3) An appreciation of how Industry (particularly the Food Industry) is using knowledge of biomolecular properties.
(4) A range of relevant practical techniques and methodologies and their uses, together with appropriate procedures for analysis and presentation of data.

Intellectual skills - the ability to:
(1) Evaluate critically current research and advanced scholarship in the fields of biomolecular science.
(2) Acquire substantial quantities of information systematically and process it selectively and effectively.
(3) Develop ideas and opinions through the use of information from a wide variety of sources.

Practical/Professional skills - the ability to:
(1) Plan, execute and report laboratory-based work
(2) Search for and retrieve information from a wide range of sources including electronic and print systems.
(3) Present in a range of formats (written work assignments, numerical work, practical write-ups and examination)
(4) Work safely in the laboratory and respond appropriately to relevant safety issues.

Transferable/key skills - the ability to:
(1) Communicate effectively in written forms.
(2) Critically appraise and present information from a wide range of sources
(3) Use general IT tools, Internet and other learning resources to generate concise scientific overviews and to advance their own knowledge base.
(4) Act autonomously in planning and implementing tasks
(5) Participate effectively in team working activities.

Recommended Reading:
M.P. Tombs and S.E. Harding : An Introduction to Polysaccharide Biotechnology (Taylor & Francis, London, 1997) - Particularly chapter 1.
S.E. Hill, D.A. Ledward & J.R. Mitchell (eds.) Functional Properties of Food Macromolecules (Aspen/ Chapman & Hall, Maryland, 1998).

D235F8 Personal and Professional Development for Food Scientists

Module Convenors: Dr Judith Wayte Judith.wayte@nottingham.ac.uk and Emma Weston (Associated Professor) emma.weston@nottingham.ac.uk

Lecturers – Experts in professional development and speakers from industry

Module Details: Level 3 Autumn semester, 10 credits

Pre-requisites: Participation in the tour of food manufacturing sites (end of the first year)

Co-requisite(s): Not open to exchange or study abroad students

Capped module at 35 – You will need permission from the module convenor to take this module unless it is compulsory for your course.

Target Students: Food Science and Nutrition and Food Science Students

Availability to Exchange Students: Yes provided they email module convenor first

Aims: To provide specific training and learning opportunities to prepare students for a range of careers on graduation and in successfully securing a job.

Summary of Content: This module provides specific training and learning opportunities to develop a range of key skills and competencies that improve employability prospects for the students, and their performance once in work.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Example:

Week	SUBJECT	LECTURER
1	Introduction to the module	EW/JW
2	Personality Assessment	RS Careers Service
3	Making Job Applications & CVs	External e.g. Pespsico
4	Building Targeted CVs	Self Directed Learning
5	You and Your Career – 1 Career Planning	EW/JW Self-Directed Learning
6	Careers Launch Pad	Field Trip
7	Drop In 1:1 Appointments	EW/JW
8	The Interview Process I	External – e.g. recruitment consultant
9	The Interview Process II – Group Assess	External – e.g. Tesco

10	Understanding the Job Market	External e.g CFA
11	Module Review and Coursework Support	EW/JW

Module Activities:

- Visit four food/drink manufacturing sites at the end of year 1 (2-day field trip) – attendance compulsory as part of the module
- Participate in a range of workshops, for example: CV and cover letter writing; application forms and interview techniques; career planning; aptitude tests
- Attend a field trip to an employment event
- Attend employer presentations
- Create online personal portfolio/profile

Assessment:

Coursework 1	80%	A collection of 3 reflective logs and 1 Personal Development Plan. Reflections can be audio; video or 1-2 page written reports. Marked as per written assessments
Coursework 2	0%	Pass/Fail. Portfolio of 5 items that contains evidence of the acquisition & realisation of skills, and draws on activities scheduled throughout the course and promotes a high degree of reflective practice. Students can align with a range of specific career
Participation	20%	Attendance at 4 employer events / workshops outside of the module activities.

Learning Outcomes: On successful completion of this module students will be able to:

- Demonstrate a range of professional behaviours
- Synthesise their skills and capabilities into a targeted portfolio
- Evaluate their performance at networking, interviews and assessment centres
- Construct an action plan for Personal and Professional Development to build on strengths and develop areas of weakness.

D235FR Trends in Food Research

Module Convenor: Dr David Gray david.gray@nottingham.ac.uk

Module Details: Level 3 autumn semester, 10 credits

Pre-requisite(s): D223F0 Manufacture of Food (40 credits)

Co-requisite(s): None.

Expected Number of Students Taking Module: 60

Target Students: Food Science' and 'Nutrition and Food Science' students.

Availability to Exchange Students Yes – but limited numbers

Summary of Content: This module will expose final year students to research and development in a number of areas of current academic interest within the Divisions of Food Sciences and Nutritional Sciences. This includes: flavour science; properties of biopolymers; interfacial properties of selected materials; sustainable nutrition; salt reduction; engineering new food structures. Factors that initiate, shape, and direct this research, will be discussed and explored. Exercises in experimental design, statistical analysis and data presentation, along with insights into the process of carrying out an undergraduate research project will prepare students for their final semester.

Module Activities:

- Description of current research within food science (mini research symposia)
- Selection of research project (mid-semester)
- Write a research proposal based on the final year research project you have just selected
- Research skills tutorials

Timetable: Typically two one-hour timetabled sessions per week: sixteen hours of lectures, and three hours of tutorials with project supervisor; three hours dedicated to identifying all reagents/methods/equipment required for the research project in the Spring. The timetable can be viewed at www.nottingham.ac.uk/timetable

Provisional Timetable for Trends in Food Research D235FR – Autumn 2016

Teaching Week	Topic/Activity	Research Symposia/Tutorial Speakers/Organisers
1	Module Introduction Innovative Manufacture/Product Design	Tim F. David G., and Maria T.B. Tim F.
2	Biomaterials Approach to Sustainable Nutrition Reduction of Meat Consumption	David G. Andy S.
3	Flavour Measurement and Perception Sensory Science and Consumer Behaviour	Ian F. Rebecca C.

4	Food Engineering Biopolymers and Macromolecules	Bettina W. Steve Harding
5	Allocation of research areas to students; small-group tutorial with supervisor - finalise research title and start writing research proposal	All Project Supervisors
6	Experimental Design	Rob L.
7	Science and Society Undertaking Independent Research – Extending use of library resources	Kate M. Jane Maltby
8	Statistical Analysis and Data Presentation	Darren/Neil/Maria
9	Writing your Project Dissertation as a Research Manuscript How to successfully navigate the research project: student-led tutorial	David G. Previous final year students
10	***Identify methods/materials/reagents/access to kit/ etc. required for your research***	
11	Individual Tutorial with project supervisor - feedback on project proposal and discuss plan for experimental work	All Project Supervisors

Module Structure

1. **Introduction**
   Factors that affect the direction of food related research (industry and academia)

2. **Mini-Symposia on Current Research Activities**
   1. Innovative Manufacture/Product Design – Tim Foster
   2. Sustainable Nutrition – David Gray and Andy Salter
   3. Flavour Measurement and Perception – Ian Fisk
   4. Sensory Science and Consumer Behaviour – Rebecca Clark
   5. Food Engineering – Bettina Wolf
   6. Biopolymers and Macromolecules – Steve Harding
   7. Science and Society – Kate Millar

Format of Mini-Symposia

Organisers of the Mini Symposia can organise the sessions as they wish. The mini-symposia will introduce the students to particular areas of research and provide a platform to (to a greater of lesser extent):

- explain the driving forces that shape research in general, for example: personal interest; funding agency priorities; Government policy; industrial priorities
- provide insights into certain advanced technology/tools used in specific research areas
- debate/discuss issues at the interface of science and society

3. Assessment (Individual)

- Write a short research proposal (2000-2500 words) based on the research you have chosen for your final year project (Spring semester). The proposal should set the scene of your work, offer a compelling case for the work to take place, and outline the methods that will be employed to meet the objectives. The research proposal needs to be well-referenced, and technical terms need to be defined. After justifying the work, you need to articulate an overall aim followed by a list of objectives that should include an indication of the experimental approach/methods you hope to employ.
- **Assessment Weighting:** 1x Written Research Proposal 100%
  Marking Criteria for Research Project Proposal
  See Marking Sheet at end of document

4. Reinforce Research Specific Skills

- Tutorials on literature searching, experimental design, statistical analysis, data presentation and manuscript/dissertation writing
- Student-led insights into the process of carrying out an undergraduate research project

Aims: To stimulate an interest in the importance of research in the field of Food Science, to explore the range of factors that shape this endeavour, and to reinforce skills required to successfully tackle the research project in the Spring semester.

Learning Outcomes: On successful completion of this module, students will be able to:

Knowledge and Understanding

- Demonstrate an appreciation of the context for, and the driving forces that shape, research in food science

Intellectual Skills

- Devise a plan of work based on a particular area of research and/or development

Transferable/Key Skills

- Analyse and present data effectively
- Write a coherent research proposal
- Manage time efficiently and work to deadlines

D235P2 Plant Cell Signalling

Module Convenor: Dr A Bishopp, Anthony.Bishopp@nottingham.ac.uk

Lecturers: Prof. JA Roberts, Dr TP Robbins, Dr R Swarup, Prof. M. Dickinson, Prof M Holdsworth, Dr. Darren Wells

Module Details: Level 3, Autumn semester, 10 credit

Pre-requisites: A selection of genetics and plant science modules at levels one and two.

Expected Number of Students Taking Module: 25

Target Students: Students in the Schools of Biosciences and Life Sciences

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module deals with the production and perception of plant signaling molecules. The ways in which these signals are integrated to ensure appropriate responses to environmental conditions or plant pathogen attack are discussed.

Assessment:

Exam	70%	2 hour exam.
Coursework	30%	1500-word essay. Essay is set at this length because of technical detail required at Level 3 and to give student chance to develop a sufficiently cogent argument with detail.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

General

1 Introduction to the module; types of signals and receptors, basic concepts of receptors And signal transduction cascades (RGF).
2 Auxin transport and signalling (RS)
3 ABA, (MH)
4 Ethylene perception and signal transduction (JAR)
5 Gibberellic acid signalling (RGF)
6 Plant defences – signalling to keep pathogens out (MD)
7 Cytokinin (and Brasinosteroids) (RGF)
8 Phytochromes and perception and response to light. (RS)
9 Signalling in pollen tubes (TPR).
Practical (DW)
10 Practical (DW)
11 Hormone crosstalk: Integration of signalling pathways (RS)
Revision and module debriefing (RGF).

Aims: The aims are to provide a detailed knowledge of how plants use intercellular and intracellular signalling strategies to provide information about their environment. Particular emphasis will be placed on the way in which molecular genetics is enabling us to determine the nature of the signals, their perception and the cross-talk that takes place between them. The objectives of this module are:
i. To impart an appreciation of the properties of receptors and the transduction chains activated by them. ii. To illustrate the range of genes induced by signals from other cells and external stimuli and how they differ from other plant genes. iii. To develop a range of transferable skills.

Learning outcomes: On Successful completion of the module, students will be able to;

- Compare different mechanisms used by plants to convert a hormone or environmental signal into altered gene expression.
- Evaluate research papers in the general area of plant cell signalling.
- Describe the how plants control the synthesis and turnover of growth regulators.
- Explain how key plant hormones interact to co-ordinate plant growth.
- Discuss the agricultural importance of manipulating plant growth habits.

D235P6 Plants and the Light Environment

Module Convenor: Dr Kevin Pyke Kevin.Pyke@Nottingham.ac.uk

Lecturers: Dr Zinnia Gonzalez and Dr Erik Murchie

Total Credits: 10

Level: 3, Autumn Semester

Pre-requisite(s): Normally two plant science modules in previous semesters.

Number of Places: 30

Availability to Exchange Students: Yes provided they email module convenor first

Module Details: The module provides a wide-ranging, detailed and modern training extending from the cellular to community level, for those with interest in plant physiology, environmental biology, agronomy and horticulture. The module focuses on the influence of the light environment on the physiology of native and crop species. It considers how this knowledge contributes to an understanding of the causes of variations in crop yields and may be used to assist in the search for improved varieties and increased productivity in agricultural systems.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: To be announced

Week	Lecturer	Topic
1	ZG	1.Light: properties and perception 2. Light as an ecological signal
2	ZG	1. Phytochrome and photomorphogenesis 2. Photomorphogenetic mutants and their uses
3		Phytochrome in the natural environment
4	ZG	Phototropism (preparation)
5	ZG	Phototropism presentations and discussion
6	ZG	1. Photoperiodism 2. Light measurement and endogenous rhythms
7	KP	Light and leaf development
8	KP	Photosynthesis and the light reactions
9	KP	1. C3 photosynthesis and its regulation 2. C4 photosynthesis and its regulation
10	KP	1.CAM photosynthesis and its regulation 2. Environmental factors regulating photosynthesis
11	EM	Crops and the Environment

Teaching Staff: ZG – Dr. Zinnia Gonzalez; KP - Dr Kevin Pyke; EM – Erik Murchie

Non Lecture Programme: Student centred exercise

Coursework: Essay and oral presentation

Assessment: Exam 1 75% 2-hour examination. Coursework 1 15% 1,500-word essay. Coursework 2 10% Group presentation

Aims: The module focuses on the influence of the light environment on the physiology of native and crop species. It considers how this knowledge contributes to an understanding of the causes of variations in crop yields and may be used to assist in the search for improved varieties and increased productivity in agricultural systems. The module provides a detailed and modern training extending from the cellular to the whole plant and community levels for those with interests in plant physiology, environmental biology, environmental science, applied biology and crop science.

Learning Outcomes: On successful completion of the module, students will be able to:
1. Synthesise information about how light interacts with plants at a variety of levels; organ, tissue, cell and molecule.
2. Explain how light is absorbed by plants to initiate energy transfer systems and to stimulate developmental pathways of photomorphogenesis.
3. Analyse literature and produce a coherent argument to support or disagree with the Cholodney-Went theory of phototropism.
4. Differentiate between different light signalling pathways in plants and demonstrate how these pathways function in plants.

