BTEC

HIGHER NATIONALS

Agriculture

Specification

First Teaching from September 2018

First Certification from 2019

Higher National Certificate Lvl 4

Higher National Diploma Lvl 5

Pearson

About Pearson

We are the world's leading learning company operating in countries all around the world. We provide content, assessment and digital services to learners, educational institutions, employers, governments and other partners globally. We are committed to helping equip learners with the skills they need to enhance their employability prospects and to succeed in the changing world of work. We believe that wherever learning flourishes so do people.

All information in this specification is correct at time of publication.

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Summary of changes in Pearson BTEC Higher Nationals in Agriculture Issue 3

Summary of changes made between previous issue and this current issue	Page number
Unit 20: Forage Production and Management Unit code corrected to L/616/7975	230
2.5.1 Progression to university University recognition and articulations section updated and reflects new website.	11
6.5.2 Compensation of HNC Clarified statement by inserting words "*attempted but*" as is the case with the wording on compensation of HND	76

Summary of changes in Pearson BTEC Higher Nationals in Agriculture Issue 2

Summary of changes made between previous issue and this current issue	Page number
Branding Added new front cover Applied updated Pearson BTEC Higher Nationals branding colour, font and tables throughout the spec	1-400
1.4 Qualification Titles Addition of Dairy Engineering pathway at Level 4 and Level 5	3
2.2 Objectives of the BTEC Higher Nationals in Agriculture Addition of Dairy Engineering to 2nd bullet point	6
2.3 Aims of the Level 4 Higher National Certificate in Agriculture Additional row added to table to incorporate Dairy Engineering pathway and specialist units Optional unit titles list updated to reflect optional dairy engineering units	7
2.4 Aims of the Level 5 Higher National Diploma in Agriculture Addition of Dairy Engineering pathway	9
2.5 What could these qualifications lead to? Table updated to reflect Dairy Engineering pathway job roles	10

Summary of changes made between previous issue and this current issue	Page number
2.7 How Pearson BTEC Higher Nationals in Agriculture provide both transferable employability skills and academic study skills Correction. Changed word from moderated to verified	13
4.2 Programme Structures Addition of Dairy Engineering pathway unit structure table(s) New optional unit banks C and D created for Dairy Engineering pathways. These units are not available for other pathways. Existing optional banks have been labelled A and B to distinguish.	26-44
4.2.3 Units selected from the Pearson BTEC Higher Nationals in Engineering Addition of table detailing units which have been selected from the HN in Engineering and corresponding unit numbers	45
4.2.4 Meeting local needs and centre devised units Updated section and guidance Maximum number of imported credits by pathway table updated to reflect the inclusion of the new Dairy Engineering pathway	45-46
4.5 Recommended Level 4 and Level 5 Unit Combinations Table updated to reflect the addition of new engineering units	49
5.4.7 Assessment feedback Correction to term used from 'marking' to 'grading' and 'mark(s)' to 'grade(s)'	63
6.4 Planning and record keeping Removed requirement for spreadsheet only, as Programme Leaders must have assessment plans that can be in any appropriate format.	74
Unit 35: Electro, Pneumatic and Hydraulic Systems Unit added from the HN in Engineering to create the Dairy Engineering pathway	334-340
Unit 36: Engineering Maths Unit added from the HN in Engineering to create the Dairy Engineering pathway	341-346
Unit 37: Engineering Science Unit added from the HN in Engineering to create the Dairy Engineering pathway	347-352

Summary of changes made between previous issue and this current issue	Page number
Unit 38: Quality and Process Improvement Unit added from the HN in Engineering to create the Dairy Engineering pathway	353-359
Unit 39: Electrical and Electronic Principles Unit added from the HN in Engineering to create the Dairy Engineering pathway	360-366
Unit 40: Further Control Systems Engineering Unit added from the HN in Engineering to create the Dairy Engineering pathway	367-373
Unit 41: Further Mathematics Unit added from the HN in Engineering to create the Dairy Engineering pathway	374-380
Appendix 2: HNC/HND Agriculture Programme Outcomes for Students Table updated to reflect addition of HN in Engineering units	387-388
Appendix 5: Transferable skills mapping Table updated to reflect addition of HN in Engineering units	397-399

If you need further information on these changes or what they mean, contact us via our website at: qualifications.pearson.com/en/support/contact-us.html.

Contents

1 Introduction 1

1.1 The Student Voice 1

1.2 Why choose Pearson BTEC Higher Nationals? 1

1.3 HN Global 2

1.4 Qualification Titles 3

1.5 Qualification codes 3

1.6 Awarding institution 3

1.7 Key features 4

1.8 Collaborative development 5

2 Programming purpose and objectives 6

2.1 Purpose of the BTEC Higher Nationals in Agriculture 6

2.2 Objectives of the BTEC Higher Nationals in Agriculture 6

2.3 Aims of the Level 4 Higher National Certificate in Agriculture 7

2.4 Aims of the Level 5 Higher National Diploma in Agriculture 9

2.5 What could these qualifications lead to? 10

2.6 Use of Maths and English within the curriculum 13

2.7 How Pearson BTEC Higher Nationals in Agriculture provide both transferable employability skills and academic study skills 13

3 Planning your programme 16

3.1 Delivering the Higher Nationals in Agriculture 16

3.2 Entry requirements and admissions 16

3.3 Access to study 19

3.4 Student registration and entry 19

3.5 Access to assessments 20

3.6 Administrative arrangements for internal assessment 20

3.7 Dealing with malpractice in assessment 21

4 Programme structure 25

4.1 Units, credits, Total Qualification Time (TQT) and Guided Learning (GL) 25

4.2 Programme structures 26

4.2.1 Pearson BTEC Level 4 Higher National Certificate in Agriculture 27

4.2.2 Pearson BTEC Level 5 Higher National Diploma in Agriculture 35

4.2.3 Shared RQF units 45
4.2.4 Meeting local needs (MLN) 45
4.2.5 Pearson BTEC Higher National Commissioned Development 46
4.3 Pearson-set Assignments 47
4.4 Optional Units 48
4.5 Recommended Level 4 and Level 5 Unit Combinations 49
4.6 The Unit Descriptor 50
5 Teaching and learning 53
5.1 Delivering quality and depth 53
5.2 Engaging with employers 55
5.3 Engaging with students 55
5.4 Planning and structuring a programme 56
5.4.1 Sequencing units 57
5.4.2 Condensed and expanded delivery 57
5.4.3 Drawing on a wide range of delivery techniques 59
5.4.4 Assessment considerations 62
5.4.5 Formative assessment 62
5.4.6 Summative assessment 62
5.4.7 Assessment feedback 63
5.4.8 Designing valid and reliable assessments 63
6 Assessment 65
6.1 Principles of internal assessment 66
6.1.1 Assessment through assignments 66
6.1.2 Assessment decisions through applying unit-based criteria 67
6.1.3 The assessment team 67
6.1.4 Effective organisation 68
6.1.5 Student preparation 68
6.2 Setting effective assessments 69
6.2.1 Setting the number and structure of assignments 69
6.2.2 Providing an assignment brief 70
6.2.3 Forms of evidence 70

6.3 Making valid assessment decisions 72
6.3.1 Authenticity of student work 72
6.3.2 Making assessment decisions using criteria 72
6.3.3 Dealing with late completion of assignments 72
6.3.4 Issuing assessment decisions and feedback 73
6.3.5 Resubmission opportunity 73
6.3.6 Repeat Units 74
6.3.7 Assessment Boards 74
6.4 Planning and record keeping 74
6.5 Calculation of the final qualification grade 75
6.5.1 Conditions for the Award 75
6.5.2 Compensation Provisions 76
6.5.3 Calculation of the overall qualification grade 76
6.5.4 Modelled Student Outcomes 78

7 Quality assurance 79

7.1 The approval process 79
7.2 Monitoring of internal Centre systems 80
7.3 Independent assessment review 80
7.4 Annual Programme Monitoring Report (APMR) 80
7.5 Annual student survey 81
7.6 Centre and qualification approval 81
7.7 Continuing quality assurance and standards verification 81

8 Recognition of Prior Learning and attainment 83

9 Equality and diversity 84

10 Pearson BTEC Higher Nationals in Agriculture Units 86

Unit 1: Business and the Business Environment 87
Unit 2: Management Accounting 94
Unit 3: Managing a Successful Project (Pearson-set) 102
Unit 4: Principles of Livestock Production 110
Unit 5: Animal Health and Welfare 117
Unit 6: Animal Nutrition 125
Unit 7: Principles of Crop Production 134
Unit 8: Plant and Soil Science 141
Unit 9: Land-based Machinery and Technology 148

Unit 10: Rural Business Administration and Accounting 154
Unit 11: Human Resource Management 161
Unit 12: Marketing Essentials 169
Unit 13: Plant and Crop Nutrition 175
Unit 14: Animal Anatomy and Physiology 182
Unit 15: Animal Husbandry 191
Unit 16: Protective Crop Production 201
Unit 17: Teaching in a Specialist Subject 208
Unit 18: Advanced Financial Accounting 216
Unit 19: Research Project (Pearson-set) 222
Unit 20: Forage Production and Management 230
Unit 21: Animal Breeding and Genetics 237
Unit 22: Plant and Crop Health (Diseases, Pests and Weeds) 246
Unit 23: Plant Breeding and Genetics 255
Unit 24: Business Strategy 263
Unit 25: Diversification and Alternative Enterprises 269
Unit 26: Management of Land-based Machinery and Technology 275
Unit 27: Global Business Environment 283
Unit 28: Product and Service Development 290
Unit 29: Identifying Entrepreneurial Opportunities 297
Unit 30: Sustainable Practices 304
Unit 31: Environmental Management and Conservation 310
Unit 32: Woodland Management 315
Unit 33: Work Experience 321
Unit 34: Automation, Robotics and Programmable Logic Controllers (PLCs) 327
Unit 35: Electro, Pneumatic and Hydraulic Systems 334
Unit 36: Engineering Maths 341
Unit 37: Engineering Science 347
Unit 38: Quality and Process Improvement 353
Unit 39: Electrical and Electronic Principles 360
Unit 40: Further Control Systems Engineering 367
Unit 41: Further Mathematics 374

11 Appendices **381**

Appendix 1: Mapping of HND in Agriculture against FHEQ Level 5 382

Appendix 2: HNC/HND Agriculture Programme Outcomes for Students 387

Appendix 3: Glossary of terms used for internally assessed units 389

Appendix 4: Assessment methods and techniques for Higher Nationals 393

Appendix 5: Transferable skills mapping 397

Level 4 Higher National Certificate in Agriculture: mapping of transferable employability and academic study skills 397

Level 5 Higher National Diploma in Agriculture: mapping of transferable employability and academic study skills 399

1 Introduction

BTEC is one of the world's most recognised applied learning brands, engaging students in practical, interpersonal and thinking skills, for more than thirty years.

BTECs are work-related qualifications for students taking their first steps into employment, or for those already in employment and seeking career development opportunities. BTECs provide progression into the workplace either directly or via study at university and are also designed to meet employer's needs. Therefore, Pearson BTEC Higher National qualifications are widely recognised by industry and higher education as the principal vocational qualification at Levels 4 and 5.

When developing the Pearson BTEC Higher National qualifications in Agriculture, we collaborated with a wide range of students, employers, higher education providers, colleges and subject experts to ensure that the new qualifications meet their needs and expectations. We also worked closely with the relevant Professional Bodies, to ensure alignment with recognised professional standards.

There is now a greater emphasis on employer engagement and work readiness. The new BTEC Higher National qualifications in Agriculture are designed to reflect this increasing need for high quality professional and technical education pathways at Levels 4 and 5, thereby providing students with a clear line of sight to employment and to progression to a degree at Level 6.

1.1 The Student Voice

Students are at the heart of what we do. That is why, from the outset, we consulted with students in the development of these qualifications. We involved them in writing groups, sought their feedback, and added their voices and views to those of other stakeholders.

The result, we believe, are qualifications that will meet the needs and expectations of students worldwide.

1.2 Why choose Pearson BTEC Higher Nationals?

Pearson BTEC Higher Nationals are designed to help students secure the knowledge skills and behaviours needed to succeed in the workplace. They represent the latest in professional standards and provide opportunities for students to develop behaviours for work, for example by undertaking a group project, or responding to a client brief. A student may even achieve exemption from professional or vendor qualifications, or student membership of selected professional bodies, to help them on their journey to professional competence.

At the same time the BTEC Higher Nationals are intended to keep doors open for future study should a student wish to progress further in their education after their Level 5 study. They do this by allowing space for the development of higher education study skills, such as the ability to research. Clear alignment of level of demand with the Framework for Higher Education qualification descriptors at levels 4 and 5 means that students wishing to progress to Level 6 study should feel better prepared. The Pearson BTEC Higher Nationals address these various requirements by providing:

- A range of core, optional and specialist units, each with a clear purpose, so there is something to suit each student's choice of programme and future progression plans.
- Fully revised content that is closely aligned with the needs of employers, professional bodies, vendors and higher education for a skilled future workforce.
- 'The opportunity to develop transferable skills useful for work and for higher education, including research skills, the ability to meet deadlines and commutation skills.'
- Learning Outcomes mapped against Professional Body standards and vendor accreditation requirements, where appropriate.
- Assessments and projects chosen to help students progress to the next stage (this means some are set by the centre to meet local needs, while others are set by Pearson). Students are required to apply their knowledge to a variety of assignments and activities, with a focus on the holistic development of practical, interpersonal and higher level thinking skills.
- An approach to demand at level 4 and 5 which is aligned with the Framework for Higher Education Qualifications (FHEQ).
- Support for student and tutors including Schemes of Work and Example Assessment Briefs (EABs).

1.3 HN Global

Pearson BTEC Higher Nationals are supported by a specially designed range of digital resources, to ensure that tutors and students have the best possible experience during their course. These are available from the HN Global website (http://www.highernationals.com/).

With HN Global, tutors can access programme specifications which contain useful information on programme planning and quality assurance processes. Tutors can also view schemes of work and example assessment briefs, helping them create meaningful courses and assessments. HN Global also allows tutors to create and annotate reading lists for their students and also keep up-to-date on the latest news regarding HN programmes.

1.4 Qualification Titles

Pearson BTEC Level 4 Higher National Certificate in Agriculture

Pathways are included within brackets in the qualification title:

- Pearson BTEC Level 4 Higher National Certificate in Agriculture (Livestock Production)
- Pearson BTEC Level 4 Higher National Certificate in Agriculture (Crop Production)
- Pearson BTEC Level 4 Higher National Certificate in Agriculture (Rural Business Administration)
- Pearson BTEC Level 4 Higher National Certificate in Agriculture (Dairy Engineering)
- Pearson BTEC Level 4 Higher National Certificate in Agriculture (General)

Pearson BTEC Level 5 Higher National Diploma in Agriculture

Pathways are included within brackets in the qualification title:

- Pearson BTEC Level 5 Higher National Diploma in Agriculture (Livestock Production)
- Pearson BTEC Level 5 Higher National Diploma in Agriculture (Crop Production)
- Pearson BTEC Level 5 Higher National Diploma in Agriculture (Rural Business Administration)
- Pearson BTEC Level 5 Higher National Diploma in Agriculture (Dairy Engineering)
- Pearson BTEC Level 5 Higher National Diploma in Agriculture (General)

1.5 Qualification codes

Ofqual Regulated Qualifications Framework (RQF) Qualification numbers:

- 603/2794/7 Pearson BTEC Level 5 Higher National Diploma in Agriculture
- 603/2796/0 Pearson BTEC Level 4 Higher National Certificate in Agriculture

1.6 Awarding institution

Pearson Education Ltd.

1.7 Key features

Pearson BTEC Higher National qualifications in Agriculture offer:

- A stimulating and challenging programme of study that will be both engaging and memorable for students
- The essential subject knowledge that students need to progress successfully into further study or the world of work
- A simplified structure: students undertake a substantial core of learning in the Higher National Certificate and can build on this in the Higher National Diploma, with optional units linked to their specialist area of study
- Recommended optional unit groupings at Level 5 Diploma, so there is something to suit each student's preference of study and future progression plans
- Refreshed content that is closely aligned with Professional Body, employer and higher education needs
- Assessments that consider cognitive skills (what students know) along with affective and applied skills (respectively how they behave and what they can do)

Unit-specific grading and Pearson-set assignments

- A varied approach to assessment that supports progression to Level 6 and also allows Centres to offer assessment relevant to the local economy, thereby accommodating and enhancing different learning styles
- Quality Assurance measures – as outlined in *sections 6 and 7* of this Programme Specification – to ensure that all stakeholders (e.g. professional bodies, universities, colleges and students) can feel confident in the integrity and value of the qualifications
- A qualification designed to meet the needs and expectations of students aspiring to work in an international horticultural environment.

Qualification frameworks

Pearson BTEC Higher National qualifications are designated higher education qualifications in the UK. They are aligned to the Framework for Higher Education Qualifications (FHEQ) in England, Wales and Northern Ireland, and Quality Assurance Agency (QAA) Subject Benchmark Statements. These qualifications are part of the UK Regulated Qualifications Framework (RQF).

1.8 Collaborative development

Students completing their BTEC Higher Nationals in Agriculture will be aiming to go on to employment or progress to a final year at university. Therefore, it was essential that we developed these qualifications in close collaboration with experts from professional bodies and universities, and with the providers who will be delivering the qualifications.

We are very grateful to the university and further education tutors, employers, Professional Body representatives and other individuals who have generously shared their time and expertise to help us develop these new qualifications.

- Belfast Metropolitan College
- Dudley College
- Hartpury College (Associate Faculty of the University of the West of England)
- Kirkless College
- North Lindsey College
- North Shropshire College
- NPTC Group of Colleges
- Landex
- National Land-based College
- Wiltshire College and University Centre
- Farming Connect
- National Farmers Union (NFU)
- Royal College of Veterinary Surgeons (RCVS)
- Institute of Agricultural Secretaries and Administrators (IAgSA)

2 Programming purpose and objectives

2.1 Purpose of the BTEC Higher Nationals in Agriculture

The purpose of BTEC Higher Nationals in Agriculture is to develop students as professional, self-reflecting individuals able to meet the demands of employers in the Agriculture sector and adapt to a constantly changing world. The qualifications aim to widen access to higher education and enhance the career prospects of those who undertake them.

2.2 Objectives of the BTEC Higher Nationals in Agriculture

The objectives of the BTEC Higher Nationals in Agriculture are as follows:

- To equip students with Agricultural skills, knowledge and the understanding necessary to achieve high performance in the global agricultural environment.
- To provide education and training for a range of careers in Agriculture, including Agricultural Livestock Production, Agricultural Crop Production, Rural Business Administration, Dairy Engineering and Agricultural Management.
- To provide insight and understanding into the diversity of roles within Agriculture, recognising the importance of collaboration at all levels.
- To equip students with knowledge and understanding of culturally diverse organisations, cross-cultural issues, diversity and values.
- To provide opportunities for students to enter or progress in employment in Agriculture, or progress to higher education qualifications such as an Honours degree in Agriculture, Agricultural Livestock Production, Agricultural Crop Production, Rural Business Administration, Agricultural Management or a related area.
- To provide opportunities for students to develop the skills, techniques and personal attributes essential for successful working lives.
- To support students to understand the local, regional and global context of Agriculture and, for those students with a global outlook, to aspire to international career pathways.
- To provide students with opportunities to address contemporary issues facing the industry, and society at large; with particular emphasis on sustainability and the environment, recognising the role that Agriculture plays in addressing these issues.
- To provide opportunities for students to achieve a nationally-recognised professional qualification within their chosen area of specialisation.
- To provide opportunities for students to achieve certifications.

- To offer students the chance of career progression in their chosen field, with particular emphasis on achieving management-level positions, professional recognition and beyond.
- To allow flexibility of study and to meet local or specialist needs.
- To offer a balance between employability skills and the knowledge essential for students with entrepreneurial, employment or academic aspirations.
- To provide students with opportunities to engage in an industry-recognised apprenticeship scheme that aligns with their employer's needs and their own career aspirations.
- To provide students with the context in which to consider professional ethics and their relation to personal, professional and statutory responsibilities within the industry.

We meet these objectives by:

- Providing a thorough grounding in agricultural principles that leads the student to a range of specialist progression pathways relating to individual professions within the sector.
- Equipping individuals with commercial acumen, understanding and agricultural skills for success in a range of the roles in this sector.
- Enabling progression to a university degree by supporting the development of appropriate academic study skills.
- Enabling progression to further professional qualifications in specific agricultural areas by mapping to units in a range of professional qualifications.

Who is this qualification for?

The BTEC Higher National qualifications in Agriculture are aimed at students wanting to continue their education through applied learning. Higher Nationals provide a wide-ranging study of Agriculture and are designed for students who wish to pursue or advance their career in an aspect of Agriculture. In addition to the knowledge, understanding and skills that underpin the study of Agriculture, Pearson BTEC Higher Nationals in Agriculture give students experience of the breadth and depth of the sector that will prepare them for further study or training.

2.3 Aims of the Level 4 Higher National Certificate in Agriculture

The Level 4 Higher National Certificate in Agriculture offers students a broad introduction to the subject area via a mandatory core of learning, while allowing for the acquisition of skills and experience through the selection of specialist and optional units across a range of occupational sectors at Level 4. This effectively builds underpinning core skills while preparing the student for progression onto Level 5. Students will gain a wide range of sector knowledge tied to practical skills gained in research, self-study, directed study and workplace scenarios.

At Level 4 students develop a broad knowledge and awareness of key aspects of Agriculture through three core units, which include one unit assessed by a Pearson-set assignment. The units are:

- Business and Business Environment
- Management Accounting
- Managing a Successful Project (Pearson-set unit).

There is a 'general pathway' and four 'specialist pathways'. Depending on the 'specialist pathway', at Level 4, students will undertake a further three specialist units (related to their Level 4 Pathway) from:

Pathway	**Specialist Units**
General	There are no specialist units identified
Livestock Production	• Principles of Livestock Production • Animal Health and Welfare • Animal Nutrition
Crop Production	• Principles of Crop Production • Plant and Soil Science • Land-based Machinery and Technology
Rural Business Administration	• Rural Business Administration and Accounting • Human Resource Management • Marketing Essentials
Dairy Engineering	• Land-based Machinery and Technology • Automation, Robotics and Programmable Logic Controllers (PLCs) • Electro, Pneumatic and Hydraulic Systems

If the 'general pathway' is chosen then five further optional units will need to be identified at Level 4. If a 'specialist pathway' is chosen then two further optional units at Level 4 will need to be identified from the following:

*Specialist units (above) are also available as optional units.

- *Principles of Livestock Production
- *Animal Health and Welfare
- *Animal Nutrition
- *Principles of Crop Production

- *Plant and Soil Science
- *Land-based Machinery and Technology
- *Rural Business Administration and Accounting
- *Human Resource Management
- *Marketing Essentials
- *Automation, Robotics and Programmable Logic Controllers (PLCs)
- *Electro, Pneumatic and Hydraulic Systems
- Plant and Crop Nutrition
- Animal Anatomy and Physiology
- Animal Husbandry
- Protective Crop Production
- Teaching in a Specialist Subject
- Engineering Maths
- Engineering Science
- Quality and Process Improvement
- Electrical and Electronic Principles

Graduates successfully completing the Higher National Certificate will be able to demonstrate a sound knowledge of the basic concepts of Agriculture. They will be able to communicate accurately and appropriately and they will have the qualities needed for employment that requires some degree of personal responsibility. They will have developed a range of transferable skills to ensure effective team working, independent initiatives, organisational competence and problem-solving strategies. They will be adaptable and flexible in their approach to Agriculture, show resilience under pressure, and meet challenging targets within a given resource. They will be adaptable and flexible in their approach to Agriculture, show resilience under pressure, and meet challenging targets within a given resource.

2.4 Aims of the Level 5 Higher National Diploma in Agriculture

The Level 5 Higher National Diploma in Agriculture enables students to continue on their chosen pathway, whether this is the 'general pathway' or the four 'specialist pathways' designed to support progression into relevant occupational areas or on to degree-level study. These pathways are linked to Professional Body standards (where appropriate) and can provide professional status and progression to direct employment.

The Level 5 Higher National Diploma continues to offer the following specialist pathways for students who wish to concentrate on a particular aspect of Agriculture:

- Agricultural Livestock Production
- Agricultural Crop Production
- Rural Business Administration
- Dairy Engineering

The non-specialist 'General Agricultural pathway', allows students to complete a Level 5 Higher National Diploma without committing to a particular professional specialism. This offers additional flexibility to providers and students.

Students will typically progress from Level 4 to Level 5 within the same specialist pathway. (See section 4.1 for information about units and progression). Where students may wish to change pathway when progressing from Level 4 to Level 5, Centres may undertake a mapping of Recognised Prior Learning (RPL) to determine whether the student has sufficient knowledge and experience to be a suitable candidate for the Level 5 subject of study. (See section 8 Recognition of Prior Learning and Attainment.)

Holders of the Level 5 Higher National Diploma will have developed a sound understanding of the principles in their field of study and will have learned to apply those principles more widely. They will have learned to evaluate the appropriateness of different approaches to solving problems. They will be able to perform effectively in their chosen field and will have the qualities necessary for employment in situations requiring the exercise of personal responsibility and decision-making.

2.5 What could these qualifications lead to?

The Level 4 Higher National Certificate provides a solid grounding in Agriculture, which students can build on should they decide to continue their studies beyond the Certificate stage. The Level 5 Higher National Diploma allows students to specialise by committing to specific career paths and progression routes to degree-level study.

On successful completion of the Level 5 Higher National Diploma, students can develop their careers in the agricultural sector through:

- Entering employment
- Continuing existing employment
- Linking with the appropriate Professional Body
- Linking with the appropriate certificates
- Committing to Continuing Professional Development (CPD)
- Progressing to university.

2.5.1 Progression to university

The Level 5 Higher National Diploma is recognised by Higher Education providers as meeting admission requirements to many relevant agricultural-related courses, for example:

- BSc (Hons) in Agriculture
- BSc (Hons) in Agricultural Management
- BSc (Hons) in Agricultural Business Management
- BSc (Hons) in Agriculture (Animal Science)
- BSc (Hons) in Agriculture (Crop Science)

Students should always check the entry requirements for degree programmes at specific Higher Education providers. After completing a BTEC Higher National Certificate or Diploma, students can also progress directly into employment.

University recognition and articulations

We work with a range of higher education institutions around the world that recognise and accept BTEC Higher Nationals as a qualification for entry onto an undergraduate degree. Many universities allow advanced entry onto the second or third year of a degree, and agreements can include credit transfer, articulation and case-by-case admission. Students should be aware that university admission criteria are always subject to change and remain at the discretion of the institution. Students should take time to understand the course entry requirements for subject, year and grade before applying.

For more information on entry requirements, including 2+1 articulations, please visit: https://www.highernationals.com/degree-finder.

2.5.2 Employment

The skills offered as part of the Pearson BTEC Higher National Diploma can provide graduates with the opportunity to work in many different areas of the agricultural sector. Below are some examples of job roles each qualification could lead to.

Pathway	Job Roles
General	Farm Enterprise Manager Farm and Estate Manager Self Employed Contractor Animal Health Officer Retail Supervisor Feed Nutritionist

Pathway	Job Roles
	Sales Representative Agriculture Instructure Agriculture Lecturer
Livestock Production	Farm Enterprise Manager (Dairy, Sheep, Beef, Pigs, Poultry) Farm and Estates Manager Self Employed Contractor Animal Health Officer Retail Supervisor Agricultural Livestock Instructure Laboratory Technician Research Officer Feed Nutritionist Sales Representative Agriculture Livestock Lecturer
Crop Production	Farm Enterprise Manager (Combinable Crops, Root, Vegetables, etc.) Crop Technician Farm and Estates Manager Self Employed Contractor Retail Supervisor Agricultural Crop / Mechanisation Instructure Research Officer Sales Representative Agriculture Crop / Mechanisation Lecturer
Rural Business Administration	Farm Secretary Self Employed Farm Accounts Administrator Farm Enterprise manager Allied Services Administrator Rural Events Coordinator Promotions and Marketing Supervisor

Pathway	Job Roles
	Human Resource Supervisor Retail Supervisor Sales Representative Agriculture Lecturer
Dairy Engineering	Dairy Engineer Engineering Technician Self Employed Contractor

2.6 Use of Maths and English within the curriculum

Those working within the agricultural sector cannot just rely on their technical skills and must ensure they develop all relevant employability skills to increase employment opportunities. For example, they will be required to communicate appropriately with stakeholders throughout their career, so the ability to use maths and English in a professional context is an essential employability skill that must be developed at all levels of study.

Development of essential maths and English skills are embedded throughout these qualifications in accordance with industry requirements and below are some examples of how these skills are developed in the BTEC Higher National curriculum:

- Written reports
- Formal presentations
- Informal conversations
- Use of professional, sector specific language

Some aspects of Agriculture require high level maths skills and we strongly recommend all students complete diagnostic maths assessments preferably before beginning a Higher National course, as well as having an A* to C grade and/or 9 to 4 in GCSE Maths, prior to starting the course (see Entry requirements in section 3.2 of this specification).

2.7 How Pearson BTEC Higher Nationals in Agriculture provide both transferable employability skills and academic study skills

Students need both relevant qualifications and employability skills to enhance their career prospects and contribute to their personal development. Pearson Higher National Agricultural qualifications embed throughout the programme the development of key skills, attributes and strengths required by 21st century employers.

Where employability skills are referred to in this specification, this generally refers to skills in five main categories:

- **Cognitive and problem**-solving skills: critical thinking, approaching non-routine problems by applying expert and creative solutions, use of systems and digital technology, generating and communicating ideas creatively.
- **Intra-personal skills**: self-management, adaptability and resilience, self-monitoring and self-development, self-analysis and reflection, planning and prioritising.
- **Interpersonal skills**: effective communication and articulation of information, working collaboratively, negotiating and influencing, self-presentation.
- **Commercial skills**: sector awareness; sales; marketing/promotion; budget management/monitoring;
- **Business skills**: awareness of types of companies, company formation, invoicing, calculating fees, business management.

Pearson Example Assessment Briefs (EABs) make recommendations for a range of real or simulated assessment activities, for example, group work where appropriate, to encourage development of collaborative and interpersonal skills or a solution focused case study to provide the opportunity to develop cognitive skills. There are specific requirements for the assessment of these skills, as relevant, within the assessment grids for each unit. Example Assessment Briefs are for guidance and support only and **must** be customised and amended according to localised needs and requirements. All assignments must still be verified as per the internal verification process.

Students can also benefit from opportunities for deeper learning, where they are able to make connections between units and select areas of interest for detailed study. In this way BTEC Higher Nationals provide a vocational context in which students can develop the knowledge and academic study skills required for progression to university degree courses, including:

- Active research skills
- Effective writing skills
- Analytical skills
- Critical thinking
- Creative problem-solving
- Decision-making
- Team building
- Exam preparation skills
- Digital literacy
- Competence in assessment methods used in higher education.

To support you in developing these skills in your students, we have developed a map of Higher Education relevant transferable and academic study skills, available in appendices.

3 Planning your programme

3.1 Delivering the Higher Nationals in Agriculture

You play a central role in helping your students to choose the right BTEC Higher National qualification.

You should assess your students very carefully to ensure that they take the right qualification and the right pathways or optional units, to allow them to progress to the next stage. You should check the qualification structures and unit combinations carefully when advising students.

You will need to ensure that your students have access to a full range of information, advice and guidance in order to support them in making the necessary qualification and unit choices. When students are recruited, you need to give them accurate information on the title and focus of the qualification for which they are studying.

3.2 Entry requirements and admissions

Although Pearson do not specify formal entry requirements, as a centre it is your responsibility to ensure that the students you recruit have a reasonable expectation of success on the programme.

For students who have recently been in education, the entry profile is likely to include one of the following:

- A BTEC Level 3 qualification in Agriculture
- A GCE Advanced Level profile that demonstrates strong performance in a relevant subject or adequate performance in more than one GCE subject. This profile is likely to be supported by GCSE grades A* to C (or equivalent), and/or 9 to 4 (or equivalent) in subjects such as maths and English
- Other related Level 3 qualifications
- An Access to Higher Education Diploma awarded by an approved further education institution
- Related work experience
- An international equivalent of the above.

Centres may wish to consider applicants' prior learning when considering their acceptance on a BTEC Higher Nationals, through Recognition of Prior Learning. (For further information please refer to *section 8* of this document.)

3.2.1 English language requirements

Pearson's mission is to help people make more of their lives through learning. In order for students to be successful on Pearson BTEC Higher National qualifications which are **both** taught and assessed in English, it is critical that they have an appropriate level of English language skills.

The following clarifies the requirements for all centres when recruiting applicants on to new Pearson BTEC Higher National qualifications.

All centres delivering the new Pearson BTEC Higher National qualifications must ensure that all students who are non-native English speakers and who have not undertaken their final two years of schooling in English, can demonstrate capability in English at a standard equivalent to the levels identified below, before being recruited to the programme **where the programme is both taught and assessed in English**:

- Common European Framework of Reference (CEFR) level B2
- PTE **51**
- IELTS **5.5**; Reading and Writing must be at **5.5**
- or equivalent.

It is up to the centre to decide what proof will be necessary to evidence individual student proficiency.

The following clarifies the requirements for all centres when recruiting applicants on to new Pearson BTEC Higher National qualifications which are taught in a language other than English, but are assessed in English.

All centres delivering the new Pearson BTEC Higher National qualifications **wholly or partially** in a language other than English, but who are assessed in English, must ensure that all students can demonstrate capability in English at a standard equivalent to the levels identified below, on completion of the programme:

- Common European Framework of Reference (CEFR) level B2
- PTE **51**
- IELTS **5.5;** Reading and Writing must be at **5.5**
- or equivalent.

It is up to the centre to decide what proof will be necessary to evidence individual student proficiency.

3.2.2 Centre approval

To ensure that centres are ready to assess students and that we can provide the support that is needed all centres must be approved before they can offer these qualifications. For more information about becoming a centre and seeking approval to run our qualifications please visit the support section on our website (http://qualifications.pearson.com/).

3.2.3 Level of sector knowledge required

We do not set any requirements for tutors, but we do recommend that centres assess the overall skills and knowledge of the teaching team, which should be relevant, up to date and at the appropriate level.

3.2.4 Resources required

As part of your centre approval, you will need to show that the necessary material resources and work spaces are available to deliver BTEC Higher Nationals. For some units, specific resources are required, this is clearly indicated in the unit descriptors.

3.2.5 HN Global support

HN Global is an online resource that supports centre planning and delivery of BTEC Higher Nationals by providing appropriate teaching and learning resources. For further information see Sections 5 and 6 of this Programme Specification.

3.2.6 Modes of delivery

Subject to approval by Pearson, centres are free to deliver BTEC Higher Nationals using modes of delivery that meet the needs of their students. We recommend making use of a wide variety of modes, including:

- Full-time
- Part-time
- Blended learning.

3.2.7 Recommendations for employer engagement

BTEC Higher Nationals are vocational qualifications and as an approved centre you are encouraged to work with employers on the design, delivery and assessment of the course. This will ensure that students enjoy a programme of study that is engaging and relevant, and which equips them for progression. There are suggestions in section 5.2 about how employers could become involved in delivery and/or assessment, but these are not intended to be exhaustive and there will be other possibilities at a local level.

3.2.8 Support from Pearson

We provide a range of support materials, including Schemes of Work and suggested assignments, with supporting templates. You will be allocated an External Examiner early in the planning stage, to support you with planning your assessments, and there will be training events and support from our Subject Leads.

3.2.9 Student employability

All BTEC Higher Nationals have been designed and developed with consideration of National Occupational Standards, where relevant.

Employability skills such as team working and entrepreneurialism as well as practical hands-on skills have been built into the design of the learning aims and content. This gives you the opportunity to use relevant contexts, scenarios and materials to enable students to develop a portfolio of evidence demonstrating the breadth of their skills and knowledge in a way that equips them for employment.

3.3 Access to study

This section focuses on the administrative requirements for delivering a BTEC Higher National qualification. It will be of value to Quality Nominees, Programme Leaders and Examinations Officers.

Our policy regarding access to our qualifications is that:

- They should be available to everyone who is capable of reaching the required standards.
- They should be free from any barriers that restrict access and progression.

There should be equal opportunities for all those wishing to access the qualifications. We refer Centres to our Pearson Equality and Diversity Policy, which can be found in the support section of our website (http://qualifications.pearson.com/).

Centres are required to recruit students to Higher National programmes with integrity. They will need to make sure that applicants have relevant information and advice about the qualification, to make sure it meets their needs. Centres should review the applicant's prior qualifications and/or experience to consider whether this profile shows that they have the potential to achieve the qualification. For students with disabilities and specific needs, this review will need to take account of the support available to the student during the teaching and assessment of the qualification. For further guidance and advice please refer to *Section 9* on reasonable adjustments.

3.4 Student registration and entry

All students should be registered for the qualification, and appropriate arrangements made for internal and external verification. For information on making registrations for the qualification, you will need to refer to the information manual available in the support section of our website (http://qualifications.pearson.com/).

Students can be formally assessed only for a qualification on which they are registered. If students' intended qualifications change (for example, if a student decides to choose a different specialist pathway), then the centre must transfer the student to the chosen pathway appropriately. Please note that student work cannot be sampled if the student is not registered or is registered on an incorrect pathway.

3.5 Access to assessments

Assessments need to be administered carefully, to ensure that all students are treated fairly, and that results and certification are issued on time, allowing students to move on to chosen progression opportunities.

Our equality policy requires that all students should have equal opportunity to access our qualifications and assessments, and that our qualifications are awarded in a way that is fair to every student. We are committed to making sure that:

- Students with a protected characteristic (as defined in legislation) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic.
- All students achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Further information on access arrangements can be found on the Joint Council for Qualifications website (http://www.jcq.org.uk/).

3.6 Administrative arrangements for internal assessment

3.6.1 Records

You are required to retain records of assessment for each student. Records should include assessments taken, decisions reached and any adjustments or appeals. Further information on quality and assessment can be found in our UK and international guides available in the support section on our website (http://qualifications.pearson.com/). We may ask to audit your records, so they must be retained as specified. All student work must be retained for **a minimum of 12 weeks** after certification has taken place.

3.6.2 Reasonable adjustments to assessment

A reasonable adjustment is one that is made before a student takes an assessment, to ensure that he or she has fair access to demonstrate the requirements of the assessments.