Recommended Reading: Information to be provided with lectures

D235Z1 Biotechnology in Animal Physiology

Module Convenor: Dr Ramiro Alberio Ramiro.alberio@nottingham.ac.uk

Total Credits: 10

Level: 3, Autumn Semester

Number of Places: 60

Target Students: Unrestricted. Availability to Exchange Students

Module Details: This module gives an introduction into the Structure of the biotechnology industry. The content of the module reflects recent advances in biotechnology. A series of lectures is presented by the module convener and guest lecturer's to cover the following topics: use of recombinant DNA technology; concept of epigenetics in gene regulation and disease. Epigenetics in therpeutics and diagnostics of disease. Applications of genetic engineering to production of vaccines, antibodies, and enzymes; genetic improvement and assisted reproduction; use of embryo manipulation technologies and animal transgenesis; ethical regulatory framework for genetic modification of animals.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Example:

Date	Time	Staff	Subject
Week 2	9:30 - 12	R Alberio	The biotech industry DNA
Week 3	9:30 - 12	R Alberio	DNA technologies and Protein expression systems: **SDL**
Week 4	9:30 - 12	S May	Microarray, next generation sequencing
Week 5	9:30 - 12	R Alberio	Vaccines and Monoclonal Antibodies: **SDL**
Week 6	9:30 - 12	R Stoger	Chromatin and Epigenetics
Week 7	9:30 - 12	R Alberio	Epigenetics - disease and therapy & Gamete biology and manipulation
Week 8	9:30 - 12	K Millar	Animal Biotechnology: Ethics And Law
Week 9	9:30 - 12	R Alberio	Stem cells basics
Week 10	9:30 - 12	R Alberio	Advanced Concepts in Stem Cell Biology and applications: **SDL**
Week 11	9:30 - 12	R Alberio	Transgenesis + 1 hr for video
Week 12	9:30 - 12	R Alberio	Mock Vivas + MODULE EVALUATION

Assessment:

Exam 1	100%	2 hour exam
Coursework 1	0%	Formative assessment
Coursework 2	0%	Formative assessment

Aims and Objectives: The aim of this module is to provide an understanding of the structure of the biotechnology industry, of the techniques involved, and of the opportunities offered by biotechnology. Students will learn about genetic and epigenetic basis of gene regulation, and how this knowledge is used to develop treatments for disease. Students will also learn how assisted reproductive technologies are currently used for generating transgenic animals.

Learning Outcomes:

- To describe about the current status of animal biotechnology and the applications.
- To recognise which molecular tools can be used in animal biotechnological.
- To identify the principal growth areas in animal biotechnology.
- To assess the commercial opportunities and constraints involved in the exploitation of novel technologies.
- To explain the ethical implications of genetic manipulation of animals.

D235Z5 Applied Bioethics 1: Animals, Biotechnology and Society

Module Convenor: Dr K Millar kate.millar@nottingham.ac.uk

Module Details: Level 3 Autumn semester, 10 credit

Pre-requisite(s): None.

Co-requisite(s): None.

Expected Number of Students Taking Module: 90

Target Students: Students in the School of Biosciences.

Availability to Exchange Students: Yes provided they email module convenor first

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Teaching Staff: Dr Kate Millar (Centre for Applied Bioethics)

Summary of Content: The module consists of lectures and associated seminars on: bioethical theory, research with animals, animal agriculture, applications of modern biotechnology to animals, animals and professional ethics, generic issues concerning: risk, precaution and trust; political dimensions of the biosciences; research bioethics.

Assessment:
Exam 1 (60%) 2 hour exam
Coursework 1 (40%) - One 2000-word essay

Aims: The module aims to provide students with a sound understanding of widely accepted ethical principles and encourage the application of these insights to the analysis of contemporary issues concerning modern biotechnologies and research in the biosciences, in relation to both humans and non-human species.

The module consists of lectures and associated seminars on: bioethical theory, research with animals, animal agriculture, applications of modern biotechnology to animals, animal and professional ethics, generic issues concerning: risk, precaution and trust; political dimensions of the biosciences; research bioethics.

Learning outcomes: On successful completion of the module, students will be able to:
- Recognise and explain the ethical dimensions of prominent issues raised by animal-human interactions
- Interpret the main ethical theories and principles and apply these to specific animal and biotechnology cases to inform professional decision-making
- Describe and apply ethical frameworks to analyse specific dilemmas raised by the human use of animal

D235Z7 Coordinated Physiological Functions

Module Convenor: Dr Carl Stevenson carl.stevens@nottingham.ac.uk,

Lecturer: Dr Alan Waterfall

Total credits: 10

Level: 3 Autumn Semester

Capped module at 60 – You will need permission from the module convenor to take this module unless it is compulsory for your course.

Pre-requisite(s): D212Z5 Introductory Physiology

Co-requisite(s): None

Target Students: Students in the School of Biosciences

Availability to Exchange Students: yes provided they email the module convenor first

Module Details: This module covers the physiological basis of integrated behaviours. It focuses on hypothalamic control of the endocrine system, appetite, emotion, body temperature, and integrative aspects of physical exercise.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Changes to the module introduced this session: Inclusion of a self-directed study session (see below), omission of learning material on reproductive physiology.

Lecture Programme: Structure and function of the hypothalamus and pituitary gland; Appetite regulation; Emotion, motivation and stress; Thermoregulation; Exercise Physiology

None Lecture Programme: Two practical sessions on exercise physiology in human subjects. Self-directed study session on exercise physiology practical data presentation and analysis. Student presentations on exercise physiology practical data.

Teaching Staff: Dr Carl Stevenson, Dr Alan Waterfall

Assessment:

Exam 1 60% Exam - short answer and essay questions - 1 Hour 30 Mins

Coursework 1 40% Seminar presentation

Aims and Objectives: The aims of this module are to provide students with an appreciation of the central role of the hypothalamus in co-ordinating fundamental physiological processes and behaviours, and to provide experience of practical measurement of a co-ordinated physiological activity (exercise).

At the end of this module, students should understand:

(i) The anatomy of the hypothalamus and its main connections within the brain
(ii) How the hypothalamus links physiology and behaviour
(iii) Specific examples of hypothalamic co-ordination of physiology (e.g. thermoregulation, appetite, emotion)
(v) The physiological adaptations to physical exercise and how they are controlled

Learning outcomes: On successful completion of this module students will be able to:

1) Explain how the control of homeostasis by the hypothalamus and inter-connected brain areas is important for regulating physiology and behaviour
2) Explain how the hypothalamus and inter-connected brain areas regulate appetite, body temperature, exercise physiology and complex behaviours
3) Work as a team to analyze and present the exercise physiology data obtained in the practical session in an effective manner
4) Interpret the exercise physiology data in relation to the scientific literature

Recommended Reading: A full reading list will be provided at the outset of the module.

D236A2 Management Consultancy

Module Convenor: Miss K Harris-Adams keely.harris-adams@nottingham.ac.uk

Pre-requisite(s): D235A4 Rural Business Management

Module Details: Level 3 Spring Semester, 10

Expected Number of Students Taking this module: 15

Target Students: Students specialising in Management

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The module is orientated to real-life case studies that will allow students to develop and apply their knowledge of management principles. These case studies will be based on the University farm. This will involve assessment of enterprise performance and/or whole farm performance under the current agricultural policy and market environment. Each student will provide written and oral consultancy reports on their findings that will be assessed by members of academic staff. The reports will outline the impact of possible changes and provide recommendations to the manager of the business.

Timetable: It is expected that students will primarily direct their own study for this module. There will be three lectures and three individual workshop sessions to provide students with guidance. Staff will also be available for questions. The timetable can be viewed at www.nottingham.ac.uk/timetable

Week	Content	Staff
1	Introduction to module Choosing your case study	KHA/CS
2	Farm Manager's perspective Q&A on farm resources Individual meetings on case study	KHA/MGD
3	Farm Accounting revision session	KHA
4	Guest lecture: Management consultancy in practice	KHA
5	"*Consultation with senior consultants*" [25 mins as scheduled]	KHA/CS
6	"*Consultation with senior consultants*" [25 mins as scheduled]	KHA/CS
7	No lecture. Student directed study	-
8	"*Progress review*" [15 mins as scheduled]	KHA
9	**Deadline for written consultancy reports**	-
10	Student's individual oral presentations [25 mins as scheduled]	KHA/CS/MGD
11	Feedback and module review session	KHA

Teaching Staff: KHA: Keely Harris-Adams, MGD: Mike Davies

Coursework: Written report (80%), Oral presentation (20%).

Assessment: Coursework 1 (80%) Report - 3500 words. Coursework 2 (20%) Presentation - individual presentation based on findings in report

Aims: The module aims to introduce students to the practicalities of management consultancy and thus integrate their knowledge of management principles to real-life case studies.

Learning Outcomes: Knowledge and Understanding - to learn of 1) How to appraise individual enterprises and whole firms with a view to improving the respective financial and technical performance of the business 2) Appropriate terminology and nomenclature to appreciate and express knowledge of the subject area; including understanding the commercial environment in which consultants work 3) A diverse range of the essential information, major concepts, principles and theories associated with a specific case-study relevant to agriculture and sustainable agricultural systems, focusing upon management and economics but also including crop and animal science as appropriate 4) The latest trends and developments relevant to the specific case-study and of the associated philosophical, ethical and policy issues 5) The ability to acquire, interpret and critically analyse biological and management data and information derived from a variety of sources 6) A range of practical techniques and methodologies, together with appropriate procedures for data analysis and presentation. Intellectual Skills - the ability to 1) Recognise and use appropriate theories, concepts and principles from a range of relevant disciplines, drawing particularly on business management techniques 2) Collect and integrate several lines of evidence and apply them in a balanced manner to support an argument for choosing one competing alternative over others 3) Apply knowledge and understanding of business management and scientific principles to address familiar and unfamiliar problems 4) Critically analyse, synthesise and summarise information drawn from various sources, including published research papers and reports. Practical/Professional Skills - the ability to 1) Design and carry out appropriate analysis to assess feasibility of competing alternatives 2) Collect, record and analyse information and data in the library making accurate observations and to summarise it using appropriate business management techniques 3) Appreciate and analyse financial and other management information and use it in decision making. Transferable/Key Skills - the ability to 1) Communicate accurately, clearly, concisely and confidently in written, verbal and visual forms making appropriate acknowledgement to the work of others 2) Work productively as an individual 3) Listen to, appreciate and evaluate the views of others 4) Manage and organise time efficiently and work to deadlines by using flexible and effective approaches to study 5) Process, analyse and present data using a variety of methods, including appropriate qualitative and quantitative techniques and packages 6) Use the Internet and other electronic means critically for communication and as a source of information 7) Appreciate the difficulties of having incomplete information on which to base decisions and understanding the nature of risk.

D236A3 Current Issues in Crop Science

Module Convenor: Dr MJ Foulkes john.foulkes@nottingham.ac.uk

Lecturers: plus various speakers from industry and research. Dr. S. Ramsden.

Pre-requisites: D223P9 Applied plant physiology: from cell to

crop **Module Details:** Spring, 10 credit module.

Expected Number of Students Taking Module: 20

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This integrative module considers future options and possible strategies for crop production in UK and world agriculture. Students are introduced to a number of issues that have current or possible future impacts on crop production systems and the environment. Examples of issues that will be addressed include: the future of genetically modified crops, impact of crop production on biodiversity and prospects for organic crop production. The content will change every year to reflect current issues in crop science. This module is suitable for students interested in applied plant science, crop science agriculture and the environment.

Changes to the module introduced this session: The content will change each year depending on current issues.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: (provisional)
Introduction to the module and course work
Impact of crop production on biodiversity
The future of genetically modified crops
Prospects for organic crop production
Climate change
Energy crops
Biological control in cropping systems

Non- Lecture Programme:
Week 9 Paper review exercise
Week 11 Research and presentation exercise

Coursework: This module is assessed entirely by coursework.

Assessment: Coursework 1 100% (2500 words)

Aims: To raise awareness of students to current issues in crop science. To enable students to analyse the advantages and disadvantages of a range of current and future developments in crop science.

Learning Outcomes: Knowledge and Understanding - to learn of 1) Appropriate terminology and nomenclature to appreciate and express knowledge of contemporary issues in crop science 2) A diverse range of the essential information, major concepts, principles and theories associated with current issues in crop science, including genetically modified crops, organic production, biodiversity 3) The latest trends and developments within crop science, and the philosophical, ethical and policy issues associated with them 4) The ability to acquire, interpret and critically analyse biological and/or management data and information data derived from a variety of sources. Intellectual Skills - the ability to 1) Recognise and use appropriate theories, concepts and principles from a range of relevant disciplines and use these to critically analyse current issues associated with crop science 2) Collect and integrate several lines of evidence

and apply them in a balanced manner to support an argument, taking ethical considerations into account where appropriate 3) Apply subject knowledge and understanding to address familiar and unfamiliar problems 4) Critically analyse, synthesise and summarise information drawn from various sources, including published research papers and reports 5) Demonstrate the provisional nature of facts and principles associated with the latest developments within crop science. Practical/Professional Skills - the ability to 1) Collect, record and analyse information and data in the library, and to summarise it using appropriate techniques. Transferable/Key Skills - the ability to 1) Communicate accurately, clearly, concisely and confidently to a variety of audiences in written, verbal and visual form 2) Work productively as an individual or as part of a team including identification, allocation and assessment of individual and collective roles and responsibilities 3) Listen to, appreciate and evaluate views of others and contribute to group discussions 4) Manage and organise time efficiently and work to deadlines by using flexible and effective approaches to study 5) Process, analyse and present data using a variety of methods, including the use of computer based information handling and data processing tools where appropriate 6) Use the internet and other electronic means critically for communication and as a source of information.

Recommended Reading: The nature of this module means that there are no key texts associated with it. However, students will be expected to read widely around the issues discussed. It will be particularly important for students to be aware of recent publications, both in terms of refereed papers and of articles in New Scientist etc.

Reading List: To be given to students at the beginning of the module.

D236A8 Field Crops Cereals

Module Convenor: Dr John. Foulkes john.foulkes@nottingham.ac.uk,

Lecturers: Dr. D. Sparkes, Dr Erik Murchie

Module Details: A level 3 module taught in the Spring Semester. The module will consist of lectures, seminars, practicals and field classes. 10 credits

Pre-requisites: D223P9 Applied plant physiology: from cell to crop or equivalent

Expected Number of Students Taking Module: 20

Target Students: Crop Science and agricultural students

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: Plant structure and methods of quantifying morphological development and the sequence of apex differentiation from vegetative to reproductive. Influence of the environment on development, growth and yield formation. Crop improvement through breeding. Production strategies for the major grain cereals grown in contrasting environments with particular emphasis on factors controlling yield and quality.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Changes to the module introduced this session: Update of module content

Lecture Programme: (provisional)
Week 1 Introduction to the module and course work
Principles of cereal growth and development I
Week 2 Principles of cereal growth and development II
Week 4 Seed rate, sowing date and sowing depth
Week 6 Cereal nutrition
Week 7 Cereal quality
Week 8 Lodging
Week 9 Species and variety selection

Non- Lecture Programme:
Week 3 Field class
Week 5 Practical class
Week 10 Cereal diseases

Coursework: The coursework will contribute 30% of the total module mark.