You are able to make adjustments to internal assessments to take account of the needs of individual students. In most cases this can be achieved through a defined time extension or by adjusting the format of evidence. We can advise you if you are uncertain as to whether an adjustment is fair and reasonable. You need to plan for time to make adjustments, if necessary.

Further details on how to make adjustments for students with protected characteristics are available on the support section of our website (http://qualifications.pearson.com/).

3.6.3 Special consideration

Special consideration is given after an assessment has taken place for students who have been affected by adverse circumstances, such as illness, and require an adjustment of grade to reflect normal level of attainment. You must operate special consideration in line with Pearson policy (see previous paragraph). You can provide special consideration related to the period of time given for evidence to be provided, or for the format of the assessment (if it is equally valid). You may not substitute alternative forms of evidence to that required in a unit, or omit the application of any assessment criteria to judge attainment. Pearson can consider applications for special consideration in line with the policy, which can be found in the document linked above.

Please note that your centre must have a policy for dealing with mitigating circumstances if students are affected by adverse circumstances, such as illness, which result in non-submission or late submission of assessment.

3.6.4 Appeals against assessment

Your centre must have a policy for dealing with appeals from students. These appeals may relate to assessment decisions being incorrect or assessment not being conducted fairly. The first step in such a policy could be a consideration of the evidence by a Programme Leader or other member of the programme team. The assessment plan should allow time for potential appeals after assessment decisions have been given to students. If there is an appeal by a student, you must document the appeal and its resolution. Students have a final right of appeal to Pearson, but only if the procedures that you have put in place have been followed.

Further details of our policy on enquiries and appeals is available on the support section of our website (http://qualifications.pearson.com/).

If your centre is located in England or Wales and the student is still dissatisfied with the final outcome of their appeal s/he can make a further appeal to the Office of the Independent Adjudicator (OIA) by emailing: enquiries@oiahe.org.uk. In Northern Ireland a further appeal may be lodged with the Northern Ireland Public Service Ombudsman (NIPSO) by emailing: nipso@nipso.org.uk.

3.7 Dealing with malpractice in assessment

'Malpractice' means acts that undermine the integrity and validity of assessment, the certification of qualifications, and/or that may damage the authority of those responsible for delivering the assessment and certification. Malpractice may arise, or be suspected, in relation to any unit or type of assessment within the qualification.

Pearson does not tolerate actions (or attempted actions) of malpractice by students, centre staff or centres in connection with Pearson qualifications. Pearson may impose penalties and/or sanctions on students, centre staff or centres where incidents (or attempted incidents) of malpractice have been proven.

Further details regarding malpractice and advice on preventing malpractice by students, can be found in the support section of our website (http://qualifications.pearson.com/).

In the interests of students and centre staff, centres need to respond effectively and openly to all requests relating to an investigation into an incident of suspected malpractice. The procedures we ask you to adopt when tackling malpractice vary between units that are internally assessed and those that are externally assessed.

3.7.1 Internally assessed units

Centres are required to take steps to prevent malpractice and to investigate instances of suspected malpractice. Students must be given information that explains what malpractice is for internal assessment and how suspected incidents will be dealt with by the centre. Full information on dealing with malpractice and the actions we expect you to take is available on the support section of our website (http://qualifications.pearson.com/).

Pearson may conduct investigations if it is believed that a centre is failing to conduct internal assessment according to Pearson policies. The above document gives further information, provides examples, and details the penalties and sanctions that may be imposed.

3.7.2 Student malpractice

Heads of centres are required to report incidents of any suspected student malpractice that occur during Pearson external assessments. We ask that centres do so by completing JCQ Form M1 from the Joint Council for Qualifications website (http://www.jcq.org.uk/) and emailing it, along with any accompanying documents, (signed statements from the student, invigilator, copies of evidence, etc.), to the Investigations Team at **pqsmalpractice@pearson.com**. The responsibility for determining appropriate sanctions or penalties to be imposed on students lies with Pearson.

Students must be informed at the earliest opportunity of the specific allegation and the centre's malpractice policy, including the right of appeal. Students found guilty of malpractice may be disqualified from the qualification for which they have been entered with Pearson.

3.7.3 Staff and centre malpractice

Staff and centre malpractice includes both deliberate malpractice and maladministration of our qualifications. As with candidate malpractice, staff and centre malpractice is any act that compromises or seeks to compromise the process of assessment or which undermines the integrity of the qualifications or the validity of results/certificates.

Heads of centres are required to inform Pearson's Investigations Team of any incident of suspected malpractice by centre staff, before any investigation is undertaken. All

cases of suspected staff malpractice and maladministration must be reported immediately, before any investigation is undertaken by the centre, to Pearson on a JCQ Form M2(a) (available at www.jcq.org.uk/exams-office/malpractice). The form, supporting documentation and as much information as possible should be emailed to pqsmalpractice@pearson.com

Note that the final decision regarding appropriate sanctions lies with Pearson. Failure to report malpractice itself constitutes malpractice.

More-detailed guidance on malpractice can be found in the latest version of the document Suspected Malpractice in Examinations and Assessments, available at www.jcq.org.uk/exams-office/malpractice

Where Pearson receives allegations of malpractice from other sources (for example, Pearson staff or anonymous informants), the Investigations Team will conduct the investigation directly or may ask the head of centre to assist.

Incidents of maladministration (accidental errors in the delivery of Pearson qualifications that may affect the assessment of students) should also be reported to the Investigations Team, using the same method.

Heads of centres/Principals/Chief Executive Officers or their nominees are required to inform students and centre staff suspected of malpractice of their responsibilities and rights; see 6.15 of JCQ Suspected Malpractice in Examinations and Assessments Policies and Procedures (www.jcq.org.uk).

Pearson reserves the right in cases of suspected malpractice to withhold the issue of results and/or certificates while an investigation is in progress. Depending on the outcome of the investigation, results and/or certificates may be released or withheld. We reserve the right to withhold certification when undertaking investigations, audits and quality assurances processes. You will be notified within a reasonable period of time if this occurs.

3.7.4 Sanctions and appeals

Wherever malpractice is proven, we may impose sanctions or penalties. Where student malpractice is evidenced, penalties may be imposed such as:

- Disqualification from the qualification
- Being barred from registration for Pearson qualifications for a specified period of time.

If we are concerned about your centre's quality procedures, we may impose sanctions such as:

- Working with you to create an improvement action plan
- Requiring staff members to receive further training
- Placing temporary blocks on your certificates
- Placing temporary blocks on registrations of students

- Debarring staff members or the centre from delivering Pearson qualifications
- Suspending or withdrawing centre approval status.

Your centre will be notified if any of these apply.

Pearson has established procedures for centres that are considering appeals against penalties and sanctions arising from malpractice. Appeals against a decision made by Pearson will normally be accepted only from heads of centres (on behalf of students and/or members or staff) and from individual members (in respect of a decision taken against them personally). Further information on appeals can be found in our Enquiries and Appeals Policy available in the support section on our website (http://qualifications.pearson.com/).

In the initial stage of any aspect of malpractice, please notify the Investigations Team by email (**pqsmalpractice@pearson.com**), who will inform you of the next steps.

4 Programme structure

4.1 Units, credits, Total Qualification Time (TQT) and Guided Learning (GL)

The Higher National Certificate (HNC) is a Level 4 qualification made up of 120 credits. It is usually studied full-time over one year, or part-time over two years.

The Higher National Diploma (HND) is a Level 4 and Level 5 qualification made up of 240 credits. It is usually studied full-time over two years, or part-time over four years.

Pearson would expect that an HND student would have achieved at least 90 credits at Level 4 before progressing to Level 5 units. This allows for the students to submit the remaining 30 credits at Level 4 while undertaking their Level 5 study.

Students undertaking an HND who fail to successfully complete the full qualification may be awarded an HNC, if their credit achievement permits.

BTEC Higher Nationals consist of core units, specialist units and optional units:

- Core units are mandatory
- Specialist units are designed to provide a specific occupational focus to the qualification and are aligned to Professional Body standards
- Required combinations of optional units are clearly set out in the tables below.

All units are usually 15 credits in value, or a multiple thereof. These units have been designed from a learning time perspective, and are expressed in terms of **Total Qualification Time (TQT)**. TQT is an estimate of the total amount of time that could reasonably be expected to be required for a student to achieve and demonstrate the achievement of the level of attainment necessary for the award of a qualification. TQT includes undertaking each of the activities of Guided Learning, Directed Learning and Invigilated Assessment. Each 15-credit unit approximates to a Total Unit Time of 150 hours and 60 hours of Guided Learning.

Total Qualification Time (TQT) Higher National Certificate (HNC) = 1,200 hours

Total Qualification Time (TQT) Higher National Diploma (HND) = 2,400 hours

Examples of activities which can contribute to Total Qualification Time include:

- Guided Learning
- Independent and unsupervised research/learning
- Unsupervised compilation of a portfolio of work experience
- Unsupervised e-learning
- Unsupervised e-assessment

- Unsupervised coursework
- Watching a pre-recorded podcast or webinar
- Unsupervised work-based learning.

Guided Learning (GL) is defined as the time when a tutor is present to give specific guidance towards the learning aim being studied on a programme. This definition includes lectures, tutorials and supervised study in, for example, open learning centres and learning workshops. Guided Learning includes any supervised assessment activity; this includes invigilated examination and observed assessment and observed work-based practice.

Total Guided Learning (GL) Higher National Certificate (HNC) = 480 hours

Total Guided Learning (GL) Higher National Diploma (HND) = 960 hours

Some examples of activities which can contribute to Guided Learning include:

- Classroom-based learning supervised by a tutor
- Work-based learning supervised by a tutor
- Live webinar or telephone tutorial with a tutor in real time
- E-learning supervised by a tutor in real time
- All forms of assessment which take place under the immediate guidance or supervision of a tutor or other appropriate provider of education or training, including where the assessment is competence-based and may be turned into a learning opportunity.

4.2 Programme structures

The programme structures specify:

- The total credit value of the qualification
- The minimum credit to be achieved at the level of the qualification
- The core units
- The specialist units
- The optional units
- The maximum credit value in units that can be centre commissioned.

When combining units for a Pearson Higher National qualification, it is the centre's responsibility to make sure that the correct combinations are followed.

4.2.1 Pearson BTEC Level 4 Higher National Certificate in Agriculture

- Qualification credit value: a minimum of 120 credits. This is made up of eight units, each with a value of 15 credits.
- **Total Qualification Time (TQT)** Higher National Certificate (HNC) = 1,200 hours
- **Total Guided Learning (GL)** Higher National Certificate (HNC) = 480 hours
- There is a required mix of Core, Specialist and Optional units totalling 120 credits. All units are at Level 4.
- In some cases a maximum of 30 credits from a Higher National qualification may be from units designed by the Centre and approved by Pearson. Core units may **not** be substituted and are **mandatory**. For more information please refer to Higher National Commissioned Qualifications.
- Please note that some Specialist units are available as Optional units and some Optional units are available as Specialist units.

Pearson BTEC Level 4 Higher National Certificate in Agriculture (General)		Unit credit	Level
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway.			

Pearson BTEC Level 4 Higher National Certificate in Agriculture (Livestock Production)		Unit credit	Level
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Specialist Unit	**4 *Principles of Livestock Production**	15	4
Specialist Unit	**5 *Animal Health and Welfare**	15	4
Specialist Unit	**6 *Animal Nutrition**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4

Pearson BTEC Level 4 Higher National Certificate in Agriculture (Crop Production)		Unit credit	Level
Level 4 Units:			
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Specialist Unit	**7 *Principles of Crop Production**	15	4
Specialist Unit	**8 *Plant and Soil Science**	15	4
Specialist Unit	**9 *Land-based Machinery and Technology**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4

Pearson BTEC Level 4 Higher National Certificate in Agriculture (Rural Business Administration)		Unit credit	Level
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Specialist Unit	**10 *Rural Business Administration and Accounting**	15	4
Specialist Unit	**11 *Human Resource Management**	15	4
Specialist Unit	**12 *Marketing Essentials**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4

Optional unit Bank A (for preceding pathways)		Unit credit	Level
Optional Level 4 units:			
Optional Unit	**4 *Principles of Livestock Production**	15	4
Optional Unit	**5 *Animal Health and Welfare**	15	4
Optional Unit	**6 *Animal Nutrition**	15	4
Optional Unit	**7 *Principles of Crop Production**	15	4
Optional Unit	**8 *Plant and Soil Science**	15	4
Optional Unit	**9 *Land-based Machinery and Technology**	15	4
Optional Unit	**10 *Rural Business Administration and Accounting**	15	4
Optional Unit	**11 *Human Resource Management**	15	4
Optional Unit	**12 *Marketing Essentials**	15	4
Optional Unit	**13 Plant and Crop Nutrition**	15	4
Optional Unit	**14 Animal Anatomy and Physiology**	15	4
Optional Unit	**15 Animal Husbandry**	15	4
Optional Unit	**16 Protective Crop Production**	15	4
Optional Unit	**17 Teaching in a Specialist Subject**	15	4

*specialist units also available as an optional unit

Pearson BTEC Level 4 Higher National Certificate in Agriculture (Dairy Engineering)		Unit credit	Level
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson- set)**	15	4
Specialist Unit	**9 Land-based Machinery and Technology**	15	4
Specialist Unit	**34 Automation, Robotics and Programmable Logic Controllers (PLCs)**	15	4
Specialist Unit	**35 Electro, Pneumatic and Hydraulic Systems**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank C)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank C)**	15	4
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway. Specialist units 7 and 8 are not available for this pathway.			

Optional unit Bank C (for Dairy Engineering)		Unit credit	Level
Optional Level 4 units:			
Optional Unit	**4 *Principles of Livestock Production**	15	4
Optional Unit	**5 *Animal Health and Welfare**	15	4
Optional Unit	**6 *Animal Nutrition**	15	4
Optional Unit	**10 *Rural Business Administration and Accounting**	15	4
Optional Unit	**11 *Human Resource Management**	15	4
Optional Unit	**12 *Marketing Essentials**	15	4
Optional Unit	**13 Plant and Crop Nutrition**	15	4
Optional Unit	**14 Animal Anatomy and Physiology**	15	4
Optional Unit	**15 Animal Husbandry**	15	4
Optional Unit	**16 Protective Crop Production**	15	4
Optional Unit	**17 Teaching in a Specialist Subject**	15	4
Optional Unit	**36 Engineering Maths**	15	4
Optional Unit	**37 Engineering Science**	15	4
Optional Unit	**38 Quality and Process Improvement**	15	4
Optional Unit	**39 Electrical and Electronic Principles**	15	4

4.2.2 Pearson BTEC Level 5 Higher National Diploma in Agriculture

The Level 5 Higher National Diploma consists of the appropriate Level 4 Higher National Certificate (above) plus an additional 120 credits at Level 5 delivered via the following pathways:

- Agriculture (General)
- Livestock Production
- Crop Production
- Rural Business Administration
- Dairy Engineering

Students will typically progress within the pathways. Where a Centre may allow students to change pathways, from Level 4 to Level 5, they must undertake a suitable mapping of recognition of prior learning (RPL) in support of any potential review by an External Examiner.

Qualification credit value: a minimum of 240 credits, of which 120 credits are at Level 5, and 120 credits are at Level 4 and usually attained via the HNC.

There is a required mix of core, specialist and optional units totalling 240 credits. The Core units required for each Level 5 specialist pathway (in addition to the specialist units) are Advanced Financial Accounting, which is weighted at 15 credits, and Research Project (Pearson Set), weighted at 30 credits.

The requirements of the Higher National Certificate (or equivalent) have to be met. In some cases a maximum of 60 credits can be imported from another RQF Pearson BTEC Higher National qualification and/or from units designed by the Centre and approved by Pearson. Core units and specialist units may not be substituted.

Pearson BTEC Level 5 Higher National Diploma in Agriculture (General)		Unit credit	Level
Level 4 Units:			
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Level 5 Units:			
Core Unit	**18 Advanced Financial Accounting**	15	5
Core Unit	**19 Research Project (Pearson-set)**	30	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway			

Pearson BTEC Level 5 Higher National Diploma in Agriculture (Livestock Production)		Unit credit	Level
Level 4 Units:			
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Specialist Unit	**4 *Principles of Livestock Production**	15	4
Specialist Unit	**5 *Animal Health and Welfare**	15	4
Specialist Unit	**6 *Animal Nutrition**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Level 5 Units:			
Core Unit	**18 Advanced Financial Accounting**	15	5
Core Unit	**19 Research Project (Pearson-set)**	30	5
Specialist Unit	**20 *Forage Production and Management**	15	5
Specialist Unit	**21 *Animal Breeding and Genetics**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway			

Pearson BTEC Level 5 Higher National Diploma in Agriculture (Crop Production)		Unit credit	Level
Level 4 Units:			
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Specialist Unit	**7 *Principles of Crop Production**	15	4
Specialist Unit	**8 *Plant and Soil Science**	15	4
Specialist Unit	**9 *Land-based Machinery and Technology**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Level 5 Units:			
Core Unit	**18 Advanced Financial Accounting**	15	5
Core Unit	**19 Research Project (Pearson-set)**	30	5
Specialist Unit	**22 *Plant and Crop Health (Diseases, Pests and Weeds)**	15	5
Specialist Unit	**23 *Plant Breeding and Genetics**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway			

Pearson BTEC Level 5 Higher National Diploma in Agriculture (Rural Business Administration)		Unit credit	Level
Level 4 Units:			
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson-set)**	15	4
Specialist Unit	**10 *Rural Business Administration and Accounting**	15	4
Specialist Unit	**11 *Human Resource Management**	15	4
Specialist Unit	**12 *Marketing Essentials**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank A)**	15	4
Level 5 Units:			
Core Unit	**18 Advanced Financial Accounting**	15	5
Core Unit	**19 Research Project (Pearson-set)**	30	5
Specialist Unit	**24 *Business Strategy**	15	5
Specialist Unit	**25 *Diversification and Alternative Enterprises**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank B)**	15	5
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway			

Optional unit Bank A (for preceding pathways)		Unit credit	Level
Optional Level 4 units:			
Optional Unit	**4 *Principles of Livestock Production**	15	4
Optional Unit	**5 *Animal Health and Welfare**	15	4
Optional Unit	**6 *Animal Nutrition**	15	4
Optional Unit	**7 *Principles of Crop Production**	15	4
Optional Unit	**8 *Plant and Soil Science**	15	4
Optional Unit	**9 *Land-based Machinery and Technology**	15	4
Optional Unit	**10 *Rural Business Administration and Accounting**	15	4
Optional Unit	**11 *Human Resource Management**	15	4
Optional Unit	**12 *Marketing Essentials**	15	4
Optional Unit	**13 Plant and Crop Nutrition**	15	4
Optional Unit	**14 Animal Anatomy and Physiology**	15	4
Optional Unit	**15 Animal Husbandry**	15	4
Optional Unit	**16 Protective Crop Production**	15	4
Optional Unit	**17 Teaching in a Specialist Subject**	15	4

*specialist unit also available as an optional unit

Optional unit Bank B (for preceding pathways)		Unit credit	Level
Optional Level 5 units:			
Optional Unit	**20 *Forage Production and Management**	15	5
Optional Unit	**21 *Animal Breeding and Genetics**	15	5
Optional Unit	**22 *Plant and Crop Health (Diseases, Pests and Weeds)**	15	5
Optional Unit	**23 *Plant Breeding and Genetics**	15	5
Optional Unit	**24 *Business Strategy**	15	5
Optional Unit	**25 *Diversification and Alternative Enterprises**	15	5
Optional Unit	**26 Management of Land-based Machinery and Technology**	15	5
Optional Unit	**27 Global Business Environment**	15	5
Optional Unit	**28 Product and Service Development**	15	5
Optional Unit	**29 Identifying Entrepreneurial Opportunities**	15	5
Optional Unit	**30 Sustainable Practices**	15	5
Optional Unit	**31 Environmental Management and Conservation**	15	5
Optional Unit	**32 Woodland Management**	15	5
Optional Unit	**33 Work Experience**	15	5

*specialist unit also available as an optional unit

Pearson BTEC Level 5 Higher National Diploma in Agriculture (Dairy Engineering)		Unit credit	Level
Level 4 Units:			
Core Unit	**1 Business and the Business Environment**	15	4
Core Unit	**2 Management Accounting**	15	4
Core Unit	**3 Managing a Successful Project (Pearson- set)**	15	4
Specialist Unit	**9 *Land-based Machinery and Technology**	15	4
Specialist Unit	**34 *Automation, Robotics and Programmable Logic Controllers (PLCs)**	15	4
Specialist Unit	**35 *Electro, Pneumatic and Hydraulic Systems**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank C)**	15	4
Optional Unit	**Plus ONE Level 4 Optional or Specialist unit from another pathway (See Bank C)**	15	4
Level 5 Units:			
Core Unit	**18 Advanced Financial Accounting**	15	5
Core Unit	**19 Research Project (Pearson-set)**	30	5
Specialist Unit	20 *Forage Production and Management	15	5
Specialist Unit	21 *Animal Breeding and Genetics	15	5
Specialist Unit	40 *Further Control Systems Engineering	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank D)**	15	5
Optional Unit	**Plus ONE Level 5 Optional or Specialist unit from another pathway (See Bank D)**	15	5
Note: That the selection of Specialist Units **must** not exceed two units from the same pathway. Specialist units 7 and 8 are not available for this pathway.			

Optional unit Bank C (for Dairy Engineering)		Unit credit	Level
Optional Level 4 units:			
Optional Unit	**4 *Principles of Livestock Production**	15	4
Optional Unit	**5 *Animal Health and Welfare**	15	4
Optional Unit	**6 *Animal Nutrition**	15	4
Optional Unit	**9 *Land-based Machinery and Technology**	15	4
Optional Unit	**10 *Rural Business Administration and Accounting**	15	4
Optional Unit	**11 *Human Resource Management**	15	4
Optional Unit	**12 *Marketing Essentials**	15	4
Optional Unit	**13 Plant and Crop Nutrition**	15	4
Optional Unit	**14 Animal Anatomy and Physiology**	15	4
Optional Unit	**15 Animal Husbandry**	15	4
Optional Unit	**16 Protective Crop Production**	15	4
Optional Unit	**17 Teaching in a Specialist Subject**	15	4
Optional Unit	**34 *Automation, Robotics and Programmable Logic Controllers**	15	4
Optional Unit	**35 *Electro, Pneumatic and Hydraulic Systems**	15	4
Optional Unit	**36 Engineering Maths**	15	4
Optional Unit	**37 Engineering Science**	15	4
Optional Unit	**38 Quality and Process Improvement**	15	4
Optional Unit	**39 Electrical and Electronic Principles**	15	4

*specialist unit also available as an optional unit

Optional unit Bank D (for Dairy Engineering)		Unit credit	Level
Optional Level 5 units:			
Optional Unit	**22 *Plant and Crop Health (Diseases, Pests and Weeds)**	15	5
Optional Unit	**23 *Plant Breeding and Genetics**	15	5
Optional Unit	**24 *Business Strategy**	15	5
Optional Unit	**25 *Diversification and Alternative Enterprises**	15	5
Optional Unit	**26 Management of Land-based Machinery and Technology**	15	5
Optional Unit	**27 Global Business Environment**	15	5
Optional Unit	**28 Product and Service Development**	15	5
Optional Unit	**29 Identifying Entrepreneurial Opportunities**	15	5
Optional Unit	**30 Sustainable Practices**	15	5
Optional Unit	**31 Environmental Management and Conservation**	15	5
Optional Unit	**32 Woodland Management**	15	5
Optional Unit	**33 Work Experience**	15	5
Optional Unit	**41 Further Mathematics**	15	5

*specialist unit also available as an optional unit

4.2.3 Shared RQF units

Units selected from the Pearson BTEC Higher Nationals in Engineering

The following units have been selected from the Pearson BTEC Higher Nationals in Engineering. The table provides details of the unit numbers within this qualification and also the Pearson BTEC Higher Nationals in Engineering.

Unit Title	Unit Number	
	HN in Agriculture	HN in Engineering
Automation, Robotics and Programmable Logic Controllers (PLCs)	34	15
Electro, Pneumatic and Hydraulic Systems	35	29
Engineering Maths	36	2
Engineering Science	37	3
Quality and Process Improvement	38	17
Electrical and Electronic Principles	39	19
Further Control Systems Engineering	40	54
Further Mathematics	41	39

4.2.4 Meeting local needs (MLN)

Centres should note that Pearson BTEC Higher National qualifications have been developed in consultation with centres, employers and relevant professional organisations. The units were designed to meet the skill needs of the sector and thereby allow coverage of the full range of employment within the sector. Centres should make maximum use of the choices available to them within the specialist pathways to meet the needs of their students, as well as the local skills and training needs.

Where centres identify a specific need that cannot be addressed using the units in this specification, centres can seek approval to use units from other RQF Pearson BTEC Higher National qualifications, through the MLN process (refer to *Commissioned qualification design and validation service* of our website http://qualifications.pearson.com or get in touch your Pearson regional contact for application details. Centres will need to justify the rationale for importing units from other RQF Pearson BTEC Higher National specifications. **Meeting local need applications must be made in advance of delivery and before 31 January in the year of student registration.**

The flexibility to import standard units from other RQF Pearson BTEC Higher National specifications is limited to a maximum of 30 credits in a BTEC HNC qualification and a maximum of 60 credits in a BTEC HND qualification (30 credits at Level 4 and 30 credits at Level 5). This is an overall maximum of units that can be imported. MLN units cannot be used at the expense of the mandatory units in any qualification nor can the qualification's rules of combination, as detailed in the specification, be compromised. It is the responsibility of the centre requesting the MLN to ensure that approved units are used only in eligible combinations.

For the **Pearson BTEC Higher National Certificate and Diploma in Agriculture** the maximum number of credits that can be imported by pathway are as follows:

Qualification	Pathway	Import at Level 4	Import at Level 5
HNC Agriculture	**Agriculture (General)**	30	-
	Livestock Production	30	-
	Crop Production	30	-
	Rural Business Administration	30	-
	Dairy Engineering	30	-
HND Agriculture	**Agriculture (General)**	30	30
	Livestock Production	30	30
	Crop Production	30	30
	Rural Business Administration	30	30
	Dairy Engineering	30	30

4.2.5 Pearson BTEC Higher National Commissioned Development

Where MLN does not provide enough flexibility in terms of qualification structure, centres can request design and development of units by Pearson to meet their specific needs. This is offered by the following types of developments; full commission or partial commission.

We would be pleased to discuss your ideas for a Pearson BTEC Higher National Commissioned Development. For more information please refer to the *Commissioned qualification design and validation service* on our website http://qualifications.pearson.com

Once the centre is ready to proceed with a commissioned development, an application must be made, which provides a clear rationale for the development request. Pearson will review the application and may confirm or deny the request. The commissioned unit(s) will be authored by Pearson, in full consultation within the commissioning centre. Applications must be made one year in advance of the first year of commissioned unit(s) delivery.

4.3 Pearson-set Assignments

There are Pearson-set assignments. Each year, Pearson will issue a *Theme* and (for Level 4) a set of related *Topics.* Centres will develop an assignment, to be internally assessed, to engage students in work related to the Pearson-set Theme.

At Level 4, students will select a Topic to further define their approach to the Theme and assignment. At Level 5, it is expected that students will define their own Topic, in negotiation with Tutors, based on the Pearson-set Theme.

For example, from the Higher Nationals in Business:

Theme: "Corporate Social Responsibility (CSR) and its importance for sustainability and competitive advantage"

Level 4 Topics:

- How to start up a socially responsible company
- The impact of CSR on a functional area (e.g. HR, Marketing, Finance) within an organisation to promote profitability and financial sustainability.
- Implementing CSR activities within organisations to meet sustainability objectives.

Centres can find relevant support in the Pearson-set Assignment Guidance for the units, and the theme and topic release documentation which will be provided for each level.

The aim of the Pearson-set assignments is to provide a common framework for centres to develop work that will allow cross-sector benchmarking, through the standardisation of student work, and identification and sharing of 'best practice.' in higher education teaching and learning. Pearson will share the 'best practice' results with all centres. For further information about Pearson-set Assignments and assessment, see section **6.0 Assessment** of this document.

4.4 Optional Units

The Optional units available in the Higher Nationals in Agriculture are intended to provide Centres with a range of units that may be applicable to an identified specialism. These units have been written to provide scope for a Centre to tailor their course offer to include areas of additional content that provide a unique student experience.

As an example, at Level 4, a standard approach to Agriculture (General) might see the following units offered:

Unit	Type	Credits
Unit 1 Business and the Business Environment	Core	15
Unit 2 Management Accounting	Core	15
Unit 3 Managing a Successful Project (Pearson-set)	Core	15
Unit 4 Principles of Livestock Production	Optional	15
Unit 7 Principles of Crop Production	Optional	15
Unit 8 Plant and Soil Science	Optional	15
Unit 9 Land-based Machinery and Technology	Optional	15
Unit 14 Animal Anatomy and Physiology	Optional	15

However, a Centre may choose to develop a more 'specialised' programme; with greater emphasis on Rural Business Administration and offer:

Unit	Type	Credits
Unit 1 Business and the Business Environment	Core	15
Unit 2 Management Accounting	Core	15
Unit 3 Managing a Successful Project (Pearson-set)	Core	15
Unit 10 Rural Business Administration and Accounting	Specialist	15
Unit 11 Human Resource Management	Specialist	15
Unit 12 Marketing Essentials	Specialist	15
Unit 4 Principles of Livestock Production	Optional	15
Unit 7 Principles of Crop Production	Optional	15

In each example, students would have the key skills for Agriculture (through practice-based units at Level 4 and Level 5), but will have a unique experience based on the combination of Optional units offered by the Centre.

In addition to the designated Optional units, a Centre may also choose to include one of the Specialist units from another pathway; thereby, further expanding the scope of units that may be combined to form the qualification.

4.5 Recommended Level 4 and Level 5 Unit Combinations

To ensure that students studying at Level 5 are enabled to engage with the learning and teaching provided within Optional Units, we recommend that careful consideration be given to the units offered at Level 4 and how these prepare the student for Level 5 Optional Units.

The following table provides guidance as to recommended Level 4 unit(s) that should be offered, in order that students are prepared for the corresponding Level 5 unit(s).

Combination of Level 4 Units	**Level 5 Unit**
Unit 2 Management Accounting Unit 10 Rural Business Administration and Accounting	Unit 18 Advanced Financial Accounting
Unit 1 Business and the Business Environment	Unit 27 Global Business Environment
Unit 7 Principles of Crop Production	Unit 22 Plant and Crop Health (Diseases, Pests and Weeds)
Unit 4 Principles of Livestock Production	Unit 21 Animal Breeding and Genetics
Unit 9 Land-based Machinery and Technology	Unit 26 Management of Land-based Machinery and Technology
Unit 12 Marketing Essentials	Unit 28 Product and Service Development
Unit 36 Engineering Maths	Unit 41 Further Maths

4.6 The Unit Descriptor

The Unit Descriptor is how we define the individual units of study that make up a Higher National qualification. Students will study and complete the units included in the programme offered at your centre.

We have described each part of the unit, as below. You may refer to any of the Unit Descriptors in *Section 10* of this programme specification.

Unit Title	A broad statement of what the unit will cover.
Unit Code	The Ofqual unit designation
Unit Type	There are three unit types: core (mandatory to all pathways); specialist (mandatory to specific pathways); and optional (available to most pathways)
Unit level	All Pearson BTEC Higher National units are at Level 4 or Level 5
Credit value	The credit value is related to total qualification time (TQT) and unit learning hours (ULH), and is easy to calculate. 1 credit is equal to 10 ULH, so 15 credits are equal to 150 ULH. To complete a Higher National Certificate or Diploma students are expected to achieve the appropriate number of credits
Introduction	Some general notes on the unit, setting the scene, stating the purpose, outlining the topics and skills gained on completion of the unit
Learning Outcomes	The Learning Outcomes are explicit statements that clearly express what students will be able to do after the completion of the unit. There are, typically, four Learning Outcomes for each unit.
Essential Content	This section covers the content that students can expect to study as they work towards achieving their Learning Outcomes.

Learning Outcomes and Assessment Criteria	Each unit sets out the 'Pass', 'Merit' and 'Distinction' criteria for that unit. When assignments are graded, a tutor will refer to this table, which connects the unit's Learning Outcomes with the student's work. This assignment may be graded at 'Pass', 'Merit' or 'Distinction level, depending on the quality of the students work.
Recommended Resources	Lists the resources appropriate to support the study of this unit. This includes books, journals and online material to support learning. The programme tutor may suggest alternatives and additions, usually with a local application or relevance.

Web resources – referencing:

Some units have web resources as part of their recommended resources lists. Hyperlinking to these resources directly can be problematic as locations and addresses of resources can change over time. To combat this we have referenced web resources as follows:

[1] A link to the main page of the website

[2] The title of the site

[3] The name of the section or element of the website where the resource can be found

[4] The type of resource it is, which may be one of the following –

- research
- general reference
- tutorials
- training
- e-books
- report
- wiki
- article
- datasets
- development tool
- discussion forum

Web

[1] www.redtractor.org.uk [2] Red Tractor Assurance
[3] Standards
[4] (Current standards)

5 Teaching and learning

The aim of this section is to provide guidance to Centres so that they can engage students in a dynamic, interactive and reflective learning experience. This experience should effectively prepare students to successfully engage in the assessments, which will measure depth, as well as breadth, of knowledge. Teaching should stimulate academic engagement, develop challenging yet constructive discourse and encourage students to reflect on their own performance in preparation for a professional career. Additionally, Centres are encouraged to expose students to autonomous and independent learning, which will facilitate the development of their academic skills, experiences and techniques required as they progress from one level of study to the next.

Centres are encouraged to develop programmes that have a distinctive focus on entry into work, delivering a curriculum that embeds employability, has a strong commitment to ethics and diversity, and introduces students to contemporary as well as seminal research. All teaching and learning should reflect the expectations of employers and society, and be informed and guided by external benchmarks such as professional and statutory bodies. In so doing students completing a Higher National in Agriculture will have the attributes, skills, principles and behaviours that will enable them to make a valuable contribution to local, national and international commerce.

The contributions students make to their own experiences, alongside the experience of their peers, is invaluable. Student engagement and the student voice should form a significant aspect of a student's life. Centres are encouraged to gather student opinions on a range of teaching and learning matters, which would be used to inform and enhance future practice within a programme of study and within a Centre.

5.1 Delivering quality and depth

A high quality teaching and learning experience should include qualified and experienced lecturers, an interactive and engaging curriculum, motivated and inspired students, and a support system that caters for the pastoral as well as academic interests of students.

In addition to delivering a quality learning experience, Centres must also encourage students to have a deeper understanding of the subject where they are able to go beyond the fundamentals of explaining and describing. Students are expected to show they can analyse data and information, make sense of this and then reach evaluative judgements. At the higher levels of study there is an expectation that students will be able to apply a degree of criticality to their synthesis of knowledge. This criticality would come from exposure to appropriate and relevant theories, concepts and models.

One of the reasons for delivering a quality learning experience, which has depth as well as breadth, is the benchmarking of the qualification to the Framework for Higher Education Qualifications (FHEQ). It also meets requirements set by the Regulated Qualifications Framework (RQF). The first stage of a Higher National in Agriculture is the Higher National Certificate (HNC), which is aligned with Level 4 of both frameworks; with the Higher National Diploma (HND) aligned with Level 5. This means that the HNC has the same level of demand and expectations as the first year of a degree programme, with the HND having the same level of demand and expectations as the second year of a degree programme.

Centres are expected to provide a broadly similar experience for students to that which they would have if they attended a similar programme at a university. This could mean:

- Providing access to library facilities which has, as a minimum, available copies (physically and/or electronically) of all required reading material
- Access to research papers and journals
- Utilising a virtual learning environment (VLE) to support teaching
- Working with local employers (see below) to present real-life case studies
- Creating schemes of work that embrace a range of teaching and learning techniques
- Listening to the student voice.

Irrespective of the type of programme on which a student is enrolled, it is highly advisable that students are inducted onto their Higher National programme. This induction should include an introduction to the course programme and academic study skills that will be essential in supporting their research and studies, and, therefore, enhance the learning experience.

An induction programme should consist of the following:

- Course programme overview
- Preparing for lessons
- Effective engagement in lectures and seminars
- Making the most out of their tutor
- Assignment requirements
- Referencing and plagiarism
- Centre policies
- Academic study skills.

Pearson offer Higher National Global Study Skills to all students − an online toolkit that supports the delivery, assessment and quality assurance of BTECs in centres. This is available on the HN Global website www.highernationals.com. HN Global provides a wealth of support to ensure that tutors and students have the best possible experience during their course.

In addition, there is a wide range of free-to-access websites that can be used to support students in developing their learning and academic study skills.

5.2 Engaging with employers

Just as the student voice is important, so too is the employer's. Employers play a significant role in the design and development of all regulated qualifications, including the Higher Nationals in Agriculture. This input should extend into the learning experience, where engagement with employers will add value to students, particularly in transferring theory into practice.

Centres should consider a range of employer engagement activities. These could include:

- Field trips to local Farms, Livestock Markets or Allied Business Services
- Inviting members of the local membership organisations centre to present guest lectures
- Using employers to judge the quality of assessed presentations and/or products
- (For the more entrepreneurial) establishing a panel of experts who students can pitch an idea to.

While detailed guidance on assessment has been provided in this specification (see *section 6*), it is worth considering the involvement of employers when determining assessment strategies and the use of different assessment vehicles. This enables Centres to design assessments that are more closely related to what students would be doing in the workplace. Employers are able to comment on relevance and content, as well as the challenge presented by an assessment. Notwithstanding this, ultimately it is the Centre's responsibility to judge the extent to which any employer contributes to teaching and learning.

5.3 Engaging with students

Students are integral to teaching and learning. As such it is important that they are involved as much as possible with most aspects of the programme on to which they are enrolled. This input could include taking into account their views on how teaching and learning will take place, their role in helping to design a curriculum, or on the assessment strategy that will test their knowledge and understanding.

There are many ways in which to capture the student voice and student feedback, both formal and informal. Formal mechanisms include the nomination of student representatives to act as the collective student voice for each student cohort, student representation at course team meetings, and an elected Higher Education representative as part of the Student Union. Student forums should also take place periodically throughout the year with minutes and action plans updated and informing the overall annual course monitoring process. Unit specific feedback can also be collated by students completing unit feedback forms, end of year course evaluations, and scheduled performance review meetings with their tutor.

However, this should not be the only time when feedback from students is sought. Discourse with students should be constant, whereby teachers adopt a 'reflection on action' approach to adjust teaching, so that students are presented with an environment that is most supportive of their learning styles. Just as employers could have an input into assessment design, so too could students. This will support the development of assignments that are exciting and dynamic, and fully engage students in meaningful and informative assessment.

The biggest advantage of consulting students on their teaching, learning and assessment is securing their engagement in their own learning. Students are likely to feel empowered and develop a sense of ownership of all matters related to teaching, learning and assessment, not just their own experiences. Students could also view themselves as more accountable to their lecturers, ideally seeing themselves as partners in their own learning and not just part of a process.

5.4 Planning and structuring a programme

Learning should be challenging yet exciting; teaching should be motivating and inspirational. Consequently, both teaching and learning should form part of a programme structure that is active, flexible and progressive, and has an industry focus wherever possible.

It is important for a programme structure to be effectively planned, taking into account the nature of the student cohort, the primary mode of delivery (face-to-face or distance learning) and the level of study. It is also advisable to consider the student voice (whether that voice is heard through end of programme feedback, or through on-going dialogue) when planning how and when students will be exposed to a particular subject. One other vital source of information that centres would do well to embrace is the feedback from tutors who have been and/or will be delivering learning.

It is recommended that centres establish a programme planning forum where various stakeholders are represented. This forum could consider different perspectives of teaching and learning and how these are planned into an effective programme structure. Consideration could be given to, for example, the holistic and consistent use of Virtual Learning Environments (VLEs), a programme of field trips, a strategy for engaging with employers, and how and when to assess learning.

Consideration should be given to a number of factors when planning a programme structure. These include:

- The sequencing of units
- Whether to have condensed or expanded delivery
- Teaching and learning techniques.

5.4.1 Sequencing units

The level of demand embedded within a unit is benchmarked to recognised standards. This applies to all units within a level of study, and this means that all Level 4 units have similar demands, as do all Level 5 units. However, this does not mean that units can, or should, be delivered in any order. For example, in the Higher National Diploma in Agriculture it is strongly advised that Level 4 units are delivered, and achieved, by students before progression to Level 5. However, students are able to progress to Level 5 with a minimum of 90 credits at Level 4.

Within each level it is advisable to sequence units so that those providing fundamental knowledge and understanding are scheduled early in the programme. It may also be advisable to schedule the assessment of units requiring the practice and application of more advanced skills later in the programme.

For example, at Level 4 if a more business administration pathway is required, Unit 2 Business and the Business Environment and Unit 10 Rural Business Administration and Accounting could be the first two units that Higher National Certificate students are exposed to. Unit 2 introduces students to the fundamentals of the sector, how it is structured and the internal and external factors that influence strategy and operations. Unit 10 provides students with an opportunity to gain an understanding of how business administrations operate and how they are managed. At Level 5 Centres could sequence, for example, Unit 34 Advanced Financial Accounting before Unit 30 Business Strategy. The former provides a broader understanding of financial management and business performance, with the latter using part of this knowledge to develop a deeper understanding strategic management.

5.4.2 Condensed and expanded delivery

The next consideration is whether to deliver a unit in a condensed format alongside other units, or to deliver units over an expanded period. The following tables provide examples of this, based on four units being delivered in one teaching block.

Condensed version:

Weeks 1 to 6	Week 7	Weeks 8 to 13	Week 14
Unit 1	Assessment	Unit 3	Assessment
Unit 2		Unit 4	

Expanded version:

Weeks 1 to 12	Weeks 13 and 14
Unit 1	Assessment
Unit 2	
Unit 3	
Unit 4	

Mixed version:

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Unit 1													**Assessment**
Unit 2						**Assessment**	**Unit 3**						
Unit 4													

The decision to deliver a condensed, expanded or mixed programme would depend on a number of factors, including availability of resources, the subjects to be taught and the requirements of students. Each version has advantages: the condensed version would provide an opportunity for students to gain early success and achievement. This will enhance their self-efficacy, the sense of one's belief in one's ability to succeed, and self-confidence, with tutors being able to identify and respond to less able students early in the teaching and learning cycle.

The advantages of the expanded version include providing a longer timescale for students to absorb new knowledge and therefore, potentially, improve success, and giving tutors an opportunity to coach and support less able students over a longer period of time.

The mixed version, with some units spanning over the entire period and others lasting for shorter periods, provides opportunities for learning in some units to support development in others. This format may be particularly suited to a combination of practical and theoretical units. In all cases, the choice of which type of unit sequence must consider student opportunities as well as staff and physical resources of the centre.

As there are pros and cons to both approaches, the use of a planning forum would help to ensure the most appropriate approach is taken. For example, centres could chose to deliver the first teaching block using the expanded version, with the subsequent teaching block being delivered through a condensed approach.

It should be noted that the above consideration would apply equally to programmes that are being delivered face-to-face or through distance learning.

5.4.3 Drawing on a wide range of delivery techniques

As part of planning the range of techniques that will be used to deliver the syllabus, centres should also consider an appropriate combination of techniques for the subject.

The table below lists some of the techniques that centres could introduce into a planned programme structure.

Technique	Face-to-face	Distance learning
Lectures and seminars	These are the most common techniques used by tutors. They offer an opportunity to engage with a large number of students, where the focus is on sharing knowledge through the use of presentations.	Delivery would be through video conferencing and/or pre-recorded audio and/or visual material, available through an online platform. Synchronous discussion forums could also be used.

Technique	Face-to-face	Distance learning
Workshops	These are used to build on knowledge shared via tutors and seminars. Teaching can be more in-depth where knowledge is applied, for example to case studies or real-life examples. Workshops could be student-led, where students present, for example, findings from independent study.	While more challenging to organise than for face-to-face delivery, workshops should not be dismissed. Smaller groups of three or four students could access a forum simultaneously and engage in the same type of activity as for face-to-face.
Tutorials	These present an opportunity for focused one-to-one support, where teaching is led by an individual student's requirements. These can be most effective in the run up to assessment, where tutors can provide more focused direction, perhaps based on a formative assessment.	Other than not necessarily being in the same room as a student, tutors could still provide effective tutorials. Video conferencing tools provide the means to see a student, which makes any conversation more personal.
Virtual Learning Environments (VLEs)	These are invaluable to students studying on a face-to-face programme. Used effectively, VLEs not only provide a repository for taught material such as presentation slides or handouts, but could be used to set formative tasks such as quizzes. Further reading could also be located on a VLE, along with a copy of the programme documents, such as the handbook and assessment timetable.	A VLE is a must if students are engaged with online delivery through distance or blended learning, as this would be the primary or the key source of learning. Where distance learning is primarily delivered through hard copies of workbooks, etc., the same principle would apply as for face-to-face learning.
Blended learning	The combination of traditional face-to-face learning and online learning. This can enable the students to gain personalised support, instruction and guidance while completing assigned activities and tasks remotely.	Offline learning enables students to develop autonomy and self-discipline by completing set activities and tasks with limited direction and traditional classroom-based constraints.

Technique	Face-to-face	Distance learning
Work-based learning	Any opportunity to integrate work-based learning into a curriculum should be taken. This adds realism and provides students with an opportunity to link theory to practice in a way in which case studies do not. Many full-time students are involved in some form of employment, either paid or voluntary, which could be used, where appropriate, as part of their learning, for example when assignments require students to contextualise a response to a real organisation.	It is likely that the majority of distance learning students would be employed and possibly classed as mature students. Bringing theory to life through a curriculum, which requires work-based application of knowledge, would make learning for these students more relevant and meaningful. Perhaps more importantly, assessment should be grounded in a student's place of work, wherever possible.
Guest speakers	These could be experts from industry or visiting academics in the subject area that is being studied. They could be used to present a lecture/seminar, a workshop or to contribute to assessment. The objective is to make the most effective use of an expert's knowledge and skill by adding value to the teaching and learning experience.	As long as the expert has access to the same platform as the students then the value-added contribution would still be very high. Consideration would need to be given to timings and logistics, but with some innovative management this technique would still have a place in distance learning programmes.
Field trips	Effectively planned field trips, which have a direct relevance to the syllabus, would add value to the learning experience. Through these trips students could relate theory to practice, have an opportunity to experience organisations in action, and potentially open their minds to career routes.	The use of field trips could be included as part of a distance learning programme. They will add the same value and require the same planning. One additional benefit of field trips for distance learning is that they provide an opportunity for all students in a cohort to meet, which is a rare occurrence for distance learning students.

5.4.4 Assessment considerations

Centres should design assessment for learning. This is where an assessment strategy requires students to engage with a variety of assessment tools that are accessible, appropriately challenging, and support the development of student self-efficacy and self-confidence. To ensure that assignments are valid and reliable, Centres must implement robust Quality Assurance measures and monitor the effectiveness of their implementation (see section 7 of this Programme Specification). This includes ensuring that all students engage in assessment positively and honestly.

Assessment also provides a learning opportunity for all stakeholders of the assessment to have access to feedback that is both individual to each student and holistic to the cohort. Feedback to students should be supportive and constructive. Student self-efficacy (and therefore self-confidence) can be significantly enhanced where feedback not only focuses on areas for improvement but recognises the strengths a student has. At the cohort level, similar trends could be identified that inform future approaches to assessments and teaching. Assessment is an integral part of the overall learning process and assessment strategy must be developed to support effective, reflective, thinking Agriculture practitioners for the future. Assessment can be either formative, summative or both.

5.4.5 Formative assessment

Formative assessment is primarily developmental in nature and designed to give feedback to students on their performance and progress. Assessment designed formatively should develop and consolidate knowledge, understanding, skills and competencies. It is a key part of the learning process and can enhance learning and contribute to raising standards.

Through formative assessment tutors can identify students' differing learning needs early on in the programme and so make timely corrective interventions. Tutors can also reflect on the results of formative assessment to measure how effective the planned teaching and learning is at delivering the syllabus. Each student should receive one set of written formative feedback, otherwise some students may feel that others are being given more than their share of verbal feedback.

5.4.6 Summative assessment

Summative assessment is where students are provided with the assignment grades contributing towards the overall unit grade. For summative assessment to be effective it should also give students additional formative feedback to support on-going development and improvement in subsequent assignments. All formative assessment feeds directly into the summative assessment for each unit and lays the foundations from which students develop the necessary knowledge and skills required for the summative assessment.

5.4.7 Assessment feedback

Effective assessment feedback is part of continuous guided learning which promotes learning and enables improvement. It also allows students to reflect on their performance and helps them understand how to make effective use of feedback. Constructive and useful feedback should enable students to understand the strengths and limitations of their performance, providing positive comments where possible as well as explicit comments on how improvements can be made. Feedback should reflect the learning outcomes and assessment criteria to also help students understand how these inform the process of judging the overall grade.

The timing of the provision of feedback and of the returned assessed work also contributes to making feedback effective. Specific turnaround time for feedback should be agreed and communicated with both tutors and students. Timing should allow students the opportunity to reflect on the feedback and consider how to make use of it in forthcoming assessments, taking into account the tutor's workload and ability to provide effective feedback.

5.4.8 Designing valid and reliable assessments

To help ensure valid and reliable assignments are designed and are consistent across all units, centres could consider a number of actions.

Use of language

The first aspect of an assignment that a centre could focus on is ensuring that language makes tasks/questions more accessible to students.

Due consideration must be given to the command verbs (i.e. the verbs used in unit assessment criteria) when considering the learning outcomes of a unit. Assignments must use appropriate command verbs that equate to the demand of the learning outcome. If the outcome requires 'analysis' then 'evaluative' requirements within the assignment must not be set when testing that outcome. This would be viewed as over-assessing. Similarly, it is possible to under-assess where analytical demands are tested using, for example, explanatory command verbs.

The following can be used as a guide to support assignment design:

- Ensure there is a holistic understanding (by tutors and students) and use of command verbs.
- Set assignment briefs that use a single command verb, focusing on the highest level of demand expected for the learning outcome(s) that is (are) being tested.
- Assignments should be supported by additional guidance that helps students to interpret the demand of the assessment criteria.

- Time-constrained assessments should utilise the full range of command verbs (or acceptable equivalents) appropriate to the academic level. Modes of time-constrained assessments include in-class tests and exams that could be both open- or closed-book. Centres should pay close consideration to ensuring tests and exams are not replicated during the course of the year.

Consistency

This relates to the consistency of presentation and structure, the consistent use of appropriate assessment language, and the consistent application of grading criteria. Where assignments are consistent, reliability is enhanced. Where validity is present in assignments this will result in assignments that are fit for purpose and provide a fair and equitable opportunity for all students to engage with the assignment requirements.

Employing a range of assessment tools

Just as variation in teaching methods used is important to the planning of a programme structure, so too is the use of a range of assessment tools appropriate to the unit and its content. Centres should consider taking a holistic view of assessment, ensuring a balanced assessment approach with consideration given to the subject being tested and what is in the best interests of students. As mentioned above, consultation with employers could add a sense of realism to an assessment strategy. (A comprehensive list of assessment tools is provided in section 6.2 *Setting effective assignments*).

No matter what tool is used, assignments should have a sector focus (whether this is in a workplace context or through a case study), and be explicitly clear in its instructions. In the absence of a case study a scenario should be used to provide some context. Finally, students should be clear on the purpose of the assignment and which elements of the unit it is targeting.

6 Assessment

BTEC Higher Nationals in Agriculture are assessed using a combination of internally assessed **centre-devised internal assignments** (which are set and marked by centres) and internally assessed **Pearson-set assignments** (which are set by Pearson and marked by centres). Pearson-set assignments are mandatory and target particular industry-specific skills. The number and value of these units are dependent on qualification size:

- For the HNC, one core, 15 credit, unit at Level 4 will be assessed by a mandatory Pearson-set assignment targeted at particular skills;
- For the HND, two core units: one core, 15 credit, unit at Level 4 and one core, 30 credit, unit at Level 5, will be assessed by a mandatory Pearson-set assignment targeted at particular skills;
- all other units are assessed by centre-devised internal assignments.

The purpose and rationale of having Pearson-set units on Higher Nationals is as follows:

Standardisation of student work – Assessing the quality of student work, that it is meeting the level and the requirements of the unit across all centres, that grade decisions and assessor feedback are justified, and that internal verification and moderation processes are picking up any discrepancies and issues.

Sharing of good practice – We will share good practice in relation to themes such as innovative approaches to delivery, the use of digital literacy, enhancement of student employability skills and employer engagement. **These themes will align to those for QAA Higher Education Reviews**.

An appointed External Examiner (EE) for the centre will ask to sample the Pearson-set assignment briefs in advance of the external examination visit. Although this is not a mandatory requirement for centres, we strongly advise that centres seek guidance and support from their EE on the Pearson-set assignments. The EE may also include the Pearson-set units in their sample of student work during their centre visit.

We have taken great care to ensure that the assessment method chosen is appropriate to the content of the unit and in line with requirements from professional bodies, employers and higher education.

In developing an overall plan for delivery and assessment for the programme, you will need to consider the order in which you deliver units, whether delivery will take place over short or long periods of time, and when assessment can take place.

6.0.1 Example Assessment Briefs

Each unit has supporting Example Assessment Briefs (EABs) that are available to download from the course materials section on our website (http://qualifications.pearson.com/). The EABs are there to give you an example of what the assessment will look like in terms of the feel and level of demand of the assessment.

The EABs, with the exception of the mandatory Pearson-set unit, provide tutors with suggested types of assignment and structure that can be adopted or adapted accordingly.

6.1 Principles of internal assessment

This section gives an overview of the key features of internal assessment and how you, as an approved Centre, can offer it effectively. The full requirements and operational information are given in the Pearson Quality Assurance Handbook available in the support section of our website (http://qualifications.pearson.com/). All the assessment team will need to refer to this document.

For BTEC Higher Nationals it is important that you can meet the expectations of stakeholders and the needs of students by providing a programme that is practical and applied. Centres can tailor programmes to meet local needs and should use links with local employers and the wider business sector.

When internal assessment is operated effectively it is challenging, engaging, practical and up to date. It must also be fair to all students and meet national standards.

6.1.1 Assessment through assignments

For internally assessed units the format of assessment is an assignment taken after the content of the unit, or part of the unit if several assignments are used, has been fully delivered. An assignment may take a variety of forms, including practical and written types. An assignment is a distinct activity completed independently by students (either alone or in a team). An assignment is separate from teaching, practice, exploration and other activities that students complete with direction from and, formative assessment by, tutors.

An assignment is issued to students as an **assignment brief** with a hand-out date, a completion date and clear requirements for the evidence that students are expected to provide. There may be specific observed practical components during the assignment period. Assignments can be divided into separate parts and may require several forms of evidence. A valid assignment will enable a clear and formal assessment outcome based on the assessment criteria.

6.1.2 Assessment decisions through applying unit-based criteria

Assessment decisions for BTEC Higher Nationals are based on the specific criteria given in each unit and set at each grade level. The criteria for each unit have been defined according to a framework to ensure that standards are consistent in the qualification and across the suite as a whole. The way in which individual units are written provides a balance of assessment of understanding, practical skills and vocational attributes appropriate to the purpose of the qualifications.

The assessment criteria for a unit are hierarchical and holistic. For example, if an M criterion requires the student to show 'analysis' and the related P criterion requires the student to 'explain', then to satisfy the M criterion a student will need to cover both 'explain' and 'analyse'. The unit assessment grid shows the relationships among the criteria so that assessors can apply all the criteria to the student's evidence at the same time. In *Appendix 3* we have set out a definition of terms that assessors need to understand.

Assessors must show how they have reached their decisions using the criteria in the assessment records. When a student has completed all the assessment for a unit then the assessment team will give a grade for the unit. This is given simply according to the highest level for which the student is judged to have met all the criteria. Therefore:

- **To achieve a Pass**, a student must have satisfied all the Pass criteria for the learning outcomes, showing coverage of the unit content and therefore attainment at Level 4 or 5 of the national framework.
- **To achieve a Merit**, a student must have satisfied all the Merit criteria (and therefore the Pass criteria) through high performance in each learning outcome.
- **To achieve a Distinction**, a student must have satisfied all the Distinction criteria (and therefore the Pass and Merit criteria), and these define outstanding performance across the unit as a whole.

The award of a Pass is a defined level of performance and cannot be given solely on the basis of a student completing assignments. Students who do not satisfy the Pass criteria should be reported as Unclassified.

6.1.3 The assessment team

It is important that there is an effective team for internal assessment. There are three key roles involved in implementing assessment processes in your centre, each with different interrelated responsibilities, and these roles are listed below. Full information is given in the Pearson Quality Assurance Handbook available in the support section of our website (http://qualifications.pearson.com/).

- **The Programme Leader** has overall responsibility for the programme, its assessment and internal verification to meet our requirements, record keeping and liaison with the External Examiner. The Programme Leader registers with Pearson annually and acts as an assessor, supports the rest of the assessment team, makes sure they have the information they need about our assessment requirements, and organises training, making use of our guidance and support materials.
- **Internal Verifiers** (IVs) oversee all assessment activity in consultation with the Programme Leader. They check that assignments and assessment decisions are valid and that they meet our requirements. IVs will be standardised by working with the Programme Leader. Normally, IVs are also assessors, but they do not verify their own assessments.
- **Assessors** set or use assignments to assess students to national standards. Before taking any assessment decisions, assessors participate in standardisation activities led by the Programme Leader. They work with the Programme Leader and IVs to ensure that the assessment is planned and carried out in line with our requirements.
- Your **External Examiner** (EE) will sample student work across assessors. Your EE will also want to see evidence of informal verification of assignments and assess decisions.

6.1.4 Effective organisation

Internal assessment needs to be well organised so that student progress can be tracked and so that we can monitor that assessment is being carried out in line with national standards. We support you in this through, for example, providing training materials and sample documentation. Our online HN Global service can also help support you in planning and record keeping.

It is particularly important that you manage the overall assignment programme and deadlines to make sure that all your students are able to complete assignments on time.

6.1.5 Student preparation

To ensure that you provide effective assessment for your students, you need to make sure that they understand their responsibilities for assessment and the centre's arrangements. From induction onwards you will want to ensure that students are motivated to work consistently and independently to achieve the requirements of the qualifications. They need to understand how assignments are used, the importance of meeting assignment deadlines, and that all the work submitted for assessment must be their own.

You will need to give your students a guide that explains:

- How assignments are used for assessment
- How assignments relate to the teaching programme
- How students should use and reference source materials, including what would constitute plagiarism.

The guide should also set out your centre's approach to operating assessments, such as how students must submit assignments/work and the consequences of submitting late work and the procedure for requesting extensions for mitigating circumstances.

6.2 Setting effective assessments

6.2.1 Setting the number and structure of assignments

In setting your assessments you need to work with the structure of assessments shown in the relevant section of a unit. This shows the learning aims and outcomes and the criteria that you are expected to follow.

Pearson provide online Example Assessment Briefs for each unit to support you in developing and designing your own assessments.

In designing your own assignment briefs you should bear in mind the following points:

- The number of assignments for a unit must not exceed the number of learning outcomes listed in the unit descriptor. However, you may choose to combine assignments, either to cover a number of learning outcomes or to create a single assignment for the entire unit.
- You may also choose to combine all or parts of different units into single assignments, provided that all units and all their associated learning outcomes are fully addressed in the programme overall. If you choose to take this approach you need to make sure that students are fully prepared, so that they can provide all the required evidence for assessment, and that you are able to track achievement in assessment records.
- A learning outcome must always be assessed as a whole and must not be split into two or more elements.
- The assignment must be targeted to the learning outcomes but the learning outcomes and their associated criteria are not tasks in themselves. Criteria are expressed in terms of the outcome shown in the evidence.

You do not have to follow the order of the learning outcomes of a unit in setting assignments, but later Learning Outcomes often require students to apply the content of earlier learning outcomes, and they may require students to draw their learning together.

Assignments must be structured to allow students to demonstrate the full range of achievement at all grade levels. Students need to be treated fairly by being given the opportunity to achieve a higher grade, if they have the ability.

As assignments provide a final assessment, they will draw on the specified range of teaching content for the learning outcomes. **The specified unit content must be taught/delivered**. The evidence for assessment need not cover every aspect of the teaching content, as students will normally be given particular examples, case studies or contexts in their assignments. For example, if a student is carrying out one practical performance, or an investigation of one organisation, then they will address all the relevant range of content that applies in that instance.

6.2.2 Providing an assignment brief

A good assignment brief is one that, through providing challenging and authentic sector/work-related tasks, motivates students to provide appropriate evidence of what they have learnt.

An assignment brief should have:

- A vocational scenario: this could be a simple situation or a full, detailed set of vocational requirements that motivates the student to apply their learning through the assignment.
- Clear instructions to the student about what they are required to do, normally set out through a series of tasks.
- An audience or purpose for which the evidence is being provided.
- An explanation of how the assignment relates to the unit(s) being assessed.

6.2.3 Forms of evidence

BTEC Higher Nationals have always allowed for a variety of forms of assessment evidence to be used, provided they are suited to the type of learning outcomes being assessed. For many units, the practical demonstration of skills is necessary and, for others, students will need to carry out their own research and analysis, working independently or as part of a team.

The EABs give you information on what would be suitable forms of evidence to give students the opportunity to apply a range of employability or transferable skills. Centres may choose to use different suitable forms of evidence to those proposed. Overall, students should be assessed using varied forms of evidence.

These are some of the main types of assessment:

- Written reports, essays
- In-class tests
- Examinations
- Creation of financial documents
- Creation of planning documents
- Work-based projects
- Academic posters, displays, leaflets
- PowerPoint (or similar) presentations
- Recordings of interviews/role plays
- Working logbooks, reflective journals
- Presentations with assessor questioning
- Time-constrained assessment.

(Full definitions of different types of assessment are given in *Appendix 4*.)

The form(s) of evidence selected must:

- Allow the student to provide all the evidence required for the learning outcomes and the associated assessment criteria at all grade levels.
- Allow the student to produce evidence that is their own independent work.
- Allow a verifier to independently reassess the student to check the assessor's decisions.

For example, when you are using performance evidence, you need to think about how supporting evidence can be captured through recordings, photographs or task sheets.

Centres need to take particular care that students are enabled to produce independent work. For example, if students are asked to use real examples, then best practice would be to encourage them to use examples of their own or to give the group a number of examples that can be used in varied combinations.

6.3 Making valid assessment decisions

6.3.1 Authenticity of student work

An assessor must assess only student work that is authentic, i.e. the student's own independent work. Students must authenticate the evidence that they provide for assessment through signing a declaration stating that it is their own work. A student declaration must state that:

- Evidence submitted for the assignment is the student's own
- The student understands that false declaration is a form of malpractice.

Assessors must ensure that evidence is authentic to a student through setting valid assignments and supervising them during the assessment period. Assessors must also take care not to provide direct input, instructions or specific feedback that may compromise authenticity.

Centres may use Pearson templates or their own templates to document authentication.

During assessment an assessor may suspect that some or all of the evidence from a student is not authentic. The assessor must then take appropriate action using the centre's policies for malpractice. (*See section 3.7* in this Programme Specification for further information.)

6.3.2 Making assessment decisions using criteria

Assessors make judgements using the criteria. The evidence from a student can be judged using all the relevant criteria at the same time. The assessor needs to make a judgement against each criterion that evidence is present and sufficiently comprehensive. For example, the inclusion of a concluding section may be insufficient to satisfy a criterion requiring 'evaluation'.

Assessors should use the following information and support in reaching assessment decisions:

- The explanation of key terms in *Appendix 3* of this document
- Examples of verified assessed work
- Your Programme Leader and assessment team's collective experience.

6.3.3 Dealing with late completion of assignments

Students must have a clear understanding of the centre's policy on completing assignments by the deadlines that you give them. Students may be given authorised extensions for legitimate reasons, such as illness, at the time of submission, in line with your centre policies (see also Section 3.6 "Administrative arrangements for internal assessment").

For assessment to be fair, it is important that students are all assessed in the same way and that some students are not advantaged by having additional time or the opportunity to learn from others. Centres should develop and publish their own regulations on late submission; and, this should make clear the relationship between late submission and the centre's mitigating circumstances policy.

Centres may apply a penalty to assignments that are submitted beyond the published deadline. However, if a late submission is accepted, then the assignment should be assessed normally, when it is submitted, using the relevant assessment criteria; with any penalty or cap applied after the assessment. Where the result of assessment may be capped, due to late submission of the assignment, the student should be given an indication of their uncapped grade; in order to recognise the learning that has been achieved, and assessment feedback should be provided in relation to the uncapped achievement.

As with all assessment results, both the uncapped and capped grades should be recorded and ratified by an appropriate assessment board; taking into account any mitigating circumstances that may have been submitted.

6.3.4 Issuing assessment decisions and feedback

Once the assessment team has completed the assessment process for an assignment, the outcome is a formal assessment decision. This is recorded formally and reported to students. The information given to the student:

- Must show the formal decision and how it has been reached, indicating how or where criteria have been met.
- May show why attainment against criteria has not been demonstrated.
- Must not provide feedback on how to improve evidence but how to improve in the future.

6.3.5 Resubmission opportunity

An assignment provides the final assessment for the relevant learning outcomes and is normally a final assessment decision. A student who, for the first assessment opportunity, has failed to achieve a Pass for that unit specification **shall be expected to undertake a reassessment**.

- Only one opportunity for reassessment of the unit will be permitted.
- Reassessment for course work, project- or portfolio-based assessments shall normally involve the reworking of the original task.
- For examinations, reassessment shall involve completion of a new task.
- A student who undertakes a reassessment will have their grade capped at a Pass for that unit.
- A student will not be entitled to be reassessed in any component of assessment for which a Pass grade or higher has already been awarded.

6.3.6 Repeat Units

A student who, for the first assessment opportunity and resubmission opportunity, still failed to achieve a Pass for that unit specification can:

- At Centre discretion and Assessment Board, decisions can be made to permit a repeat of a unit.
- The student must study the unit again with full attendance and payment of the unit fee.
- The overall unit grade for a successfully completed repeat unit is capped at a Pass for that unit.
- Units can only be repeated once.

6.3.7 Assessment Boards

Each centre is expected by Pearson to hold Assessment Boards for all of its BTEC Higher National programmes. The main purpose of an Assessment Board is to make recommendations on:

- The grades achieved by students on the individual units
- Extenuating circumstances
- Cases of cheating and plagiarism
- Progression of students on to the next stage of the programme
- The awards to be made to students
- Referrals and deferrals.

Assessment Boards may also monitor academic standards. The main boards are normally held at the end of the session, although if your centre operates on a semester system there may be (intermediate) boards at the end of the first semester. There may also be separate boards to deal with referrals.

Where a centre does not currently have such a process then the External Examiner (EE) should discuss this with the Quality Nominee and Programme Leader, stressing the requirement for Assessment Boards by both Pearson and QAA and that Assessment Board reports and minutes provide valuable evidence for QAA's Review of Higher Education process.

6.4 Planning and record keeping

For internal processes to be effective, an assessment team needs to be well organised and keep effective records. The centre will also work closely with us so that we can quality assure that national standards are being satisfied. This process gives stakeholders confidence in the assessment approach.

The Programme Leader should have an assessment plan. When producing a plan the assessment team will wish to consider:

- The time required for training and standardisation of the assessment team.
- The time available to undertake teaching and carrying out of assessment, taking account of when students may complete external assessments and when quality assurance will take place.
- The completion dates for different assignments.
- Who is acting as Internal Verifier (IV) for each assignment and the date by which the assignment needs to be verified.
- Setting an approach to sampling assessor decisions though internal verification that covers all assignments, assessors and a range of students.
- How to manage the assessment and verification of students' work, so that they can be given formal decisions promptly.
- How resubmission opportunities can be scheduled.

The Programme Leader will also maintain records of assessment undertaken. The key records are:

- Verification of assignment briefs
- Student authentication declarations
- Assessor decisions on assignments, with feedback given to students
- Verification of assessment decisions.

Examples of records and further information are available in the Pearson Quality Assurance Handbook available in the support section of our website (http://qualifications.pearson.com).

6.5 Calculation of the final qualification grade

6.5.1 Conditions for the Award

Conditions for the Award of the HND

To achieve a Pearson BTEC Higher National Diploma qualification a student must have:

- completed units equivalent to 120 credits at level 5;
- achieved at least a pass in 105 credits at level 5;
- completed units equivalent to 120 credits at level 4;
- achieved at least a pass in 105 credits at level 4.

Conditions for the award of the HNC

To achieve a Pearson BTEC Higher National Certificate qualification a student must have:

- completed units equivalent to 120 credits at level 4;
- achieved at least a pass in 105 credits at level 4.

6.5.2 Compensation Provisions

Compensation Provisions for the HND

Students can still be awarded an HND if they have attempted but not achieved a Pass in one of the 15 credit units completed at level 4 and similarly if they have attempted but not achieved a Pass in one of the 15 credit units at level 5. However they must complete and pass the remaining units for an HNC or HND as per the unit rules of combination of the required qualification.

Compensation Provisions for the HNC

Students can still be awarded an HNC if they have attempted but not achieved a Pass in one of the 15 credit units completed, but have completed and passed the remaining units.

6.5.3 Calculation of the overall qualification grade

The calculation of the overall qualification grade is based on the student's performance in all units. Students are awarded a Pass, Merit or Distinction qualification grade using the points gained through all 120 credits, at Level 4 for the HNC or Level 5 for the HND, based on unit achievement. The overall qualification grade is calculated in the same way for the HNC and for the HND.

All units in valid combination must have been attempted for each qualification. The conditions of award and the compensation provisions will apply as outlined above. All 120 credits count in calculating the grade (at each level, as applicable).

The overall qualification grade for the HND will be calculated based on student performance in Level 5 units only.

Units that have been attempted but not achieved, and subsequently granted compensation, will appear as 'Unclassified'; i.e. a 'U' grade, on the student's Notification of Performance, that is issued with the student certificate.

Points per credit

Grade	Points
Pass	4
Merit	6
Distinction	8

Point boundaries

Grade	Point boundaries
Pass	420–599
Merit	600–839
Distinction	840 +

6.5.4 Modelled Student Outcomes

Pearson BTEC Level 4 Higher National Certificate

				STUDENT 1		STUDENT 2		STUDENT 3		STUDENT 4		STUDENT 5	
	Credits	Level	Grade point	Grade	Unit points	Grade	Unit points	Grade	Unit points	Grade	Unit points	Grade	Unit points
Core 1	15	4	4	P	60	P	60	P	60	D	120	D	120
Core 2	15	4	4	P	60	P	60	P	60	D	120	M	90
Core 3	15	4	4	P	60	P	60	P	60	D	120	M	90
Core 4	15	4	4	P	60	P	60	M	90	M	90	M	90
Core 5	15	4	6	M	90	P	60	M	90	M	90	M	90
Core 6	15	4	6	M	90	P	60	M	90	M	90	M	90
Opt 1	15	4	6	M	90	M	90	D	120	D	120	D	120
Opt 2	15	4	6	M	90	M	90	D	120	D	120	D	120
TOTAL	120				600		540		690		870		810
GRADE					M		P		M		D		M

Pearson BTEC Level 5 Higher National Diploma

				STUDENT 1		STUDENT 2		STUDENT 3		STUDENT 4		STUDENT 5	
	Credits	Level	Grade point	Grade	Unit points	Grade	Unit points	Grade	Unit points	Grade	Unit points	Grade	Unit points
Core 1	15	4	0	P	0	P	0	P	0	D	0	P	0
Core 2	15	4	0	P	0	P	0	P	0	D	0	M	0
Core 3	15	4	0	P	0	P	0	P	0	D	0	M	0
Core 4	15	4	0	P	0	P	0	M	0	M	0	M	0
Core 5	15	4	0	M	0	P	0	M	0	M	0	P	0
Core 6	15	4	0	M	0	P	0	M	0	D	0	U	0
Opt 1	15	4	0	M	0	P	0	D	0	D	0	D	0
Opt 2	15	4	0	M	0	P	0	D	0	D	0	D	0
Core 7	30	5	6	M	180	M	180	M	180	P	120	D	240
Core 8	15	5	6	M	90	M	90	M	90	P	60	D	120
Opt 3	15	5	6	M	90	M	90	D	120	P	60	D	120
Opt 4	15	5	6	M	90	P	60	D	120	P	60	D	120
Opt 5	15	5	6	M	90	P	60	D	120	M	90	M	90
Opt 6	15	5	6	M	90	P	60	M	90	M	90	P	60
Opt 7	15	5	6	M	90	P	60	M	90	M	90	M	90
TOTAL	240				720		600		810		570		840
GRADE					M		M		M		P		D

7 Quality assurance

Pearson's quality assurance system for all Pearson BTEC Higher National programmes is benchmarked to Level 4 and Level 5 on the Quality Assurance Agency (QAA) Framework for Higher Education Qualifications (FHEQ). This will ensure that centres have effective quality assurance processes to review programme delivery. It will also ensure that the outcomes of assessment are to national standards.

The quality assurance process for centres offering Pearson BTEC Higher National programmes comprise five key components:

1 The approval process

2 Monitoring of internal centre systems

3 Independent assessment review

4 Annual programme monitoring report

5 Annual student survey

7.1 The approval process

Centres new to the delivery of Pearson programmes will be required to seek approval initially through the existing centre approval process and then through the programme approval process. Programme approval for new centres can be considered in one of two ways:

- Desk-based approval review
- Review and approval visit to the centre.

Prior to approval being given, centres will be required to submit evidence to demonstrate that they:

- Have the human and physical resources required for effective delivery and assessment.
- Understand the implications for independent assessment and agree to abide by these.
- Have a robust internal assessment system supported by 'fit for purpose' assessment documentation.
- Have a system to internally verify assessment decisions, to ensure standardised assessment decisions are made across all assessors and sites.

Applications for approval must be supported by the head of the centre (Principal or Chief Executive, etc.) and include a declaration that the centre will operate the programmes strictly, as approved and in line with Pearson requirements.

Centres seeking to renew their programme approval upon expiry of their current approval period may be eligible for the Automatic Approval process, subject to the centre meeting the eligibility criteria set out by Pearson.

Regardless of the type of centre, Pearson reserves the right to withdraw either qualification or centre approval when it deems there is an irreversible breakdown in the centre's ability either to quality assure its programme delivery or its assessment standards.

7.2 Monitoring of internal Centre systems

Centres will be required to demonstrate on-going fulfilment of the centre approval criteria over time and across all Higher National programmes. The process that assures this is external examination, which is undertaken by EE. Centres will be given the opportunity to present evidence of the on-going suitability and deployment of their systems to carry out the required functions. This includes the consistent application of policies affecting student registrations, appeals, effective internal examination and standardisation processes. Where appropriate, centres may present evidence of their operation within a recognised code of practice, such as that of the Quality Assurance Agency for Higher Education. Pearson reserves the right to confirm independently that these arrangements are operating to Pearson's standards.

Pearson will affirm, or not, the on-going effectiveness of such systems. Where system failures are identified, sanctions (appropriate to the nature of the problem) will be applied, in order to assist the centre in correcting the problem.

7.3 Independent assessment review

The internal assessment outcomes reached for all Pearson BTEC Higher National programmes benchmarked to Level 4 and Level 5 of the QAA FHEQ, are subject to a visit from a Pearson appointed External Examiner. The outcomes of this process will be:

- To confirm that internal assessment is to national standards and allow certification, ***or***
- To make recommendations to improve the quality of assessment outcomes before certification is released, **or**
- To make recommendations about the centre's ability to continue to be approved for the Pearson BTEC Higher National qualifications in question.

7.4 Annual Programme Monitoring Report (APMR)

The APMR is a written annual review form that provides opportunity for centres to analyse and reflect on the most recent teaching year. By working in collaboration with centres, the information can be used by Pearson to further enhance the quality assurance of the Pearson BTEC Higher National programmes.

7.5 Annual student survey

Pearson will conduct an annual survey of Pearson BTEC Higher National students. The purpose of the survey is to enable Pearson to evaluate the student experience as part of the quality assurance process, by engaging with students studying on these programmes.

7.6 Centre and qualification approval

As part of the approval process, your centre must make sure that the resource requirements listed below are in place before offering the qualification.

Centres must have appropriate physical resources (for example equipment, IT, learning materials, teaching rooms) to support the delivery and assessment of the qualifications.

- Staff involved in the assessment process must have relevant expertise and/or occupational experience.
- There must be systems in place to ensure continuing professional development for staff delivering the qualification.
- Centres must have in place appropriate health and safety policies relating to the use of equipment by staff and students.
- Centres must deliver the qualification in accordance with current equality legislation.
- Centres should refer to the individual unit descriptors to check for any specific resources required.

The result, we believe, are qualifications that will meet the needs and expectations of students worldwide.

7.7 Continuing quality assurance and standards verification

We produce annually the latest version of the Pearson Quality Assurance Handbook available in the support section of our website (http://qualifications.pearson.com). It contains detailed guidance on the quality processes required to underpin robust assessment and internal verification.