Assessment: Exam 1 100% 2 hour exam.

Aims: This module is designed to provide an analysis of the production of cereal crops. Emphasis will be placed on understanding production strategies for the major grain cereals, with particular emphasis on factors controlling yield and quality. The structure and function of the Gramineae will be presented and the influence of the environment and management practices on crop growth and development examined. This understanding will be used to show how the management of different cereal crops can be optimised to meet the requirements of specific environments and end-uses.

Learning Outcomes: Learning Outcomes: Knowledge and Understanding - to learn of 1) The principles governing the environmental and management factors that influence cereal production and the commercial applications of these principles in agronomy 2) Key features of development and growth (vegetative and reproductive) of cereal crops and their responses to

the environment 3) An understanding of the reasons for yield and quality variation from site to site and from year to year 4) An appreciation of how growers utilise information on development and growth of cereal crops to optimise management strategies in a given situation 5) A range of relevant practical techniques and methodologies and their uses, together with appropriate procedures for evaluation of relevant agronomic data sets. Intellectual Skills - the ability to 1) Critically evaluate current research and advanced scholarship in cereals agronomy and production literature 2) Analyse data sets systematically and precisely and interpret them accurately and effectively 3) Integrate information selectively from a variety of sources on environment, crop development and growth and management inputs to predict performance of cereal crops. Practical/Professional Skills - the ability to 1) Collect plant data according to standard protocols to compare measurements of crop development and growth against benchmarks to make informed management decisions 2) Use electronic library resources, print systems and the Internet to access information from a wide range of sources 3) Use management guidelines predictively, recognising the importance of agronomic and physiological influences on decisions 4) Present in a range of written formats data and interpretation of this to a standard and format consistent with that as accepted by the professional crop science community. Transferable/Key Skills - the ability to 1) Communicate effectively in written, verbal and visual forms, including efficient presentation of data (tables v. figures) as in scientific papers 2) Objectively compare experimental results with the scientific literature 3) Critically integrate information from a wide range of sources, including the Internet and other learning resources, to advance to synthesize concepts and advance their own knowledge base 4) Act independently in planning and implementing tasks.

Recommended Reading: Azam-Ali, S.N. & Squire, G.R. (2002) *Principles of Tropical Agroomy*. CAB Publishing. Fageria, N.K. (2006) Physiology of crop production / N.K. Fageria, V.C. Baligar, R.B. Clark (eds). Hay, Robert K.M. (2006) The physiology of crop yield / Robert K.M. Hay, John R. Porter. 2nd ed. 2006.

D236F5 Rapid Methods in Microbial Analysis

Module Convenor: Dr Jon Hobman jon.hobman@nottingham.ac.uk

Total Credits: 10

Level: 3, Spring Semester

Pre-requisite(s): D212F7 Microbial Physiology, D224FA Microbial Mechanisms of Food Borne Disease (20 credit) or equivalents

Availability to Exchange Students: Yes subject to appropriate background.

Module Details: The use of viable counting as a standard for determining bacterial contamination of foods will be evaluated. Alternative methods used industrially (e.g. impedance, DEFT) will be examined. The limitations of sampling methods for quality control will be discussed. Antibody based and ELISA systems will be described and demonstrated. The role of electrical signal monitoring (impedance) will be discussed as will emerging techniques based on gene engineering that include DNA probes, RNA probes, PCR and phage based assays. A particular emphasis will be placed on the problems of technology transfer into the food microbiology laboratory.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme:

Time	Content	Staff
Week 1		
09.00-09.30	Introduction, module aims, coursework etc.	CD
09.30-10.45	Detection and identification of microorganisms; an introductory seminar	TBA
11.05-11.55	Sampling Plans	TBA
12.05-12.50	Rapid methods of microbial detection – an introduction	TBA
Week 2		
09.00-10.00	Physical methods of microbial detection, including DEFT and flow cytometry	TBA
10.00-10.45	DNA probes; the polymerase chain reaction	TBA
11.05-12.00	Other emerging techniques of detection	TBA
12.00-12.45	Antibody-linked detection systems, including ELISA	TBA
Week 3		
10.00-11.00	Impedance microbiology	TBA
11.05-13.00	Impedance Demonstration	TBA
Week 4		
09.00-10.00	Cleaning and disinfection – an introductory seminar	TBA
10.05-10.45	Cleaning and disinfection I	TBA
11.05-12.00	Cleaning and disinfection II	TBA
Week 5		
09.00-10.00	Phage and its application	CR
10.05-12.45	ELISA Demonstration	JW
Week 6		
10.05-12.45	Sterilisation Assurance Test demonstration	3M to be confirmed
Week 7		
09.00-10.00	Immunomagnetic separation	TBA
10.00-11.00	Immunomagnetic separation demonstration	TBA
11.05-12.45	Petri film demonstration	3M to be confirmed
Week 8		
10.00-12.00	Sub-species typing of bacteria: classical and phenotypic methods	CD
Week 9		

10.00-12.00	Sub-species typing of bacteria: DNA-based methods	CD
Week 10 10.00-12.00	Course summary and revision The written examinations Course evaluation and feedback	TBA

Assessment:

Exam 1 60% 1 hour 30 mins examination
Coursework 1 20% Letter - 300 words
Coursework 2 20% Memorandum - 600 words

Aims and Objectives: The purpose of the module is to enable students to understand and evaluate the methods used industrially for microbiological analysis including rapid methods. Students will benefit by being able to put into perspective the different approaches to enumeration and detection of microorganisms. By the end of the module the student will be able to determine appropriate microbiological sampling plans for food quality control and select current microbial analysis regimes with due regard to their advantages and limitations.

Learning Outcomes: On successful completion of this module students will be able to:

- Comprehend the terminology, nomenclature and fundamental principles used in rapid microbiological methods.
- Apply fundamental principles to understand the advantages and limitations of traditional and modern detection and identification methods.
- Analyse where novel advances in rapid microbiological methods are likely to occur.
- Evaluate rapid pathogen identification methods safely in the laboratory under ACDP2 conditions.
- Synthesize subject knowledge in order to solve problems in a logical manner.

D236F6 Microbial Fermentation

Module Convenor: Dr Jon Hobman jon.hobman@nottingham.ac.uk

Lecturers: Prof C Dodd, Dr L Whitley

Total Credits: 10

Level: 3 spring Semester

Pre-requisite(s): D212F7 Microbial Physiology

Expected Number of Students Taking Module: 30

Target Students: Optional for students reading for degrees in Food Microbiology, Food Science, Microbiology, Nutrition & Food Science and Biotechnology

Availability to Exchange Students: Yes subject to appropriate background.

Module Details: This module commences with a review of microbial fermentation, including beer, cheese, yoghurt, meat and single-cell protein production, as well as sewage treatment. The underlying principles of microbial fermentation will be discussed, in addition to specific examples which will be examined in depth. From this basic knowledge the problems of microbial contamination and spoilage of the finished product will be analysed. A visit will be an important part of the module.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Aims and Objectives: The purpose of the module is to provide an understanding of the activity of microorganisms during fermentation, particularly with regard to food production. On completion of the module students will understand how microorganisms act to preserve food by the production of chemicals which prevent the growth of those microorganisms associated with food spoilage and food borne illness. Students will develop an understanding of microbial growth and associated problem solving skills.

Learning Outcomes: On successful completion of this module students will be able to:
(1) Comprehend the terminology and fundamental biochemical pathways involved in microbial fermentations.
(2) Identify the uses of, and processes involved in, fermentations- both in food production and elsewhere.
(3) Collect, record, and analyse data generated during microbial fermentation experiments, and present these data in the form of a scientific paper.
(4) Synthesize subject knowledge in order to address specific problems and questions.

Assessment:
Exam 1 60% 1 hour 30 min examination.
Coursework 1 40% Lab Report - 3000 words

Lecture Programme:

Time	Content	Staff
Week 1		
09.00-10.00	Module introduction: aims; timetable; coursework, exam	TBA
10.00-12.00	A review of microbial energetics: fermentation, fermentative pathways, energy production, metabolic products. Batch vs. continuous culture	TBA
12.00-13.00	Overview of fermentation, with particular reference to food, but touching on 'new' biotechnology	TBA
Week 2		
09.00-10.00	The microbiology of brewing, beers, lagers and wines	TBA
10.00-11.00	Improvement of beer yeast including genetic manipulation	TBA
11.00-12.00	Introduction to brewing practical	TBA
12.00-13.00	Fermentation practical – part 1	TBA
Trip to brewery	Need to arrange for a fully detailed description of the process	
Week 3		
09.00-10.00	Microbial spoilage of beer	TBA
10.00-13.00	Fermentation practical – part 2	TBA
Week 4		
13.00-17.00	Visit to Coors Brewery, Burton-upon-Trent	
Week 5		
09.00-10.00	General dairy microbiology and the normal microflora of milk	TBA
10.00-11.00	The microflora of cheese	LW
11.00-13.00	Problems encountered in cheese production	TBA
Week 6		
09.00-10.00	Yoghurt production: the methods/microbiology/biochemistry	TBA
10.00-11.00	Fermented meat products: products/methods/microbiology/biochemistry	CERD
11.00-13.00	Demonstration of novel methods for detecting antimicrobials	CERD
Week 7		
9.00-10.00	Acetic acid production	TBA
10.00-11.30	'Traditional' fermentations (eg miso, tempeh and tea)	TBA
11.30-13.00	Cocoa and casava production	TBA
Week 8		
9.00-10.00	An introduction to 'new' biotechnology	TBA
10.00-11.00	Mycoprotein production	
11.00-13.00	Production of industrially useful compounds: historically (eg acetone and butanol); current (eg GMOs for insulin and industrial enzymes)	TBA
Week 9		
09.00-10.00	Normal microflora of water	TBA
10.00-12.00	Sewage fermentation and bioremediation	TBA
12.00-13.00	Module feedback and revision session	TBA
Week 10		
09.00-13.00	Trip to sewage farm	
Week 11	Study week	
Week 12	Spring semester exams begin	

Lecturers:
TBA To be agreed; CERD Prof Chris Dodd; LW Dr Liz Whitley
Lectures: 24h. Practicals/demonstrations: 7h. Site visits: 8h. Student-centred learning: 41h.

D236M1 Virology and Cellular Microbiology

Module Convenor: Dr Ken Mellits ken.mellits@nottingham.ac.uk

Module Details: Level 3, Spring Semester, 10 credits

Pre-requisites for admission to the module: D223F7 Virology, D224F9 Analysis of Bacterial Gene Expression or equivalent

Co-requisites for the module: None

Expected Number of Students Taking Module: 25

Target Students: Food Microbiology and Microbiology. Also for students reading Animal Sciences, Applied Biology, Biotechnology, Food Science and Plant Sciences

Availability to Exchange Students Yes – but must email module convenor for permission.

Summary of Content: The module will provide an in-depth induction into the relationship of bacterial and viral pathogens and their hosts. This will include an understanding the underlying molecular basis of the adaptive response of bacteria to the host environments and the mechanisms by which bacteria and viruses subvert cellular machinery.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Assessment details:

Exam 1	60%	90 minutes	1 Hour 30 Mins
Coursework 1	20%	Lab based practical report length (1000 words)	2 x A4
Coursework 2	10%	Assessed by Group presentation.	
Coursework 3	10%	Assessed by Group presentation.	

Aims: The module aims to describe the underlying molecular basis of the adaptive response of bacteria to various environments and to describe the mechanisms by which bacteria and viruses invade eukaryotic cells. In addition students are given experience of literature analysis, preparing material for a problem based learning exercise, to investigate host-pathogen interaction. The practical exercise will provide some experience of designing experimental strategies.

Learning Outcomes:

- Understand aspects of adaptive and population gene control and sensing in bacteria, in relation to their environment or host cell.
- Understand mechanisms by which bacteria and viruses invade eukaryotic cells, and how they use cellular machinery to their own advantage to infect.
- Acquire basic skill in critical appraisal of data, experimental design strategy, and problem solving for use in group based learning

D236P3 Plant Disease Control

Module Convenor: Dr R Ray Rumiana.ray@nottingham.ac.uk

Total credits: 10

Level: 3 Spring Semester

Expected number of Students Taking Module: 60

Target Students: Students in the Schools of Biosciences and Life Sciences

Module Details: This is a course which deals with the applied aspects of plant disease control, comprising transmission, epidemiology, detection and diagnosis and control options. Control strategies based on application of fungicides, biological control, deployment of disease resistant varieties and biotechnological approaches are described. The relative strengths and weaknesses of the different approaches will be considered.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme 2016-2017

Week	Topic	Activity
1	Introduction to the module	RR
	Cause of disease, symptoms and assessment	RR
	The concept of IDM	RR
2	Plant health risk and policy	NB
	Molecular diagnostics	NB
	Plant disease epidemiology	RR
3	Dispersal of plant pathogens	BF
	Case study - phoma in OSR	BF
	Coursework brief	RR
4	Cultural control methods	RR
	Disease resistance	RR
5	Durable resistance	GJ
	Breeding for disease resistance	GJ
	Tutorial	RR
6	Field walk	RR
7	Cereal diseases	RR
	Management strategies	RR
	Chemical control	RR
8	Fungicide mode of action	RO
	Fungicide resistance	RO
	Tutorial	RR
9	Virus transmission and sugar beet diseases	MS
	Integrated pest management	TB
10	Nematodes and potato diseases	MB
	Independent studies	
11	Student presentations MSc,	RR
	Feedback and module overview	

RR= Dr Rumiana Ray, NB= Prof Neil Boonham (Fera), TB= Prof Toby Bruce (Rothamsted Research), MS= Dr Mark Stevens (BBRO), MB= Dr Matt Back (Harper Adams University), GJ= Prof Graham Jellis

(formerly HGCA), RO= Prof Richard Oliver (Curtin University), BF= Prof Bruce Fitt (University of Hertfordshire)

None Lecture Programme: Practical exercise to support taught material ondiagnosis.