The key principles of quality assurance are that:

- A centre delivering Pearson BTEC Higher National programmes must be an approved centre, and must have approval for the programmes or groups of programmes that it is delivering.
- The centre agrees, as part of gaining approval, to abide by specific terms and conditions around the effective delivery and quality assurance of assessment; it must abide by these conditions throughout the period of delivery.

- Pearson makes available to approved centres a range of materials and opportunities through the assessment checking service. This is intended to exemplify the processes required for effective assessment and provide examples of effective standards. Approved centres must use the materials and services to ensure that all staff delivering BTEC qualifications keep up to date with the guidance on assessment.
- An approved centre must follow agreed protocols for standardisation of assessors and verifiers, for the planning, monitoring and recording of assessment processes, and for dealing with special circumstances, appeals and malpractice.

The approach of quality-assured assessment is through a partnership between an approved centre and Pearson. We will make sure that each centre follows best practice and employs appropriate technology to support quality-assurance processes where practicable. We work to support centres and seek to make sure that our quality-assurance processes do not place undue bureaucratic processes on centres. We monitor and support centres in the effective operation of assessment and quality assurance.

The methods we use to do this for BTEC Higher Nationals include:

- Making sure that all centres complete appropriate declarations at the time of approval
- Undertaking approval visits to centres
- Making sure that centres have effective teams of assessors and verifiers who are trained to undertake assessment
- Assessment sampling and verification through requested samples of assessments, completed assessed student work and associated documentation
- An overarching review and assessment of a centre's strategy for assessing and quality-assuring its BTEC programmes.

An approved centre must make certification claims only when authorised by us and strictly in accordance with requirements for reporting. Centres that do not fully address and maintain rigorous approaches to quality assurance cannot seek certification for individual programmes or for all BTEC Higher National qualifications.

Centres that do not comply with remedial action plans may have their approval to deliver qualifications removed.

8 Recognition of Prior Learning and attainment

Recognition of Prior Learning (RPL) is a method of assessment (leading to the award of credit) that considers whether students can demonstrate that they can meet the assessment requirements for a unit through knowledge, understanding or skills they already possess, and so do not need to develop through a course of learning.

Pearson encourages centres to recognise students' previous achievements and experiences whether at work, home or at leisure, as well as in the classroom. RPL provides a route for the recognition of the achievements resulting from continuous learning. RPL enables recognition of achievement from a range of activities using any valid assessment methodology. Provided that the assessment requirements of a given unit or qualification have been met, the use of RPL is acceptable for accrediting a unit, units or a whole qualification. Evidence of learning must be valid and reliable.

For full guidance on RPL please refer to the Recognition of Prior Learning policy document available in the support section of our website (https://qualifications.pearson.com).

9 Equality and diversity

Equality and fairness are central to our work. The design of these qualifications embeds consideration of equality and diversity as set out in the qualification regulators' General Conditions of Recognition. Promoting equality and diversity involves treating everyone with equal dignity and worth, while also raising aspirations and supporting achievement for people with diverse requirements, entitlements and backgrounds. An inclusive environment for learning anticipates the varied requirements of students, and aims to ensure that all students have equal access to educational opportunities. Equality of opportunity involves enabling access for people who have differing individual requirements as well as eliminating arbitrary and unnecessary barriers to learning. In addition, students with and without disabilities are offered learning opportunities that are equally accessible to them, by means of inclusive qualification design.

Pearson's equality policy requires all students to have equal opportunity to access our qualifications and assessments. It also requires our qualifications to be designed and awarded in a way that is fair to every student. We are committed to making sure that:

- Students with a protected characteristic (as defined in legislation) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic.
- All students achieve the recognition they deserve from undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Pearson's policy regarding access to its qualifications is that:

- They should be available to everyone who is capable of reaching the required standards
- They should be free from any barriers that restrict access and progression
- There should be equal opportunities for all those wishing to access the qualifications.

Centres are required to recruit students to Higher National qualifications with integrity. This will include ensuring that applicants have appropriate information and advice about the qualifications, and that the qualification will meet their needs. Centres will need to review the entry profile of qualifications and/or experience held by applicants, considering whether this profile shows an ability to progress to a higher level qualification. Centres should take appropriate steps to assess each applicant's potential and make a professional judgement about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the student within the centre during their programme of study and any specific support that might be necessary to allow the student to access the assessment for the qualification. Centres should consult our policy documents on students with particular requirements.

Access to qualifications for students with disabilities or specific needs

Students taking a qualification may be assessed in a recognised regional sign language, where it is permitted for the purpose of reasonable adjustments. Further information on access arrangements can be found in the Joint Council for Qualifications (JCQ) document Access Arrangements, Reasonable Adjustments and Special Consideration for General and Vocational Qualifications. Details on how to make adjustments for students with protected characteristics are given in the document *Pearson Supplementary Guidance for Reasonable Adjustment* and *Special Consideration in Vocational Internally Assessed Units*. See the support section of our website for both documents (http://qualifications.pearson.com/).

10 Pearson BTEC Higher Nationals in Agriculture Units

Unit 1: Business and the Business Environment

Unit code	**L/616/7829**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

Introduction

The aim of this unit is to provide students with background knowledge and understanding of Agricultural business, the functions of an organisation and the wider business environments in which organisations operate. Students will examine the different types of Agricultural organisations (including for profit and not for profit), their size and scope (for instance, micro, SME, transnational and global) and how they operate.

Students will explore the relationships that Agricultural organisations have with their various stakeholders and how the wider external environments influence and shape business decision-making.

The knowledge, understanding and skill sets gained in this unit will help students to choose their own preferred areas of specialism in future studies and in their professional career.

Learning Outcomes

By the end of this unit a student will be able to:

1 Explain the different types, size and scope of Agricultural organisations

2 Demonstrate the interrelationship of the various functions within an Agricultural organisation and how they link to organisational structure

3 Use contemporary examples to demonstrate both the positive and negative influence/impact the macro environment has on Agricultural business operations

4 Determine the internal strengths and weaknesses of specific Agricultural businesses and explain their interrelationship with external macro factors.

Essential Content

LO1 **Explain the different types, size and scope of Agricultural organisations**

Different types of organisations:

Differences between for profit and not for profit and non-government organisations (NGOs)

Micro, small, medium-sized enterprises (SMEs)

Different business purposes, objectives and supply of goods and services

The range of legal structures associated with different forms of business: sole traders, partnerships and private limited companies.

Size and scope of organisations:

Differences between large, medium-sized and small organisations including objectives and goals, market share, profit share, growth and sustainability

Global growth and developments of transnational, international and global organisations

Differences between franchising, joint ventures and licensing

Industrial structures and competitive analysis

Market forces and economic operations e.g. scarcity and choice, supply and demand, income elasticity

Stakeholders and responsibilities of organisations to meet different stakeholder interests and expectations.

LO2 **Demonstrate the interrelationship of the various functions within an Agricultural organisation and how they link to organisational structure**

The various functions within an organisation:

The role of marketing, finance, human resource management and operations within an organisational context and the interrelationships

How functions relate to overall organisation mission and objectives.

Organisational structure:

Different structures depending upon the size and scope of the organisation, including bureaucratic and post-bureaucratic, parent, strategic business units (SBUs), matrix and functional levels

Organisation structures and complexities of transnational, international and global organisations.

LO3 **Use contemporary examples to demonstrate both the positive and negative influence/impact the macro environment has on Agricultural business operations**

The context of the macro environment:

The application of the PESTLE framework and how organisations need to monitor and forecast external influences

How the macro environment influences/impacts upon business activities: the impact of the digital revolution on production and consumption, the impact of social technologies, cybersecurity, emerging BRICS markets, the global shift in economic and social power and ethical and sustainable growth

How organisations go through the transformation process and overcome resistance to change in response to the changing market environment.

LO4 **Determine the internal strengths and weaknesses of specific Agricultural businesses and explain their interrelationship with external macro factors.**

Frameworks for analysis:

Introduction to SWOT and/or TOWS analysis and how they can assist in the decision-making process within organisations

Key external macro factors including the competitive environment and government intervention that influence organisations and business

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain the different types, size and scope of Agricultural organisations</td><td rowspan="5">LO1 LO2

D1 Provide a critical analysis of the complexities of different types of business structures and the interrelationships of the different organisational functions.</td></tr>
<tr><td>P1 Explain different types and purposes of Agricultural organisations; public, private and voluntary sectors and legal structures.

P2 Explain the size and scope of a range of different types of Agricultural organisations.</td><td>M1 Analyse how the structure, size and scope of different Agricultural organisations link to the business objectives and product and services offered by the organisation.</td></tr>
<tr><td colspan="2">LO2 Demonstrate the interrelationship of the various functions within an Agricultural organisation and how they link to organisational structure</td></tr>
<tr><td>P3 Explain the relationship between different organisational functions and how they link to organisational objectives and structure.</td><td>M2 Analyse the advantages and disadvantages of interrelationships between organisational functions and the impact that can have upon organisational structure.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Use contemporary examples to demonstrate both the positive and negative influence/impact the macro environment has on Agricultural business operations		
P4 Identify the positive and negative impacts the macro environment has upon business operations, supported by specific examples.	**M3** Apply appropriately the PESTLE model to support a detailed analysis of the macro environment within an Agricultural organisation.	**LO3 LO4** **D2** Critically evaluate the impacts that both macro and micro factors have upon business objectives and decision-making.
LO4 Determine the internal strengths and weaknesses of specific Agricultural businesses and explain their interrelationship with external macro factors.		
P5 Conduct internal and external analysis of specific Agricultural organisations in order to identify strengths and weaknesses. **P6** Explain how strengths and weaknesses interrelate with external macro factors.	**M4** Apply appropriately SWOT/TOWS analysis and justify how they influence decision-making.	

Recommended Resources

BARON, P. (2012) *Business and its Environment*. 7th edn. London: Prentice Hall.

PALMER, A. and HARTLEY, B. (2011) *The Business Environmen*t. 7th edn. Maidenhead: McGraw-Hill.

WEATHERLEY, P. and OTTER, D. (eds) (2014) *The Business Environment: Themes and Issues in a Globalised World.* 3rd edn. Oxford: Oxford University Press.

WORTHINGTON, I. and BRITTON. C. (2014) *The Business Environment*. 7th edn. Harlow: Pearson.

Links

This unit links to the following related units:

Unit 2: Management Accounting

Unit 11: Human Resource Management

Unit 12: Marketing Essentials

Unit 2: Management Accounting

Unit code	**H/508/0489**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

Introduction

The overall aim of this unit is to introduce the fundamentals of management accounting which apply to the wider Agricultural business environment and the organisations which operate within that environment. Students will explore how management accounting uses financial data to aid planning decisions, and the monitoring and control of finance within organisations.

On successful completion of this unit, students will be in a position to present financial statements in a workplace context and be able to assist senior colleagues with financial business planning. In addition, students will have the fundamental knowledge and skills to progress onto a higher level of study.

Learning Outcomes

By the end of this unit a student will be able to:

1 Demonstrate an understanding of management accounting systems

2 Apply a range of management accounting techniques

3 Explain the use of planning tools used in management accounting

4 Compare ways in which organisations could use management accounting to respond to financial problems.

Essential Content

LO1 **Demonstrate an understanding of management accounting systems**

Introduction to management accounting:

What is management accounting? Definition of management accounting

What is a management accounting system?

Why is it important to integrate these within an organisation?

Explore the origin, role and principles of management accounting

The distinction between management and financial accounting.

Different types of management accounting systems:

Cost-accounting systems, inventory management systems, job-costing systems and price-optimising systems

Benefits of different types of systems.

Presenting financial information:

Why information should be relevant to the user, reliable, up to date and accurate

Why the way in which the information is presented must be understandable

Different types of managerial accounting reports.

LO2 **Apply a range of management accounting techniques**

Microeconomic techniques:

What is meant by cost? Different costs and cost analysis

Cost-volume profit, flexible budgeting and cost variances

Applying absorption and marginal costing.

Product costings:

Fixed and variable costs, cost allocation

Normal and standard costing, activity-based costing and the role of costing in setting price.

Cost of inventory:

Definition and meaning of inventory costs and different types of inventory costs

The benefits of reducing inventory costs to an organisation

Valuation methods

Cost variances

Overhead costs.

LO3 **Explain the use of planning tools used in management accounting**

Using budgets for planning and control:

Preparing a budget

Different types of budgets (e.g. capital and operating)

Alternative methods of budgeting

Behavioural implications of budgets.

Pricing:

Pricing strategies

How do competitors determine their prices?

Supply and demand considerations.

Common costing systems:

Actual costing, normal costing and standard costing systems

How cost systems differ depending on the costing activity: job costing, process costing, batch costing and contract costing.

Strategic planning:

Applying PEST, SWOT, balance scorecard or Porter's Five Forces analysis to the financial position of an organisation.

LO4 **Compare ways in which organisations could use management accounting to respond to financial problems**

Identifying financial problems:

Using benchmarks, key performance indicators (financial and non-financial) and budgetary targets to identify variances and problems.

Financial governance:

Definitions of financial governance, and how this can be used to pre-empt or prevent financial problems

Using financial governance to monitor strategy.

Management accounting skill sets:

What are the characteristics of an effective management accountant?

How can these skills be used to prevent and/or deal with problems?

Effective strategies and systems:

The development of strategies and systems which require effective and timely reporting, full disclosure of financial positions and are responsibly owned and governed.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Demonstrate an understanding of management accounting systems</td><td rowspan="2">LO1

D1 Critically evaluate how management accounting systems and management accounting reporting is integrated within organisational processes.</td></tr>
<tr><td>P1 Explain management accounting and give the essential requirements of different types of management accounting systems.

P2 Explain different methods used for management accounting reporting.</td><td>M1 Evaluate the benefits of management accounting systems and their application within an organisational context.</td></tr>
<tr><td colspan="2">LO2 Apply a range of management accounting techniques</td><td rowspan="2">LO2

D2 Produce financial reports that accurately apply and interpret data for a range of business activities.</td></tr>
<tr><td>P3 Calculate costs using appropriate techniques of cost analysis to prepare an income statement using marginal and absorption costs.</td><td>M2 Accurately apply a range of management accounting techniques and produce appropriate financial reporting documents.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Explain the use of planning tools used in management accounting		**LO3 LO4** **D3** Evaluate how planning tools for accounting respond appropriately to solving financial problems to lead organisations to sustainable success.
P4 Explain the advantages and disadvantages of different types of planning tools used for budgetary control.	**M3** Analyse the use of different planning tools and their application for preparing and forecasting budgets.	
LO4 Compare ways in which organisations could use management accounting to respond to financial problems.		
P5 Compare how organisations are adapting management accounting systems to respond to financial problems.	**M4** Analyse how, in responding to financial problems, management accounting can lead organisations to sustainable success.	

Recommended Resources

DRURY, C. (2015) *Management and Cost Accounting*. 9th edn. Andover: Cengage Learning.

EDMONDS, T. and OLDS, P. (2013) *Fundamental Managerial Accounting Concepts*. 7th edn. Maidenhead: McGraw-Hill.

HORNGREN, C., SUNDEN, G., STRATTON, W., BURGSTALHER, D. and SCHATZBERG, J. (2013) *Introduction to Management Accounting*. Global edn. Harlow: Pearson. (This text is available electronically and is supported by access to an online course)

SEAL, W., GARRISON, R. and NOREEN, E. (2014) *Management Accounting.* 5th edn. Maidenhead: McGraw-Hill.

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 18: Advanced Financial Accounting

Unit 3: Managing a Successful Project (Pearson-set)

Unit code	**F/616/7830**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

Introduction

This unit is assessed by a Pearson-set assignment. The project brief will be set by the Centre, based on a theme provided by Pearson (this will change annually). The theme and chosen project within the theme will enable students to explore and examine a relevant and current topical aspect of business in the context of the Land-based business environment.

The aim of this unit is to offer students an opportunity to demonstrate the skills required for managing and implementing a project. They will undertake independent research and investigation for carrying out and executing a business project which meets appropriate business aims and objectives.

On successful completion of this unit, students will have the confidence to engage in decision-making, problem-solving and research activities using project management skills. They will have the fundamental knowledge and skills to enable them to investigate and examine relevant business concepts within a work-related context, determine appropriate outcomes, decisions or solutions and present evidence to various stakeholders in an acceptable and understandable format.

Please refer to the accompanying Pearson-set Assignment Guide and the Theme Release document for further support and guidance on the delivery of the Pearson-set unit.

Learning Outcomes

By the end of this unit a student will be able to:

1 Establish project aims, objectives and timeframes based on the chosen theme

2 Conduct small-scale research, information gathering and data collection to generate knowledge to support the project

3 Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis

4 Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance.

Essential Content

LO1 Establish project aims, objectives and timeframes based on the chosen theme

Project management:

What is project management and what does it involve?

The key stages of project management

The advantages of using project management and why it is important.

Initiation of the project and project planning phase:

Scoping a project − defining objectives, scope, purpose and deliverables to be produced

Steps and documentation required in the initiation phase

Developing the project plan, including planning for timescales and time management, cost, quality, change, risk and issues

The work breakdown structure

Use of Bar and Gantt Charts for effective planning.

LO2 Conduct small-scale research, information gathering and data collection to generate knowledge to support the project

Project execution phase:

Selecting appropriate methods of information gathering, data collection and material resourcing

The distinct phases that support a coherent and logical argument

Use of secondary research to inform a primary empirical study

Qualitative and quantitative research methods.

Field work:

Selecting a sample of the consumer market, businesses or individuals (those who meet certain characteristics relevant to the research theme) is used to gather data (qualitative or quantitative)

Sampling approaches and techniques, including probability and non-probability sampling.

Ethics, reliability and validity:

All research should be conducted ethically − how is this achieved and reported?

Research should also be reliable (similar results achieved from a similar sample) and valid (the research should measure what it aimed to measure).

Analysing information and data:

Using data collection tools such as interviews and questionnaires

Using analytical techniques such as trend analysis, coding or typologies.

LO3 **Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis**

Communicating outcomes:

Consider the method (e.g. written, verbal) and the medium (e.g. report, online, presentation)

Both method and medium will be influenced by the project research and its intended audience.

Convincing arguments:

All findings/outcomes should be convincing and presented logically where the assumption is that the audience has little or no knowledge of the project process

Developing evaluative conclusions.

Critical and objective analysis and evaluation:

Secondary and primary data should be critiqued and considered with an objective mindset

Objectivity results in more robust evaluations where an analysis justifies a judgement.

LO4 **Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance**

Reflection for learning and practice:

The difference between reflecting on performance and evaluating a project − the former considers the research process, information gathering and data collection, the latter the quality of the research argument and use of evidence.

The cycle of reflection:

To include reflection in action and reflection on action

How to use reflection to inform future behaviour, particularly directed towards sustainable performance.

Reflective writing:

Avoiding generalisation and focusing on personal development and the research journey in a critical and objective way.

Generalisation:

Many studies result in generalised findings. Research that has its basis in a specific field such as Human Resource Management (HRM) and in a specific context should avoid generalised conclusions

Outcomes should be specific and actionable.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Establish project aims, objectives and timeframes based on the chosen theme</td><td rowspan="5">LO1 LO2

D1 Critically evaluate the project management process and appropriate research methodologies applied.</td></tr>
<tr><td>P1 Devise project aims and objectives for a chosen scenario.

P2 Produce a project management plan that covers aspects of cost, scope, time, quality, communication, risk and resources.

P3 Produce a work breakdown structure and a Gantt Chart to provide timeframes and stages for completion.</td><td>M1 Produce a comprehensive project management plan, milestone schedule and project schedule for monitoring and completing the aims and objectives of the project.</td></tr>
<tr><td colspan="2">LO2 Conduct small-scale research, information gathering and data collection to generate knowledge to support the project</td></tr>
<tr><td>P4 Carry out small-scale research by applying qualitative and quantitative research methods appropriate for meeting project aims and objectives.</td><td>M2 Evaluate the accuracy and reliability of different research methods applied.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis		**LO3 LO4** **D2** Critically evaluate and reflect on the project outcomes, the decision-making process and changes or developments of the initial project management plan to support justification of recommendations and learning during the project.
P5 Analyse research and data using appropriate tools and techniques. **P6** Communicate appropriate recommendations as a result of research and data analysis to draw valid and meaningful conclusions.	**M3** Evaluate the selection of appropriate tools and techniques for accuracy and authenticity to support and justify recommendations.	
LO4 Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance.		
P7 Reflect on the value of undertaking the research to meet stated objectives and own learning and performance.	**M4** Evaluate the value of the project management process and use of quality research to meet stated objectives and support own learning and performance.	

Additional Evidence Requirements

In addition to the above assessment criteria students will also be required to complete a project logbook to record ideas, changes and developments as they progress and complete the project.

Recommended Resources

Textbooks

COSTLEY, C., ELLIOT, G. and GIBBS, P. (2010) *Doing Work Based Research: Approaches to Enquiry for Insider-researchers.* London: SAGE.

FLICK, U. (2011) *Introducing Research Methodology: A Beginner's Guide to Doing a Research Project.* London: SAGE.

GRAY, D. (2009) *Doing Research in the Real World*. 2nd edn. London: SAGE.

SAUNDERS, M., LEWIS, P. and THORNHILL, A. (2012) *Research Methods for Business Students.* 6th edn. Harlow: Pearson.

Websites

www.eajournals.org	European American Journals International Journal of Quantitative and Qualitative Research (Journal)
www.emeraldinsight.com	Emerald Insight Qualitative Research Journal (Journal)

Links

This unit links to the following related units:

Unit 19: Research Project (Pearson-set)

Unit 4: Principles of Livestock Production

Unit code	**L/616/7832**
Unit level	**4**
Credit value	**15**

Introduction

This unit is aimed at potential farm owners, farm managers, herds people, shepherds and other people who look after livestock who wish to manage efficient and effective livestock production units. The learning outcomes will be achieved by encouraging students to gain knowledge, develop understanding and critically evaluate the principles of livestock production in an ever-changing industry.

Students are encouraged to develop an understanding of the principles of livestock production through the stages of the production cycle, breeding for replacements or market, maintaining the health and welfare of the livestock and understanding the financial aspects of managing a livestock production unit, be it on a large or small extensive or intensive farm. Students are also encouraged to develop an understanding of Health and Safety issues and current legislation as well as the long term viability of livestock farming.

This will allow students to apply their knowledge to the requirements of specified livestock at different stages of the production cycle to help maximise production and manage an enterprise. They will be able to compare different production systems for a named species of livestock and understand how to maximise production throughout the production cycle for the named species.

The knowledge and skill sets gained will help further develop the students understanding in their chosen animal production specialism and give them the skills to optimise animal performance, production, viability and health and welfare as well as having a good understanding of the finances required to manage a livestock production unit.

Learning Outcomes

By the end of this unit students will be able to:

1 Compare production systems of a named species of animal through its production cycle

2 Discuss the principles of breeding to maximise the output of a production system

3 Outline accommodation and feeding systems for a specified livestock production system

4 Describe the health and welfare measures required to maximise livestock production.

Essential content

LO1 **Compare production systems of a named species of animal through its production cycle**

Intensive systems

Extensive systems

Economic viability

Marketing

Basic record keeping:

Such as stock numbers, stock sold, females served, females given birth, stocking rates, replacement rates, daily live weight gains, feed conversion efficiencies.

Accounts to include:

Gross margins, net profit and loss, fixed costs, variable costs, gross outputs

Health and Safety

Legislation

LO2 **Discuss the principles of breeding to maximise the output of a production system**

Breeds of livestock and their suitability for different production systems

Genetics

Natural breeding methods

Artificial breeding methods

Embryo transfer

Ethics and legislation

LO3 **Outline accommodation and feeding systems for a specified livestock production system**

Housing design

Handling systems

Feeding systems

Grazing management

Nutrition and nutritional requirements

Legislation and codes of practice

Health and Safety

LO4 **Describe the health and welfare measures required to maximise livestock production**

Diseases:

*V*iral, bacterial, fungal, metabolic, parasites.

Immunology

Health plans

Preventative care

Treatments

Legislation and codes of practice

Health and Safety

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Compare production systems of a named species of animal through its production cycle</td><td rowspan="4"></td></tr>
<tr><td>P1 Describe a production system of a named species of livestock through its production cycle.

P2 Describe how to rear replacements for the production system.

P3 Identify markets for the products of a named livestock production unit.</td><td>M1 Evaluate the advantages and disadvantages of an intensive and extensive production system for a named species of livestock.</td></tr>
<tr><td colspan="2">LO2 Discuss the principles of breeding to maximise the output of a production system</td></tr>
<tr><td>P4 Describe the attributes of different breeds for a named production system.

P5 Describe the methods of breeding livestock for a named production system.</td><td>M2 Evaluate two different breeding methods for a named production system.</td></tr>
<tr><td colspan="2"></td><td>LO1 LO2

D1 Provide a detailed critical analysis of named production systems (to include the breed of livestock, breeding and rearing of replacements, marketing of products, financial costs and expected profits).</td></tr>
</table>

Pass	Merit	Distinction
LO3 Outline accommodation and feeding systems for a specified livestock production system		**LO3 LO4** **D2** Critically evaluate accommodation designs and feeding systems currently available for a named species of livestock and discuss how each accommodation design/feeding system can impact on the health and welfare of the named species of livestock and meet the legislative requirements.
P6 Identify accommodation requirements for a named species of livestock. **P7** Identify the advantages and disadvantages of feeding systems for a named species of livestock.	**M3** Design accommodation for a named species of livestock.	
LO4 Describe the health and welfare measures required to maximise livestock production.		
P8 Outline the cause, symptoms, treatments and preventions of three common diseases and disorders that can affect a named species of livestock. **P9** Create a health plan for a named species of livestock. **P10** Describe the legislation and codes of practice that affects the health and welfare of a named species of livestock.	**M4** Evaluate a current health plan, suggesting improvements that could be put in place for a named livestock production unit.	

Recommended Resources

Textbooks

FINCH, H.J.S., SAMUEL, A.M. and LANE, G.P.F. (2014) *Lochhart & Wiseman's Crop Husbandry including Grassland.* 9th edn. Cambridge: Woodhead Publishing.

SOFFE, R.J. (2017) *The Agricultural Notebook.* 21st edn. Oxford: Wiley-Blackwell.

KHATIB, H. (2015) *Molecular and Quantitative Animal Genetics (Course Smart).* New Jersey: Wiley-Blackwell.

NUTHALL, P.L. (2016) *Farm Business Management The Fundamentals of Good Practice*. Oxfordshire: CABI.

Websites

www.fwi.co.uk	Farmers Weekly
	Livestock
	(Research)
www.moredun.org.uk	Moredun Research Institute
	Disease Summaries
	(Research)

Links

This unit links to the following related units:

Unit 5: Animal Health and Welfare

Unit 6: Animal Nutrition

Unit 15: Animal Husbandry

Unit 5: Animal Health and Welfare

Unit code	**L/616/7833**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

Introduction

Animal Health and Welfare is important to the wellbeing of the animal and is at the forefront of efficient production cycles and systems. A healthy animal who is also free to display natural behaviours will enhance development and improve production and farm profitability.

Knowledge of how to maintain animal health and how to maximise the welfare of animals across a range of different enterprises, are fundamental skills, which underpin a successful career.

Students will learn how to recognise signs of health and disease across a range of ages within a chosen sector as well as how to manage animals to promote good health and prevent disease. Key diseases and parasites will be reviewed. Interpretation of health in a range of systems will be undertaken, as well as outlining legislation that governs animal health.

Students will also learn how to measure and influence animal welfare within their chosen sector e.g. dairy or beef or sheep or poultry or pigs or mixed farming enterprises. They will learn how to conduct an animal welfare assessment. Positive and negative welfare states will be defined and the use of enrichment to enhance welfare will be discussed in detail.

Learning Outcomes

By the end of this unit students will be able to:

1 Define causal pathogens and factors that can influence animal health and disease

2 Discuss the concepts of animal health and disease, and methods of disease prevention

3 Assess physiological, behavioural and physical measures of animal welfare

4 Evaluate changes to animal management systems to enhance animal welfare

Essential Content

LO1 Define causal pathogens and factors that can influence animal health and disease

Review a range of causal pathogens and diagnosis and control measures:

Viruses, bacteria, fungi and protozoa

Endo and ectoparasites.

Differences between infectious, contagious and zoonotic diseases

Methods of disease transmission:

Direct transmission

Indirect transmission

Role of vectors.

Factors that influence health and disease:

Environment

Housing types

Management regimes

Social interaction

Stocking density

Immunity

Vaccination.

LO2 Discuss the concepts of animal health and disease, and methods of disease prevention

Control measures for common diseases:

Viruses, bacteria, fungi and protozoa

Endo and ectoparasites

Vaccination

Notifiable diseases.

Prevention of spread of disease:

Monitoring health

Disease management

Isolation/quarantine

Euthanasia.

LO3 **Assess physiological, behavioural and physical measures of animal welfare**

Define eustress, stress and distress

Physiological measures of welfare assessment:

Role of autonomic nervous system

Heart rate

Respiratory rate

Catecheolamines

Hypothalamic-pituitary axis: glucorticoid levels.

Behavioural measures of welfare assessment:

Changes in behaviour

Fear behaviour

Eating and drinking behaviour

Social interaction

Abnormal behaviour

Stereotypical behaviour

Preference testing.

Physical measures of welfare assessment:

Body condition score / weight

Productivity measures

Immune function

Disease prevalence

Mortality rates.

LO4 **Evaluate changes to animal management systems to enhance animal welfare**

Key reasons for assessing animal welfare:

Ethics

Legislation

Productivity

Human-animal interaction.

Factors which can affect animal welfare:

Environment

Housing types

Management regimes

Enrichment

Social interaction

Stocking density.

Welfare assessment in a range of environments:

Intensive / extensive

Housed

Outside

Exhibited animals at shows and sales.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Define causal pathogens and factors that can influence animal health and disease		
P1 Describe causal pathogens and discuss the difference between infectious and contagious diseases. **P2** Identify an infectious and contagious disease for a named animal species.	**M1** Discuss the impact of a named disease on animal health.	**D1** Evaluate environmental factors that can influence the risk of disease outbreaks in animals.
LO2 Discuss the concepts of animal health and disease, and methods of disease prevention		
P3 Describe signs of health across three animal species. **P4** Outline common signs of disease in animals.	**M2** Review three methods of disease prevention in animals.	**D2** Produce a management plan to prevent disease for a named animal species.
LO3 Assess physiological, behavioural and physical measures of animal welfare		
P5 Define physiological, behavioural and physical measures that can be used to assess animal welfare. **P6** Describe how physiological, behavioural and physical measures are used within animal welfare assessment.	**M3** Analyse the impact of external factors on animal welfare assessment.	**D3** Evaluate the importance of assessing animal welfare.
LO4 Evaluate changes to animal management systems to enhance animal welfare.		
P7 Conduct an animal welfare assessment. **P8** Produce a management plan to enhance animal welfare for a named animal/s.	**M4** Justify the improvements suggested within the animal management plan.	**D4** Determine what effect the proposed changes will have on animal welfare.

Recommended Resources

Textbooks

APPLEBY, M.C. and HUGHES, B.O. (2011) *Animal Welfare*. Wallingford: CAB International.

BARR, S.C. and BOWMANN, D.D. (2001) *Canine and Feline Infectious Diseases and Parasitology*. Chichester: Wiley-Blackwell.

BROOM, D.M. and FRASER, A.F. (2015) *Domestic Animal Behaviour and Welfare*. Wallingford: CAB International.

COUMBE, K. (2012) *Equine Veterinary Nursing.* 2nd edn. Chichester: Wiley-Blackwell.

FRASER, A.F. and BROOM, D.M. (1990) *Farm Animal Behaviour and Welfare*. Wallingford: CAB International.

HOSTON-MOORE, P. and HUGHES, A. (2007) *BSAVA Manual of Practical Animal Care*. Gloucester: BSAVA.

MELLOR, D.J., PATTERSON-KANE, E. and STAFFORD, K.J. (2009) *The Sciences of Animal Welfare*. Oxford: Wiley-Blackwell.

MOBERG, G. and MENCH, J.A. (2000) *The Biology of Animal Stress: Basic Principles and Implications for Animal Welfare*. Wallingford: CAB International.

WILLIAMS, J.M. (2009) *The Complete Textbook of Animal Health and Welfare*. Amsterdam: Elsevier.

Websites

www.defra.gov.uk	Department for Food and Rural Affairs Website (General Reference)
www.ufaw.org.uk	Universities Federation for Animal Welfare Website (General Reference)
www.oie.int	World Organisation for Animal Health Website (General Reference)

www.ufaw.org.uk	Universities Federation for Animal Welfare The UFAW Journal – Animal Welfare (Journal)
www.tandfonline.com	Taylor & Francis Online Journal of Applied Animal Welfare Science (Journal)

Links

This unit links to the following related units:

Unit 6: Animal Nutrition

Unit 15: Animal Husbandry

Unit 6: Animal Nutrition

Unit code	**L/616/7834**
Unit level	**4**
Credit value	**15**

Introduction

Understanding the nutritional requirements of animals is essential to be able to devise and plan diets to maintain animal health and production. This unit introduces students to the scientific basis of animal nutrition, which supports a range of careers within the agricultural industries.

Students will define the macro and micronutrients that make up food and evaluate how each constituent contributes to balanced animal nutrition and influences metabolism. Students will also explore the importance of hydration and acid-base balance within homeostasis.

The dietary requirements for a range of different animal species and how these vary with life stage, health status, reproduction, production, live weight gain and activity levels will be analysed. Students will learn how to calculate feed rations for a range of animal species and explore the relationship between diet, productivity and behaviour.

Students will also conduct basic laboratory tests to analyse foodstuffs during this unit, providing them with practical skills they could use in the workplace.

Learning Outcomes

By the end of this unit students will be able to:

1 Describe the role of macro and micronutrients and water within animal nutrition

2 Analyse the dietary requirements of animals during different stages of their lives

3 Formulate dietary rations that meet animals' nutritional requirements

4 Evaluate the advantages and disadvantages of different types of diet to provide animals nutritional and behavioural needs.

Essential Content

LO1 **Describe the role of macro and micronutrients and water within animal nutrition**

Key nutrients and their roles:

Macro-nutrients: carbohydrates, lipids, proteins, fibre

Micro-nutrients: vitamins, minerals

Water.

Metabolism

Hydration

Acid-base balance

Digestion, absorption and synthesis of key nutrients

Key differences between herbivores, carnivores and omnivores

LO2 **Analyse the dietary requirements of animals during different stages of their lives**

Nutritional requirements of a range of animal species:

Companion animals, for example dogs

Dairy cattle

Beef cattle

Sheep

Pigs

Poultry.

Nutritional requirements of animals: lifestage:

Pregnant

Lactation

Neonate

Growth

Adult

Breeding

Geriatric.

Nutritional requirements of animals: activity:

Working

Production

Disease.

Grassland management for herbivores:

Rotation

Fertilisers

Mowing

Weed control

Stocking density.

LO3 **Formulate dietary rations that meet animals' nutritional requirements**

Design ration formulation sheets:

Scientific rationing

Systems of rationing

Use of Microsoft Excel® spreadsheets

Animal requirements.

Commercial diets:

Commercial manufacture of animal feeds

Legislation and labelling

Availability of foodstuffs

Nutrient analysis.

LO4 **Evaluate the advantages and disadvantages of different types of diet to provide animals nutritional and behavioural needs**

Animal nutritional needs:

Effects of deficiencies and excesses of core nutrients

Impact on behaviour

Impact on health

Impact on productivity / performance / function / live weight gain

Impact on longevity

Impact on reproduction

Impact of obesity.

Treatment for deficiencies and excesses:

Inclusion of additives

Restriction / removal of certain foodstuffs.

Management of obesity:

Exercise

Diet.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Describe the role of macro and micronutrients and water within animal nutrition</td><td rowspan="2">D1 Appraise the role of macro and micronutrients, and water in maintaining homeostasis and supporting metabolism.</td></tr>
<tr><td>P1 Describe the role of macronutrients in animal nutrition.
P2 Explain the role of micronutrients and water in animal nutrition.</td><td>M1 Assess how key nutrients are absorbed or synthesised in the animal body for two animal species.</td></tr>
<tr><td colspan="2">LO2 Analyse the dietary requirements of animals during different stages of their lives</td><td rowspan="2">D2 Interpret how nutritional requirements of animals vary between species and at different stages of their lives.</td></tr>
<tr><td>P3 Define the key dietary requirements for named animals to support adult health.
P4 Recognise how nutritional requirements differ between the growing and geriatric animal.</td><td>M2 Evaluate how nutritional requirements vary within gestation, reproduction and during lactation.</td></tr>
<tr><td colspan="2">LO3 Formulate dietary rations that meet animals' nutritional requirements</td><td rowspan="2">D3 Justify how the ration proposed meets the nutrient and energy requirements of the selected animal.</td></tr>
<tr><td>P5 Design a ration formulation spreadsheet.
P6 Calculate an appropriate daily ration for a named animal.</td><td>M3 Choose suitable feedstuffs to deliver the formulated ration.</td></tr>
</table>

Pass	Merit	Distinction
LO4 Evaluate the advantages and disadvantages of different types of diet to provide animals nutritional and behavioural needs.		
P7 Describe how diet can influence animal behaviour. **P8** Outline advantages and disadvantages of two different diets for a named animal.	**M4** Assess the relationship between feeding, diet and animal behaviour and production.	**D4** Examine the impact of dietary deficiencies and excesses on animal health, production and function, and how these can be rectified.

Recommended Resources

Textbooks

BLAS, C. and WISEMAN, J. (1998) *The Nutrition of the Rabbit*. New York: CABI Publishing.

BURGER, I.H. (ed) (1996) *The Waltham Book of Companion Animal Nutrition*. Oxford: Pergammon.

FRAPE, D. (2010) *Equine Nutrition and Feeding*. Oxford: Blackwell Science Ltd.

HILL, J. (2003) *Nutritional Physiology of the Horse*. Nottingham: Nottingham University Press.

LONSDALE, C. (1989) *Straights. Raw Materials for Animal Feed Compounders and Farmers*. Marlow: Chalcombe Publications.

MCDONALD, P., EDWARDS, R.A., GREENHALGH, J.F.D. and MORGAN, C.A. (2011) *Animal Nutrition*. Harlow: Longman Scientific & Technical.

NATIONAL RESEARCH COUNCIL (2007) *Nutrient Requirements of Horses*. Washington, D.C: National Academy Press.

NATIONAL RESEARCH COUNCIL (2006) *Nutrient Requirements of Dogs and Cats*. Washington, D.C.: National Academy Press.

NATIONAL RESEARCH COUNCIL (2001) *Nutrient Requirements of Dairy Cattle*. Washington, D.C.: National Academy Press.

NATIONAL RESEARCH COUNCIL (1995) *Nutrient Requirements of Laboratory Animals.* Washington, D.C.: National Academy Press.

POND, W.G., CHURCH, D.C. and POND, K.R. (2005) *Basic Animal Nutrition and Feeding.* New Jersey: John Wiley & Sons.

WILLIAMS, J.M. (2009) *The Complete Textbook of Animal Health and Welfare.* Amsterdam: Elsevier.

Websites

www.ufaw.org.uk	Universities Federation for Animal Welfare
	The UFAW Journal - Animal Welfare (Journal)
onlinelibrary.wiley.com	Wiley Online Library
	Journal of Animal Physiology and Animal Nutrition
	(Journal)

Essential Requirements

Tutors must be appropriately qualified and experienced within this subject to cover the principles and skills development aspects of this unit.

Links

This unit links to the following related units:

Unit 4: Principles of Livestock Production

Unit 5: Animal Health and Welfare

Unit 15: Animal Husbandry

Unit 7: Principles of Crop Production

Unit code	**K/616/7966**
Unit level	**4**
Credit value	**15**

Introduction

All aspects of agriculture are underpinned, directly or indirectly, by crop production; this includes animal feedstuffs and bedding, human food, pharmaceutical and industrial products, and fuel and fibre. Therefore, understanding the principles of crop production is fundamental to a successful agriculture industry.

This unit investigates a range of crops and associated production systems, from those grown extensively to intensively grown crops produced in controlled environments, identifying crops' suitability for end markets. Students will evaluate the establishment and maintenance of different crops, including differences between the requirements of various end users.

This unit should be completed alongside the practical growing, harvesting and storing of a range of crops, which will give students a relevant context within the industry, and will provide experience and knowledge in meeting the specific quality and time requirements placed upon growers. The unit culminates with the harvesting and storage of crop products.

Learning Outcomes

By the end of this unit, students will be able to:

1 Analyse the requirements for growing crops

2 Assess the principles of crop establishment

3 Assess the management of growing crops

4 Demonstrate the application of appropriate quality criteria to the harvesting and storage of crops.

Essential Content

LO1 **Analyse crop growth requirements**

Definitions:

Annual, biennial, perennial crops, botanical features.

Types of crop:

Forage, combinable, roots, field vegetables, soft fruit, top fruit, specialist crops.

Crop growth requirements:

Light, water, nutrients, appropriate temperature, carbon dioxide.

Factors determining crop-growing locations:

Climate, topography, length of growing season, day length, soil type, water use efficiency.

LO2 **Assess the principles of crop establishment**

Cultivar choice:

Target end use, site-specific suitability, evaluation of quality/yield, sources of information, trials data.

Soil conditions:

Drainage, subsoil structure, soil aggregate distribution, soil biota, cultivation equipment.

Crop establishment systems:

Establishment methods and associated machinery, seedbed conditions, planting depth, seed: soil contact, seed size, seed dressings.

LO3 **Assess the management of growing crops**

Monitoring the crop through the growing season:

Plant counts, growth and development stages, plant health monitoring, intercepted solar radiation, water use efficiency, use of meteorological data.

Manipulation of plant growth:

Planting dates, pruning and training, use of growth inhibitors, fertiliser application and timings

Weed, pest and disease control

Cultural, chemical and biological controls, Integrated Pest Management, legislation, Codes of Practice.

LO4 **Demonstrate the application of appropriate quality criteria to the harvesting and storage of crop products**

Harvesting:

Timing, machinery requirement, minimising damage and waste, use and disposal of by-products.

Quality criteria:

End user specifications, supply chain requirements.

Store:

Types, environmental controls, monitoring requirements, loading and unloading, assurance/ industry accreditation schemes.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Analyse crop growth requirements		
P1 Assess the suitability of different crops for contrasting locations. **P2** Describe the botanical characteristics of a range of contrasting crops.	**M1** Explain the factors affecting the selection of crops in a range of contrasting locations.	**D1** Evaluate the factors affecting the selection of crops in a range of contrasting locations.
LO2 Assess the principles of crop establishment		
P3 Select suitable cultivars for the production of commercial crops in a range of situations. **P4** Assess the establishment conditions of a range of contrasting crops.	**M2** Evaluate the suitability of the establishment conditions for the crops and cultivars selected.	**D2** Justify the suitability of the establishment conditions for the crops and cultivars selected.
LO3 Assess the management of growing crops		
P5 Perform appropriate crop monitoring tasks through the growing season. **P6** Assess the effectiveness of different weed, pest and disease management systems in specific crops.	**M3** Evaluate the management systems used throughout the production of specific crops.	**D3** Justify recommendations to crop management systems to improve the production of specific crops.

Pass	Merit	Distinction
LO4 Demonstrate the application of appropriate quality criteria to the harvesting and storage of crop products.		
P7 Perform a crop harvesting operation to commercial standards. **P8** Monitor crop products to expected commercial specifications during storage.	**M4** Assess the effectiveness of harvesting and storing crop products in meeting the stated quality criteria.	**D4** Justify the crop quality criteria included within the customer specifications.

Recommended Resources

Textbooks

DEFRA. (2010) *Fertiliser Manual (RB209)*. 8th edn. Norwich: The Stationery Office.

Websites

www.ahdb.org.uk	Agriculture and Horticulture Development Board (General reference)
www.gov.uk	UK Government Publications (General reference)
www.redtractor.org.uk	Red Tractor Assurance Homepage (General reference)
https://assurance.redtractor.org.uk	Red Tractor Assurance Standards (Standards Manual)
https://cereals.ahdb.org.uk	Agriculture and Horticulture Development Board AHDB Recommended Lists 2017-2018/2018-2019 (Online summaries)

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 8: Plant and Soil Science

Unit 16: Protective Crop Production

Unit 22: Plant and Crop Health (Diseases, Pests and Weeds)

Unit 8: Plant and Soil Science

Unit code	**T/616/7968**
Unit level	**4**
Credit value	**15**

Introduction

Soils can be described as the factory floor for agriculture and horticultural production, whilst plants can be described as the product requiring nurturing and development. To be successful in the industry it is essential to be able to appreciate the underlying scientific principles that allow efficient manipulation of the properties and characteristics to optimise production. For soils, the student needs to be able to assess type and characteristics to allow optimal structural and nutritional adjustment to be made. For plants, the student needs to appreciate the structure and processes that facilitate healthy growth and reproduction.

This unit will develop the skills and knowledge required to identify different soil types and their condition along with techniques to modify them to allow optimum production. From the plant perspective the unit will develop the knowledge of internal and external form and function to allow plants to be managed appropriately to achieve desired objectives.

The unit will cover soil identification and assessment techniques, both in the field and in the laboratory or classroom. It will also look at methods for improving soil condition to make them more productive. This will cover physical methods ranging from the use of hand tools to large scale machinery, the incorporation of additives to improve physical properties and chemical treatment. Plant physiology and systems will be studied, including photosynthesis, transpiration, water and nutrient uptake, transportation and storage. Plant reproduction and fruit and seed dispersal will be examined. Physical adaptations of plants will be explored to verify how plants are adapted to their environment. Inputs in terms of pesticides, disease treatment and nutrient and water requirements will be examined.

By the end of the unit the student will be able to assess soil type and condition and be able to modify condition to improve production capacity. For plants, the student will be able to understand the internal processes in order to provide optimum conditions for growth, including the provision of appropriate nutrients and pest and disease treatment.

Learning Outcomes

By the end of this unit students will be able to:

1 Identify soil type and condition

2 Assess adjustments which can be made to improve soils, both physical and chemical

3 Describe plant form and function

4 Describe the inputs required to optimise plant development and growth.

Essential Content

LO1 **Identify soil type and condition**

Soil type:

From inspection of a profile, describe and categorise soil type present on a given site

Apply physical assessment techniques, referring to recognised methodologies to assess soil type

Refer to published documents and on-site information, such as soil maps and vegetation type to support assessment.

Soil condition:

Use equipment and visual appraisal to assess soil condition i.e. compaction, water-logging, crumb size, organic matter content

Discuss how previous management practices have impacted on soil condition.

Consider how weather and climate can impact on soil condition with reference to cultivation methods and timing

Analyse chemical and nutrient status of soils.

LO2 **Assess adjustments which can be made to improve soils, both physical and chemical**

Physical adjustments:

Soil water management through drainage practices

Routine soil preparation and cultivation techniques appropriate to the scale and type of production

Mechanical structural improvement practices appropriate to the scale and type of production

Addition of materials to adjust structure, both organic and inorganic.

Chemical adjustments:

With reference to on-site assessment, define methods for adjusting soil pH

Analyse nutrient status and calculate adjustments required to meet the needs of crops being produced.

LO3 **Describe plant form and function**

Plant form:

Monocotyledons, dicotyledons.

Root systems and modifications

Stems, woody and non-woody

Leaf structure and adaptation

Flowers and seeds.

Plant function:

Water regulation (uptake, transportation and transpiration)

Photosynthesis (the process, dark and light cycles, limiting factors)

Nutrient transport and storage

Reproduction (vegetative, seed production – angiosperms and gymnosperms, flower structure, pollination methods / processes, seed dispersal methods / processes, fruit and seed types).

LO4 **Describe the inputs required to optimise plant development and growth**

Water:

Quantity, sources, timing.

Nutrients:

Macro nutrients and trace elements.

Light:

Planting time, sowing density and competition.

Temperature:

Optimum levels, adjustment techniques.

Pest and disease control:

Herbicides, fungicides, pesticides and biological control methods.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Identify soil type and condition</td><td rowspan="5">LO1 LO2

D1 Critically evaluate the impact of different management regimes on soils.</td></tr>
<tr><td>P1 For a given profile and soil sample, describe the soil type and its characteristics

P2 From on-site analysis and provided records, produce a report on soil condition.</td><td>M1 Discuss the impact of different management practices on two different soil types.</td></tr>
<tr><td colspan="2">LO2 Assess adjustments which can be made to improve soils, both physical and chemical</td></tr>
<tr><td>P3 Explain physical amelioration techniques which would be applicable, and recommend chemical adjustments to be made.</td><td>M2 Evaluate the practicality and efficiency of the recommendations.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Describe plant form and function		**LO3 LO4** **D2** Evaluate the feasibility and effectiveness of artificially influencing plant production.
P4 Produce an annotated diagram of a typical flowering plant and describe two adaptations of each feature. **P5** For two physiological processes, describe their function and importance to the plant.	**M3** Discuss how external influences impact on plant form and function.	
LO4 Describe the inputs required to optimise plant development and growth.		
P6 Produce a report identifying the key inputs required by plants and the impacts these have on them.	**M4** Evaluate the influence of external conditions on major plant inputs.	

Recommended Resources

Textbooks

ASHMAN, M. and PURI, G. (2008) *Essential Soil Science: A Clear and Concise Introduction to Soil Science.* New Jersey: Wiley-Blackwell.

BRADY, N.C. and WEIL, R.R. (2010) *Elements of the Nature and Properties of Soils.* 3rd Edn. Harlow: Pearson.

HODSON, M.J. and BRYANT, J.A. (2011) *Functional Biology of Plants.* New Jersey: Wiley.

SMITH, A.L., COUPLAND, G., DOLAN, L., HARBERD, N., JONES, J., MARTIN, C., SABLOWSKI, R. and AMEY, A. (2009) *Plant Biology*. Garland Science, London: Taylor & Francis Group.

Websites

www.soils.org.uk	British society of soil science All about soils (General reference)

Links

This unit links to the following related units:

Unit 7: Principles of Crop Production

Unit 22: Plant and Crop Health (Diseases, Pests and Weeds)

Unit 9: Land-based Machinery and Technology

Unit code	**L/616/7837**
Unit level	**4**
Credit value	**15**

Introduction

Large-scale agricultural and horticultural enterprises make extensive use of machinery. These machines are invariably expensive and complex. The correct selection and use of these is an important factor in the viability of a business and to ensure timely operations. The land-based labour force has reduced dramatically and there has been an equally dramatic increase in the average power of the tractors in use. These complex machines require skilled operators and knowledge of their maintenance requirements. Legislation not only covers on the road requirements and operator competence but also the increased complexity of pollution control.

This unit will develop student knowledge and skills in selecting and understanding the operation of tractors and equipment: both individually and in combinations. This will include understanding how machines work, engine, fuel types and overall maintenance. Students will undertake some practical review and operation of tractors and machinery to facilitate an understanding of these from an operator perspective.

Assessment will include assessed practical investigations, written reports and presentations.

On completion of this unit students will have an intimate knowledge of the basic characteristics of a range of power units, tractors and machines enabling them to make informed choices and decisions in machine selection and operation. This unit is intended to be flexible in content to take account of the diversity of agriculture in the UK and overseas and to provide a basis for further specialist study of mechanisation and perhaps international crop production courses.

Learning Outcomes

By the end of this unit students will be able to:

1 Identify the machinery requirements of an enterprise

2 Explain the operation and characteristics of engine powered land-based vehicles

3 Demonstrate an understanding of the operation and maintenance of machines

4 Examine issues relating to machinery use in land-based operations.

Essential Content

LO1 Identify the machinery requirements of an enterprise

Machines available to the industry:

Tractor units, multi-purpose machines, special purpose machines

Tractor mounted and trailed equipment and self-propelled machines

Two-wheel and four-wheel drive, all-wheel drive, articulated and self-steering

Purpose of machines (haulage, transport, powering other equipment, application of materials).

Understanding the complexity of the enterprise:

Scale, machinery systems, seasonality, soil types

Machine adaptations for adverse and unusual circumstances.

LO2 Explain the operation and characteristics of engine powered land-based vehicles

Power sources:

Engines including two and four stroke cycles and electric motors

Cooling, air supply, lubrication, steering, braking and electrical systems

Petrol, diesel, bio-fuels and lpg fuels.

Transmission of power:

Through drive chains, use of gears, gearboxes and hydraulics, clutch types and safety clutches

Operation of ancillary and attached equipment and hitches.

LO3 Demonstrate an understanding of the operation and maintenance of machines

Principles of industry standard operation and operator maintenance:

Awareness of standards required and working methods

Operator competence and operator training

Management support processes and understanding of machine layout and working systems.

Operation:

Pre-use setting up of machine and machine combinations

Understand operational requirements and operator competence

Machine controls and safety features, safe operation

Use of clutch, gears, brakes, steering and auxiliary controls.

Maintenance:

Use of operator manuals

Pre-start and daily checks, routine maintenance, repairs and servicing

Facilities and tools required

Pre-season preparation.

LO4 **Examine issues relating to machinery use in land-based operations**

Operational:

In-field support, fueling, supply, access, transport, maneuverability.

Storage requirements:

Covered/uncovered, security, siting of storage and support facilities, legislative factors

Fuel storage requirements and legislation.

Maintenance and repair:

Operator skills, what to do on site or use of dealer/engineer, staffing, record keeping and maintenance scheduling

Facilities for maintenance: workshop, tools and equipment, spares to be held.

Legislation:

Law relating to moving machinery on the road, age limits for machine use.

Operator certificates of competence

Health and Safety legislation: self-protection and protection of others Personal protective equipment (PPE); safe systems of work

Legislation relating to machine design; noise regulations, guards and CE markings

Waste disposal requirements and legislation

First aid facilities.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Identify the machinery requirements of an enterprise.</td><td rowspan="5">LO1 LO2
D1 Critically analyse the suitability of the machinery identified.</td></tr>
<tr><td>P1 Explain the requirements for an identified enterprise.
P2 Describe machinery suitable for the identified enterprise.</td><td>M1 Justify machinery selection.</td></tr>
<tr><td colspan="2">LO2 Explain the operation and characteristics of engine powered land-based vehicles.</td></tr>
<tr><td>P3 Compare power units available for machinery.
P4 Explain how the power of an engine may be harnessed and applied.</td><td>M2 Evaluate a machinery combination for an identified operation.</td></tr>
<tr><td colspan="2">LO3 Demonstrate an understanding of the operation and maintenance of machines.</td></tr>
<tr><td>P5 Demonstrate an understanding of the operation of a tractor.
P6 Demonstrate an understanding of the maintenance of a tractor.</td><td>M3 Assess the operation and maintenance of a tractor in use.</td><td rowspan="5">LO3 LO4
D2 Evaluate the use and support of machinery in an enterprise.</td></tr>
<tr><td colspan="2">LO4 Examine issues relating to machinery use in land-based operations.</td></tr>
<tr><td>P7 Describe the legislation relevant to the use of machinery.
P8 Explain the requirements to support the operation of machinery.</td><td>M4 Examine how Health and Safety factors interact with the operation and support of machinery.</td></tr>
</table>

Recommended Resources

Textbooks

BALLS, R. (1985) *Horticultural Engineering Technology – Field Machinery*. Basingstoke: MacMillan.

BELL, B. (2016) *Farm Machinery*. 6th edn. Sheffield: Farming Press.

CULPIN, C. (2014) *Farm Machinery*. 12th edn. New Jersey: Wiley.

HILLIER, V.A.W. and PITTUCK, F. (2012) *Fundamentals of Motor Vehicle Technology*. 3rd edn. Cheltenham: Nelson Thornes.

HSC. (2017) *Farm Wise – Your Essential Guide to Health and safety in Agriculture*. 3rd edn. UK: Stationary Office.

HSE. (2012) *Working Safely with Agricultural Machinery*. Norwich: Stationary Office.

WITNEY, B. (1998) *Choosing and Using Farm Machines*. New York: Longman Scientific and Technical.

Websites

www.fwi.co.uk	Farmers Weekly Arable/precision farming (General reference)
www.iagre.org	Institute of Agricultural Engineers Publications (General reference)

Links

This unit links to the following related units:

Unit 7: Principles of Crop Production

Unit 26: Management of Land-based Machinery and Technology

Unit 10: Rural Business Administration and Accounting

Unit code	**T/616/7971**
Unit level	**4**
Credit value	**15**

Introduction

The Centre hub for most businesses is the office, which often is the first 'port of call' for visitors, goods and correspondence. This is where direction and control initially take place. This unit links up with all business type activities (Accounting, Finance, HR, Marketing and Management) and is an integral part of all elements of running a business. Processing of information and presenting it in a format that is easily understood will aid management and the effective planning of the business. The importance of business administration and the people who conduct this operation cannot be underestimated.

For effective management and planning it is important that paperwork is managed effectively by placing all correspondence from whatever source e.g. electronic, postal, etc. into the correct order and retrieval systems. An effective paper handling system should lead onto improved efficiency in processing thus negating costly delays.

The overall aim of this unit will be to enable students to create, maintain and complete financial records as required by an accountant in order for them to produce year end accounts and produce information for the calculation of Payroll.

Students will cover areas such as business transactions, flow of information processes, bookkeeping systems, bank reconciliations, calculating Value Added Tax (VAT) and the calculation of gross pay.

On successful completion of this unit, students will be able to set up a financial accounting system which will comply with the statutory rules and regulation for accounting record keeping for a rural business and have the fundamental knowledge to use these records for a higher level of study.

Learning Outcomes

By the end of this unit students will be able to:

1 Describe the paperwork that is required for the effective recording of business transactions

2 Perform an accounting system suitable for a Land-based business so to enable the completion of year end accounts

3 Prepare information required for VAT reporting to HMRC

4 Explain the operation of basic PAYE within a Land-based business and calculate gross pay.

Essential Content

LO1 Describe the paperwork that is required for the effective recording of business transactions

Business transactions:

Identification of appropriate paperwork

Assess the different types of transactions (sales, purchase, receipts and payments

Self-bill invoices

Private apportionment of costs

Contra invoices.

Information processes:

Processes that are used to maintain a flow of information from the business to the office (quote, order, delivery note, invoice, statement, etc.).

LO2 Perform an accounting system suitable for a Land-based business so to enable the completion of year end accounts

Single entry / double entry book keeping:

Assess the differences between the two methods of book keeping

Sales and purchases

Categorisation of business inputs and expenditure for management accounting purposes (standard and business specific)

Petty cash systems.

Effectively record transactions

Bank reconciliation:

Bank statement

Cashbook entries (receipts and payments)

Unpresented cheques and receipts

Calculation of bank reconciliation.

LO3 **Prepare information required for VAT reporting to HMRC**

VAT calculation and reporting:

Calculation of VAT

Reporting time restrictions to the HMRC

Reporting process.

Various methods of accounting VAT:

Standard rate

Flat rate

Annual accounting scheme

Cash accounting scheme.

Registration thresholds and types:

Standard rate

Flat rate

Annual accounting scheme

Cash accounting scheme.

LO4 **Explain the operation of basic PAYE within a Land-based business and calculate gross pay**

Definition of PAYE:

HMRC

Employer

Employee.

Calculation of gross pay:

Time sheets

Validation of the work done

Pay rates

Holiday entitlement

Other statutory entitlements e.g. sick pay, maternity pay, paternity pay, pension, etc.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Describe the paperwork that is required for the effective recording of business transactions</td><td rowspan="5">LO1 LO2

D1 Critically evaluate how differing accounts systems are suitable for different businesses.</td></tr>
<tr><td>P1 Describe a method of effectively and efficiently collecting the financial information, of a given business, for input into an identified accounting system.

P2 Explain the differing transaction types and how they are entered into an accounting system.</td><td>M1 Discuss the term ‘contra’ within the context of financial accounting and provide Two examples of how this could happen.</td></tr>
<tr><td colspan="2">LO2 Perform an accounting system suitable for a Land-based business so to enable the completion of year end accounts.</td></tr>
<tr><td>P3 Demonstrate through preparing and recording entries onto a single entry accounts system for an identified land-based business for a three month period.

P4 Describe the term ‘bank reconciliation’ and how it is calculated.</td><td>M2 Discuss how the information from the accounts system is used and to what purpose.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Prepare information required for VAT reporting to HMRC.		
P5 Prepare a VAT Return for an identified land-based business. **P6** Explain the reporting process to the HMRC and to include any time restrictions.	**M3** Evaluate the different methods of VAT accounting for land-based businesses.	**D2** Analyse the VAT registration types and discuss their benefits to land-based businesses.
LO4 Explain the operation of basic PAYE within a Land-based business and calculate gross pay.		
P7 Describe gross pay and calculate from Two given time sheets examples. **P8** Describe the calculation of holiday entitlement.	**M4** Discuss the process of collecting accurate information to assist wage calculation.	**D3** Investigate the statutory requirements of PAYE.

Recommended Resources

Textbooks

IAGSA (Great Britain) (2016) *The Farm Office Handbook*. Sheffield: Old Pond Publishing Ltd.

Websites

www.gov.uk	UK Government Employing-people (General reference)
www.gov.uk	UK Government Business-tax (General reference)

Links

This unit links to the following related units:

Unit 2: Management Accounting

Unit 18: Advanced Financial Accounting

Unit 11: Human Resource Management

Unit code	**A/616/7843**
Unit level	**4**
Credit value	**15**

Introduction

The aim of this unit is to enable students to appreciate and apply principles of effective Human Resource Management (HRM). People are the lifeblood of any Land-based organisation and being able to attract, recruit and retain talented staff and volunteers is at the core of all HRM activity. This unit will explore the tools and techniques used in HRM to maximise the employee/volunteer contribution and how to use HR methods to gain competitive advantage. Students will explore the importance of training and development in building and extending the skills base of the organisation and ensuring it is relevant to the ever-changing business environment. Students will also consider the growing importance of becoming a flexible organisation, within the Land-based sector, with an equally flexible labour force, and become familiar with techniques of job design and with different reward systems.

The unit investigates the importance of good employee/volunteer relations and the ways in which employers engage with their staff and possibly with trade unions. Students will gain an understanding of the law governing HRM processes as well as the best practices which enable an employer to become an 'employer of choice' in their labour market.

Learning Outcomes

By the end of this unit a student will be able to:

1 Explain the purpose and scope of Human Resource Management in terms of resourcing a Land-based organisation with talent and skills appropriate to fulfil business objectives

2 Evaluate the effectiveness of the key elements of Human Resource Management in a Land-based organisation

3 Analyse internal and external factors that affect Human Resource Management decision-making, including employment legislation

4 Apply Human Resource Management practices in a work-related context.

Essential Content

LO1 **Explain the purpose and scope of Human Resource Management in terms of resourcing a Land-based organisation with talent and skills appropriate to fulfil business objectives**

The nature and scope of HRM:

Definitions of HRM

What are the main functions and activities of HRM

The 'Best Fit' approach vs 'Best Practice'

The hard and soft models of HRM

Workforce planning

Types of labour market, labour market trends and PESTLE

The internal labour market

Analysing turnover, stability and retention

The impact of legal and regulatory frameworks

The impact that advances in technology have had upon improving the efficiency of HR practices.

Recruitment (employees and volunteers):

Sources of recruitment: internal vs external recruitment

Job analysis, job descriptions, personal specifications and competency frameworks.

Selection (employees and volunteers):

Main methods of selection: strengths and weaknesses of each
Reliability and validity as key criteria.

On-boarding and induction (employees and volunteers):

The issues affecting successful induction and socialisation of employees.

LO2 **Evaluate the effectiveness of the key elements of Human Resource Management in a Land-based organisation**

Learning, development and training:

Differentiating development and training

Identifying training needs − the training gap

Types of training

Evaluation of training.

Job and workplace design:

Reward management: extrinsic and intrinsic rewards from work

The link between motivational theory and reward

Series of job design-job extension techniques.

The flexible organisation:

Types of flexibility (numerical, structural and functional flexibility)

Models of flexible organisations (e.g. Handy, Atkinson)

Flexible working options in modern organisations

Benefits to employers and benefits to employees/volunteers of flexible working practices.

Performance and reward:

Performance management and methods used to monitor employee/volunteer performance

Types of payment and reward system

Methods of a determination.

LO3 **Analyse internal and external factors that affect Human Resource Management decision-making, including employment legislation**

Employee/volunteer relations:

Maintaining good employee/volunteer relations

Strategies for building and improving employee/volunteer relations and engagement.

Employee/volunteer relations and the law:

The purpose of employment law

Key legal issues and constraints (e.g. equality, data protection, Health and Safety, redundancy, dismissal, employment contracts)

Ethical and social responsibilities.

Trade unions and workplace representation:

The role of trade unions − local/national

Collective agreements

Discipline, grievances and redundancy − best practice.

LO4 **Apply Human Resource Management practices in a work-related context**

Job and person specifications:

Preparing job specifications and person specifications applicable to the recruitment context and needs of the organisations, taking into account legislation and company policies.

Recruitment and selection in practice:

The impact of technology on improving the recruitment and selection process: the use of online resources, digital platforms and social networking

Designing and placing job advertisements

Shortlisting and processing applications

Interviewing preparation and best practice

Selection best practice

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain the purpose and scope of Human Resource Management in terms of resourcing a Land-based organisation with talent and skills appropriate to fulfil business objectives</td><td rowspan="2">D1 Critically evaluate the strengths and weaknesses of different approaches to recruitment and selection, supported by specific examples.</td></tr>
<tr><td>P1 Explain the purpose and the functions of HRM, applicable to workforce planning and resourcing an organisation.

P2 Explain the strengths and weaknesses of different approaches to recruitment and selection.</td><td>M1 Assess how the functions of HRM can provide talent and skills appropriate to fulfil business objectives.

M2 Evaluate the strengths and weaknesses of different approaches to recruitment and selection.</td></tr>
<tr><td colspan="2">LO2 Evaluate the effectiveness of the key elements of Human Resource Management in a Land-based organisation</td><td rowspan="2">D2 Critically evaluate HRM practices and application within an organisational context, using a range of specific examples.</td></tr>
<tr><td>P3 Explain the benefits of different HRM practices within an organisation for both the employer and employee/volunteer.

P4 Evaluate the effectiveness of different HRM practices in terms of raising organisational profit and productivity.</td><td>M3 Explore the different methods used in HRM practices, providing specific examples to support evaluation within an organisational context.</td></tr>
</table>

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO3 Analyse internal and external factors that affect Human Resource Management decision-making, including employment legislation</td><td rowspan="5">LO3 LO4
D3 Critically evaluate employee relations and the application of HRM practices that inform and influence decision-making in an organisational context.</td></tr>
<tr><td>P5 Analyse the importance of employee/volunteer relations in respect to influencing HRM decision-making.
P6 Identify the key elements of employment legislation and the impact it has upon HRM decision-making.</td><td>M4 Evaluate the key aspects of employee/volunteer relations management and employment legislation that affect HRM decision-making in an organisational context.</td></tr>
<tr><td colspan="2">LO4 Apply Human Resource Management practices in a work-related context.</td></tr>
<tr><td>P7 Illustrate the application of HRM practices in a work-related context, using specific examples.</td><td>M5 Provide a rationale for the application of specific HRM practices in a work-related context.</td></tr>
</table>

Recommended Resources

ARMSTRONG, M. and TAYLOR, S. (2014) *Armstrong's Handbook of Human Resource Management Practice.* 13th edn. London: Kogan Page.

BACH, S. and EDWARDS, M. (2013) *Managing Human Resources*. Oxford: Wiley.

BRATTON, J. and GOLD, J. (2012) *Human Resource Management: Theory and Practice.* 5th edn. Basingstoke: Palgrave.

TORRINGTON, D. et al. (2011) *Human Resource Management.* 8th edn. London: Prentice Hall.

Websites

www.cipd.co.uk	Chartered Institute of Personnel and Development Homepage (General reference)

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 12: Marketing Essentials

Unit code	**F/616/7844**
Unit level	**4**
Credit value	**15**

Introduction

This unit is designed to introduce students to the principles of marketing, enabling them to develop a basic marketing plan and to employ elements of the marketing mix to achieve results. While they will learn the underpinning theories and frameworks, they will also be able to relate these to real-world examples, including products/services that they encounter in their own daily lives.

Organisations that work within the Land-based sector or are associated with it such as Cadbury, Nestle, Unilever, Muller, John Deer, ABP, NFU and small local businesses all have at least one thing in common: they all use marketing to influence us to engage with their products and/or services. Whether it is becoming a loyal customer buying a product and service or donating to a charity, organisations use a range of marketing techniques and tools to inform and influence us.

The knowledge, understanding and skill sets that students will gain on successfully completing this unit will enhance their career opportunities; whether setting up their own business or being employed by a Land-based organisation.

Learning Outcomes

By the end of this unit a student will be able to:

1 Explain the role of marketing and how it interrelates with other functional units of a Land-based organisation

2 Compare ways in which organisations use elements of the marketing mix (7Ps) to achieve overall business objectives

3 Develop and evaluate a basic marketing plan.

Essential Content

LO1 Explain the role of marketing and how it interrelates with other functional units of a Land-based organisation

Definitions and the marketing concept:

Definitions of marketing and the nature of marketing

The development of the marketing concept, including current and future trends

How the external environment influences and impacts upon marketing activity.

The role of marketing:

The structure and operations of marketing departments

Overview of marketing processes that include analysis, strategic planning and the marketing mix

The different roles of marketing within both a B2C and B2B context.

The interrelationships of functional units:

Marketing as a business function

The different roles of business units and the interrelationships between these functional units and marketing.

LO2 Compare ways in which organisations use elements of the marketing mix (7Ps) to achieve overall business objectives

The 7Ps marketing mix:

Product – Differences between products and services, importance of brands, product development and product lifestyle

Price – Pricing context, pricing strategies and tactics

Place – Channel management, supply chain management and logistics

Promotion – Integrated communication mix and promotional tools

People – The different roles of 'people' in marketing, including customer interfacing and support personnel, the different skills, attitudes and behaviour of people delivering the product or service to customers

Physical evidence – The tangible aspects of service delivery − visual, aural and olfactory elements

Process – Systems and processes involved in delivering a consistent service. Different types of processes used to expedite the marketing function.

Achieving overall business objectives:

The shift from the 4Ps to the 7Ps and the significance of the extended marketing mix

An overview of the marketing planning process (Analysis, Planning, Implementation and Control) and marketing strategy.

LO3 **Develop and evaluate a basic marketing plan.**

Marketing planning:

The importance and value of marketing plans

The links between marketing plans, marketing objectives and marketing strategies

Evaluating and monitoring marketing plans using appropriate control and evaluation techniques such as sales analysis, market-share analysis, efficiency ratios and cost-profitability analysis.

Structure and development of marketing plans:

Market segmentation and target market selection

Market segmentation and target market selection

Setting goals and objectives

Situational analysis tools and techniques

Creating a marketing strategy

Allocation of resources

Monitoring and control measures.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain the role of marketing and how it interrelates with other functional units of a Land-based organisation</td><td rowspan="2"></td></tr>
<tr><td>P1 Explain the key roles and responsibilities of the marketing function.

P2 Explain how roles and responsibilities of marketing relate to the wider organisational context.</td><td>M1 Analyse the roles and responsibilities of marketing in the context of the marketing environment.

M2 Analyse the significance of interrelationships between marketing and other functional units of an organisation.</td></tr>
<tr><td colspan="2">LO2 Compare ways in which organisations use elements of the marketing mix (7Ps) to achieve overall business objectives</td><td rowspan="4">LO2 LO3

D2 Design a strategic marketing plan that tactically applies the use of the 7Ps to achieve overall marketing objectives.</td></tr>
<tr><td>P3 Compare the ways in which different organisations apply the marketing mix to the marketing planning process to achieve business objectives.</td><td>M3 Evaluate different tactics applied by organisations to demonstrate how business objectives can be achieved.</td></tr>
<tr><td colspan="2">LO3 Develop and evaluate a basic marketing plan</td></tr>
<tr><td>P4 Produce and evaluate a basic marketing plan for an organisation.</td><td>M4 Produce a detailed, coherent evidence-based marketing plan for an organisation.</td></tr>
</table>

Recommended Resources

BRASSINGTON, F. and PETTITT, S. (2012) *Essentials of Marketing.* 3rd edn. Harlow: Pearson.

GROUCUTT, J. and HOPKINS, C. (2015) *Marketing* (Business Briefings). London: Palgrave Macmillan.

JOBBER, D. and CHADWICK, F. (2012) *Principles and Practice of Marketing*. 7th edn. Maidenhead: McGraw-Hill.

KOTLER, P. and ARMSTRONG, G. (2013) *Principles of Marketing.* London: Prentice Hall.

MCDONALD, M. and WILSON, H. (2011) *Marketing Plans: How to Prepare Them, How to Use Them.* 7th edn. Chichester: John Riley and Sons.

Websites

www.ama.org	American Marketing Association Homepage (General reference)
www.cim.co.uk	Chartered Institute of Marketing (UK) Homepage (General reference)

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 13: Plant and Crop Nutrition

Unit code	**A/616/7972**
Unit level	**4**
Credit value	**15**

Introduction

The common farming saying that 'the answer lies in the soil' is close to the truth. Without a close monitoring of the nutritional needs of plants it is not possible to maximise the yield or quality of the crop. Excess fertiliser application may also be wasteful not only in cost, but also in its adverse impact on the plant and also a wider environmental impact too.

This unit will enable the student to understand the importance and function of key plant nutrients, how they are formulated and the most effective ways of applying them to crops. These theoretical concepts will then be used to recommend a suitable fertiliser regime for specific crop situations.

This unit contains important foundation knowledge for anyone involved with the production of plants and underpins many other scientific and practical concepts.

Learning Outcomes

By the end of this unit students will be able to:

1 Discuss the role of plant nutrients on the growth of plants

2 Describe the factors affecting the uptake of nutrients by plants

3 Compare different fertiliser options for their effectiveness and cost

4 Recommend suitable plant nutrition regimes for a range of crops.

Essential Content

LO1 **Discuss the role of plant nutrients on the growth of plants**

The role of macronutrients in plant development and growth:

Primary nutrients (nitrogen, phosphorus, potassium)

Secondary nutrients (calcium, magnesium, sulphur).

The role of micronutrients in plant development and growth:

Boron

Copper

Chlorine

Manganese

Molybdenum

Zinc

Iron

Nickel

Symptoms in plants of deficiency and over-supply of nutrients.

LO2 **Describe the factors affecting the uptake of nutrients by plants**

Abiotic factors:

Rainfall/water availability

Soil and air temperature

pH of growing medium

Nutrient availability

Cation exchange.

Biotic factors:

Stage of plant development

Root health

Impact of other organisms on uptake and availability of nutrients (bacteria, fungi)

Current nutrient status of plant.

Forms of nutrients available for uptake by plants:

Influence of associated ions (impact of calcium)

Common available forms of primary macronutrients (nitrogen, phosphorus, potassium).

Impact of limiting factors:

Economic and maximum yield

Adaptation of growing conditions

Loss of nutrients (from growing medium, plants).

LO3 **Compare different fertiliser options for their effectiveness and cost**

Fertiliser formulations:

Organic, inorganic

Speed of action (fast acting, controlled released, slow release)

Composition (compound fertiliser, straight fertiliser)

Formulation (granule, powder, liquid)

Site of nutrient delivery (roots, foliage)

Non-nutritional carriers/fillers within fertilisers (humus, peat, sand, sawdust, polymer coatings, etc.).

Costs of application:

Procurement cost

Storage cost

Application costs (machinery and labour)

Longevity of application.

Effectiveness of formulation:

Rate of nutrient availability to plants post-application

Fertiliser analysis

Environmental impacts (impacts on biotic activity, leaching, eutrophication, salinisation).

LO4 **Recommend suitable plant nutrition regimes for a range of crops.**

Methods to determine nutrient availability:

Remote nutrient analysis (from soil or growing medium, plant material/tissue analysis)

Direct measure (open and closed hydroponic-based systems).

Nutrient requirements of crops:

Duration of crop (growing season)

Mode of production (open ground, protected cropping, hydroponics)

Type of product harvested (root, shoot, leaf, flower, seed, fruit, whole plant).