Assessment:
Exam 1 100% 2 hour examination

Aims and Objectives: The module aims to instruct students in the current practices, which are available for crop protection, and to provide an understanding of how new measures are developed. The objectives of this module are to enable students to: i) appreciate the problems associated with plant disease ii) develop an understanding of the crop protection options available iii) develop laboratory skills associated with disease diagnosis iv) understand the commercial considerations associated with crop protection

Learning outcomes: On successful completion of the module, students will be able to:
- Compare the strategies used by plant pathogens to spread between plants and cause disease epidemics
- Critically analyse methods available for disease diagnosis in different situations
- Explain the range of approaches used in plant disease control
- Evaluate the strengths and weaknesses of these methods when used in crop protection

D236P4 Sex, Flowers and Biotechnology

Module convenor: Prof ZA Wilson (convenor) zoe.wilson@nottingham.ac.uk,

Lecturers: Dr RG Fray, Prof S Owen (RHS Kew), Dr TP Robbins , Dr D. Dietrich

Module Details: level 3, Spring semester, 10 credit

Pre-requisites: A suitable range of plant science and genetic modules in previous semesters.

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: The processes of floral development and reproduction are some of the most critical stages occurring during plant growth and development. They are fundamental for plant breeding, crop productivity and horticulture. The significance of plant reproduction is particularly pertinent to issues of food security and the future development of high yielding crops. This module will focus on recent developments that have been made in the understanding of floral development, reproduction and seed production. Topics will focus on how such processes can be manipulated for commercial exploitation and to provide an understanding of the current goals, methods and achievements in the genetic engineering of crop and horticultural plants.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme 2016-2017

1 The goals and problems for plant biotechnology- how can we achieve food security? The importance of flowering and fruiting in crop production. (ZAW)
2 Genetic control of floral initiation 1: Flowering time signals: the influence of environmental stimuli. (ZAW)
3 Genetic control of floral initiation 2: Vernalization and epigenetic control of flowering. (ZAW)
4 Floral development and floral organ identity genes: Homeotic mutants and models of flower development in *Arabidopsis* and *Antirrhinum*. (TPR)
5 Cell and Molecular Biology of sexual reproduction in plants. (SO)
6 Applied aspects of flowering and reproduction: Pollen development and male sterility in plant breeding and commercial production of hybrid seed. (ZAW)
7 Molecular basis of self-incompatibility in gametophytic and sporophytic systems. Model systems for the study of cell-cell signalling in plants: the RNase system of *Solanaceae*; receptor kinases in Brassica. (TPR)
8 Student Seminars: Small group presentations relating to key areas of plant developmental biology. (ZAW)
9 Floral senescence and cell death: Processes associated with programme cell death during plant reproduction. (ZAW)
Seed development and germination. Hormonal aspects of regulation of seed development. (DD)
10 Physiological, biochemistry and molecular biology of fruit ripening. (RF)

Coursework: A small group assessed (10%) presentation of library work. Assessed (15%) journal style reviews (1000 words) summarising the individual group's presented topic

Assessment: 2-hour written examination (75%) Answer 2 essay style questions out of 5 in 2 hours. Continuous assessment (25%) see coursework.

Exam 1 75% 2-hour examination.

Coursework 1 10% 15-20 minute group presentation

Coursework 2 15% Journal style report of presentation - 1000 words

Aims: Advances in molecular biology and genetics have provided the basis for improving crop quality and performance. This module will explore recent innovative research in plant developmental biology and genetics, and demonstrate how such processes can be manipulated to optimise horticultural and crop production. Particular emphasis will be placed on floral and reproductive pathways in higher plants and how such information can be utilised to minimise the ecological impact of genetically modified crops. The significance of plant reproduction is particularly pertinent to issues of food security and the future development of high yielding crops.

Learning outcomes: On successful completion of this module, students will be able:-
1) To demonstrate knowledge and understanding of the fundamental principles and practices that underpin plant reproductive development.
2) Synthesise specialist information focusing on floral and reproductive development and its biotechnological applications.
3) Develop an appreciation of the targets of the Agro-industry and the approaches that can be used to meet these targets.
4) To communicate effectively knowledge of different aspects of floral and reproductive development.

D236P7 Plants and the Soil Environment

Module Convenor: Prof MR Broadley martin.broadley@nottingham.ac.uk

Lecturers: Dr MJA Foulkes, Dr A French, Dr NS Graham, Dr D Wells, Professor PJ White

Total credits: 10

Level: 3, Spring Semester

Pre-requisite(s): D223P9 Applied plant physiology: from cell to crop

Expected Number of Students Taking Module: 40

Target Students: Students in the Schools of Biosciences and Life Sciences.

Availability to Exchange Students: Yes subject to appropriate background.

Module Content: This module provides a detailed study into below-ground biological processes which influence the uptake of water and nutrients by plants. The module considers the acquisition of water and nutrients by plants in both agricultural and natural systems, and how plants interact with the soil environment. Consideration is given to using this knowledge to improve crop productivity and resource management and to understanding how resource capture by plant roots has influenced plant evolution over wider timescales. The module includes a practical study component on the development of new methods and technologies for below-ground phenotyping of roots. The module provides a detailed and modern training extending from cellular to whole organism level. It is highly suitable for those with interests in plant physiology, environmental biology, environmental science, biology, and crop science.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Module Synopsis:

1 Soil structure, movement of water in soils, plant root growth in soils (MB)
2 Water uptake by plant roots, shoot factors controlling water transport, plant adaptations to drought/waterlogging (MB)
3 Nutrition: movement of macro and micronutrients to roots in soils, root uptake mechanisms, transport (MB) Nutrition: plant adaptations to hostile mineral soils (salinity and metals) (MB)
4 Nutrition: evolutionary and ecological aspects of nutrient capture by plants (MB, PW)
5 Breeding crops for improved resource-use efficiency (water and nutrients) (JF)
6 Plant root phenotyping practical and data analysis (AF, DW, MB, NG)

Assessment: Exam 1 75% 2 hour examination - 2 essay style answers from 4 or 5 questions in two sections covering the water relations and nutrition elements of the module. Coursework 1 25% – Data analysis/report on phenotyping plants in the soil environment (1000 words or equivalent).

Aims and Objectives: To provide a fundamental understanding of how water and nutrients are acquired by plants from the soil environment, and their influence on plant growth and development. By the end of the module, students should understand: (i) the pathways and mechanisms involved in the uptake, transport and use of water and nutrients; (ii) the impact of water and nutrient availability on plant growth and development and crop productivity; (iii) plant adaptive responses to water and nutrient stress; (iv) methods to study roots in the soil; (v) how knowledge of water and nutrient uptake by plants can be used to improve crop productivity and resource management.

Learning outcomes: On successful completion of this module, students will be able to:

- Describe how water and nutrients are acquired by plants from the soil.
- Describe the evolution of root adaptations which enable plants to thrive in environments with limited or excess water and nutrients.
- Explain how knowledge of water and nutrient uptake by plants can be used to improve crop productivity and resource management, and the phenotyping techniques used to do this.
- Analyse high-throughput phenotyping data, including computer-based image analysis techniques.

Recommended Reading: Reference lists are provided by each lecturer at the beginning of their section of the module.

D236Z4 Systems Neurophysiology

Module Convenor: Dr John Harris john.harris@nottingham.ac.uk,

Lecturers: Dr Alan Waterfall (AW), Dr Carl Stevenson (CS).

Total credits: 10

Level: 3 Spring Semester

Pre-requisite(s): Physiology of Electrically Excitable Tissues [D223A8]

Number of Places: 65

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module draws on current research to develop specific themes from Neurophysiology and Pharmacology. These include typical experimental techniques and the neurophysiology, neuropharmacology and pathology of sensorimotor systems. A strong emphasis will be on the physiology and pharmacology of acute and chronic pain including studying the use of analgesics to treat these conditions.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Module introduction
2 Spinal Reflexes
3 Bipedalism
4 Methods in Neuroscience
5 The Electroencephalogram
6 Fear Learning & Memory I
7 Fear Learning & Memory II
8 Pain Pathways
9 Acute Pain
10 Techniques in Pain Research
11 Peripheral Sensitization
12 Central Sensitization
13 Inflammatory Pain
14 Neuropathic Pain
15 Non-Steroidal Anti-Inflammatories
16 Opioids
17 Cannabinoids
18 Module Review and Exam Advice

Practical Class Programme: Practical class programme is provisional and more detailed information will be given to you in the first session.

1 Proprioception, Kinaesthesia and Reflexes
2 Anatomy of the Nervous System and Skeletal Muscles
3 Anatomy of Sensory and Motor Pathways
4 The Electroencephalogram

Coursework: Lab report for practical 1 (25%); Essay, virtual poster or equivalent alternative based on practicals 2 and 3 (15%)

Assessment: Exam (60%) - 1.5 hours formal examination. Coursework 1 (25%) - 2000-word practical report. Coursework 2 (15%) - Virtual poster assignment, 1200 word essay, or equivalent.

Aims and Objectives: The aim of the module is to demonstrate that animal behaviour is an emergent property of integrated activity in multiple physiological systems.

At the end of this module, students should:-

(i) Understand the concept and practice of the sensori-motor system.
(ii) Appreciate the role of the CNS in motor control
(iii) Understand how survival depends on the integrated functioning of basic neural systems
(iv) Understand how plasticity in the nervous system leads to the development of chronic pain states.

Learning outcomes: On successful completion of this module, students will be able to:

- Describe the anatomy, physiology and pharmacology of sensory and motor systems and their integration in posture, co-ordinated movement and protective reflex responses
- Discuss the methodology behind a number of neuroscientific techniques and their application in novel research
- Explain the physiology and pharmacology behind acute and chronic pain states hence the rationale behind analgesic treatment regimes
- Analyse physiological data obtained in a practical setting
- Discuss experimental data incorporating knowledge acquired via further reading in the subject area

Recommended Reading:

Squire, L.R., Berg, D., Bloom, F.E., du Lac, S., Ghosh, A. and Spitzer, N.C. (2012) *Fundamental Neuroscience*, 4th Edition, San Diego, Academic Press. Latash, M.L. (2008) Neurophysiological Basis of Movement, 2nd Edition, Champaign, Human Kinetics. McMahon, S.B., Koltzenburg, M., Tracey, I. & Turk, D. (2013) *Wall and Melzack's Textbook of Pain*, 6th Edition, Philadelphia, Elsevier Churchill Livingstone.

A full reading list will be provided at the outset of the module.

D236Z5 Reproduction and Fertility

Module Convenor: Dr G. Mann George.mann@nottingham.ac.uk

Module Contributor: Dr R Anand-Ivell, Prof B Campbell

Total credits: 10

Level: 3, Spring Semester

Pre-requisite(s): D223Z7 Reproductive Physiology

Capped module at 100 – You will need permission from the module convenor to take this module unless it is compulsory for your course.

Target Students: Bioscience (D320 Animal Science), and available to Life Science and Exchange Students subject to appropriate background.

Summary of Content: This course builds on information covered in earlier module(s) and covers fertility regulation and manipulation in mammals. It deals with the artificial control of reproductive cycles in the female and mechanisms involved in pregnancy recognition and maintenance. In both female and male reproduction, emphasis is given to reproductive technology.

Timetable: Typically three one-hour timetabled lecture sessions or one two to four hour practical session per week. The timetable can also be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

1	Comparative Reproduction	Lecture
2	Ovarian function, gamete transport	Lecture
3	Oocyte maturation & early embryo development	Lecture
4	Pregnancy and placentation	Lecture
5	Pregnancy Practical	Practical
6	Reproductive Behaviour	Lecture
7	Technologies in humans	Lecture
8	Technologies in animals	Lecture
9	Semen Analysis Practical	Practical
10	Semen Analysis Workshop	Workshop
11	Suppression of Reproduction	Lecture

Assessment

Exam 1 75% 1.5 hour examination

Coursework 1 25% Produce an educational game

Aims: To provide an understanding of current reproductive technology and the physiology of pregnancy. By the end of the module successful students should be able to: i) appreciate how knowledge of reproductive physiology can be applied to manipulate reproduction ii) understand why fertility manipulation can be advantageous to human, farm and other species iii) understand the physiological control of pregnancy and lactation

Learning Outcomes: Knowledge and Understanding - to learn of: (1) The detailed physiological control of reproductive processes in male and female mammals and appreciate how this knowledge can be applied to manipulate reproduction (2) Recent developments in reproductive technology and embryology as it applies to farm species, humans and endangered species. Intellectual Skills - the ability to: (1) Apply subject knowledge to solve

problems (2) Locate and analyse material from a range of sources (3) Integrate evidence from several sources and use it to support a hypothesis Practical/Professional Skills - the ability to: (1) Carry out experiments to test a hypothesis (2) Collect data and calculate final results (3) Work safely in the laboratory Transferable/key skills - the ability to: (1) Communicate clearly and concisely in a written form (2) Work as part of a group (3) Time-manage efficiently

D236Z6 Applied Bioethics 2: Sustainable Food Production, Biotechnology and the Environment

Module Convenor: Dr K Millar kate.millar@nottingham.ac.uk

Module Details: Level 3, Spring semester, 10 credit

Pre-requisites: D235Z5 Applied Bioethics 1: Animals, Biotechnology and Society.

Applied Bioethics 1 except in the exceptional circumstances where the student already has an appropriate academic background.

Co-requisites: None.

Expected Number of Students Taking Module: 60

Target Students: Students in the School of Biosciences.

Availability to Exchange Students: Yes subject to appropriate background.

Summary of Content: The module consists of lectures and associated seminars on: bioethical theory; the ethical dimensions of the nutritional needs of the global population; ethics of population management, use of new reproductive technologies and development; agricultural practices designed to meet the nutritional needs of the global population (including the use of GM crops); the impacts of agricultural and industrial activities on the sustainability of the global environment

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Teaching Staff: Dr Kate Millar (Centre for Applied Bioethics)

Assessment:

Coursework 1	(50%)	One2000-word essay
Coursework 2	(30%)	One 1000-word position paper
Oral Assessment	(20%)	Assessed oral presentation

Aims: The module aims to provide students with a sound understanding of widely accepted ethical principles and encourage the application of these insights to the analysis of contemporary issues in the agricultural, food and environmental sciences.

Learning outcomes: On successful completion of the module, students will be able to:

- Recognise and explain the ethical dimensions of prominent issues raised by agricultural practices (including the use of biotechnology) designed to meet the nutritional needs of the global population;
- Demonstrate how ethical theory can inform professional choices and public policies related to food production and environmental management
- Using team-based approaches to apply value-aware communication skills to discuss the ethical dimensions of agriculture and food production
- Set out and support an ethical position on an agricultural or environmental issue by applying arguments that draw on science and ethics literatures

D236Z8 Epigenetics and Development

Module Convenor: Dr Dylan Sweetman Dylan.sweetman@nottingham.ac.uk,

Lecturer: Dr Reinhard Stöger

Module Details: A level 3, 10 credit module taught in the Spring Semester at Sutton Bonington. The module consists of lectures and practical classes

Expected Number of Students Taking Module: 30

Target Students: Biosciences

Availability to Exchange Students: Yes subject to appropriate background.

Summary of Content: This module introduces current concepts of molecular mechanisms in animal development. A goal is to convey how developmental programs are remarkably conserved among species, including humans. Insights gained from molecular studies of the fruit fly, zebra fish and chicken are directly relevant to our understanding of mammalian development. Signals and factors regulating key events in establishing the body plan of an animal are discussed. Epigenetic processes that mediate X-chromosome inactivation and genomic imprinting will be described.

Timetable: Two-hour timetabled sessions per week: nine lectures, one practical session and one seminar session. The timetable can also be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and more detailed information will be given to you in the first session.

- Model systems and techniques — Dr Reinhart Stöger
- Segmentation in drosophila — Dr Dylan Sweetman
- Vertebrate segmentation — Dr Dylan Sweetman

  Practical – chicken embryo culture
- Introduction to Epigenetics — Dr Reinhart Stöger
- X-chromosome inactivation — Dr Reinhart Stöger
- Genomic imprinting — Dr Reinhart Stöger

  Seminars in epigenetics
- Limb development — Dr Dylan Sweetman
- Muscle formation — Dr Dylan Sweetman
- MicroRNA in Development — Dr Dylan Sweetman

Assessment: Exam 1 80% 2-hour examination. Presentation 20% epigenetics presentations

Aims: This module aims to provide students with a detailed understanding of developmental biology and epigenetic regulation in mammalian species and introduces current concepts of molecular mechanisms in animal development. A goal is to convey how developmental programs are remarkably conserved among species, including humans. Insights gained from molecular studies of the fruit fly, zebra fish and chicken are directly relevant to our understanding of mammalian development. Signals and factors regulating key events in establishing the body plan of an animal are discussed. Epigenetic processes that mediate X-chromosome inactivation and genomic imprinting will be described.

Learning outcomes: On successful completion a student will be able to:
1: Describe the morphological and phenotypic changes that take place during animal development and how this is regulated by genetic and epigenetic mechanisms
2: Analyse research papers by explaining the data presented and how this informs our understanding of animal development and epigenetics
3: Interpret morphological changes in embryo development and relate this to published literature
4: Relate how genome level information and changes result in evolution of novel forms and functions

D236Z9 Principles of Animal Health and Disease 2

Module Convener: Dr Sarah Egan sarah.egan@nottingham.ac.uk (Vet School)

Module Details: Level 3 Spring Semester 10 credits. Primarily aimed at students taking a degree in Animal Science but available to other students subject to completing the prerequisite

Pre-requisite modules or other requirements: D212Z5 Introductory Physiology

Expected Number of Students Taking Module: 60

Target Students: D320 Animal Science, and available to Exchange students subject to appropriate background

Summary of Content: The module will develop the concepts introduced in the Level 2 module Principles of Animal Health and Disease 1, providing further detail on the physiological and immunological response to disease using examples from companion, farm and rodent species. The economic /welfare / legal impacts of disease will be discussed.

Timetable: The timetable can be viewed on www.nottingham.ac.uk/timetable

Assessment:

Exam 1	100%	MCQ examination	1.hr 30 mins

Aims: To develop an advanced knowledge and understanding of the effects of disease in domesticated animals.

Learning outcomes:
Knowledge and Understanding – to learn (1) The major effects of disease on the body (2) To develop a detailed understanding of the effects of diseases on specific body systems using examples from companion, farm and rodent species.

Intellectual Skills – The ability to (1) be able to integrate knowledge of the various body systems into an understanding of the effects of diseases (2) Develop an understanding of how to assess the health of an animal (3) Develop an understanding of the economic impact of disease in specific examples (4) be capable of retrieving information from a variety of sources.

Practical/professional Transferable/key skills – The ability to (1) work productively individually and as a group (2) manage time efficiently (3) present data/information in a group setting.

D23BA1 Livestock Production Science

Module Convenor: Prof Phil Garnsworthy (MC) phil.garnsworthy@nottingham.ac.uk,

Lecturers: Prof Julian Wiseman, Prof Kevin Sinclair, Dr George Mann, Dr Jean Margerison

Module Details: Level 3 All Year; 20 credits

Pre-requisites: D223A7 Applied Animal Science

Co-requisites: None.

Availability to Exchange Students Yes subject to appropriate background.

Expected Number of Students Taking Module: 40

Target Students: Students in the School of Biosciences

Summary of Content: Scientific principles governing responses of major livestock species to nutritional, environmental, genetic and management inputs in terms of overall biological performance (growth, lactation, nutrition and reproduction), biological efficiency, profitability, animal welfare and environmental impact. Product quality, how this is measured and perceived by both the retail sector and the consumer, and how it may be manipulated during production. UK livestock production in the context of global food security.

Timetable: The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme:

Week	*SUBJECT*	*LECTURER*
2	Poultry: Meat Production and growth	JW
3	Poultry: Meat Biology and carcass quality	JW
4	Poultry: Egg Production	JW
5	Self-access to Pig Fact Files	JW
6	Self-access to Pig Fact Files	JW
7	Pigs: Breeding and Reproduction	JW
8	Pigs: Student Presentations	JW
9	Dairy: Biology of Lactation Dairy: Nutrition and Milk Composition	PCG PCG
10	Dairy: Housing	PCG
11	Dairy: Environmental impacts	PCG
12	Cattle Health	PCG
13-16	Vacation	
17-18	January Assessment (not for this module)	

19	Cattle: Reproduction	PCG
20	Dairy Consultancy Exercise	PCG
21	Beef: Systems 1	KDS
22	Beef: Systems 2	KDS
23	Feeds for Cattle	TBC
24	Beef: Systems 3	KDS
25	Sheep: Production systems	GEM
26	Sheep: Lamb production and welfare	GEM
27	Sheep: Nutrition	GEM
28-31	Vacation	
32	Sheep: Breeding	GEM
33	Sheep: Health & reproduction	GEM
34-37	Revision / Assessment	

Teaching Staff: Prof Phil Garnsworthy (PCG; Module Convenor), Prof Julian Wiseman (JW), Prof Kevin Sinclair (KDS), Dr George Mann (GEM), Dr Jean Margerison (JM).

Assessment:

Exam	60%	one 3 hour paper
Coursework 1	40%	2 essays each of 1500 words

Aims: Link previously acquired scientific knowledge of physiology, nutrition, genetics, health, welfare and management when studying the production of meat/milk/eggs and health/well-being. Detailed consideration of the integration of the production, nutrition, product quality, management and health of beef and dairy cattle, sheep, pigs and poultry at UK and global scales.

Learning Outcomes: After successful completion of the module students will be able to:
1. Integrate knowledge of nutrition, reproduction, growth, management, health and welfare when evaluating livestock production systems.
2. Demonstrate ability to acquire, interpret and critically analyse biological and/or management data and information derived from a variety of sources, including international comparisons.
3. Compare resource requirements and environmental impact of alternative livestock systems.
4. Explain how to adapt production systems to meet demands for animal products in contrasting global markets.
5. Critically analyse key performance indicators and provide solutions to problems encountered in livestock production enterprises.

D23BA7 Genetic Improvement of Crop Plants

Module Convenor: Dr Sean Mayes sean.mayes@nottingham.ac.uk

Module Details: Level 3 autumn and spring, 20 credits

Target Students: Students registered on the undergraduate courses Students interested in Plant Breeding and biotechnology

Availability to Exchange Students: Yes subject to appropriate background.

Summary of Content: The genetic improvement of crop plants is critical to address issues of food security for a growing world population. It is also the key to tackling environmental degradation and to meeting the increasing strict regulations on agricultural pollution which are coming into force in many Western countries. While these issues are not identical, they are linked and efficient plant breeding can be part of the solution to both. The module will use lectures, case and literature studies, research plan presentations, external expert seminars and practical exposure to crop breeding and molecular techniques to provide a firm basis for future crop breeding. The emphasis is the application of Biotechnology to conventional breeding, but the place of Genetic Modification in the genetic improvement of crops is also addressed. Crops covered include temperate and tropical, annual and perennial, in-breeding and out-breeding with emphasis on how genetic improvement will be achieved in the near future, while recognising the potential of novel techniques and the existence of varying priorities, in the face of a changing climate.

Timetable: The timetable can be viewed on www.nottingham.ac.uk/timetable

Lecture Programme: Example:

Week	SUBJECT	LECTURER
1	GMOs: ethics, commercial interests, consumer concern and environmental impact.	TBC
2	Engineering transgenic plants: transgene delivery strategies.	RS
3	Expressing transgene products in chloroplasts.	RGF
4	Post-transcriptional regulation of gene expression.	RGF
5	Revision	RGF

Teaching Staff: Mike Holdsworth (MH), John Foulkes (JF), Erik Murchie (EM); Tim Robbins (TM); Mike Davey (MD); Rumiana Ray (RR); Martin Broadley (MB); Debbie Sparkes (DS); Chungui Lu (CL); Martin Blythe (MBl) (PM) Penny Maplestone (British Society of Plant Breeders); (DF) David Feuerhelm (Syngenta seeds); Alastair Clemence (Consultant on GM regulation)

Assessment Details:

Exam	45%	2 Hour examination- Spring semester
Practical	25%	Lab amplification of marker loci in a wheat population, write up and analysis (max 1500 words)
Presentation	30%	Groups investigate a topic in genetic improve and report a 20 minute presentation to the wider group and assessors, plus a one-page executive summary.

Aims:

- To provide students with an understanding of crop genetic improvement through lectures, practicals and case studies
- To provide students with an appreciation of how modern and technological approaches can enhance crop breeding programmes and be able to assess the limitations of these approaches
- To give students the intellectual and practical skills to form a basis for a potential career in biotechnology as applied to crop breeding.

Learning Outcomes: On successful completion of this module, students will be able to:

- Explain the domestication of crops, the genetics of traits and how crops are bred.
- Describe the application of molecular markers as a way to assist crop breeding and their use for the development of genetic maps.
- Identify major traits and issues which will need to be tackled by crop breeding and improvement.
- Compare multiple approaches that are currently being used in genetic improvement programmes.
- Test the use of genetic markers for genetic linkage in wide cross mapping populations.

D23BN1 Nutrition and the Health of Populations

Module Convenor: Jo Pearce Jo.Pearce@nottingham.ac.uk

Module Details: Level 3, full year, 20 credits.

Pre-requisite(s): Introduction to Nutrition (D21BN1) Nutritional Regulations, Physiology and Endocrinology (D223NA)

Co-requisites: None.

Expected Number of Students Taking Module: 90

Target Students: Students studying Master of Nutrition (B401), BSc Nutrition (B400), Nutritional Biochemistry (C770) and Nutrition and Food Science (B4D6).

Availability to Exchange Students: Yes subject to appropriate background.

Summary of Content: Module considers the influence of nutritional factors at all stages of life upon the development of specific disease states, it will provide an integrated programme of epidemiology, basic nutrition and molecular science and public health nutrition and policy. Nutritional assessment tools: will consider the perils and pitfalls of available methods for assessing nutrient intake and levels of physical activity. Nutritional epidemiology: Overview of approaches used in nutritional epidemiology and provide a guide to interpreting the findings of epidemiological studies. Nutrition in Pregnancy & Lactation, Infant Nutrition: Consider the impact of diet upon the normal development of the human fetus, the nutritional requirements of infants and the transition from milk to solid diets. Intervention strategies: When elements of the diet are identified as playing a role in the development of disease it may be desirable to intervene, perhaps by encouraging the population to eat more or less of particular foods, or to indulge in more exercise. Disease states in the developed world: Consider some of the known nutritional risk-factors for these cardiovascular disease, osteoporosis and cancer and consider how changes in diet may reduce risk. Issues in the developing world: For much of the population of the world food supply is insecure. Ageing: Consider specific aspects of nutrition that are important to the over 65 populatation and describe current theories of how we age at the cellular level

Timetable: Typically two one-hour timetabled sessions per week: forty-four lectures, supporting journal clubs, and revision session. The timetable can also be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: The lecture programme is provisional and more detailed information will be given to you in the first session.

1. Introduction and Nutritional assessment (TBC & JP)
2. Nutritional assessment and physical activity (JP)
3. Nutritional epidemiology (JM)
4. Nutritional epidemiology (JM)
5. Intervention strategies (JP)
6. Nutrition and fertility (TBC)
7. Periconceptual nutrition and pregnancy (TBC & JP)
8. Nutrition and pregnancy (JP)
9. Developmental origins of disease (TBC)
10. Lactation and infant feeding (TBC)
11. Nutrition and infancy (JP)
12. Obesity in childhood (TBC)
13. Schools and nutrition (JP)
14. Nutrition and adolescence (JP)
15. The nutrition transition and developing countries (LC)
16. Diet and cancer (TBC)

17. Diet and cancer (TBC)
18. Diet and cardiovascular disease (JM)
19. Diet and cardiovascular disease and Nutrition and bone health (JM & TBC)
20. Nutrition and bone health, Nutrition and the elderly (TBC)
21. Nutrition and ageing (TBC)

TBC To Be Confirmed, JP- Jo Pearce, JM- Jon Majewicz, LC- Lisa Coneyworth

Coursework:
Coursework 1: Critical analysis of study designs in nutritional epidemiology (20% of module)
Coursework 2: Essay (2000 words), (20% of module)

Assessment: Exam 1 (60%) 3 hours exam. Coursework 1 (20%). Coursework 2 (20%).