Fertiliser application plans:

Specification of product

Application rate

Timing

Environmental and legal constraints.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Discuss the role of plant nutrients on the growth of plants</td><td rowspan="4">LO1 LO2
D1 Critically analyse the importance of providing suitable levels of nutrients for growing crops.</td></tr>
<tr><td>P1 Explain the role of macronutrients in the health and development of plants.
P2 Explain the role of micronutrients in the health and development of plants.</td><td>M1 Evaluate the impact of balanced nutrient availability on the development of plants.</td></tr>
<tr><td colspan="2">LO2 Describe the factors affecting the uptake of nutrients by plants</td></tr>
<tr><td>P3 Explain the biotic and abiotic factors impacting upon the uptake of nutrients by plants.</td><td>M2 Analyse the impact of nutrient availability on yield.</td></tr>
<tr><td colspan="2">LO3 Compare different fertiliser options for their effectiveness and cost</td><td rowspan="3">D2 Critically analyse the environmental impact of selected fertiliser formulations.</td></tr>
<tr><td>P4 Describe the impact of fertiliser formulation upon the availability of plant nutrients.
P5 Describe the costs associated with the procurement, storage and application of different fertiliser formulations.
P6 Compare the effectiveness of different fertiliser formulations.</td><td>M3 Evaluate a range of fertiliser formulations for their effectiveness to meet specific criteria.</td></tr>
<tr><td colspan="2">LO4 Recommend suitable plant nutrition regimes for a range of crops.</td></tr>
<tr><td>P7 Identify the nutritional needs for selected crops.
P8 Develop fertiliser plans for selected crops.</td><td>M4 Analyse the effectiveness of plant nutrition recommendations.</td><td>D3 Evaluate a range of fertiliser plans to meet specific customer needs.</td></tr>
</table>

Recommended Resources

Textbooks

EASH, N.S., SAUER, T.J., O'DELL, D., ODOI, E. and BRATZ, M.C. (2015) *Soil Science Simplified.* 6th edn. New Jersey: Wiley-Blackwell.

HUSSEIN, M. and NESSIM, H. (2014) *Fertilizer Understanding: Concepts, Specifications, Adulteration and Analysis.* Saarbrucken: Lambert Academic Publishing.

NAEEM, M., ANSARI, A.A. and GILL, S.S. (2017) *Essential Plant Nutrients: Uptake, Use Efficiency, and Management.* London: Springer.

PARKER, A.V. and PILBEAM, D.J. (2015) *Handbook of Plant Nutrition.* 2nd edn. Boca Raton: CRC Press.

Websites

extensionpublications.unl.edu	Extension dept. of University of Nebraska Plant Nutrients and Soil Fertility (E-Book)

Links

This unit links to the following related units:

Unit 7: Principles of Crop Production

Unit 8: Plant and Soil Science

Unit 14: Animal Anatomy and Physiology

Unit code	**L/616/7842**
Unit level	**4**
Credit value	**15**

Introduction

Animals of any species and setting require high levels of care and attention to ensure optimal health and welfare. A person holding responsibility for this should have an established knowledge of biological functioning in an aim to understand normal biological measures, what changes may occur and the influences of these changes to overall health of an animal.

This unit develops knowledge of the biological systems of animals, with a detailed look at functioning. It will require students to analyse the interaction of systems and how environmental factors may impact an animal's health. It is through this that students will be able to enter roles within the animal sector feeling confident to make decisions and advise others in best management practices.

Students will study the following biological systems and gain understanding of the important roles they play in maintaining the life of an animal. Muscular and skeletal systems and how they interact with one another to create movement. Lymphatic and cardiovascular systems and their involvement with transportation of essential materials, with a detailed look at the role of blood. Respiratory, digestive and urinary systems evaluating how they interact to obtain raw materials for metabolism and excrete waste. Male and female reproductive systems, reproductive stages and the management of these to influence breeding of animal species.

On completion of the unit students should hold sufficient knowledge on the biological systems of animals to understand how animal gait, life style and management can influence animal health and normal biological functioning. They should be able to interpret information given to them by a veterinary professional, and develop improvements to how an animal is cared for in response. Students will also be able to review the management of breeding animals, and make informed choices with animal wellbeing in mind.

The knowledge gained from this unit will create links between other units covering health, disease and husbandry management of animals.

Learning Outcomes

By the end of this unit students will be able to:

1 Determine how the skeletal and muscular systems interact with one another to provide support and create movement

2 Discuss how the body transports essential materials around the body to maintain life and compensates to meet demands

3 Evaluate the functioning of systems which obtain raw materials for metabolism and excrete waste to highlight the effects changes in management systems may have on animal wellbeing

4 Develop material to share information on animal reproductive processes and the ways that these processes can be managed, for animal owners to make informed choices.

Essential Content

LO1 **Determine how the skeletal and muscular systems interact with one another to provide support and create movement**

Support systems:

Types of support systems (hydroskeleton, endoskeleton and exoskeleton) Bone types and functions, structure and composition of bone tissue

Bone renewal and growth

Types of joint (fibrous, cartilaginous, synovial), synarthrosis, amphiarthrosis, diarthrosis

Joint anatomy

Range of joint movement.

Movement:

Structure and composition of muscle types (skeletal, cardiac, smooth), muscle contraction (sliding filament theory)

Skeletal muscle types associated to particular movements

Tendons and ligament structure and role

Common types and sites of injury through movement.

LO2 **Discuss how the body transports essential materials around the body to maintain life and how it compensates to meet demands**

Blood:

Composition and function of blood: Function and morphology of blood cells (erythrocytes, leucocytes – neutrophils, eosinophils, basophils, lymphocytes, monocytes, macrophages)

Origin of blood cells

Role of platelets and fibrinogen

Blood plasma

Environmental and management impact on blood composition (altitude, workload, diet).

Cardiovascular system:

Structure and function of the heart, origin and conduction of heartbeat, cardiac cycle, structure and function of blood vessels, circulatory pathways (pulmonary circulation, systemic circulation, coronary circulation)

Open and closed circulatory systems

Circulatory physiology, response to demand (thermoregulation, exercise, fight/flight response).

Lymphatic system:

Lymphatic vessels, formation and transportation of lymph, structure and location of lymph nodes, lymphoid tissues and organs

Conditions affecting correct functioning.

LO3 **Evaluate the functioning of systems which obtain raw materials for metabolism and excrete waste to highlight the effects changes in management systems may have on animal wellbeing**

Respiratory system:

Structure and function of the respiratory tract Ventilation of lungs, gaseous exchange

Transport of respiratory gases

Management of respiratory diseases and disorders.

Digestive system:

Structure and functions of the organs of the digestive tract (ruminant, monogastric, hindgut fermenter)

Phases of digestion and absorption, digestive enzymes, neural and hormonal control of digestion

Functions of the liver and pancreas.

Urinary system:

Structure and functions of the kidney

Urine formation

Urine movement through the system

Osmoregulation and pH regulation.

Husbandry techniques and wellbeing:

Impact of animal management systems on the Respiratory, Digestive and Urinary systems

Bedding / substrate use, cleaning procedures, feeding and watering systems, housing, exercise.

LO4 **Develop material to share information on animal reproductive processes and the ways that these processes can be managed for animal owners to make informed choices**

Reproductive system:

Structure and function of the male and female reproductive systems, oestrus, hormonal control, spermatogenesis and oogenesis

Variations between species.

Reproductive stages and management:

Sexual maturity, fertilisation, implantation / egg and shell production, embryonic development, parturition

Breeding management, natural breeding, artificial insemination, embryonic transfer, surrogacy, cloning.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Determine how the skeletal and muscular systems interact with one another to provide support and create movement		
P1 Explain how skeletal and muscular systems function. **P2** Identify the methods of interaction between the skeletal and muscular systems to provide support and create movement.	**M1** Explain in detail the functioning of skeletal and muscular systems to include the differences between bone and muscle types.	**D1** Evaluate sites of weakness where the muscular and skeletal systems interact for a named animal species to influence management of the species.

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO2 Discuss how the body transports essential materials around the body to maintain life and compensates to meet demands</td><td rowspan="5">LO2 LO3
D2 Critically review the demands placed on a named animal species through human interaction, which affects the animals' wellbeing and identify potential improvements to care.</td></tr>
<tr><td>P3 Describe the structure and function of the cardiovascular and lymphatic systems.
P4 Discuss the composition of blood and how it may vary to meet demands.</td><td>M2 Explain the morphology of erythrocytes and leucocytes to determine cell health through blood samples.</td></tr>
<tr><td colspan="2">LO3 Evaluate the functioning of systems which obtain raw materials for metabolism and excrete waste to highlight the effects changes in management systems may have on animal wellbeing</td></tr>
<tr><td>P5 Evaluate how the respiratory, digestive and urinary systems function effectively on a daily basis for a named species.
P6 Explain two examples of management systems, which may affect functioning of either the respiratory, digestive or urinary system in a named species.</td><td>M3 Analyse the reasoning for management systems used which may affect animal wellbeing.</td></tr>
<tr><td colspan="2">LO4 Develop material to share information on animal reproductive processes and the ways that these processes can be managed for animal owners to make informed choices.</td><td rowspan="2">D3 Evaluate artificial breeding interventions to provide unbiased information for the animal owner/carer.</td></tr>
<tr><td>P7 Create a means of communicating information to animal owners on the reproductive processes of a named animal species and describe how these can be managed for breeding purposes.</td><td>M4 Explain in detail the events of oestrus in a named species and how this can affect behaviour traits.</td></tr>
</table>

Recommended Resources

Textbooks

AKERS, R.M. and DENBOW, D.B. (2013) *Anatomy & Physiology of Domestic Animals.* 2nd edn. Chichester: Wiley.

BREGA, J. (2005) *Essential Equine Studies: book one: anatomy and physiology.* London: J.A. Allen.

BRITISH HORSE SOCIETY and HASTIE, P. (2012) *The BHS Veterinary Manual.* 2nd edn. Shrewsbury: Kenilworth Press.

FRANDSON R.D., WILKE, W.L. and FAILS, A.D. (2013) *Anatomy & Physiology of Farm Animals.* 7th edn. Oxford: Blackwell.

REECE, W.O. and ROWE, E.W. (2017) *Functional Anatomy and Physiology of Domestic Animals.* 5th edn. Chichester: Wiley.

TORTORA, G.J. and DERRICKSON, B.H. (2014) *Principles of Anatomy and Physiology.* 14th edn. Chichester: Wiley.

Websites

www.onlineveterinaryanatomy.net	Online Veterinary Anatomy Museum Whole site use (General Reference/Research)
www.khanacademy.org	Khan academy Human Biology (General Reference)
https://academic.oup.com	Oxford Academic Journals Journal of Animal Science (Journal)
https://bsas.org.uk/	British Society of Animal Science Animal Science (Journal)
http://onlinelibrary.wiley.com	Wiley Online Library Equine Veterinary Journal (Journal)

Essential Requirements

Tutors must be appropriately qualified and experienced within this subject to cover the principles and skills development aspects of this unit.

Links

This unit links to the following related units:

Unit 5: Animal Health and Welfare

Unit 6: Animal Nutrition

Unit 15: Animal Husbandry

Unit 15: Animal Husbandry

Unit code	**L/616/7843**
Unit level	**4**
Credit value	**15**

Introduction

The aim of this unit is to provide students with essential knowledge and practical experience in Animal Husbandry and Management techniques. This is important for the development of sector specific and transferable skills.

The unit promotes keeping animals in an environment where maintenance of mental and physical health, prevention of ill health and good welfare practice is paramount.

Students will study core concepts of good husbandry practice, Health and Safety, animal management techniques and administration as well as practical aspects of handling, accommodation, provision of feed, health and welfare and legislative requirements relevant to animal husbandry.

Assessment strategies will include assessed practical investigations, written reports and presentations.

Having completed this unit, students will be equipped with the practical skills and underpinning knowledge which can be applied to their choices of specialism and career progression.

Learning Outcomes

By the end of this unit students will be able to:

1 Examine Health and Safety practice within animal husbandry

2 Demonstrate animal husbandry practices and health monitoring to industry standard

3 Demonstrate the management of animal accommodation

4 Review methods of record keeping within animal facilities.

Essential Content

LO1 **Examine Health and Safety practice within animal husbandry**

Legislative considerations for Health and Safety within animal husbandry:

To cover the following sectors:

Health and Safety in the workplace

Regulations for management and control of hazardous substances

Reporting of injury, disease or death

Personal protective equipment

Manual handling activities.

Risk Assessment:

Why carry out risk assessment: HSE

Methods of risk assessment.

Factors affecting safe handling:

When to, and when not to handle animals

Animal: species, size, temperament, age, physiological condition

Handler: experience, confidence, competence

Enclosure: access, size

Procedure: health check, veterinary consultation/treatment.

LO2 **Demonstrate animal husbandry practices and health monitoring processes to industry standard**

Principles of industry standard animal husbandry practice:

Relationship between environment and physiological status

Five needs.

Animal handling and restraint:

Handling techniques for a range of farm livestock and physiological conditions

Approach methods and techniques

Capture and restraint techniques for a range of situations

Selection and correct use of PPE and handling equipment

Consideration of toxic and venomous species

Movement of animals in line with legislative guidelines.

Animal health and monitoring:

Signs of good and ill health and interpretation of these

Assessment and reporting of health status

Prophylaxis and treatment of disease

Quarantine

Barrier nursing and isolation

Euthanasia: reasons for, methods and disposal.

LO3 **Demonstrate the management of animal accommodation**

Animal accommodation requirements:

Codes of practice for housing (RSPCA)

Species specificity for a range of livestock (size, materials, ventilation, drainage, temperature, safety and security, substrate/bedding, furnishings and feeding and watering equipment)

Provision of feed and water

Enrichment of accommodation

Legislation pertaining to animal accommodation.

Preparation and maintenance of accommodation:

Design, preparation and maintenance of a range of livestock accommodation (dairy cattle, beef cattle, young stock, sheep, pigs, poultry)

Daily, weekly and monthly cleaning and maintenance (regimes, use of PPE and Health and Safety, chemicals suitable for various species)

Disposal of waste and environmental impact

Appraisal of livestock facilities.

LO4 **Review methods of record keeping within animal facilities**

Legislative requirements for record keeping:

DEFRA stock identification requirements (farm animals)

Drugs legislation and COSHH

Data Protection and Privacy of Electronic Communications Regulations.

Data management:

Identification of records and data required

Methods of data gathering and retrieval (manual, computerised).

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Examine Health and Safety practice within animal husbandry		
P1 Describe the legislation pertaining to Health and Safety and risk assessment within animal husbandry. **P2** Explain the factors affecting the safe handling of animals using relevant examples across a range of species.	**M1** Examine how Health and Safety considerations interact with the factors affecting safe handling within animal husbandry scenarios.	**D1** Complete and analyse the overall process of risk assessment within animal husbandry Health and Safety practice.

Pass	Merit	Distinction
LO2 Demonstrate animal husbandry practices and health monitoring to industry standard		
P3 Explain how the principles of good animal husbandry practice apply to the maintenance of the physiological welfare of a given species. **P4** Demonstrate, for a range of species, varying situations and physiological conditions, the processes of health monitoring and reporting. **P5** Demonstrate, for a range of species, varying situations and physiological conditions, appropriate handling and restraint techniques. **P6** Review the roles and practice of prevention and treatment of disease, as part of the monitoring of animal health.	**M2** Assess the practice of animal husbandry techniques undertaken.	**D2** Analyse how the principles of industry standard animal husbandry practice underpin the management of both health and husbandry of animal species.

Pass	Merit	Distinction
LO3 Demonstrate the management of animal accommodation		
P7 Explain the requirements for the provision and ongoing maintenance of adequate accommodation for a range of species ensuring that enrichment of the environment is considered. **P8** Demonstrate the design, preparation and ongoing maintenance of a range of accommodation for a variety of species.	**M3** Provide a justification of the planning and design of animal accommodation in terms of codes of practice and any relevant legislation.	**D3** Critically analyse accommodation in two different animal facilities.
LO4 Review methods of record keeping within animal facilities.		
P9 Review the legislation relevant to record keeping within animal facilities. **P10** Explain the methods used to gather, retrieve and interpret specified data, within the agriculture sector.	**M4** Apply an appropriate data management system to an animal collection and analyse information collected.	**D4** Provide an evaluation of a data management system used within an animal facility.

Recommended Resources

Textbooks

COOPER, B., MULINEAUX, E. and TURNER, L. (2011) *BSAVA Manual of Veterinary Nursing*. Gloucester: British Small Animal Veterinary Association.

HUBRECHT, R. and KIRKWOOD, J. (2010) *UFAW Handbook on the Care and Management of Laboratory and Other Research Animals.* 8th edn. Chichester: Wiley-Blackwell.

MEREDITH, A. and JOHNSON-DELANEY, C. (2010) *BSAVA Manual of Exotic Pets*. Gloucester: British Small Animal Veterinary Association.

RAITI, P. and GIRLING, S. (2004) *BSAVA Manual of Reptiles.* British Small Animal Veterinary Association.

WARREN, D. (2015) *Small Animal Care and Management.* 2nd edn. Toronto: Thompson Learning.

Websites

worksmart.org.uk	TUC Work Smart Health What are the main health and safety regulations (General Reference)
www.hse.gov.uk	Health and Safety Executive Homepage (Research/General Reference)
www.gov.uk/	Department for Environment Food & Rural Affairs All sections (Research/General reference)

Essential Requirements

Tutors must be appropriately qualified and experienced within this subject to cover the principles and skills development aspects of this unit.

Links

This unit links to the following related units:

Unit 5: Animal Health and Welfare

Unit 6: Animal Nutrition

Unit 16: Protective Crop Production

Unit code	**F/616/7973**
Unit level	**4**
Credit value	**30**

Introduction

The consumer demand for agricultural and horticultural products means that there is an expectation for all year round availability, meeting tight quality standards. Seasonality of the outdoor growing environment does not allow this demand to be met. While this demand may be met by growing crops in other countries, the environmental cost of this type of production (the 'air miles') is also under scrutiny.

Protected cropping provides a potential solution to meet the demands for growing a crop more locally and extending the season. The challenge for the modern grower is to do this in a way that uses resources efficiently.

This unit investigates a range of production systems, from those with little investment through to complex computer controlled environments, identifying their suitability for different types of crops. Students will evaluate production systems for different crops, including how the growing blueprint may vary between different cultivars. This unit covers both the production of flowers, for cutting or in pots as well as the production of a wide range of foods.

This unit will be most effective when it is completed alongside the growing of a range of protected crops – these provide a relevant connection with this industry sector and will provide experience and knowledge in meeting the specific quality and time requirements placed upon these growers. The unit culminates with the harvesting of the crops produced – the final stage in the growing process for these crops.

Learning Outcomes

By the end of this unit students will be able to:

1 Analyse growing regimes for protected crops

2 Develop a commercial plan for the growing of crops

3 Assess the management systems used in the growing of protected crops

4 Demonstrate the application of appropriate quality criteria to the harvesting of protected crops.

Essential Content

LO1 **Analyse growing regimes for protected crops**

Types of structure:

Polythene tunnels

Glass structures

Polycarbonate structures

Cloches

Cold frames

Netting tunnels

Mushroom-growing structures

Non-rigid structures (floating cloches).

Types of crop:

Cut flowers

Houseplants

Herbs

Vegetables

Fruit

Young plant production

Mushrooms.

Pest & disease control:

Cultural

Chemical

Biological controls

Integrated pest management

Legislation.

Development of growing blueprints:

Climate management e.g. light, heat, moisture, day length, humidity, nutrients.

Availability of local resources:

Labour

Access to markets

Essential services.

LO2 **Develop a commercial plan for the growing of crops**

Planning considerations:

Time of year

Labour availability

Customer requirements

Climatic conditions.

Growing blueprints:

Computer-controlled environments

Environmental monitoring.

Varietal choice:

Predicted performance in growing conditions

Evaluation of quality/yield

Sources of varietal/cultivar information.

LO3 **Assess the management systems used in the growing of protected crops**

Environmental control:

Equipment used

Predictive technology

Use of historical data

Relationships between heat/light/carbon dioxide/humidity.

Crop scheduling:

Market needs

Successional crops.

Manipulation of plant growth:

Pest and disease control

Pruning and training

Use of growth inhibitors/modifiers

Use of environmental conditions in protected environment.

LO4 **Demonstrate the application of appropriate quality criteria to the harvesting of protected crops.**

Quality criteria:

Customer specification/market requirements

Size

Colour

Developmental stage

Labelling

Legal obligations

Presentation requirements

Cool chain requirements.

Productivity expectations:

Commercial speed expectations

Benchmarking of performance

Waste.

Markets:

Retail

Multiples

Contract

Wholesale

International and domestic legislation

Quality Assurance/industry accreditation schemes.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Analyse growing regimes for protected crops		
P1 Assess the suitability of different protected structures to meet the needs of stated crops. **P2** Describe the application of crop protection methods within protected structures.	**M1** Explain the factors affecting the selection of structures to meet the needs of specific crops.	**D1** Evaluate the suitability of a selected structure for the growing of a commercial crop.
LO2 Develop a commercial plan for the growing of crops		
P3 Develop and present plans for the production of commercial crops. **P4** Assess how commercial growing plans are adapted to optimise the growth of different cultivars of a plant species.	**M2** Evaluate the effectiveness of a growing plan to meet specific customer requirements.	**D2** Justify recommendations made to improve the effectiveness of a current commercial growing plan.
LO3 Assess the management systems used in the growing of protected crops		
P5 Analyse the management systems used in diverse protected cropping systems. **P6** Evaluate the effectiveness of different pest and disease management systems in specific crops.	**M3** Critically review the management systems used within a commercial production system.	**D3** Justify recommendations to improve a commercial production system.
LO4 Demonstrate the application of appropriate quality criteria to the harvesting of protected crops.		
P7 Perform the harvesting of crops to expected commercial specifications. **P8** Present harvested crops according to specification.	**M4** Assess the effectiveness of the harvested crop in meeting the stated quality criteria.	**D4** Explain and justify the criteria included within customer specifications.

Recommended Resources

Textbooks

BARRETT, T. (2016) *Polytunnels, Greenhouses and Protective Cropping: A Guide to Growing Techniques.* Marlborough: Crowood Press.

BEYTES, C. (2012) *Ball Redbook: Greenhouses and Equipment v1.* 18th edn. Chicago: Ball Publishing.

CASTILLA, N. and BAEZA, E.J. (2012) *Greenhouse Technology and Management.* 2nd edn. Wallingford: CABI.

MEFFERD, A. (2017) *The Greenhouse and Hoophouse Grower's Handbook: Organic Vegetable Production Using Protected Culture.* Vermont: Chelsea Green Publishing.

NAU, J. (2012) *Ball Redbook: Crop Production v2.* 18th edn. Chicago: Ball Publishing.

Websites

www.greenhousegrower.co.uk	Commercial Greenhouse Grower Specialist grower publication (Research resource)
www.greenhousemag.com	Greenhouse Management Magazine The foremost specialist UK publication for commercial greenhouse growing (News articles)

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 7: Principles of Crop Production

Unit 8: Plant and Soil Science

Unit 22: Plant and Crop Health (Diseases, Pests and Weeds)

Unit 17: Teaching in a Specialist Subject

Unit code	**Y/616/7848**
Unit level	**4**
Credit value	**15**

Introduction

Working in the animal and agricultural industries frequently includes delivery of material designed to educate others about the welfare of animals. From teaching in FE to working in the animal entertainment sector or owning a business, knowledge of the principles and practices of teaching is fundamental to ensure sufficient learning.

This unit provides an introduction to the key principles of teaching and gives students the opportunity to put what they have learned to practice.

Students will be provided with the opportunity to explore a range of learning theories used within teaching and gain an understanding of the ways in which lessons are structured.

Students will explore a range of delivery methods including inclusive approaches to activities within a specialist area. Students will be provided with an opportunity to identify issues and management strategies relating to equality and diversity as well as behavioural management.

This unit also gives the opportunity to explore the importance of using a range of assessment techniques as well as managing and developing resources to inspire. The ability to reflect will give students the chance to evaluate their own approaches to teaching and enable them to tailor this to a specialist area.

The underlying principle of the unit is to give students the opportunity to develop confidence in developing and delivering educational material to students within the animal management sector. During their careers, students will take on roles that may require professional evaluation and working effectively with others. Students will also gain skills in dealing with issues arising out of equality and diversity along with the management of behaviour which forms an integral part of teaching a specialist subject.

Learning Outcomes

By the end of this unit students will be able to:

1 Identify the application of the theories and principles of education and training in a specialist subject

2 Develop a range of resources to enable inclusive learning

3 Demonstrate how to plan, design and construct a lesson

4 Evaluate delivery techniques and improve activities.

Essential Content

LO1 **Identify the application of the theories and principles of education and training in a specialist subject**

Curriculum:

Educational / training context in specialist subject (FE College, HE, Sixth form, work based training, School visits, entertainment industry, Charity work

Delivery (knowledge based, tutor centered, student centered, lecture style, research based).

Principles of learning:

Maslow's hierarchy of needs

Behaviorists, cognitivists and humanists (e.g. Piaget, Romanowski, Kolb, Pavlov)

VAK

Inclusive learning

Blooms taxonomy.

LO2 **Develop a range of resources to enable inclusive learning**

Resource design and management:

Differentiation

Starters

Plenaries

Evaluation of own resources.

Resources and activities to promote learning:

VLE (e.g. Blackboard, Moodle)

ICT

Handouts

Case studies

Guest speakers

Educational visits

Role play

Peer working / support.

Equality and diversity:

Promoting equality

Challenging discriminatory behaviour

Legislation

Incorporating E&D in a range of lessons.

LO3 **Demonstrate how to plan, design and construct a lesson**

Session planning:

Aims and objectives

Lesson planning (pace of lesson, stages, timing, variety)

Schemes of Work

Time management techniques.

Assessment techniques:

Initial assessment

Formative assessment

Summative assessment

Peer assessment

Ways to incorporate assessment in lessons

Feedback techniques.

LO4 **Evaluate delivery techniques, improve methods and update own specialist knowledge**

Strength and development:

Use of reflective journals in evaluating own approaches

Reflection in action / reflection on action

Kolb's learning cycle.

Sharing good practice:

E.g.: team meetings, staff development days

Using feedback from others

The importance of continuing professional development

Liaising with others, experience in workplace / industry.

The observation process:

People who carry out observations in specialist areas

The importance of observations

Methods of observation

Formal / informal observations

Feedback process.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Identify the application of the theories and principles of education and training in a specialist subject</td><td rowspan="8">LO1 LO2 LO3
D1
Critically evaluate the planning and delivery process and appropriate resources applied.</td></tr>
<tr><td>P1 Explain the various ways teaching can be implemented into your specialist subject area.
P2 Describe a range of theories and philosophies used within teaching and learning, giving specific examples.</td><td>M1 Analyse the different methods of delivery of education within your specialist subject area giving both advantages and disadvantages.</td></tr>
<tr><td colspan="2">LO2 Develop a range of resources to enable inclusive learning</td></tr>
<tr><td>P3 Select and produce a range of resources, including new and emerging technologies for a minimum of two sessions in a specialist subject area.
P4 Identify, use and evaluate appropriate resources for support in promoting equality and diversity.</td><td>M2 Analyse the effectiveness of specific resources reviewing both advantages and disadvantages.</td></tr>
<tr><td colspan="2">LO3 Demonstrate how to plan, design and construct a lesson</td></tr>
<tr><td>P5 Plan a detailed scheme of work for a specialist subject area.
P6 Provide evidence of the planning and delivery of a minimum of two different sessions.</td><td>M3 Evaluate the use of differentiation within the planning and delivery of a minimum of two sessions.</td></tr>
</table>

Pass	Merit	Distinction
LO4 Evaluate delivery techniques and improve activities.		
P7 Reflect on own approaches, strengths and development needs in relation to own specialist subject area. **P8** Review the various ways in which sharing good practice can be beneficial to improve teaching and learning, giving specific examples where possible.	**M4** Analyse the positive and negative outcomes of lesson planning and delivery supported by specific examples.	**D2** Provide a critical evaluation and reflection of your planning and delivery of sessions.

Recommended Resources

Textbooks

CURZON, L.B. (2013) *Teaching in Further Education: An Outline of Principles and Practice.* London: Bloomsbury Academic.

GRAVELLS, A. (2012) P*reparing to teach in the lifelong learning sector.* Exeter: Learning matters.

PETTY, G. (2014) *Teaching today: A Practical Guide*. Oxford: Nelson Thornes.

PETTY, G. (2009) *Evidence-Based Teaching: A Practical Approach*. Oxford: Nelson Thornes.

Websites

www.educationworld.com	Education world Whole website (General reference)
www.geoffpetty.com	Geoff Petty Whole website (General reference)
www.tes.com	TES Whole website (General reference)

Links

This unit links to the following related units:

Unit 3: Managing a Successful Project (Pearson-set)

Unit 24: Research Project

Unit 18: Advanced Financial Accounting

Unit code	**J/616/7974**
Unit type	**Core**
Unit level	**5**
Credit value	**15**

Introduction

The day to day accounts of the Land-based business are the basis of the statutory accounts that are produced for HMRC. Business managers can also present their accounts in certain formats to support decision making whether this is at individual enterprise level or for the business as a whole. Preparing and understanding these accounts are vital to the development of the business and how it progresses and grows in the future.

The overall aim of this unit is to develop the student's understanding of how day to day accounts operate and are used to compile year end accounts, which assist in the production of budgets and forecasts for the upcoming year. They will also develop an understanding of how to provide management reports for budget and cash flow analysis.

On successful completion of this unit, students will be able to prepare a draft set of accounts for an accountant from their own financial records and understand appraisal techniques of accounts.

Learning Outcomes

By the end of this unit students will be able to:

1 Perform the necessary period end adjustments to the day to day accounts to enable statutory accounts to be produced

2 Demonstrate through the production of a Profit and Loss account and appraisal techniques an assessment of business performance

3 Demonstrate through the production of a balance sheet and appraisal techniques an assessment of the business performance

4 Interpret the accounts as a basis for producing budgets and forecasts for business financial sustainability and development.

Essential Content

LO1 **Perform the necessary period end adjustments to the day to day accounts to enable statutory accounts to be produced**

Period year-end adjustments:

Make the necessary period end adjustments to the day to day accounts to enable statutory accounts to be produced

Understand and compute accruals and prepayments for both income and expenses at the period end.

Maintain a Fixed Asset register and compute depreciation for the period:

Understanding of straight line and reducing balance methods.

Stock valuations:

Prepare a stock valuation for the business at the period end, including both live and dead stock and growing crop computations.

LO2 **Demonstrate through the production of a Profit and Loss account and appraisal techniques an assessment of business performance**

Compile a Profit and Loss Account:

Prepare and calculate a Profit and Loss account for a Land-based business

Understand the differences between variable costs (cost of production) and fixed costs (overheads).

Compute and understand Profit and Loss ratio analysis and their use for appraising a Land-based business

LO3 **Demonstrate through the production of a Balance Sheet and appraisal techniques an assessment of the business performance**

Compile a Balance Sheet account:

Prepare and calculate a Balance Sheet account for a land-based business

Understand the differences in the structure of the balance sheet for different corporate entities (sole trader, partnerships, limited company).

Compute and understand Balance Sheet ratio analysis and their use for appraising the business

LO4 **Interpret the accounts as a basis for producing budgets and forecasts for business financial sustainability and development**

Budgets and forecasts:

Use the past accounts to predict volumes and quantities of income and expenditure

Calculate individual enterprise accounts (gross margins)

Understand how proposed changes to enterprises will affect both enterprise and overhead forecasts

Calculate overhead (fixed costs) forecasts

Calculate a budgets Profit or Loss account.

Cash flow forecast:

Calculate a cash flow forecast for a land-based business identifying business, private and capital expenditure.

Monitoring and control:

Evaluate how the monitoring of actual performance compares against budget/forecast performance and how this can affect the management of the land-based business

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Perform the necessary period end adjustments to the day to day accounts to enable statutory accounts to be produced		
P1 Identify and compute accruals and prepayment schedules. **P2** Assess the methods of depreciation calculation for fixed assets.	**M1** Compute period end stock and growing crop valuations.	**D1** Evaluate the effects of computing period end adjustments on the accounts.
LO2 Demonstrate through the production of a Profit and Loss account and appraisal techniques an assessment of business performance		
P3 Identify and prepare the elements that constitute a profit and loss account. **P4** Identify variable and fixed costs and explain the differences between them.	**M2** Compute profit and loss margin ratios.	**D2** Evaluate margin ratios and their use in appraising a land-based business.
LO3 Demonstrate through the production of a Balance Sheet and appraisal techniques an assessment of the business performance		
P5 Identify and prepare the elements that constitute a balance sheet account. **P6** Identify the differences in the structure of the balance sheet for different corporate entities.	**M3** Compute balance sheet margin ratios.	**D3** Critically evaluate the accounts of a business by using capital ratios in appraising its performance.
LO4 Interpret the accounts as a basis for producing budgets and forecasts for business financial sustainability and development.		
P7 Produce enterprise forecasts for three individual enterprises. **P8** Produce overhead forecasts for a business.	**M4** Assess the effect of enterprise changes on the whole business forecast.	**D4** Critically evaluate the monitoring of actual performance versus budget/forecast that could affect the management of the business.

Recommended Resources

Textbooks

IAgSA. (2016) *The Farm Office Handbook*. Sheffield: Old Pond Publishing Ltd

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 2: Management Accounting

Unit 10: Rural Business Administration and Accounting

Unit 11: Human Resource Management

Unit 19: Research Project (Pearson-set)

Unit code	**R/616/7850**
Unit type	**Core**
Unit level	**5**
Credit value	**30**

Introduction

This unit is assessed by a Pearson-set assignment. Students will choose their own project based on a theme provided by Pearson (this will change annually). The project must be related to their specialist pathway of study (unless the student is studying a general pathway). This will enable students to explore and examine a relevant and current topical aspect of business in the context of the Land-based business environment and their chosen specialist pathway.

The aim of this unit is to offer students the opportunity to engage in sustained research in a specific field of study. The unit enables students to demonstrate the capacity and ability to identify a research theme, to develop research aims, objectives and outcomes, and to present the outcomes of such research in both written and verbal formats. The unit also encourages students to reflect on their engagement in the research process during which recommendations for future, personal development are key learning points.

On successful completion of this unit, students will have the confidence to engage in problem-solving and research activities, which are part of the function of a manager. Students will have the fundamental knowledge and skills to enable them to investigate workplace issues and problems, determine appropriate solutions and present evidence to various stakeholders in an acceptable and understandable format.

Please refer to the accompanying Pearson-set Assignment Guide and the Theme Release document for further support and guidance on the delivery of the Pearson-set unit.

Learning Outcomes

By the end of this unit a student will be able to:

1 Examine appropriate research methodologies and approaches as part of the research process

2 Conduct and analyse research relevant to a Land-based business research project

3 Communicate the outcomes of a research project to identified stakeholders

4 Reflect on the application of research methodologies and concepts.

Essential Content

LO1 Examine appropriate research methodologies and approaches as part of the research process

Developing a research proposition:

The importance of developing methodical and valid propositions as the foundation for a research project

Rationale e.g. the purpose and significance for research question or hypothesis

The value of the philosophical position of the researcher and the chosen methods

Use of Saunders's research onion as a guide to establishing a methodological approach.

Literature review:

Conceptualisation of the research problem or hypothesis

The importance of positioning a research project in the context of existing knowledge

Significance and means of providing benchmarks by which data can be judged.

Qualitative, quantitative and mixed method research:

Key theoretical frameworks for research

Advantages and limitations of qualitative and quantitative research approaches and methods.

LO2 Conduct and analyse research relevant for a Land-based business research project

Research as a process:

Research has distinct phases which support a coherent and logical argument e.g. using secondary research to inform a primary empirical study.

Selecting a sample:

The importance of gathering data and information (qualitative or quantitative) to support research analysis

Selecting sample types and sizes that are relevant to the research

Considering sampling approaches and techniques e.g. probability and non-probability sampling.

Ethics, reliability and validity:

Research should be conducted ethically – how is this achieved and reported?

Research should also be reliable (similar results would be achieved from a similar sample) and valid (the research measures what it aimed to measure).

Analysing data:

Using data collection tools e.g. interviews and questionnaires

Using analytical techniques e.g. trend analysis, coding or typologies.

LO3 **Communicate the outcomes of a research project to identified stakeholders**

Stakeholders:

Who are they?

Why would they be interested in the research outcomes?

What communication method do they expect?

Communicating research outcomes:

Consideration of different methods of communicating outcomes (e.g. written word, spoken word) and the medium (e.g. report, online, presentation)

The method and medium will be influenced by the research and its intended audience.

Convincing arguments:

No matter what the method/medium, all research should be convincing and presented logically where the assumption is that the audience has little or no knowledge of the research process

The importance of developing evaluative conclusions.

LO4 **Reflect on the application of research methodologies and concepts.**

Reflection for learning and practice:

Difference between reflecting on performance and evaluating a research project – the former considers the research process, the latter considers the quality of the research argument and use of evidence

Reflection on the merits, limitations and potential pitfalls of the chosen methods.

The cycle of reflection:

Reflection in action and reflection on action

Considering how to use reflection to inform future behaviour and future considerations.

Reflective writing:

Avoiding generalisation and focusing on personal development and the research journey in a critical and objective way.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Examine appropriate research methodologies and approaches as part of the research process</td><td rowspan="5">LO1 LO2

D1 Critically evaluate research methodologies and processes in application to a business research project to justify chosen research methods and analysis.</td></tr>
<tr><td>P1 Produce a research proposal that clearly defines a research question or hypothesis supported by a literature review.

P2 Examine appropriate research methods and approaches to primary and secondary research.</td><td>M1 Evaluate different research approaches and methodology and make justifications for the choice of methods selected based on philosophical/theoretical frameworks.</td></tr>
<tr><td colspan="2">LO2 Conduct and analyse research relevant for a Land-based business research project</td></tr>
<tr><td>P3 Conduct primary and secondary research using appropriate methods for a business research project that consider costs, access and ethical issues.

P4 Apply appropriate analytical tools, analyse research findings and data.</td><td>M2 Discuss merits, limitations and pitfalls of approaches to data collection and analysis.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Communicate the outcomes of a research project to identified stakeholders		
P5 Communicate research outcomes in an appropriate manner for the intended audience.	**M3** Coherently and logically communicate outcomes to the intended audience demonstrating how outcomes meet set research objectives.	**D2** Communicate critical analysis of the outcomes and make valid, justified recommendations.
LO4 Reflect on the application of research methodologies and concepts.		
P6 Reflect on the effectiveness of research methods applied for meeting objectives of the business research project. **P7** Consider alternative research methodologies and lessons learnt in view of the outcomes.	**M4** Provide critical reflection and insight that results in recommended actions for improvements and future research considerations.	**D3** Demonstrate reflection and engagement in the resource process leading to recommended actions for future improvement.

Recommended Resources

COSTLEY, C., ELLIOT, G. and GIBBS, P. (2010) *Doing Work Based Research: Approaches to Enquiry for Insider-researchers*. London: SAGE.

FLICK, U. (2011) *Introducing Research Methodology: A Beginner's Guide to Doing a Research Project.* London: SAGE.

GRAY, D. (2009) *Doing Research in the Real World.* 2nd edn. London: SAGE.

SAUNDERS, M., LEWIS, P. and THORNHILL, A. (2012) *Research Methods for Business Students.* 6th edn. Harlow: Pearson.

Websites

www.eajournals.org	European American Journals International Journal of Quantitative and Qualitative Research (Journal)
www.emeraldinsight.com	Emerald Insight Qualitative Research Journal (Journal)

Links

This unit links to the following related units:

Unit 3: Managing a Successful Project (Pearson-set)

Unit 20: Forage Production and Management

Unit code	**L/616/7975**
Unit level	**5**
Credit value	**15**

Introduction

The production of grass and other forage crops can make an important contribution to the agricultural industry in many land-based situations. The production of forage crops can also have wider benefits in an agricultural situation as part of a rotation, fixing nitrogen, allowing spring cultivations, for countryside management reasons, and for carbon sequestration.

This unit reflects the wide range of grass and forage crops cultivated commercially, but will allow students to investigate crops of local importance in more detail. Whilst studying the unit, students will consider the botanical and agronomic characteristics of the full range of forage crops grown commercially. Students will demonstrate the application of scientific principles to understand the husbandry requirements of a range of forage crops, and will demonstrate their practical ability in monitoring and maintaining healthy growing crops from establishment onwards. The harvesting and storage of forage crops is considered, together with their nutritional value as part of a ration formulation. Wider agronomic and environmental issues are also integrated across the unit, including the use of grazing animals for habitat management, use as a feedstock for anaerobic digesters, and how grass and forage crops form part of the wider agricultural industry.

Learning Outcomes

By the end of this unit, students will be able to:

1 Understand forage crop growth and development

2 Understand the principles of forage crop establishment

3 Assess the management of grazed forage crops

4 Assess the management of conservation forage crops.

Essential Content

LO1 **Understand forage crop growth and development**

Definitions:

Forage crop types, grassland definitions, botanical features, growth and development stages, vernalisation, benchmarking, grassland ecology, carbon sequestration.

Crop growth requirements:

Major nutrients, minor nutrients, trace elements, symbiotic relationships.

Distribution of forage crops:

Climate, topography, length of growing season, day length, soil type, water use efficiency.

LO2 **Understand the principles of forage crop establishment**

Species and cultivar choice:

Grazing, conservation, site-specific suitability, quality and yield, sources of information, trials data.

Soil conditions:

Poaching, drainage, subsoil structure, soil aggregate distribution, soil biota.

Establishing forage crops:

Annual, biennial and perennial crop establishment methods and associated machinery, seedbed conditions, planting depth, soil contact, seed size, seed rates and dressings.

LO3 **Assess the management of grazed forage crops**

Monitoring the crop through the growing season:

Ground cover, green area index, growth and development stages, plant health monitoring, intercepted solar radiation, water use efficiency, use of meteorological data.

Manipulation of plant growth:

Grass growth curves, planting dates, cutting and grazing regimes, use of plant growth regulators, fertiliser application and timings.

Weed, pest and disease control in grazed forage crops:

Injurious weeds, cultural, chemical and biological controls, Integrated Pest Management, legislation, Codes of Practice.

Grazing practices:

Grazing methods, fencing, Health and Safety, animal welfare, grazing practices for wildlife conservation management.

LO4 **Assess the management of conservation forage crops**

Monitoring the crop destined for conservation through the growing season:

Ground cover, green area index, growth and development stages, plant health monitoring, intercepted solar radiation, water use efficiency, use of meteorological data.

Weed, pest and disease control in conserved forage crops:

Injurious weeds, cultural, chemical and biological controls, Integrated Pest Management, legislation, Codes of Practice.

Harvesting:

Cutting regimes, timing, labour and machinery requirements, minimising waste, cutting regimes for wildlife conservation.

Quality criteria:

Class of livestock targeted, feedstock for anaerobic digesters, biochemistry and biology of silage fermentation and spoilage.

Storage:

Silage clamps, wrapped bales, monitoring requirements, loading, access, assurance/industry accreditation schemes, storage pests and diseases, environmental considerations.

Feeding forage:

Feeding and unloading, access, forage analysis, interpretation of forage analysis, inclusion of forage within rations, benchmarking.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Understand forage crop growth and development		
P1 Assess the suitability of different forage crops for contrasting locations. **P2** Discuss the biological characteristics of a range of contrasting crops.	**M1** Explain the factors affecting the selection of forage crops in a range of contrasting situations.	**D1** Evaluate the factors affecting the selection of forage crops in a range of contrasting situations.
LO2 Understand the principles of forage crop establishment		
P3 Select suitable species and cultivars for the production of commercial forage crops in a range of situations. **P4** Discuss the establishment conditions of a range of contrasting forage crops.	**M2** Evaluate the suitability of the establishment conditions for the species and cultivars selected.	**D2** Justify the selection and suitability of the establishment conditions for the species and cultivars selected.

Pass	Merit	Distinction
LO3 Assess the management of grazed growing crops		
P5 Perform appropriate management and monitoring tasks through the grazing season for a range of forage crops. **P6** Describe the effectiveness of different weed, pest and disease management systems in specific forage crops.	**M3** Critically review the management systems used throughout the grazing season of specific forage crops.	**D3** Evaluate the effectiveness of the management of specific grazed forage crops throughout the grazing season.
LO4 Assess the management of conservation forage crops.		
P7 Perform a forage crop harvesting operation to commercial standards. **P8** Monitor forage crop products to expected commercial specifications during storage.	**M4** Assess the effectiveness of harvesting and storing forage crops in meeting the stated quality criteria.	**D4** Explain and justify the specifications requirements of the end user.

Recommended Resources

Textbooks

HUMPHREYS, L.R. (1997) *Evolving Science of Grassland Improvement.* Cambridge: Cambridge University Press.

Websites

https://ahdb.org.uk	Agriculture and Horticulture Development Board
	DEFRA
	Fetiliser Manual (RB209)
	(Manual)
www.redtractor.org.uk	Red Tractor Assurance
	Standards
	(Current standards)
www.britishgrassland.com	British Grassland Society
	Recommended Grass and Clover Lists
	(Various)

Links

This unit links to the following related units:

Unit 7: Principles of Crop Production

Unit 8: Plant and Soil Science

Unit 16: Protective Crop Production

Unit 22: Plant and Crop Health (Diseases, Pests and Weeds)

Unit 21: Animal Breeding and Genetics

Unit code	**L/616/7849**
Unit level	**5**
Credit value	**15**

Introduction

The breeding of animals is fundamental to the animal industry worldwide. Possessing an understanding of genetic processes has a clear advantage for those breeding animals. Genetics spans several key areas of the animal management industry including conservation, veterinary science, and animal welfare. This unit introduces the key principles of genetics and how this impacts the overall breeding of animals. The process of mate selection to the parturition of neonates is impacted by the overall genetic information of individuals involved.

Within many settings of the animal management industry, neonatal and young animals are cared for. This unit has an industry led focus providing students with the required knowledge to progress into a range of job roles.

This unit covers a wide range of topics opening with genetic information and key principles of heredity. This develops onto the planning of breeding, caring for young animals and potential problems associated with specific species. Finally, reproductive technologies are considered with a key focus on the practicality and availability for breeders.

There is an opportunity for providers to integrate practical skills with breeding and genetics knowledge within this unit. Students can undertake laboratory sessions to enhance the learning of key content within this unit. Animal breeding is also encouraged to provide students with actual breeding and husbandry skills.

Learning Outcomes

By the end of this unit students will be able to:

1 Analyse genetic information and principles of inheritance in relation to breeding animals

2 Manage the breeding process from oestrus to parturition

3 Manage neonatal and young animals from parturition to adolescence

4 Explore the uses of reproductive technologies when breeding animals.

Essential Content

LO1 **Analyse genetic information and principles of inheritance in relation to breeding animals**

Genetic information:

Deoxyribonucleic acid

Ribonucleic acid

Chromosomes

Genes

Alleles.

Protein synthesis:

Transcription and translation.

Gene interactions:

Incomplete dominance

Lethal alleles

Co-dominance

Multiple alleles

Epistasis

Sex-linkage.

Meiosis and mitosis:

Each stage of division for somatic cells and gametes.

Mendelian genetics:

The work of Gregor Mendel

Monohybrid and dihybrid crosses using probability tables (Punnett Squares).

LO2 **Manage the breeding process from oestrus to parturition**

Mate selection:

Purpose of intended breeding

Genotype analysis

Breeding for specific phenotypes

Pedigree analysis.

Reproductive stages and potential problems:

Oestrus

Ovulation

Conception

Gestation

Parturition.

Record keeping

Health and Safety considerations

LO3 **Manage neonatal and young animals from parturition to adolescence**

Neonatal care and young animal care:

First days of life

Nutrition

Housing

Husbandry

Handling

Health

Vaccinations.

Potential problems:

Orphaned neonates

Species specific problems.

Legislative requirements:

Species specific legislative requirements

Sale/transfer of animals

Notifiable disease

Animal welfare standards.

LO4 **Explore the uses of reproductive technologies when breeding animals**

Genetic technologies:

Genetic analysis

DNA screening

Hormone therapy

Superovulation

Ovulation indicators

Artificial insemination

Oestrus synchronisation

Embryo transfer

Confirmation of gestation.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Analyse genetic information and principles of inheritance in relation to breeding animals</td><td rowspan="2">D1 Critically evaluate the work of Gregor Mendel in relation to the relevance of his laws in modern day breeding programmes.</td></tr>
<tr><td>P1 Compare the properties of DNA and RNA with specific emphasis on their roles in protein synthesis.

P2 Discuss the role of meiotic and mitotic cell division in the development of offspring.

P3 Review the use of probability tools when predicting the outcome of specific crosses/matings.</td><td>M1 Investigate the impacts of the following gene interactions with specific emphasis on phenotypic traits:
• lethal alleles
• epistasis
• incomplete dominance
• co-dominance
• multiple alleles
• sex-linkage.</td></tr>
<tr><td colspan="2">LO2 Manage the breeding process from oestrus to parturition</td><td rowspan="2">LO2 LO3

D2 Evaluate information available to breeders when planning a breeding programme from oestrus identification to the weaning of young animals for a given species.</td></tr>
<tr><td>P4 Analyse the factors the influence mate selection in a given species.

P5 Discuss stages of the breeding process for a given species.

P6 Discuss the potential problems during each stage of reproduction for a given species.

P7 Assess the Health and Safety and record keeping requirements for a given species.</td><td>M2 Provide an analysis of how breeders may prevent, manage and eradicate potential reproductive problems from a breeding programme for a specific species.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Manage neonatal and young animals from parturition to adolescence		
P8 Discuss the care requirements of neonates and young animals for a given species. **P9** Investigate the potential problems that may arise with neonatal and young animals for a given species. **P10** Analyse legislative requirements when caring for neonatal and young animals for a given species.	**M3** Create a husbandry plan for the care of neonatal and young animals from parturition to adolescence for a given species.	
LO4 Explore the uses of reproductive technologies when breeding animals.		
P11 Discuss a range of reproductive technologies available to breeders of a range of species.	**M4** Evaluate the success of reproductive technologies in relation to functionality, cost and availability for a range of species.	**D3** Critically analyse the use of reproductive technologies within breeding programmes for a range of species including moral and ethical viewpoints.

Recommended Resources

Textbooks

BOURDON, R.M. (1999) *Understanding Animal Breeding*. New Jersey: Prentice Hall.

DALTON, C. and WILLIS, M.B. (1998) *Introduction to Practical Animal Breeding*. Oxford: Blackwell.

HAFEZ, E.S.E. and HAFEZ, B. (2000) *Reproduction in Farm Animals*. Lippincott, Philadelphia: Williams & Wilkins.

HOLT, W.V., PICKARD, A.R., RODGER, J.C. and WILDT, D.E. (2002) *Reproductive Science and Integrated Conservation*. Cambridge: Cambridge University Press.

KLUG, W.S., CUMMINGS, M.R. and SPENCER, C.A. (2007) *Essentials of Genetics*. 6th edn. San Francisco: Benjamin Cummings.

MEPHAM, T.B. (1991) *Physiology of Lactation*. New Jersey: John Wiley & Sons Ltd.

MINORSKY, P.V. and JACKSON, R.B. (2008) *Biology*. 8th edn. San Francisco: Benjamin Cummings.

WATSON, J.D., BAKER, T.A., BELL, S.P., GANN, A., LEVINE, M. and LOSICK, R. (2008) *Molecular Biology of the Gene*, 6th edn. San Francisco: Benjamin Cummings.

WINTER, P., HICKEY, I. and FLETCHER, H. (2002) *Instant Notes in Genetics*. Didcot: BIOS Scientific Publishers.

Websites

www.genetics.org	Genetics Society of America Genetics (Journal)
www.animalgenetics.eu	Animal Genetics UK 1 Canine Testing 2 Equine Testing (Research)
www.isag.us	International Society for Animal Genetics Current Issues Archives (Publications)
www.animalsmart.org	Animal Science Breeding and Genetics (General reference)
www.nature.com	Nature Research Nature Genetics (Journal)
onlinelibrary.wiley.com	Wiley Online Library Journal of Animal Breeding and Genetics (Journal)

Links

This unit links to the following related units:

Unit 5: Animal Health and Welfare

Unit 14: Animal Anatomy and Physiology

Unit 15: Animal Husbandry

Unit 22: Plant and Crop Health (Diseases, Pests and Weeds)

Unit code	**Y/616/7977**
Unit level	**5**
Credit value	**15**

Introduction

Maximising plant performance is a common goal of all those growing plants, whether it be the increase in yield obtained from the plant, the numbers of plants produced or the aesthetic qualities of the plant being grown. These are essential skills in the workplace and key decisions made will have significant impacts on the end product. This unit will focus on the biotic factors that may prevent the plant from reaching its full potential, namely weeds, pests and diseases.

This unit will focus upon the key groups of organisms that impact upon plant growth, understanding symptoms of plant problems, their biology and, most importantly, how their impact may be minimised. This will include an evaluation of different control methods to allow appropriate production decisions to be made for the specific situation.

The unit includes specific study on weed, pest and disease problems, helping to understand the implications of not managing their spread as well as the environmental impacts of pest and disease control. This includes the use of chemical and non-chemical control and management methods.

By completing the unit, students will develop skills needed to identify and diagnose problems correctly and use their knowledge to select appropriate management controls for their particular situation.

Learning Outcomes

By the end of this unit students will be able to:

1 Describe the influence of common weed types on plant growth

2 Describe the life cycles of common pests and diseases of plants

3 Evaluate different approaches to pest, disease and weed control

4 Identify weeds, pests and diseases, their symptoms and select control methods to meet requirements.

Essential content

LO1 Describe the influence of common weed types on plant growth

Weed biology:

Classification by botanical classification with examples (monocotyledons, dicotyledons, bryophytes)

Classification by plant life cycle with examples (ephemeral, annual, perennial)

Classification by growth type with examples (herbaceous, woody, climbing).

Impact on growth:

Reduction in plant quality with examples (aesthetic, contamination of product)

Reduction in yield (competition for light, water, nutrients, space, host for pests and diseases)

Alternative hosts for pests and diseases

Reduction in efficiency (clogging machinery, additional resources used, impact on drainage systems, extensions to growth period).

LO2 Describe the life cycles of common pests and diseases of plants

Pests and their life cycles:

Insects (beetles, caterpillars, flies, aphids, other hemiptera)

Mites

Molluscs (slugs, snails)

Birds

Mammals (rabbits, deer, rodents)

Nematodes.

Diseases and their life cycles:

Virus

Bacteria

Fungi (soil borne, air borne, water borne).

Factors affecting spread/infection:

Climate and growing conditions

Vectors (sap sucking insects)

Nutrient status of the plant

Location of other plants.

LO3 **Evaluate different approaches to pest, disease and weed control**

Weed control principles:

Chemical controls with examples (pre-emergent, contact, translocated, selective, residual)

Biology of chemical weed control methods

Cultural weed control (mechanical methods, mulching).

Pest and disease control principles:

Pesticide use (contact, systemic, advantages and disadvantages for different plant problems)

Biological controls (predators, pathogens, pheromones)

Resistant varieties (traditional plant breeding methods, genetically modified organisms)

Non-chemical controls (cultural methods)

Crop monitoring methods.

Factors affecting the need to apply controls:

Prediction/forecasting of infestation

Assessment of relative damage

Cost/benefit analysis.

Environmental impacts of control methods:

Pesticide-related legislation (control of substances hazardous to health, plant protection regulations, code of practice for using plant protection products, European biocide regulations)

Spray drift (non-target species, impact on food chains, resistance, bio-accumulation of toxic chemicals)

Leaching of pesticides

Non-native species (impact on local ecosystem, genetically modified organisms).

LO4 **Identify weeds, pests and diseases, their symptoms and select control methods to meet requirements.**

Identification of weeds:

Use of identification keys

Appearance in different stages of growth.

Identification of pests, diseases and symptoms:

Use of identification resources

Symptoms on commonly affected plants.

Selection of specific appropriate methods to meet production requirements:

Requirements of the customer (permissible chemicals for crop, harvesting timing, quality specification, specific supply instructions)

Efficiency of control method (speed of control, relative effectiveness in control, cost of application).

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Describe the influence of common weed types on plant growth</td><td rowspan="2">D1 Critically evaluate the effectiveness of weed control in named crops.</td></tr>
<tr><td>P1 Describe the life cycle of a range of common weeds.
P2 Describe the impacts weeds will have on plant growth.</td><td>M1 Analyse the commercial impacts of weeds on named crops.</td></tr>
<tr><td colspan="2">LO2 Describe the life cycles of common pests and diseases of plants</td><td rowspan="2">D2 Critically evaluate growing systems for named crops in relation to their risk of spreading pests or diseases.</td></tr>
<tr><td>P3 Describe the life cycle of a range of common plant pests.
P4 Describe the life cycle of a range of common plant diseases.</td><td>M2 Evaluate the factors that will impact the spread of named pests and diseases.</td></tr>
<tr><td colspan="2">LO3 Evaluate different approaches to pest, disease and weed control</td><td rowspan="2">D3 Critically evaluate the differing approaches to pest, disease and weed controls of different production systems.</td></tr>
<tr><td>P5 Analyse the practical differences between chemical and non-chemical approaches to weed control.
P6 Analyse the practical differences between chemical and non-chemical approaches to pest and disease control.</td><td>M3 Evaluate the impact of differing control approaches on the environment.</td></tr>
</table>

Pass	Merit	Distinction
LO4 Identify weeds, pests and diseases, their symptoms and select control methods to meet requirements.		
P7 Examine a range of weeds in selected crops and suggest suitable control methods. **P8** Examine a range of plants affected by pests and diseases, identify the cause and select suitable control methods.	**M4** Critically evaluate the suitability of the suggested control methods against the customer's requirements.	**D4** Provide a full justification of the recommended control methods suggested for the specified crops.

Recommended resources

Textbooks

BCPC (2017) *UK pesticides guide.* 30th edn. Wallingford: CABI.

BUCZACKI, S. and HARRIS, K. (2014) *Pests, Diseases and Disorders of Garden Plants.* 4th edn. London: Harper Collins.

COOK, D., FRASER, R. and WILBY, A. (2017) *Plant Biosecurity Policy Evaluation: The Economic Impacts of Pests and Diseases.* London: World Scientific.

MATTHEWS, G. (2015) *Pesticides: Health, Safety and the Environment.* Chichester: Wiley-Blackwell.

VACANTE, V. (ed) (2017) *Handbook of Pest Management in Organic Farming.* Wallingford: CABI.

Websites

www.csdhub.com	CS Design Software National Plant Specification (Details of hardy plant specifications)
www.gardenorganic.org.uk	Garden Organic Information from the UK's leading organic gardening charity (General reference)
www.hse.gov.uk	HSE Pesticide databases (Database)
www.soilassociation.org	Soil Association Details on organic certification schemes and current campaigns (General reference)
www.ukpesticideguide.co.uk	UK Pesticides Guide Online Whole of site (General reference)

Links

This unit links to the following related units:

Unit 6: Principles of Crop Production

Unit 4: Plant and Soil Science

Unit 8: Protective Crop Production

Unit 30: Sustainable Practices

Unit 23: Plant Breeding and Genetics

Unit code	**D/616/7978**
Unit level	**5**
Credit value	**15**

Introduction

The aim of this unit is to provide students with an appreciation and understanding of the complex world of genetics and plant breeding. This is a rapidly developing sector and needs to keep up with the demand for increased food production to meet the demands of the world population in a sustainable way. Historically, the land-based sector has made great strides in the development of improved plant strains, which provide superior yields and other benefits, but the demand is for even greater improvements.

Building on other plant science units, this unit focusses upon the management and mapping of genetic information as well as the practical application of traditional and modern techniques to meet future needs. The development of new varieties and cultivars will increase in pace as time progresses and the demand for reliable, disease resistant plants becomes greater.

This unit is underpinned by theoretical knowledge but allows students to develop their practical skills, not only in the laboratory but also in the field.

Learning Outcomes

By the end of this unit students will be able to:

1 Describe the development of crop species and common cultivated plants

2 Explain the genetics of plant improvement

3 Describe the methods of plant reproduction and hybrid development

4 Evaluate the commercial processes used for a range of cultivated plants.

Essential Content

LO1 **Describe the development of crop species and common cultivated plants**

History of crop development:

Original locations of significant plant species

Comparisons of wild types with cultivated forms: size, appearance, yield

Loss of genetic variation.

History of genetic theory:

Theories of Camerarius, Kölreuter, Darwin, Mendel and their impact

Developmental work of G.H. Scull, B. McClintock.

LO2 **Explain the genetics of plant improvement**

Genetic information:

Deoxyribonucleic acid

Ribonucleic acid

Chromosomes

Genes

Alleles.

Protein synthesis:

Transcription and translation.

Gene interactions:

Incomplete dominance

Lethal alleles

Co-dominance

Multiple alleles

Epistasis.

Meiosis and mitosis:

Each stage of division for somatic cells and gametes.

Reasons for genetic variance in a population:

Meiotic changes (homologous recombination, polyploidy, mutation)

Changes in population (immigration, translocation, selection).

LO3 **Describe the methods of plant reproduction and hybrid development**

Methods to ensure fertilisation:

Barriers to self-pollination (physical, timescale, genetic, biochemical)

Stimulation of plants to flower

Use of hormones

Adaptation of light levels

Vernalisation.

Selection of appropriate plant material:

Criteria for selection (yield, colour, disease resistance, size, etc.)

Methods of scoring plant quality

Creating genetic uniformity in parents.

Prediction of results of a cross:

Monohybrid and Di-hybrid crosses using probability tables (Punnett Squares)

Production of F_1 hybrids.

Creation of mutations and variance:

Induced mutagens (irradiation, chemicals)

Inserted mutagens (DNA)

Risks and opportunities of mutagenic techniques.

LO4 **Evaluate the commercial processes used for a range of cultivated plants.**

Methods used for the breeding:

Wind-pollinated plants

Open-pollinated plants

F_1 Hybrids

Ornamental plants

Food crops.

Physical resources needed to enable plant breeding:

Buildings / growing facilities

Vectors / equipment for pollination

Equipment to prevent unintended pollination.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Describe the development of crop species and common cultivated plants</td><td rowspan="2">D1 Evaluate the impacts of plant breeding on the development of plants.</td></tr>
<tr><td>P1 Describe the development of cultivated plants through history.

P2 Describe the development of genetic theory.</td><td>M1 Analyse the impact of plant breeding on crop yield.</td></tr>
<tr><td colspan="2">LO2 Explain the genetics of plant improvement</td><td rowspan="2">D2 Critically evaluate the impact of gene interactions on the production of new plant cultivars.</td></tr>
<tr><td>P3 Compare the properties of DNA and RNA with specific emphasis on their roles in protein synthesis.

P4 Discuss the role of meiotic and mitotic cell division in the development of offspring.</td><td>M2 Investigate the impacts of the following gene interactions with specific emphasis on phenotypic traits:
Lethal alleles
Epistasis
Incomplete dominance
Co-dominance
Multiple alleles.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Describe the methods of plant reproduction and hybrid development		
P5 Describe techniques used to ensure controlled pollination of plants. **P6** Review the use of probability tools when predicting the outcome of specific crosses. **P7** Identify techniques that produce mutations in plants.	**M3** Critically analyse the effectiveness of current plant breeding techniques.	**D3** Evaluate the impact of current plant breeding techniques on the availability and effectiveness of plant introductions.
LO4 Evaluate the commercial processes used for a range of cultivated plants.		
P8 Describe processes used to produce a range of new plant cultivars.	**M4** Analyse the development of selected new plant cultivars.	**D4** Critically evaluate the development and performance of a new commercial plant cultivar.

Recommended Resources

Textbooks

ACQUAAH, G. (2012) *Principles of Plant Genetics and Breeding.* 2nd edn. Chichester: Wiley-Blackwell.

BARBER, J. and INSTITUTION OF CIVIL ENGINEERS (2002) *Health & safety in construction: guidance for construction professionals*. London: Thomas Telford.

BERNARDO, R. (2014) *Essentials of Plant Breeding*. Minnesota: Stemma Press.

BRADSHAW, J.E. (2016) *Plant Breeding: Past, Present and Future*. London: Springer.

BROWN, J., CALIGARI, P. and CAMPOS, H. (2014) *Plant Breeding.* 2nd edn. Chichester: Wiley-Blackwell.

MACADAM, J.W. (2009) *Structure and Function of Plants.* Chichester: Wiley-Blackwell.

Websites

www.escijournals.net	ESci Journals Journal of Plant Breeding and Genetics (Journal)

Links

This unit links to the following related units:

Unit 8: Plant and Soil Science

Unit 24: Business Strategy

Unit code	**T/616/7985**
Unit level	**5**
Credit value	**15**

Introduction

The aim of this unit is to develop students' awareness of the different kinds of strategy, which could be used in an operational, tactical or strategic role for a Land-based organisation. This will be underpinned by a thorough knowledge and understanding of the theories, models and concepts, which could significantly support a Land-based organisation's strategic choice and direction.

On successful completion of this unit students will have developed sufficient knowledge and understanding of strategy to make a positive, efficient and effective contribution to the development of business plans and operational direction. This could be in the role of a junior manager responsible for having a specific input into a Land-based organisation's decision-making and planning.

Learning Outcomes

By the end of this unit a student will be able to:

1 Analyse the impact and influence which the macro environment has on a Land-based organisation and its business strategies

2 Assess a Land-based organisation's internal environment and capabilities

3 Evaluate and apply the outcomes of an analysis using Porter's Five Forces model to a given market sector

4 Apply models, theories and concepts to assist with the understanding and interpretation of strategic directions available to a Land-based organisation.

Essential Content

LO1 **Analyse the impact and influence which the macro environment has on a Land-based organisation and its business strategies**

The strategic context:

Missions, visions and objectives

The definition and meaning of strategy

The role of strategy to achieve business objectives and goals, strategic intent and different strategic direction

Different strategic planning techniques.

Analytical frameworks of the macro environment:

The different types of frameworks and analysis of the macro environment

Stakeholder analysis e.g. stakeholder matrix, stakeholder mapping

Environmental analysis e.g. PESTLE and Porter's Five Forces model

Structure-conduct-performance model

Strategic positioning e.g. Ansoff's growth vector matrix

Organisational audit e.g. SWOT analysis, benchmarking indicators.

LO2 **Assess a Land-based organisation's internal environment and capabilities**

Organisational internal environment:

What are strategic capabilities and what are the key components of strategic capabilities?

Resource-based view strategy as a basis for competitive advantage and the McKinsey's 7S model as a management tool

Analysis of strategic capabilities using the VRIO/VRIN framework

Benchmarking strategic capabilities and value chain analysis

Cost-benefit analysis.

LO3 **Evaluate and apply the outcomes of an analysis using Porter's Five Forces model to a given market sector**

Analytical tools and models of analysis:

The Balanced Scorecard to align organisation vision and strategy

Competitive analysis using Porter's Five Forces model

Stakeholder analysis

Applying the Ansoff matrix to product/market strategy.

LO4 **Apply models, theories and concepts to assist with the understanding and interpretation of strategic directions available to a Land-based organisation.**

Strategic choices and directions:

The application of Porter's generic strategies e.g. cost and price leadership strategy, differentiation strategy, focus strategy and the extended model of Bowman's strategy clock

Hybrid strategy

Diversification

Vertical/horizontal integration.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Analyse the impact and influence which the macro environment has on a Land-based organisation and its business strategies</td><td rowspan="10">LO1 LO2 LO3 LO4

D1 Critique and interpret information and data applying environmental and competitive analysis to produce a set of valid strategic directions, objectives and tactical actions.</td></tr>
<tr><td>P1 Applying appropriate frameworks analyse the impact and influence of the macro environment on a given organisation and its strategies.</td><td>M1 Critically analyse the macro environment to determine and inform strategic management decisions.</td></tr>
<tr><td colspan="2">LO2 Assess a Land-based organisation’s internal environment and capabilities</td></tr>
<tr><td>P2 Analyse the internal environment and capabilities of a given organisation using appropriate frameworks.</td><td>M2 Critically evaluate the internal environment to assess strengths and weaknesses of an organisation’s internal capabilities, structure and skill set.</td></tr>
<tr><td colspan="2">LO3 Evaluate and apply the outcomes of an analysis using Porter’s Five Forces model to a given market sector</td></tr>
<tr><td>P3 Applying Porter’s Five Forces model evaluate the competitive forces of a given market sector for an organisation.</td><td>M3 Devise appropriate strategies to improve competitive edge and market position based on the outcomes.</td></tr>
<tr><td colspan="2">LO4 Apply models, theories and concepts to assist with the understanding and interpretation of strategic directions available to a Land-based organisation.</td></tr>
<tr><td>P4 Applying a range of theories, concepts and models, interpret and devise strategic planning for a given organisation.</td><td>M4 Produce a strategic management plan that has tangible and tactical strategic priorities and objectives.</td></tr>
</table>

Recommended Resources

Textbooks

JOHNSON, G., REGNÉR, P., ANGWIN, D., SCHOLES, K. and WHITTINGTON, R. (2014) *Exploring Strategy Text and Cases.* Harlow: Pearson.

JOHNSON, G., SCHOLES, K. and WHITTINGTON, R. (2011) *Fundamentals of Strategy.* 2nd edn. New Jersey: Financial Times/Prentice Hall.

KIM, W.C. and MAUBORGNE, R. (2015) *Blue Ocean Strategy.* Expanded edn. Boston: Harvard Business Review Press.

ROTHAERMEL, F. (2014) *Strategic Management.* 2nd edn. Maidenhead: McGraw-Hill.

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 18: Advanced Financial Accounting

Unit 27: Global Business Environment

Unit 30: Sustainable Practices

Unit 25: Diversification and Alternative Enterprises

Unit code	**L/616/7853**
Unit level	**5**
Credit value	**15**

Introduction

Farm diversification can play a key role in sustaining business profitability by adding additional income generating enterprises. Growing a different crop or rearing a different type of livestock is relatively straightforward as the skillset differs little from those of the core business. Many alternative enterprises, or 'adding value to existing products', can require very unfamiliar skills. This unit focuses on the factors to consider when taking on an alternative enterprise and the skillsets required to make a success of it. This module will require access to case study examples.

This unit will explore opportunities for diversification enterprises and the skills required to implement them. It will also explore barriers to implementation and how these can be overcome. Through the use of case studies, real enterprises – both successful and unsuccessful – will be analysed to gain knowledge. Monitoring and evaluation skills will be developed to facilitate analysis of the impact of a new enterprise on the core business.

Analysis of case studies will allow opportunities for setting up alternative enterprises to be identified. Skills and opportunity analysis will be undertaken to be able to assess fit with the existing business and identify threats. Monitoring and evaluation techniques will be developed to be able to understand the impact of alternative enterprises on the core business.

By the end of this unit the student will be able to identify opportunities for setting up alternative enterprises and evaluate the barriers and threats to success. They will be able to undertake a skills analysis and identify skills gaps within the current workforce. They will be able to put strategies in place to fill these needs. They will also be able to efficiently evaluate the impact of alternative enterprises on the core business.

Learning Outcomes

By the end of this unit students will be able to:

1 Identify opportunities for alternative enterprises

2 Analyse the proposals to assess the fit of an alternative enterprise with core activities

3 Identify additional skills required to deliver an alternative enterprise

4 Evaluate the impact of the enterprise on overall business performance.

Essential Content

LO1 **Identify opportunities for alternative enterprises**

Explore enterprise ideas:

Taking into consideration available skills, resources, competition, need and demand

Use analysis methodologies e.g. SWOT to clarify thinking around proposals

Explore appropriate market research techniques and apply these

Analyse existing alternative enterprises.

LO2 **Analyse the proposals to assess the fit of an alternative enterprise with core activities**

Evaluate existing business resources:

Physical, financial and human.

Evaluate proposed enterprises:

Physical, financial and human

Look at different feasibility study options and undertake a feasibility study for the proposed enterprise.

LO3 **Identify additional skills required to deliver an alternative enterprise**

Undertake skills analysis of existing staff:

Identify training needs and extra staff required to run the proposed enterprise.

Explore business planning techniques:

Apply appropriate methodologies to the enterprise proposal.

LO4 **Evaluate the impact of the enterprise on overall business performance**

Analyse core business performance:

Compare with three previous years.

Analyse the first year's performance of the alternative enterprise:

Compare results with predictions made in business plans

Explore predicted break-even points

Examine how running the enterprise is impacting on the core business.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Identify opportunities for alternative enterprises</td><td rowspan="5">LO1 LO2
D1 Critically appraise the proposal and identify contingencies and alternatives.</td></tr>
<tr><td>P1 Identify possible diversification enterprises which would fit with the existing business.
P2 Produce a SWOT analysis to support the proposals in P1.
P3 Demonstrate market research procedures.</td><td>M1 Analyse information identified to estimate the likelihood of success.</td></tr>
<tr><td colspan="2">LO2 Analyse the proposal to assess the fit of an alternative enterprise with core activities</td></tr>
<tr><td>P4 Perform an analysis of both core business and proposed enterprise.
P5 Plan a feasibility study.</td><td>M2 Drawing on the analysis and feasibility study and evaluate the proposal.</td></tr>
<tr><td colspan="2">LO3 Identify additional skills required to deliver an alternative enterprise</td></tr>
<tr><td>P6 Produce the skills needs analysis for proposed enterprise and incorporate into a business plan.</td><td>M3 Identify a strategy for meeting skills needs.</td><td>D3 Critically appraise the proposal and identify contingencies and alternatives.</td></tr>
<tr><td colspan="2">LO4 Evaluate the impact of the enterprise on overall business performance.</td><td rowspan="2">D4 Analyse the risk factors which need to be considered with business diversification.</td></tr>
<tr><td>P7 Produce an analysis of performance and report on impact.</td><td>M4 Evaluate the viability of continuing the enterprise in light of impacts identified.</td></tr>
</table>

Recommended Resources

Textbooks

NIX, J. (2016) *Farm Management Pocketbook 2017.* Melton Mowbray: Agro Business Consultants Ltd.

PRAG, P.A.B. (2000) *Rural Diversification.* London: Estates Gazette Farmers Weekly.

REUVID, J. (2003) *A Guide to Rural Business: Opportunities and Ideas for Diversifying your Countryside Enterprise.* London: Kogan Page Ltd.

WINTER, M. and TURNER, M. (2003). *Farm Diversification Activities: Benchmarking study 2002 Final report to DEFRA.* London: Department for Environment, Food and Rural Affairs.

Websites

www.gov.uk	GOV.UK Diversifying Farming Businesses Guidance (General Reference)

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 24: Business Strategy

Unit 27: Global Business Environment

Unit 28: Product Service and Development

Unit 26: Management of Land-based Machinery and Technology

Unit code	**L/616/7854**
Unit level	**5**
Credit value	**15**

Introduction

Tractors and machinery are core to large scale farming and horticultural enterprises. Work forces are ever smaller, making a dependency on the effective use of machines paramount. Such equipment is expensive, complex and requires a high level of operator skill.

The purpose of this unit is to develop your skills and knowledge in managing the efficient use of land-based machines.

Technology to manage these machines, not only in use in the field, but also to monitor efficient and effective use overall, is increasing. Satellite imagery, global positioning systems (GPS) and automation all aid the farmer and grower in maximising their use. Core to tractor use is the selection of the most beneficial power unit and an understanding of power requirements and its use. Of perhaps greatest importance is making the best choice of machine in the first place.

This unit will enable the student to understand decision-making processes in machine selection.

The unit will also enable the student to understand the key efficiency factors that can indicate how well a machine or machine combination is used and to apply these to in-field situations.

Learning Outcomes

By the end of this unit students will be able to:

1 Rationalise the decision-making processes in machine selection for an enterprise

2 Justify the selection of machines for a field-based operation

3 Evaluate a range of technology to support machinery use

4 Demonstrate the application of efficiency monitoring criteria to a field operation.

Essential Content

LO1 **Rationalise the decision-making processes in machine selection for an enterprise**

Establishing whether the machine suits and fits the working environment:

Considerations relating to size, width, height and weight, access to buildings, use of roadways, field entrances, weight in use and stability on slopes.

Compatibility:

With power unit

Similarity to other machines already in use: same manufacturer, similar operating systems, working widths, rates of work.

Understanding procurement errors:

Untried machine, incompatibility, lack of operator skills, non- availability of spares

Revising requirements in line with machines available for procurement.

Performance:

Fuel consumption, rate of work, environmental and sustainability factors, machine lifespan

Minimising soil damage and compaction-use of correct tyres, machine weight, timing of work, seasonality

Financial factors: cost, value for money, running costs, fuel costs, spares, reputation, servicing and repair.

Dealership considerations:

Proximity of dealer, dealer backup, dealer availability, availability of spares and potential down time, after sales support, maintenance and servicing, warranty and guarantees.

Procurement options:

Direct purchase, sources of finance, contract hire, leasing, purchase of used machinery.

Alternatives to purchase:

Use of contractors and machine hire, sharing machinery, co-operatives, and machinery rings.

Replacement options:

Estimation of value of used machinery or exchange value, new versus used, replacement policy and timing.

LO2 **Justify the selection of machines for a field-based operation**

Engine performance:

Concepts of work, force, power torque and torque back-up: metric and imperial units of measurement, how power is measured, methods of indicating power output including claimed engine power, maximum power

Power take-off (PTO) power and drawbar power.