Aims: This module will introduce students to the basic methodology used to explore relationships between diet, health and disease in human populations. An appreciation of these techniques will be used as the basis for in-depth exploration of current major public health priorities. The module will take a lifecourse approach to explain and develop the concepts of human health and disease as affected by diet, dietary components and interacting factors. Specific material to be covered: o Nutritional epidemiology: terminology and basic methods. Nutritional assessment at the population level. Intervention strategies and public health priorities. The nutritional requirements of women during pregnancy and lactation o The nutritional requirements of infants. Diet and coronary heart disease. Diet and cancer. Nutritional requirements from childhood to old age

Learning outcomes: On successful completion of this module, students will be able to:
1. Assess the major concepts and principles of nutritional epidemiology
2. Critically interpret epidemiological data in relation to nutrition and health, constructing balanced evidence-based arguments.
3. Evaluate the contribution of nutrition to early human growth, development and physiological function
4. Analyse the common themes and concepts in human nutrition and relate these to all stages of the lifespan and changing nutrient requirements.
5. Examine the relationship between diet and disease and how it has an impact on a molecular level, the development of degenerative diseases and impacts public health nutrition and policy.

Recommended background reading:
Langley-Evans SC (2015) Nutrition, health and disease: a lifespan approach. Wiley.

D23BN2 Animal Nutrition

Module Convenor: Dr John Brameld john.brameld@nottingham.ac.uk,

Lecturers: Dr T Parr, Dr M Elmes, Dr J Margerison

Module Details: Level 3, Year Long, 20 credits.

Pre-requisites: Introduction to Nutrition (D21BN1) Principles of Animal Nutrition (D223N8)

Co-requisites: None.

Expected Number of Students Taking Module: 30

Target Students: Students studying BSc Animal Science (D320).

Availability to Exchange Students: Yes subject to appropriate background.

Summary of Content: This module will further develop students' understanding of the specialised knowledge encompassing the subject of Animal Nutrition. The module objectives are to explain and illustrate Animal Nutrition at an advanced level by developing specific topics including Micronutrient and trace minerals, Organic micronutrients (vitamins B, choline, essential fatty acids), Regulation of growth and product quality, Specialist aspects of ruminant nutrition and Selected examples of metabolic disorders.

Timetable: Typically two one-hour timetabled sessions per week, although student seminars may be up to 4 hours: Thirty two lectures, sixteen hours student seminars, fifty hours student led studies and revision. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: The Lecture programme is provisional and more detailed information will be given to you in the first session.

1 Module introduction and Presentation Skills (JB)
2 Organic Micronutrients 1 (TP)
3 Organic Micronutrients 2 (TP)
4 Micronutrient and Trace Minerals 1 (ME)
5 Micronutrient and Trace Minerals 2 (ME)
6 Micronutrient and Trace Minerals 3 (ME)
7 Ruminant Nutrition 1 (JM)
8 Ruminant Nutrition 2 (JM)
9 Ruminant Nutrition 3 (JM)
10 Growth Regulation 1 (JB)
11 Growth Regulation 2 (JB)
12 Growth Regulation 3 (JB)
13 Product Quality 1 (TP)
14 Product Quality 2 (TP)
15 Metabolic Disorders 1 (TP)
16 Metabolic Disorders 2 (TP)

Assessment:

Exam	60%	One 2 hours exam
Coursework 1	40%	A seminar on an area of current interest in animal nutrition. The assignment will consist of writing an abstract and presenting seminar on a subject related to animal nutrition.

Aims: This module will provide students with specialised knowledge encompassing the subject of Animal Nutrition and explain and illustrate Animal Nutrition at an advanced level by developing specific topics including 1) Micronutrient and trace minerals 2) Organic

Micronutrients (vitamins B, choline, essential fatty acids) 3) Regulation of growth and product quality 4) Specialist aspects of ruminant nutrition and 5) Selected examples of metabolic disorder

Learning outcomes: On successful completion of the module, students will be able to:
1. Explain the nutritional requirements for animal health and growth in both ruminant and non-ruminant species.
2. Explain the factors involved in the regulation of growth and product quality.
3. Critique information from a range of sources on a specialist topic of current research in animal nutrition.
4. Report on the specialist topics using appropriate academic formats.

Recommended background reading: The main textbook we recommend is:
McDonald, P, Edwards, RA, Greenhalgh, JFD, Morgan, CA, Sinclair, LA & Wilkinson, RG. (2010). '*Animal Nutrition 7th Edition'*, Pearson Education, Harlow, Essex, UK.
For most topics we do not recommend specific texts, but references for reviews or original papers will be provided

D23BN3 Molecular Nutrition

Module Convenor: Dr Tim Parr (MC) tim.parr@nottingham.ac.uk,

Lecturers: Dr J Brameld, Dr L Coneyworth, Professor S Langley-Evans, Dr A Murton, Professor A Salter, Dr S Welham.

Module Details: Level 3, Year Long, 20 credits.

Pre-requisites: Biochemistry–The Building Blocks of Life (D21BN2) Principles of Immunology (D223N6)

Expected Number of Students Taking Module: 60

Target Students: BSc Nutrition (B400)

Availability to Exchange Students: Yes provided they email module convenor first

Summary of Content: This module will examine the regulatory effects of nutrients, either directly or indirectly, on cellular signaling processes and gene expression and how this influences metabolism and growth in eukaryotic systems. The mechanisms of controlling gene expression will be described. The module will explore the regulation of signaling processes as well as gene expression and the potential for manipulating metabolic processes through nutrient supply. The module will seek to enable an understanding of the molecular mechanisms by which nutrients regulate cell function, the basis of their effects on whole organisms and how variation in genomic sequence is likely to impact on nutrients' influence on gene expression.

Typically two or three one-hour timetabled sessions per week consisting of: lectures, tutorials and computer based practical class. The timetable can be viewed at www.nottingham.ac.uk/timetable

Lecture Programme: Lecture programme is provisional and detailed information will be given to you in the first session.

Wk	Subject
2	Introduction to module Introduction and revision: Regulation of the cellular response
	Molecular nutrition and the health of populations
3	Gene organisation and structure
4	Regulation of gene expression (transcription)
5	Regulation of gene expression (post-transcription)
6	Regulation of gene expression (translation)
7	Techniques for assessing gene expression
8	Introduction to coursework 1: Bioinformatics
9	Coursework 1: Bioinformatics (computer session)
10	Coursework 1: Bioinformatics (computer session)
11	Coursework 1: Bioinformatics (additional tutorial)

12	Coursework (student centred study)
	Christmas vacation
19	Introduction to semester 2
	Nutrigenetics: "Personalised" Nutrition
	Coursework feedback
20	Nuclear Receptors: Vitamins A & D
21	Lipids
22	Lipids
	Lipids: Q&A session
23	Carbohydrates
24	Amino acids
	Carbohydrates & amino acids: Q&A session
25	Minerals
26	Minerals
	Minerals and vitamins: Q&A session
26	Nutrigenetics & nutrigenomics: Zinc, class module evaluation
	Intro to Introduction to computer based revision test
27	Formative computer-based revision test
	Easter vacation
33	Revision class

Assessment:
Exam 1 (50%) – 2 hour exam.
Coursework 1 (50%) – Data interpretation and bioinformatics computer-based exercise including interpretation of experimental data; written assessment (2000 words)

Aims: Through the provision of relevant biochemical and molecular biology information, this module aims to enable students to gain an understanding of the regulatory effects of nutrients, either directly or indirectly, on gene expression and how this influences metabolism and growth in eukaryotic systems. To demonstrate through coursework and/or examination an understanding of the factors involved in regulation of signalling processes and gene expression and the potential for manipulating metabolic processes through nutrient supply.

Learning Outcomes: On successful completion of the module, students will be able to:
1) Explain the structure of the genome and mechanisms by which genes are expressed and translated into proteins
2) Explain the molecular mechanisms by which nutrients regulate gene expression.
3) Illustrate how experimental methodologies can be used to assess how nutrients influence gene expression.
4) Analyse molecular biology and biochemical experimental data generated from experiments examining the effects of a nutrient on gene expression.

Recommended background reading: The Molecular Biology of the Cell. Alberts *et al* The contents of the book are available through the following webpage: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?call=bv.View..ShowTOC&rid=mboc4.TOC&depth=10

An alternative book with much the same content is **Molecular Cell Biology.** Lodish *et al* The contents of the book are available through the following webpage: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?call=bv.View..ShowTOC&rid=mcb.TOC&depth=10

D23PRO Undergraduate Research Project

Module Convenor: Dr S Lydon sussie.lydon@nottingham.ac.uk

Total Credits: 40

Level: Level 3, Year-long module

Summary of Content: The project is a year long level 3 module. The topic of the project will be chosen from a list of suggestions, and will be finalised after consultation with the student's Course Manager and a member of academic staff who will act as the supervisor. It involves detailed research on the topic chosen after discussion with the supervisor. Each project will involve collection of data by means such as experiment, questionnaire, observation and/or literature search as well as the analysis and interpretation of the data in the context of previous work. Reading and summarising previous research by other scientists working in the area, and writing a clear concise final report are essential components of the project.

Module details: This module consists of an extended programme of research under the direction of an individual member of staff. Students are expected to undertake a challenging piece of work, in which emphasis is placed on self-motivation and self-learning. Detailed guidelines will be provided by the Division.

Expected Number of Students Taking Module: 250

Target Students: All Biosciences students registered for Honours Degrees in the School of Biosciences apart from those studying Microbiology, and Environmental Sciences degrees.

Non-lecture programme: Private study using library, Internet, laboratory, or field facilities supported by regular tutorials with the project supervisor.

Target Students: All Biosciences students registered for Honours Degrees in the School of Biosciences apart from those studying Microbiology, and Environmental Sciences degrees.

Assessment: The module will be assessed by coursework only; this will take the form of a 15 minute oral presentation of the research findings (10%), an objective assessment of project planning and execution (30%) and a 5,000-word written report (60%).

Module aims: The module aims to provide a detailed training in research work. At the end of the module, students should be familiar with the relevant published literature in the field, have become familiar with some of the fundamental techniques necessary to do the prescribed research and published their findings as both an oral report and a comprehensive written report.

Module objectives: The objectives are to enable students to:

i) Identify and analyse problems
ii) Undertake good experimental design
iii) Search for, analyse and interpret relevant literature
iv) Carry-out competent laboratory, field or survey research
v) Analyse data using appropriate methods
vi) Write and deliver an oral presentation
vii) Prepare and write a detailed report

Transferable skills

Transferable skills associated with this module include:

i) Literature searching using a range of databases

ii) Use of relevant laboratory, field or survey research methods
iii) Statistical analysis as appropriate
iv) Computing and word processing skills
v) Problem solving
vi) Oral communication skills
vii) Time management

Subject specific information

In some project areas, it is necessary to begin project work in semester 4 because of factors such as seasonal availability of crops or farm animals. This phase of the project forms a discrete, 10-credit, Part I module

27 Appendices

1 Qualitative Assessment Criteria - General Guidelines for Examinations
2 Qualitative Assessment Criteria - General Guidelines for Essays & Reports
3 Qualitative Assessment Criteria - General Guidelines for Posters
4 Qualitative Assessment Criteria - General Guidelines for Oral Presentations
5 Qualitative Assessment Criteria – Research Project Experimental Work
6 Progression and Compensation Charts
7 Marking at Different Levels within Degree Programmes
8 School of Biosciences Tutoring Statement

Appendix 1

CLASS	%	QUALITATIVE ASSESSMENT CRITERIA - GENERAL GUIDELINES FOR ESSAYS & REPORTS
First **A1** **A2** **A3** **A4**	 100 90 80 73	a. Excellent report structure with professional presentation of figures, tables, diagrams, references etc.; evidence of originality/novelty in presentation. b. Deep understanding of subject; all arguments carefully developed and clearly expounded. c. Considerable and effective use of literature information, beyond that supplied as taught material. d. Clear evidence of critical thinking, originality and novelty.
Upper Second **B1** **B2** **B3**	 68 65 62	a. Well organised report; appropriate choice of illustrative figures, tables, diagrams etc.; clearly presented throughout. b. Sound grasp of subject material; generally logical arguments. c. Reasonable evidence of wider study beyond lecture material. d. Some evidence of independent thinking and originality.
Lower Second **C1** **C2** **C3**	 58 55 52	a. Generally clear report conforming with accepted format but with some errors in style and/or omissions in presentation of illustrative figures. b. Reasonable understanding of subject material, but some flaws in the logic of arguments and factual errors. c. Only limited evidence of wider study and use of literature information. d. Very little evidence of independent thinking or originality.
Third **D1** **D2** **D3**	 48 45 42	a. Little attention given to report structure; limited use of illustrative figures, tables etc.; serious flaws in presentation. b. Limited understanding of subject; considerable factual errors demonstrated. c. Virtually no inclusion of literature information beyond lecture material. d. Virtually no evidence of independent thinking or originality.
Soft Fail **E**	 35	a. Very poorly structured; disorganised; missing sections; minimal presentation of supporting data, figures etc. b. Minimal understanding of subject; serious factual errors; general lack of any logical arguments. c. Virtually no inclusion of literature information. d. No evidence of independent thinking or originality.
Fail **F1**	 25	Very poor coverage of material with little information that is relevant. Virtually no evidence of understanding the question; minimal attempt to provide a structured answer.
Fail **F2**	 10	A few lines of relevant material
Fail **F3**	 0	No relevant material

1. Only broad classes (A,B,C,D and E) have qualitative criteria attached; the division into (e.g.) C1, C2, C3 etc. is at the discretion of the examiner.
2. The qualitative criteria include consideration of :
   a. The quality of the report/essay etc. - the use of sections; diagrams; figures etc.; citation of references; general neatness etc.
   b. Student's knowledge of subject; depth and quality of answer.
   c. Evidence of reading / study beyond regurgitation of standard taught material.
   d. Independent or critical thinking / originality etc.

Appendix 2

CLASS	%	QUALITATIVE ASSESSMENT CRITERIA - GENERAL GUIDELINES FOR EXAMINATIONS
First **A1** **A2** **A3** **A4**	 100 90 80 73	a. Deep understanding of subject; carefully balanced arguments clearly presented; all material highly relevant to the question. b. Considerable and effective use of literature information, beyond that supplied as taught material. c. Clear evidence of critical thinking, originality and novelty d. Excellent structure and good use of illustrative diagrams etc.; evidence of originality/novelty in presentation.
Upper Second **B1** **B2** **B3**	 68 65 62	a. Sound grasp of subject material; presentation of logical arguments relevant to the question. b. Reasonable evidence of wider study beyond lecture material. c. Some evidence of independent thinking and originality. d. Well organised answer; appropriate use of illustrative diagrams; clear presentation.
Lower Second **C1** **C2** **C3**	 58 55 52	a. Reasonable understanding of subject material, but some flaws in the logic of arguments and factual errors; possibly some irrelevant material. b. Only limited evidence of wider study and use of literature information. c. Little evidence of independent thinking or originality. d. Fairly clear presentation; generally conforming with accepted format but with some flaws in style; little use of illustrative diagrams.
Third **D1** **D2** **D3**	 48 45 42	a. Limited understanding of subject; numerous flaws in the logic of arguments; considerable factual errors and/or irrelevant material. b. Virtually no inclusion of literature information beyond lecture material. c. Virtually no evidence of independent thinking or originality. d. Little attention given to structure; very limited use of illustrative diagrams; serious flaws in presentation.
Soft Fail **E**	 35	a. Minimal understanding of subject; serious factual errors; general lack of any logical arguments; considerable amount of irrelevant material. b. Virtually no inclusion of literature information. c. No evidence of independent thinking or originality. d. Very poorly structured answer; disorganised and untidy; missing sections; virtually no use of illustrative diagrams.
Fail **F1**	 25	Insubstantial answer; very poor coverage of material with little information that is relevant. Virtually no evidence of understanding the question and minimal attempt at structure
Fail **F2**	 10	A few lines of relevant material
Fail **F3**	 0	No relevant material

1. Only broad classes (A,B,C,D and E) have qualitative criteria attached; the division into (e.g.) C1, C2, C3 etc. is at the discretion of the examiner.
2. The qualitative criteria include consideration of :
   a. Student's knowledge of subject; depth, relevance and quality of answer.
   b. Evidence of reading / study beyond regurgitation of standard taught material.
   c. Independent or critical thinking / originality etc.
   d. The quality of presentation - structure of answer, the use of sections; diagrams etc., general neatness etc.

Appendix 3

CLASS	%	QUALITATIVE ASSESSMENT CRITERIA - GENERAL GUIDELINES FOR POSTERS
First **A1** **A2** **A3** **A4**	100 90 80 73	a. Excellent use of headings, text appropriate size, figures and diagrams clear and well-labelled, very easy to follow progression of poster theme. b. Visually very attractive and creative. c. Factually very accurate and informative with clear evidence of extensive knowledge of published literature. d. All relevant aspects of own data presented, where inclusion is appropriate.
Upper Second **B1** **B2** **B3**	68 65 62	a. Good use of headings, text of appropriate size, some loss of figure clarity or slight errors in labelling, easy to follow progression of poster theme. b. Visually quite attractive and creative. c. Factually accurate and informative with some evidence of knowledge of published literature. d. Most relevant aspects of own data presented, where inclusion is appropriate
Lower Second **C1** **C2** **C3**	58 55 52	a. Adequate use of headings, text a little too small, figures not clear and inadequately labelled, more difficult to follow progression of poster theme. b. Visually unstimulating. c. Some factual inaccuracies with only limited evidence of knowledge of published literature. d. Several aspects of own data omitted, where inclusion is appropriate.
Third **D1** **D2** **D3**	48 45 42	a. Very poor use of headings, text too small or hand-written, figures unclear and unlabelled, no obvious progression of poster theme. b. Visually unattractive and dull. c. Many factual inaccuracies with very limited evidence of knowledge of published literature. d. Most of own data omitted, where inclusion is appropriate.
Soft Fail **E**	35	a. No headings used and poster somewhat disorganised. b. Visually unattractive and dull. c. Inaccurate with virtually no evidence of knowledge of published literature. d. None of own data included.
Fail **F1**	25	a. No headings used and poster very disorganised and difficult to understand. b. Visually very unattractive and dull. c. Inaccurate with no evidence of knowledge of published literature. d. None of own data included.
Fail **F2**	10	A few lines of relevant material presented
Fail **F3**	0	No poster presented

1. Only broad classes (A,B,C,D and E) have qualitative criteria attached; the division into (e.g.) C1, C2, C3 etc. is at the discretion of the examiner.
2. The qualitative criteria include consideration of :
    a. Structure and organisation of the poster.
    b. Visual impact and attractiveness.
    c. Accuracy and completeness of the content.
    d. Where appropriate, inclusion of students' own experimental data.

Appendix 4

CLASS	%	QUALITATIVE ASSESSMENT CRITERIA - GENERAL GUIDELINES FOR ORAL PRESENTATIONS
First **A1** **A2** **A3** **A4**	 100 90 80 73	a. Clearly audible, well-paced presentation delivered without obviously reading from notes in the time allocated. Addressed to the audience. b. Very well-planned with a clear logical structure focused on the topic being presented. Excellent introduction and summary. c. Excellent use of visual aids which are easy to read and understand. Main points of slides clearly explained. d. Content of presentation very well-researched with relevant data where appropriate. Response to questions asked indicates thorough understanding.
Upper Second **B1** **B2** **B3**	 68 65 62	a. Clearly audible, well-paced presentation delivered with some reading from notes in the time allocated. Mainly addressed to the audience. b. Quite well-planned with logical structure focused on topic being presented. Good introduction and summary. c. Good use of visual aids which are quite clear to read and understand. Good attempt to explain main points of slides. d. Content of presentation quite well-researched with relevant data where appropriate. Response to questions asked indicates good understanding.
Lower Second **C1** **C2** **C3**	 58 55 52	a. Audible presentation which may be too fast or too slow. Tendency to read from notes and to address floor or ceiling. May be outside time allocated b. Some flaws in structure and not always focused on the topic being presented. Weak introduction and summary. c. Adequate use of visual aids which are not always easy to read and understand. Little attempt to explain main points of slides. d. Some omissions in literature research and little relevant data presented. Response to questions asked indicates incomplete understanding.
Third **D1** **D2** **D3**	 48 45 42	a. Difficult to hear. Too fast or too slow. Read from notes and little attempt to address the audience. Outside allocated time. b. Poorly-structured, rambling presentation which strays from topic being presented. Very weak introduction or summary. c. Poor visual aids which are difficult to read and understand. Poor explanation of main points of slides. d. Little evidence of literature research and no data presented. Response to questions indicates poor understanding.
Soft Fail **E**	 35	a. Mumbled, halting presentation. Much too fast or too slow. No attempt to address audience and well outside allocated time. b. No discernible structure to presentation with some relevant material. No introduction or summary. c. Very poor visual aids. No explanation of main points of slides. d. Poor literature research and no data presented. Response to questions shows serious weakness in understanding.
Fail **F1**	 25	a. Extremely difficult to hear presentation and well outside allocated time. b. No discernible structure and very little relevant material. No introduction or summary. c. No visual aids used. d. Little evidence of research. Response to questions shows minimal understanding.
Fail **F2**	 10	Very minimal attempt to give a presentation.
Fail **F3**	 0	Failed to give a presentation.

1. Only broad classes (A,B,C,D and E) have qualitative criteria attached; the division into (e.g.) C1, C2, C3 etc. is at the discretion of the examiner.
2. The qualitative criteria include consideration of :
   a. Presentation of talk; audibility, speed, use of notes, addressed to audience, time keeping.
   b. Organisation of talk; logical coherent progression with introduction and summary.
   c. Use of visual aids; clarity and explanation of salient points.
   d. Research and response to questioning; evidence of extensive reading, presentation of own data (where relevant), evidence of wider understanding.

Appendix 5

CLASS	%	QUALITATIVE ASSESSMENT CRITERIA - RESEARCH PROJECT EXPERIMENTAL WORK
First **A1** **A2** **A3** **A4**	 100 90 80 73	a. Extremely independent and able to work with minimal direct supervision. Shows a great deal of initiative and perseverance when things go wrong. b. Very well organised; able to plan time in laboratory/field with minimal assistance. c. Technically extremely competent; learns new methods quickly with minimal training. d. Excellent critical ability and able to appreciate limitations of techniques used.
Upper Second **B1** **B2** **B3**	 68 65 62	a. Able to work independently with little direct supervision. Shows some initiative and perseverance. b. Well organised; able to plan time in laboratory/field with little assistance. c. Technically competent; learns new methods quite quickly when given training. d. Some critical ability and appreciation of limitations of techniques used.
Lower Second **C1** **C2** **C3**	 58 55 52	a. Needs quite close supervision and shows little initiative. Tendency to give up too quickly when things go wrong. b. Quite well organised but needs considerable help to plan experiments and time spent in laboratory/field. c. Technically quite competent, but liable to make mistakes is not supervised closely. Slow at learning new techniques. d. Limited critical ability and little appreciation of limitations of techniques used.
Third **D1** **D2** **D3**	 48 45 42	a. Little or no ability to work independently. Shows very little initiative. Liable to give up when things go wrong. b. Poorly organised; unable to plan time in laboratory/field without direct instruction. c. Technically incompetent. Liable to make mistakes even when supervised closely. Very slow at learning new techniques. d. Virtually no critical ability or appreciation of limitations of techniques used.
Soft Fail **E**	 35	a. No ability to work independently. Minimal effort put into work. b. Poorly organised and liable to miss planned work sessions. c. Technically very incompetent. Often makes mistakes, even when closely supervised. Extremely slow at learning new techniques. d. No critical ability or appreciation of limitations of techniques used.
Fail **F1**	 25	a. Rarely does any experimental work. b. Very likely to miss planned work sessions. c. Often makes errors when carrying our simple procedures. d. No critical ability or appreciation of limitations of techniques used.
Fail **F2**	 10	Very minimal laboratory/field work attempted.
Fail **F3**	 0	No laboratory/field work attempted

1. Only broad classes (A,B,C,D and E) have qualitative criteria attached; the division into (e.g.) C1, C2, C3 etc. is at the discretion of the examiner.
2. The qualitative criteria include consideration of :
    a. Independence and initiative. Perseverance when work does not go according to plan.
    b. Organisational ability; can the student plan their use if time effectively and efficiently?
    c. Technical ability; can the student carry out work competently and learn new techniques quickly
    d. Critical ability and appreciation of the limitations of the work.

Progression and Compensation BSc Hons (to Parts I and II) and MNUtr (to Part I)

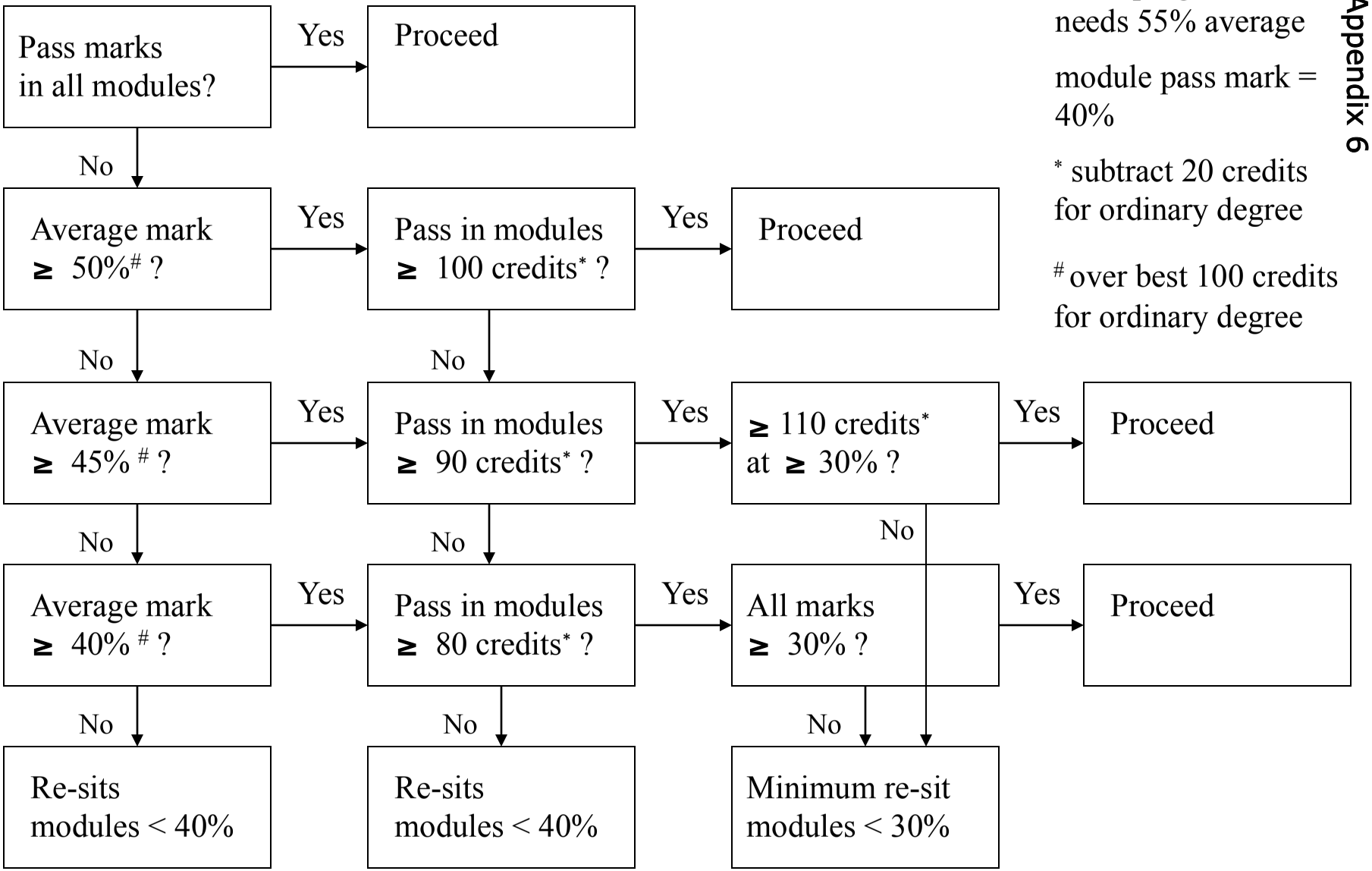
Appendix 6

MSci prog to Part II needs 55% average

module pass mark = 40%

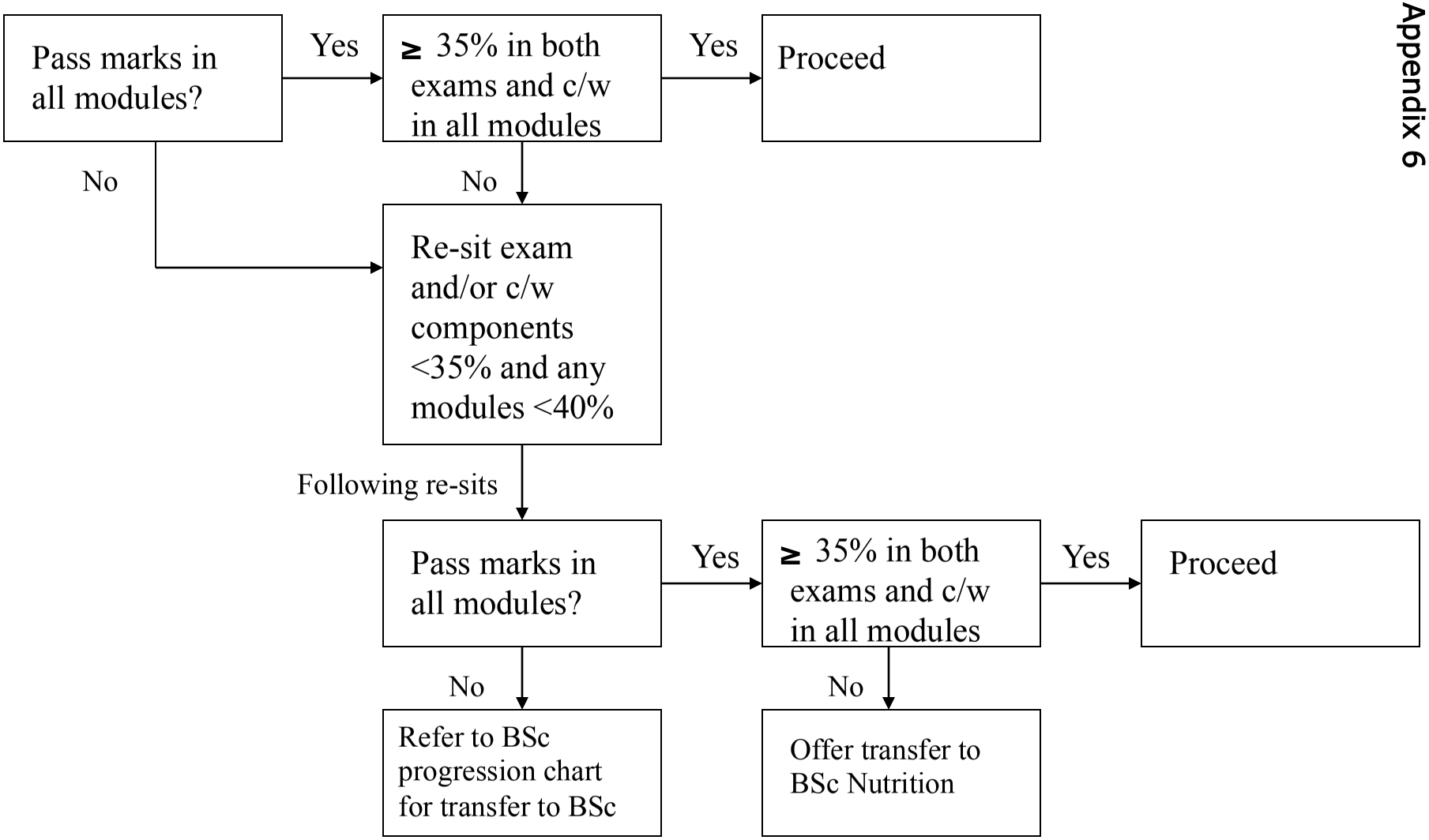
* subtract 20 credits for ordinary degree

over best 100 credits for ordinary degree



Progression and Compensation MNutr (to Parts II and III)

Appendix 6



Appendix 7

School of Biosciences Qualitative Marking Schemes
Supplementary Guidelines

Marking at Different Levels Within Degree Programmes

The School's qualitative marking schemes provide general guidance for assessment of various types of work. However, in applying these schemes to individual assessments, account must be taken of the level at which students are working. The criteria outlined below provide general guidance, and not all criteria will be applicable to all forms of assessment.

Academic Levels

Level 1 Certificate level, generally qualifying year students
Level 2 Diploma level, generally taken by year 2 students
Level 3 Degree level, generally taken by year 3 students
Level 4 Masters levels, generally taken by post-graduate or year 4 undergraduate students

Major considerations

Mark Class A

Level 1: Draws on available evidence to make sound conclusions supported from a range of sources.
Level 2: There is evidence of further reading and careful analysis offering alternative views.
Level 3: There is critical analysis offering alternative views. There is clear expression of own views, which are supported by appropriate literature. Draws on available evidence to make persuasive conclusions.
Level 4: Detailed, orderly and critical work with clearly specified focus/foci exhibiting rigorous analysis, synthesis and evaluation. There must be evidence that the student has developed their own arguments.

Mark Class B

Level 1: Content is accurate and relevant with appropriate use of supporting material.
Level 2: There is sound analysis with good expression and argument with evidence of independent thinking supported by appropriate material.
Level 3: There is sound critical analysis. Alternative views are expressed using supporting evidence from a variety of sources.
Level 4: Evidence of originality and significant critical analysis. There is evidence of integration of material from a variety of sources.

Appendix 7

Mark Class C

Level 1: Content is largely accurate and relevant with some evidence of understanding.
Level 2: There is adequate analysis with limited evidence of wider study.
Level 3: There is reasonable understanding, with some attempt at analysis and limited use of supporting material.
Level 4: There is reasonable understanding and analysis supported by a range of relevant evidence.

Mark Class D

Level 1: Some relevant content but with evidence of only very limited understanding.
Level 2: Some relevant content with limited understanding but little evidence of wider study.
Level 3: Basic understanding with limited evidence of wider study.
Level 4: Basic understanding with limited evidence of understanding and some attempt at analysis.

Mark Classes E/F

All levels: Work does not demonstrate above criteria and reference should be made the qualitative criteria in deciding final mark.

Modules offered at levels A-C are considered intermediate between Levels 1-2, 2-3 and 3-4 respectively.

School of Biosciences: Tutoring Statement

The following statement demonstrates how each of the specific outcomes of the University's principles of tutoring are delivered in the School of Biosciences.

Principle	Outcome achieved in Biosciences through . . .
1. The student should feel acknowledged, recognised and accepted within their school/department as an **individual** with distinct academic needs and preferences.	A detailed Week One programme incorporating course-specific teaching and learning support sessions. A specific Course Manager for each degree from whom students can obtain individual academic advice. Module registration days (three times/year) when students can obtain individual academic guidance on their module choices. Each student is allocated a personal tutor and this is one of the first people they meet when they arrive in the School.
2. The student should feel part of the school/department **community,** experiencing frequent contact with academic staff on an individual or small group basis and building relations with particular members of staff over an extended period.*	Three formal meetings with tutors/year, in addition to which students are encouraged to meet mid-semester with their personal tutors. Learning Community Forum deals with all issues affecting campus life (eg social, residential and catering) as well as academic issues. Close working relationship developed with project supervisor during final year of studies. Student Guild – an SB-based branch of the Students' Union which has combined social and representational roles. Semester One tutor appointed to give particular assistance to first year students at the start of their course. Semester One discussion group at end of first semester to seek feedback on students' experiences. Most first year students and many from later years reside in Bonington Hall. The Hall is closely integrated with all aspects of Campus and School life and is central to the SB community. Campus-based alumni organisation (OKA) provides continuity for graduates and is also involved with travel awards, fund-raising, communication and development.

3. The **personal development** of the student should be promoted; leading to improved communication skills and greater confidence in presentation and dealing with the unfamiliar.	Many modules require presentations, group working and practical skills to be developed – see: http://www.nottingham.ac.uk/biosciences/study-with-us/employability/employability-skills.aspx. Final year research project involves significant personal development as an individual researcher and scientist. MSci students take undertake an additional project in which their professional skills are further developed. MNutr students undertake clinical placements giving them first-hand experience of communicating with the public. Project assessment includes an oral presentation.
4. Students should receive prompt, helpful and detailed **feedback** on their assessments, in a manner that enhances learning and improves future assessment performance.	Coursework returned to students (within a 21 day turn-around time) with individual comments – often on a standard assessment feedback form. Models of good practice in feedback are provided on School intranet. Standard module feedback which is provided at the end of each module on performance over the course of the module, including the formal summative assessment. Module timetables routinely specify submission and feedback dates for coursework.
5. Students struggling with aspects of individual modules, or more generally with their programme of studies, should have clearly signposted and ready access to a reasonable level of **academic advice and support** designed to remedy their difficulties.	Guidance available from Course Manager, Module Convener, Module Registration Days, Personal tutor and School Office staff. Colleagues from Academic Support hold drop in sessions on campus throughout term-time. In 2014-15, appointment of a new Student Experience and Support Officer.
6. Students should receive the level of support in developing their **study skills** necessary to perform satisfactorily on their programme of studies.	A well-developed Study Skills Handbook, to which students are introduced during a specific session in Week One. Personal tutors also provide study-skill advice. A year-long Academic Development and Employability module delivered to first year students. Provision of self-assessment materials from the Virtual Writing Centre for students' use. Course staff provide specific aspects of guidance, especially in relation to coursework.

	All students receive detailed Module Handbooks appropriate to all years of their course. Year 2 and 3 students receive a detailed Research Project handbook. Information in these documents is explained and reinforced during discussions with Personal Tutors, project supervisors and module staff.
7. Students with **personal circumstances** adversely affecting their studies should feel able to make these known to the school/department without difficulty and to be directed to the appropriate support service.	Personal tutor, the School's Senior Tutors (undergraduate or postgraduate), any other member of academic staff, and/or School Office staff who are available to talk to students about difficulties facing them. All staff are aware of support mechanisms available such as the Student Services Centre and Counselling Service. A well-publicised extenuating circumstances procedure, which students are encouraged to make use of as appropriate. The Student Experience and Support Officer who provides support for students with extenuating circumstances.
8. Students should receive the necessary **careers information, advice and guidance** to equip them to make informed choices about their future, to understand the options open to them, and to take advantage of available opportunities.	Workshops on taking an industrial placement year, CVs and application forms, mock assessment workshops are run by Careers and Employability Service during the Autumn Semester. In addition, regular employer presentations from relevant business are hosted on campus throughout each year. Additional drop-in clinic for CV feedback offered to finalist students in June each year. Careers appointments available on the Sutton Bonington Campus throughout the year. 2014-15 a new Careers Fair held on campus in February. MSc mentoring scheme for interview skills/CV development. Some modules deliver integral employability skills. Guidance from tutor, PhD supervisor/assessor and external lectures.
9. Students should be made aware of the importance of developing and articulating their **employability skills**, including possible participation in the **Nottingham Advantage Award.**	Course and subject area staff provide guidance on opportunities in their own disciplines or facilitate connections with specialist resources/alumni/industrial partners/research organisations. Some subject areas promote placement opportunities directly; an Industrial Placement Officer provides general employment advice and opportunities for year-long internships

	Personal tutors provide general employment guidance. Additional School Placement Officer to be recruited for start of 2015-16. Personal tutors, project supervisors and other staff provide referee statements to support employment applications. Introduction to the Nottingham Advantage award given during formal Week One Induction programme and students supported to achieve this. Integral employability skills built into the second year and MSc curriculums.
10. Students should receive appropriate advice and support when considering **changing their programme of study** or contemplating **leaving the University**.	The following sources of advice and support are available to students considering changing their course of study or withdrawing from the University: Personal Tutor, Course Manager, School Manager (Academic Administration), Student Services – financial team. These resources are detailed in the Study Skills book.
11. Students should be prepared for **periods of study away** from their home campus and appropriately supported during those periods.	Students receive general information during Week One induction about the possibilities for study abroad. Students following specific courses where placement is a recognised option or obligation receive guidance and support from course staff and from the ERASMUS and Study Abroad Coordinator, and Industrial Placement Officer. Students undertaking a period of study at the Malaysian campus are provided with School briefing prior to departure. The provision of continued support for students who are studying away is a defined responsibility of personal tutors.
12. The procedures for submitting **extenuating circumstances** regarding assessments should be straightforward and well publicised.	Information about the extenuating circumstances process which is provided to all students through the Study Skills Handbooks. This is articulated to students during Week One induction. Reminders about how and when to submit extenuating circumstances which are sent to students twice/year. Tutors, Course Managers and Student Experience and Support Officer who are all able to give advice and support to students with extenuating circumstances.

13. Students with **disabilities** should be clear as to the support they will receive and where it is available, and the support should be in line with University policies.	The Study Skills Handbook which gives information about support available for students with disabilities. This is articulated during Week One by the Disability Liaison Officer (DLO) who gives a presentation to all new students. The DLO provides support to students throughout their course, and directs students to relevant support services. Tutors who are trained to deal with students with disability. A close working relationship which is maintained between the School's DLO and the University's Senior Disability Officer, who is available on the Sutton Bonington campus once/week.
14. The procedures for submitting **academic appeals and complaints** should be well publicised and staff should be aware of their responsibilities within these procedures.	The process for submitting academic appeals and complaints which is publicised in the students' Study Skills Handbooks and Course Handbooks. The School Manager (Academic Administration) who gives advice and support to students who wish to submit a complaint or an appeal. Guidance available from tutors and Course Managers. Learning Community Fora provide an opportunity for complaints to be resolved informally.
15. Students being subjected to the **academic offences** procedure should receive clear information and advice.	Information about what constitutes plagiarism and how to avoid it which is provided in the students' Study Skills Handbooks and Course Handbooks. This information is articulated in a dedicated session during Week One. On-going guidance on how to avoid plagiarism provided by module conveners and tutors. Personal tutors and the School Manager (Academic Administration) who give support for students being subjected to the academic offences procedure.
16. Students should receive relevant **health and safety** guidance, especially in laboratory or workshop-based subjects.	General information on health and safety is provided to all students during Week One induction and in the School's Study Skills Handbooks. Specific information related to laboratories and practical classes is included in module documentation. Students' attention is drawn to safety matters, including risk assessments and safety procedures, by individual course staff at times appropriate to their application. Some courses, such as those where pathogens will be used, contain a compulsory lab safety module.
17. Students should be directed in a timely and appropriate manner to	The School's Study Skills Handbooks, Course Handbooks, Personal Tutor, Senior Tutor,

University support services for assistance with all of the above matters as necessary.	School Office staff and the Student Services Centre.

The student Study Skills book is produced annually and provided in hard copy to all new students. It can also be found online at http://www.nottingham.ac.uk/~sazintra/student/current/docs/Biosciences%20Study%20Skills%20-%20updated%20July%202014.pdf

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