Tractor specification:

Engine performance: power output, fuel consumption and efficiency, fuel capacity

External services: hydraulic power, PTO options

Ergonomics and working conditions/driver comfort

Compatibility with existing machines

Tyre selection, tracks, blast, overall weight and compaction issues

Fitness for purpose, requirements of the task, topography, slopes and weather

Other considerations: specialist attachments, electronics, height width restrictions.

LO3 **Evaluate a range of technology to support machinery use**

Identification of operation to be carried out:

Size, complexity, time scale, required rate of work, field pattern, turning techniques, limitations, timing and seasonality

Key factors to monitor and how the monitoring will be carried out rate of work, field efficiency, observation, use of recorded data

Use of work-study to systematically, objectively and critically examine all factors affecting the operation.

Use of Technology:

Use of data information systems to assist machinery management

How data information systems work and their use

Guidance systems, global positioning systems (GPS)

Using electronic systems for the purposes of crop monitoring and processing harvesting information

Satellite information including ground cover, pesticide or fertilizer issues

Use of photography for recording and analysis

Auto-steer units, pass-to-pass accuracy, repeatability.

LO4 **Demonstrate the application of efficiency monitoring criteria to a field operation**

Monitoring machinery performance:

Machine capacity, field capacity, material capacity

Un-used capacity, travel time, down time, preparation time

Work rate and efficiency, spot rate, field efficiency, seasonal efficiency.

Cost of operation:

Including labour, fuel, spares, and consumables.

Procurement costs:

Deposit and payment schemes, overall cost of payment schemes, length of purchase

Opportunity cost of the procurement funds and what else the procurement funds could be used for

Opportunity cost of the management time

Costs of alternative methods of obtaining machinery.

Operating, maintenance and servicing costs:

Depreciation, straight line and reducing balance methods

Managing repair costs through recording, estimating, predicting

Tax, insurance, storage, labour

Opportunity cost associated with operating maintenance and servicing, considering what else could be done with the funds or labour required for maintenance and servicing.

Whole life costs:

Estimated life, resale value, indirect costs.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Rationalise the decision-making processes in machine selection for an enterprise</td><td rowspan="3">D1 Justify the selection of machinery for a field operation in an enterprise.</td></tr>
<tr><td>P1 Describe the factors that would influence deciding upon the specifications of a tractor for an enterprise.
P2 Explain the decision-making processes experienced when deciding which model to obtain.</td><td>M1 Evaluate the relative importance of decision-making factors in relation to obtaining machinery for an enterprise.</td></tr>
<tr><td colspan="2">LO2 Justify the selection of machines for a field-based operation</td></tr>
<tr><td>P3 Produce specifications for machines for a field-based operation.</td><td>M2 Justify the selection of machinery for a field operation.</td><td>D2 Critically analyse the selection of machinery for a field operation.</td></tr>
<tr><td colspan="2">LO3 Evaluate a range of technology to support machinery use</td><td rowspan="5">LO3 LO4
D3 Critically evaluate the effectiveness of a range of technologies in managing the effectiveness of machinery use in the field</td></tr>
<tr><td>P4 Explain how efficiency of field operations may be monitored.
P5 Describe technology to improve efficiency of machines in field work.</td><td>M3 Assess the practical application of technology in the field.</td></tr>
<tr><td colspan="2">LO4 Demonstrate the application of efficiency monitoring criteria to a field operation.</td></tr>
<tr><td>P6 Demonstrate the use of relevant efficiency monitoring measures.
P7 Demonstrate the use of relevant in-field technology.</td><td>M4 Justify the use of technology in a field operation.</td></tr>
</table>

Recommended Resources

Textbooks

BALLS, R. (1985) *Horticultural Engineering Technology – Field Machinery*. Basingstoke: MacMillan.

BELL, B. (2016) *Farm Machinery.* 6th edn. Sheffield: Farming Press.

CULPIN, C. (2014) *Farm Machinery*. 12th edn. New Jersey: Wiley.

DAVIES, D.B., EAGLES, D.J. and FINNET, J.B. (1993) *Soil Management*. 5th edn. Sheffield: Farming Press.

HEAGE, H.J. (2013) *Precision in Crop Farming: Site Specific Concepts and Measuring Methods: Applications and Results*. London: Springer.

HILLIER, V.A.W. and PITTUCK, F. (2012) *Fundamentals of Motor Vehicle Technology*. 3rd edn. Cheltenham: Nelson Thornes.

H.S.C. (2013) *Farm Wise – Your Essential Guide to Health and Safety in Agriculture.* UK: Stationary Office.

HSE (2012) *Working Safely with Agricultural Machinery.* UK: Stationary Office.

NIX, J. (2017) *Farm Management Pocket Book*. 47th edn. Leicester: Agro Business Consultants Ltd.

QIN ZHANG. (2015) *Precision Agriculture Technology for Crop Farming*. Boca Raton: CRC Press.

WITNEY, B. (1998) *Choosing and Using Farm Machines*. Harlow: Longman Scientific and Technical.

Websites

ahdb.org.uk	Agriculture and Horticulture Development Board Cereals and oilseeds (Research)
www.fwi.co.uk	Farmers Weekly Arable/precision farming (General Reference)
www.harper-adams.ac.uk	Harper Adams National Centre for Precision Farming (Research)
iagre.org	Institute of Agricultural Engineers Publications (General Reference)

Links

This unit links to the following related units:

Unit 9: Land-based Machinery and Technology

Unit 27: Global Business Environment

Unit code	**M/508/0530**
Unit level	**5**
Credit value	**15**

Introduction

The aim of this unit is to explore the wider position some organisations have in the global environment. Students will appreciate the complexities of operating in a global environment, and this will enable them to offer greater breadth and depth to an organisation's current or aspirational global presence.

On successful completion of this unit students will have developed an understanding of the wider global environment in which organisations operate. This will enable students to add value to an organisation as they will be able to apply their knowledge in such a way that they could advise senior managers (in either large or small organisations) on global matters which they may not have ordinarily considered.

Learning Outcomes

By the end of this unit a student will be able to:

1 Analyse the key factors which drive globalisation

2 Determine the strategic complexities associated with operating in a global environment

3 Evaluate how operating in a global market influences an organisation's structure, culture and functions

4 Evaluate the influence of globalisation on organisational decision-making and strategy.

Essential Content

LO1 **Analyse the key factors which drive globalisation**

Driving factors of globalisation:

Analyse the concept and theory of globalisation in terms of cultural, economic, political and social dimensions

What are the factors that drive globalisation? For example, international economic integration, foreign direct investment, international business and trade

Factors in relation to cost, market, environment and competition

The significant impact of the digital revolution e.g. creating better products and services at lower cost, the impact of social media and other applications (cloud computing), connecting the global community and digitised design, manufacturing and distribution systems making products and services available to a global market.

LO2 **Determine the strategic complexities associated with operating in a global environment**

Global strategic complexities:

The impacts of international trade law

The economics of globalisation and the environmental impacts of globalisation in the context of the challenges they pose for risk and diversification strategies

The complexities of the international supply chain management.

LO3 **Evaluate how operating in a global market influences an organisation's structure, culture and functions**

Influences on structure, culture and functions:

How does the global market influence organisations in the context of McKinsey 7S model of organisational structure?

The governance of a multi-national organisation and leadership within an international context

Using Hofstede's Dimensions of Culture, demonstrate how national cultural differences have an influence upon organisations

The influence of ethical and sustainable globalisation.

LO4 **Evaluate the influence of globalisation on organisational decision-making and strategy.**

Influences on decision-making and strategy:

The principles of leadership change and the process of internationalisation

International expansion strategies and strategic decision-making in relation to risk and diversification

The impact of barriers to international trade upon decision-making and strategy.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Analyse the key factors which drive globalisation</td><td rowspan="4">LO1 LO2

D1 Critically evaluate the global business environment, including the opportunities and challenges faced by organisations.</td></tr>
<tr><td>P1 Analyse key factors of cost, market, environment and competition that drive global commerce and trade.</td><td>M1 Critically analyse the impact that key factors have upon the global business environment in terms of benefits and challenges.</td></tr>
<tr><td colspan="2">LO2 Determine the strategic complexities associated with operating in a global environment</td></tr>
<tr><td>P2 Explain the complexity of strategic challenges faced by organisations when operating in a global environment supported by specific examples.</td><td>M2 Critically analyse strategic challenges in context of risk and diversification strategies and the supply chain flow.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Evaluate how operating in a global market influences an organisation's structure, culture and functions		**LO3 LO4** **D2** Critique strategies that can be adopted by organisations operating in a global business environment, making valid and justified recommendations of how they should adapt their organisational structure and decision-making processes.
P3 Evaluate the influences of globalisation on organisational governance and leadership, structure, culture and functions. **P4** Evaluate the influences of ethical and sustainable globalisation on organisational functions.	**M3** Critically evaluate global market influences in application to appropriate theories and models relating to organisational structure and culture.	
LO4 Evaluate the influence of globalisation on organisational decision making and strategy.		
P5 Evaluate the different ways decision making can work effectively in a global context. **P6** Determine and articulate the various routes to internationalisation an organisation may adopt, including key barriers.	**M4** Critically evaluate the key barriers in doing business internationally and make recommendations on how they can be overcome.	

Recommended Resources

Textbooks

BARTLETT, C. and BEAMISH, P. (2011) *Transnational Management: Texts, Cases, and Readings in Cross-Border Management.* 6th edn. Maidenhead: McGraw-Hill.

DANIELS, J.D., RADEBAUGH, L.H. and SULLIVAN D.P. (2013) *International Business Environments and Operations*. 14th Ed. Harlow: Pearson.

DERESKY, H. (2014) *International Management: Managing Across Borders and Cultures.* 8th edn. Harlow: Pearson.

GUAY, T.R. (2014) *The Business Environment of Europe: Firms, Governments, and Institutions.* Cambridge: Cambridge University Press.

PENG, M. (2014) *Global Business*. 3rd edn. Boston: Cengage Learning.

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 28: Product and Service Development

Unit code	**J/508/0534**
Unit level	**5**
Credit value	**15**

Introduction

This unit explores the journey from ideas generation through to the launch of a new product or service. It examines the processes behind new product development (NPD) and it also considers the potential risks involved. Through the combination of theory and practice students will develop knowledge and understanding and be able to apply that knowledge within either an organisational or entrepreneurial context.

Almost every day we encounter new products and services through a variety of marketing promotions. But how do they get from a single idea to, in some cases, becoming a household item and brand? How did, for instance, the mobile phone, e-books, 24/7 banking services and fast food become part of our lives? Moreover, why do some products enjoy a long and profitable life span, whilst others disappear almost overnight? What are the secrets to success?

Learning Outcomes

By the end of this unit a student will be able to:

1 Explain and demonstrate processes involved in new product or service development

2 Assess the life-cycle stage of the products or services in a company's portfolio and evaluate whether innovation, adaptation or renovation are needed for the individual products or services

3 Design and pitch a new/renovated product or service

4 Demonstrate an ability to critically reflect on the skills of team working, creative development and presentation.

Essential Content

LO1 **Explain and demonstrate processes involved in new product or service development**

The product/service concept:

Definition and meaning of both product and service concept e.g. tangible and intangible attributes

The level of customer integration in product/service development and marketing

The product–service system to support sustainable performance.

New product/service development:

Ideas generation, ideas screening/selection, creative methods, concept testing (marketing research) and business analysis

Risks associated with new product/service development e.g. competitor activity, customer behaviour, macro factorial and internal technical changes, levels of investment and change of strategic aims

Minimising the risk of new product failure e.g. compatibility, trialability, observability and complexity

Minimising the risks in service management e.g. intangibility, perishability, inseparability and variability

The use of digital technology in researching, designing, testing and development of new products and services

Software systems for New Product Development (NPD).

LO2 **Assess the life-cycle stage of the products or services in a company's portfolio and evaluate whether innovation, adaptation or renovation are needed for the individual products or services**

Products and services:

Five product levels e.g. core benefits, basic product, expected product, augmented product and potential product

Market classifications of products and services within both B2C and B2B contexts.

Product life-cycle and services:

Different forms and operation of a product life-cycle

Product life-cycle management e.g. repositioning and revitalising the product.

Product line and service management choices:

Standardisation versus adaptation

Macro factors and their influence/impact upon the development of new/adapted products and services

Trends and the role of innovation.

LO3 **Design and pitch a new/renovated product or service**

New product development or service innovation:

Market testing

Product launch (linking to marketing communications) and distribution

Guidance on designing and pitching new/adapted products/services

New or improved service launch, marketing communications and generating consumer interest.

LO4 **Demonstrate an ability to critically reflect on the skills of team working, creative development and presentation.**

Cognitive skill development:

Theories of and approaches to reflective learning and development

Team working skill development

Creative product/service development and entrepreneurship.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain and demonstrate processes involved in new product or service development</td><td rowspan="9">LO1 LO2 LO3

D1 Provide a well-articulated, coherent and logically presented pitch that has a fully justified approach to decision making throughout the development process, market launch and distribution.</td></tr>
<tr><td>P1 Explain the processes involved in the development of products and services and the levels of customer integration.

P2 Apply these processes in application to the development of a specific organisational product or service.</td><td>M1 Consistently demonstrate a justified application of subject knowledge and understanding to the processes of product or service development.</td></tr>
<tr><td colspan="2">LO2 Assess the life-cycle stage of the products or services in a company's portfolio and evaluate whether innovation, adaptation or renovation are needed for the individual products or services</td></tr>
<tr><td>P3 Assess the life-cycle stage of the products or services in a company's portfolio.

P4 Evaluate which appropriate product line management choices are required for individual products or services.</td><td>M2 Provide a coherent and justified evaluation that is supported by material synthesised from a range of validated sources.</td></tr>
<tr><td colspan="2">LO3 Design and pitch a new/renovated product or service</td></tr>
<tr><td>P5 Design and pitch a product or service taking in to account market testing, product/service launch and distribution.</td><td>M3 Design a creative, dynamic and detailed pitch that provides evidence of a well-planned, developed and evaluated product or service.</td></tr>
</table>

Pass	Merit	Distinction
LO4 Demonstrate an ability to critically reflect on the skills of team working, creative development and presentation.		
P6 Complete a reflective statement that critically reflects on team working, creative development and presentation.	**M4** Address concerns and issues with recommendations for improvements.	**D2** Provide an insightful and independent reflection on teamwork and creative development, giving valid and justified recommendations.

Recommended Resources

Textbooks

BRASSINGTON F. and PETTITT, S. (2012) *Essentials of Marketing.* 3rd edn. Harlow: Pearson.

COOPER, R.G. (2011) *Winning at New Products: Creating Value through Innovation.* 4th edn. New York: Basic Books.

COOPER, R.G. (2001) *Winning at New Products: Accelerating the Process from Ideas to Launch.* 2nd edn. New York: Basic Books.

COOPER, R.G. and EDGETT, S.J. (2009) *Generating Breakthrough New Product Ideas: Feeding the Innovation Funnel.* Ontario: Product Development Institute.

Links

This unit links to the following related units:

Unit 25: Diversification and Alternative Enterprises

Unit 29: Identifying Entrepreneurial Opportunities

Unit 29: Identifying Entrepreneurial Opportunities

Unit code	**Y/508/0540**
Unit level	**5**
Credit value	**15**

Introduction

The role of the entrepreneur is to weigh up opportunities, threats and personal capacity to translate an opportunity into a business idea. This unit provides students with an understanding of where new venture ideas come from and gives them the opportunity to investigate and evaluate a new venture idea.

Students will explore concepts of innovation and creativity and develop creative abilities. They will learn about and use methods and frameworks to help develop and assess venture ideas, including defining product/service benefits, identifying target customers and understanding the industry and competitors from the perspective of a new entrant. They will learn about market research and apply primary and secondary research techniques to investigate a personal entrepreneurial idea and make an assessment of whether it is likely to be a commercially viable business or social enterprise proposition.

Learning Outcomes

By the end of this unit a student will be able to:

1 Evaluate possible sources for a new and innovative business idea

2 Explain the choice of a specific entrepreneurial idea for investigation and the market gap that it addresses

3 Use primary and secondary data to identify market potential

4 Evaluate the entrepreneurial idea in the context of the market and competitors and make an assessment of potential viability.

Essential Content

LO1 Evaluate possible sources for a new and innovative business idea

Sources of business ideas:

External/macro-environmental sources of change that create opportunities (Drucker's 7 sources of innovation, STEEP factors)

The role of the 'entrepreneur' in weighing up opportunities, threats and personal capacity to translate the opportunity into a business idea

Personal situational factors and knowledge.

Types of innovation:

The scope of innovation, particularly in relation to small firms

The different types of innovation e.g. product and process innovation, incremental versus big bang, Schumpeter's sources of innovation

The difference between invention and innovation and the role of creativity

Exploring the difference between a product or service idea and a business idea

Innovation and location and the role of 'clusters' in fostering innovation amongst small firms.

Exploring creativity:

Understand and practice using creativity techniques to generate ideas.

LO2 Explain the choice of a specific entrepreneurial idea for investigation and the market gap that it addresses

Identifying customers:

Understand the need to identify specific customer types for targeting new ideas

Behavioural, demographic and geographic segmentation

Tangible and intangible features and benefits of a product or service.

Understanding the industry environment:

How the industry environment affects the likely success of a new entrant

Explore Porter's Five Forces model to analyse the attractiveness of an industry from the perspective of a new entrant

Approaches to competitor analysis relevant to entrepreneurs and small firms

Industry life-cycle.

LO3 **Use primary and secondary data to identify market potential**

Market research:

Primary and secondary research techniques for the investigation of new business ideas

Identify, plan and undertake market research required

The use of new technologies for audience research and analysis e.g. use of big data to assess market trends, internet forums and social media to test market responses and evaluation.

Gap analysis:

Gap analysis to explain the gap in the market and the target customer group.

LO4 **Evaluate the entrepreneurial idea in the context of the market and competitors and make an assessment of potential viability.**

Methods of evaluation:

Evaluation of ideas using SWOT, based on evidence from macro-environment, market and competitor analysis

Objective assessment of the idea to judge whether it is likely to be viable as a business or social enterprise proposition.

Learning Outcomes and Assessment

Pass	Merit	Distinction
LO1 Evaluate possible sources for a new and innovative business idea		
P1 Determine and evaluate different sources of entrepreneurial ideas and innovation.	**M1** Provide a detailed evaluation of Drucker's 7 sources of systematic innovation providing specific examples.	**D1** Critically evaluate the benefits and drawbacks of different approaches and sources that can lead to the identification of entrepreneurial ideas.
LO2 Explain the choice of a specific entrepreneurial idea for investigation and the market gap that it addresses		
P2 Explain the rationale and the market gap for a specific entrepreneurial idea using relevant tools and techniques to support your choice.	**M2** Provide justification of how a specific entrepreneurial idea fills a market gap using different techniques for gap and competitive analysis.	**D2** Critically evaluate a specific entrepreneurial idea based on appropriate interpretation and investigation of the competitive market place.
LO3 Use primary and secondary data to identify market potential		
P3 Present data needed to support gap analysis in the evaluation of a specific entrepreneurial idea. **P4** Interpret data appropriately to provide evidence of market potential.	**M3** Justify specific sources and methods of data collection chosen and how data relates to identifying market potential.	**D3** Analyse appropriate specific sources and methods of data to provide justified business objectives and identify market potential.

Pass	Merit	Distinction
LO4 Evaluate the entrepreneurial idea in the context of the market and competitors and make an assessment of potential viability.		
P5 Apply a SWOT framework to collate evidence to support an objective assessment of a specific entrepreneurial idea. **P6** Evaluate the competitive and market environments in which the idea will be launched to assess potential viability.	**M4** Critically evaluate a specific entrepreneurial idea in the context of the marketplace and competition.	**D4** Formulate valid conclusions and justified recommendations on how a specific entrepreneurial idea can be developed, managed and sustained within the competitive market place.

Recommended Resources

Textbooks

BURNS, P. (2014) *New Venture Creation: A Framework for Entrepreneurial Start-ups.* Basingstoke: Palgrave MacMillan.

BURNS, P. (2011) *Entrepreneurship and Small Business*. 3rd edn. Basingstoke: Palgrave MacMillan.

MOLE, K. and RAM, M. (2012) *Perspectives in Entrepreneurship: A Critical Approach.* Basingstoke: Palgrave MacMillan.

RIES, E. (2011) *The Lean Start-up.* London: Penguin Books.

WALL, S., CODAY, C. and MITCHELL, C. (2014) *Quantitative Methods for Business and Management: An Entrepreneurial Perspective.* Harlow: Pearson.

Websites

www.isbe.org.uk	The Institute for Small Business and Entrepreneurship (ISBE) Homepage (General reference)
http://onlinelibrary.wiley.com	Wiley Online Library Journal of Small Business Management (Journal)

Links

This unit links to the following related units:

Unit 24: Business Strategy

Unit 28: Product and Service Development

Unit 30: Sustainable Practices

Unit code	**D/616/7866**
Unit level	**5**
Credit value	**15**

Introduction

The concept of sustainability and sustainable practices has many interpretations. For the purpose of this unit sustainable practices are defined as operations carried out with the minimum impact allowing those practices to be continued in the long term. Sustainable practices need to be applied to both inputs and outputs from a business. Consideration needs to be given to the resources used in production, the energy used to process those resources and the management of any waste products arising. To secure the future of production businesses must seek to minimise their negative impacts in carrying out their operations.

This unit will develop the skills required to analyse business activities from the perspective of sustainability. It will allow systems and practices to be reviewed to minimise energy use and waste production enabling the reduction of negative impacts on the environment. Once practices have been reviewed, and impacts minimised, the use of green business credentials in marketing will be explored.

During unit delivery, local and national schemes to which a business can sign up will be identified and eligibility criteria examined. Methods for evaluating a business's environmental impact will be developed. Opportunities for local sourcing, collective purchasing and transportation and packaging minimisation will be explored. The application of the waste hierarchy will be explored so that resource waste can be eliminated. Utilising green business credentials will be optimised.

By the end of the unit the student will have developed the skills to review business activities to minimise environmental impacts and then utilise the green business credentials in promoting and marketing business activities and products. They will also be able to identify appropriate schemes and initiatives which could support sustainable business aims.

Learning Outcomes

By the end of this unit students will be able to:

1 Evaluate the opportunities for applying sustainable practices to business operations

2 Analyse business facilities and practices to minimise energy use

3 Identify opportunities for waste minimisation and recycling complying with current legislation

4 Communicate sustainable practices in business promotion.

Essential Content

LO1 **Evaluate the opportunities for applying sustainable practices to business operations**

All aspects of business practices need to be considered:

Identify opportunities to minimise the risk of loss or damage to land, water and air

Practices which minimise resource requirement need to be explored

Consideration must be given to the sourcing of inputs to ensure they continue to be available for production in the future.

LO2 **Analyse business facilities and practices to minimise energy use**

Technologies and systems which minimise energy use need to be explored:

These need to include insulation and thermal efficiency of buildings

The adoption of energy efficient production methods

The development of maintenance schedules for equipment

The evaluation of latest technologies for energy saving.

LO3 **Identify opportunities for waste minimisation and recycling**

Methods of reducing waste need to be explored:

Matching of systems to local circumstances

Stock control to be practiced

Avoidance of excess packaging

Use of biodegradable products

Storing and sorting waste products to maximise recycling opportunities

Preventing waste escaping into the wider environment

The waste hierarchy needs to be followed

Non-recyclable waste disposal in accordance with current legislation.

LO4 **Utilise sustainable practices in business promotion.**

Marketing opportunities utilising the business' sustainable reputation need to be developed:

Quality Assurance schemes requiring sustainable practices to be reviewed, niche marketing to be investigated

Opportunities for spreading sustainable practices up and down the supply chain to be explored.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Evaluate the opportunities for applying sustainable practices to business operations</td><td rowspan="5">LO1 LO2
D1 Critically evaluate potential savings and costs from applying sustainable practices.</td></tr>
<tr><td>P1 Produce a risk plan of activities and their negative impacts.
P2 Identify sustainable practices which would reduce the risks.
P3 Identify sustainable sources for business inputs.</td><td>M1 Evaluate the impact of the risk plan and viability of changing input sources.</td></tr>
<tr><td colspan="2">LO2 Analyse business facilities and practices to minimise energy use</td></tr>
<tr><td>P4 Produce an environmental audit of business premises and practices.</td><td>M2 Evaluate feasibility of applying technologies.</td></tr>
<tr><td colspan="2">LO3 Identify opportunities for waste minimisation and recycling</td><td rowspan="5">LO3 LO4
D2 Critically evaluate potential savings and costs from applying sustainable practices.</td></tr>
<tr><td>P5 Produce a waste management audit for the business.</td><td>M3 Evaluate waste minimisation opportunities in the local area.</td></tr>
<tr><td colspan="2">LO4 Utilise sustainable practices in business promotion.</td></tr>
<tr><td>P6 Produce a marketing plan which make use of the business' environmental credentials.</td><td>M4 Evaluate your plan against plans of similar businesses.</td></tr>
</table>

Recommended Resources

Textbooks

ESTES, J. (2009) *Smart Green: How to Implement Sustainable Business Practices in Any Industry – and Make Money.* New Jersey: Wiley.

HALL, K. (2008) *Green Building Bible – Fourth Edition, Volume 1: Essential Information to Help You Make Your Home and Buildings Less Harmful to the Environment, the Community and Your Family.* London: Green Building Press.

Websites

www.energysavingtrust.org.uk	The Energy Saving Trust Whole site (General reference)
www.gov.uk	GOV.UK Publications DEFRA (2009) *Protecting our Water, Soil and Air: A Code of Good Agricultural Practice for farmers, growers and land managers* (Publication) DEFRA (2011) *Waste Hierarchy Guidance* (Publication)

Links

This unit links to the following related units:

Unit 1: Business and the Business Environment

Unit 2: Management Accounting

Unit 18: Advanced Management Accounting

Unit 31: Environmental Management and Conservation

Unit code	**D/616/7981**
Unit level	**5**
Credit value	**15**

Introduction

It is no longer acceptable or desirable to solely focus on production without considering environmental management and conservation. There are a number of reasons for this. Firstly, environmental legislation makes it a legal requirement and in many cases this is backed up by being a requisite to accessing support funds where available. The environment provides eco system services such as pollination and natural pest control. It therefore makes common sense to effectively manage the environment to maximise these. In addition, as a result of intensive production practices many once common species are becoming rare, and rare species are being driven to extinction. We have a responsibility to play our part in reversing this trend.

This module will develop the skills required to assess the status of habitats on holdings and then develop management plans which take into consideration constraints of land use and legal requirements. The unit will also develop appropriate monitoring and evaluation methodologies to allow the impact of management practices and conservation activities to be assessed for both positive and negative impacts on habitats.

Habitat assessments will be undertaken drawing on base-line data and practical on-site surveys. The surveys will be appropriate to the scale and importance of the site and resources available. Drawing on examples, from well-managed sites, management plans will be developed to maintain or improve site conditions as appropriate. Different monitoring and evaluation methodologies will be evaluated and impact reports produced.

By the end of the unit the student will be able to accurately assess the condition of ecologically significant sites on holdings. They will be able to produce management plans which will be effective and meet legal requirements. They will be able to monitor and evaluate the impact of management prescriptions on habitats.

Learning Outcomes

By the end of this unit students will be able to:

1 Assess the status of habitats on holdings

2 Produce plans to maintain or improve their condition

3 Monitor the impact of conservation actions

4 Evaluate environmental management practice.

Essential Content

LO1 **Assess the status of habitats on holdings**

Assess habitats:

Using key species records, identify if they are still present on site and make an estimate of numbers

Assess whether species are healthy and thriving or under pressure

From records, evaluate loss of conservation areas to production.

LO2 **Produce plans to maintain or improve their condition**

Develop plans to conserve and prevent decline:

Drawing on examples from local areas, develop plans to conserve and prevent decline in the quality of conservation areas

Incorporate the principles of integrated land management in plan development

Positive non-intervention is an option.

LO3 **Monitor the impact of conservation actions**

Undertake impact monitoring:

Needs to be appropriate to the scale of individual sites

Suitable to identify if objectives are being met

Feasible within resource constraints

The methodology needs to be clearly recorded, capable of replication and preferably compatible with any previous site monitoring results.

LO4 **Evaluate environmental management practices**

Undertake the evaluation of environmental management plans:

Management practices need to be evaluated from both the perspective of pure conservation and the impact of husbandry practices on environmental conservation

Environmental management practices need to be species and habitat specific, and appropriate to the scale of the site

They need to consider any site or species' protected status and current legislation.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Assess the status of habitat on holdings</td><td rowspan="4">LO1 LO2

D1 Critically evaluate environmental management plans and their impact on site management.</td></tr>
<tr><td>P1 Produce a species survey of two sites including any locally significant species and compare the results to similar local sites to produce a basic assessment.</td><td>M1 Interpret the significance of the assessment in relation to local biodiversity action plans.</td></tr>
<tr><td colspan="2">LO2 Produce plans to maintain or improve their condition</td></tr>
<tr><td>P2 Produce management plans for the areas surveyed.</td><td>M2 With reference to other local sites, evaluate the proposed management prescriptions.</td></tr>
<tr><td colspan="2">LO3 Evaluate environmental management practices</td><td rowspan="4">LO3 LO4

D2 Discuss how your management plans contribute to improving the wider environmental condition.</td></tr>
<tr><td>P3 Drawing on given case studies, produce a report identifying three environmental management practices which could be applied to your sites.</td><td>M3 Define the predicted impacts of the management practices.</td></tr>
<tr><td colspan="2">LO4 Monitor the impact of conservation actions.</td></tr>
<tr><td>P4 Plan a monitoring programme for your selected sites.</td><td>M4 Evaluate your programmes and discuss alternative methodologies which could have been applied.</td></tr>
</table>

Recommended Resources

Textbooks

AUSDEN, M. (2007) *Habitat Management for Conservation: A Handbook of Techniques (Techniques in Ecology and Conservation).* Oxford: Oxford University Press.

DICKS, L. V., ASHPOLE, J.E., DÄNHARDT, J., JAMES, K., JÖNSSON, A., RANDALL, N., SHOWLER, D.A., SMITH, R.K., TURPIE, S., WILLIAMS, D. and SUTHERLAND, W.J. (2013) *Farmland Conservation: Evidence for the effects of interventions in northern and western Europe*. Exeter: Pelagic Publishing.

MACDONALD, D.W. and FEBER, R.E. (2015) *Wildlife Conservation on Farmland. Volume 1.* Oxford: Oxford University Press.

MACDONALD, D.W. and FEBER, R.E. (2015) *Wildlife Conservation on Farmland. Volume 2.* Oxford: Oxford University Press.

SUTHERLAND, W.J. and HILL, D.A. (1995) *Managing Habitats for Conservation.* Cambridge: Cambridge University Press.

Websites

www.banc.org.uk	British Association of Nature Conservation
	ECOS journal
	(Research)

Links

This unit links to the following related units:

Unit 30: Sustainable Practices

Unit 32: Woodland Management

Unit 32: Woodland Management

Unit code	**H/616/7982**
Unit level	**5**
Credit value	**15**

Introduction

Good woodland management has multiple benefits. It can provide additional income to a business, maximise wildlife benefit and enhance the landscape. Whether creating new areas of woodland or managing existing woods, to achieve optimum results it is essential to correctly apply the appropriate principles and practices. It is not economically viable to contract out the management of small areas of woodland, so developing the skills to look after woodland alongside other business activities will be a great advantage.

The purpose of this unit is to develop the skills and knowledge to make both appropriate management decisions and to be able to undertake the hands on work.

This unit will cover woodland establishment management and harvesting. It will also explore uses of woodland and wood products.

During the unit students will develop the theoretical and practical management skills. You will learn how to select appropriate species for stocking, the management cycle, how to assess woodland conditions and when to make interventions.

Learning Outcomes

By the end of this unit students will be able to:

1 Assess the methods of and conditions for establishing woodlands

2 Evaluate woodland management options and select those appropriate to achieving objectives

3 Apply industry standard techniques to assess woodland condition and quality

4 Identify markets and uses for woodlands and woodland products.

Essential Content

LO1 **Assess the methods of and conditions for establishing woodlands**

Methods and conditions:

Select species based on soil type, location and objectives

Consider native / non- native species for stocking

Decide on establishment techniques – planting or natural regeneration.

Consider site preparation based on conditions selected establishment method and resources

Identify protection methods for newly established woodlands appropriate to scale of site and threat.

LO2 **Evaluate woodland management options and select those appropriate to achieving objectives**

Management options:

Consider the condition of the woodland if already established and the desired objectives of management

Conifer management / broadleaf management

Priorities -commercial timber, conservation, recreation.

Stage of growth cycle / quality

Markets for thinnings / end point markets

Coppice or standards

Management constraints **–** site size, location, aspect, designations

Cost / benefit

Harvesting options.

LO3 **Apply industry standard techniques to assess woodland condition and quality**

Assessment techniques:

Visual assessment

Qualitative and quantitative methods

Surveys use of forest mensuration methodologies

Use of measurement equipment – girthing tapes clinometers, software.

LO4 **Identify markets and uses for woodlands and woodland products**

Markets and uses:

Markets for different products – thinnings, final crop, coppice products

Construction timber, pulp, fire wood, veneer

On site processing, off site sales

Additional uses of woodland sites – recreation activities, sporting activities, education activities, burials.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Assess the methods of and conditions for establishing woodlands</td><td rowspan="5">LO1 LO2
D1 Critically evaluate management proposals in line with feasibility and good practice.</td></tr>
<tr><td>P1 Produce a site appraisal.
P2 Identify suitable species and establishment methods.
P3 Plan preparation methods to suit site.</td><td>M1 Evaluate cost / benefits of proposals.</td></tr>
<tr><td colspan="2">LO2 Evaluate woodland management options and select those appropriate to achieving objectives</td></tr>
<tr><td>P4 Produce a comparison of management options for a given area.</td><td>M2 Justify the preferred management option.</td></tr>
<tr><td colspan="2">LO3 Apply industry standard techniques to assess woodland condition and quality</td></tr>
<tr><td>P5 Undertake an assessment of a given woodland.</td><td>M3 Evaluate the pros and cons of alternative assessment methods.</td><td rowspan="3">LO3 LO4
D2 Critically evaluate the feasibility of achieving optimum return on the given woodland.</td></tr>
<tr><td colspan="2">LO4 Identify markets and uses for woodlands and woodland products.</td></tr>
<tr><td>P6 Produce a marketing plan which optimises the use of a given woodland and its products.</td><td>M4 Analyse alternative uses and markets.</td></tr>
</table>

Recommended Resources

Textbooks

BLAKSLEY, D. and BUCKLEY, P.G. (2010) *Managing Your Woodlands For Wildlife*. Newbury: Pisces Publications.

EVANS, J. and ROLLS, W. (2015) *Getting Started in Your Own Wood*. Petersfield: Permanent Publications.

FORESTRY COMMISSION (2017) *The UK Forestry Standard: The Government's Approach to Sustainable Forestry*. Edinburgh: Forestry Commission.

HARMER, R. and HOWE, J. (2003) *Silviculture and Management of Coppice Woodlands*. Edinburgh: Forestry Commission.

KERR, R., HARMER, G. and THOMPSON, R.W. (2004) *Managing Native Broadleaved Woodland*. Edinburgh: Forestry Commission.

MATTHEWS, R.W. and MACKIE, E.D. (2013) *Forest Mensuration*. 2nd edn. Edinburgh: Forestry Commission.

SAVILL, P. (2013) *The Silviculture of Trees.* 2nd edn. Wallingford: CABI.

STARR, C. (2013) *Woodland Management – A Practical Guide*. Marlborough: The Crowood Press.

Links

This unit links to the following related units:

Unit 31: Environmental Management and Conservation

Unit 33: Work Experience

Unit code	**H/616/7867**
Unit level	**5**
Credit value	**15**

Introduction

A crucial part of a professional's skills, abilities and competences are developed during work, and are refined through practical experiences and 'learning by doing'. Employers rate work experience above all else and the HN qualifications aim to make students work-ready and prepare them with the appropriate, balanced skills profile that employers require.

Integral to achieving 'work readiness' is the need for practical application and contextualisation of learning – a perspective that is increasingly sought after by employers. Curriculum that helps students gain real-world, relevant experience in their chosen careers have proven to be an enabler for graduate progression to employment and of considerable value to students' personal and professional development.

This unit aims to enable students to develop personal and professional skills by engaging in practical tasks and activities within a relevant workplace. It is designed to facilitate supervised learning in a workplace that can be fit around full-time or part-time student commitments and enables both an employer, as well as an academic supervisor, to monitor and support students through a goal-orientated process. **The minimum work experience hours required for completion is 80 hours.**

Students will be given the opportunity to identify and plan their own skills development in line with a chosen career path or direction. It will be expected that students negotiate and agree work experience in an appropriate work context, agreed by the employer and academic supervisor. They will monitor and record evidence from the tasks and activities that they undertake, to allow them to evaluate the process and any shortcomings in their development going forward.

Learning Outcomes

By the end of this unit students will be able to:

1 Investigate the value and benefits of practical work experience for career and personal development

2 Plan suitable and relevant work experience in an appropriate service sector organisation

3 Undertake appropriate work experience to develop professional skills and competences

4 Evaluate personal skills and competences developed during practical work experiences.

Essential content

LO1 Investigate the value and benefits of practical work experience for career and personal development

Organisational contexts for career development:

Different service sector sub-sectors and organisational contexts

The key roles and responsibilities found within different service sub-sectors.

Learning and development in work environments:

Academic knowledge versus practical knowledge and skills

Learning theories e.g. Blooms taxonomy, Gardner's Multiple Intelligences and Bandura's Social Learning Theory

Concept of application of theory to practice

The benefits of practical learning

Career progression and employer expectations of key employability skills

e.g. interpersonal skills, communication skills, critical thinking, presentation skills, leadership skills, teamwork

The importance and value of soft skills to the hospitality industry

Soft skills versus hard skills.

LO2 Plan suitable and relevant work experience in an appropriate service sector organisation

Setting development plans, goals and objectives:

'SMART' planning, writing of goals and objectives

Self-assessment of skills and competences.

Learning and development approaches:

Visual, Auditory, Kinaesthetic (VAK) learning styles, Honey & Mumford learning cycle, Kolb's learning cycle

Different learning approaches e.g. shadowing, in-house courses and on-job training, online learning, formal training, buddying, secondment, coaching and mentoring, job rotation, workshops, conferences.

Preparation tools and techniques for career development:

Looking at job applications, CV and interview preparation

Interview and presentation skills

The importance of understanding the appropriate uniform and dress-code for the job role in relation to the interview process

Service sub-sector specific equipment and requirements.

LO3 **Undertake appropriate work experience to develop professional skills and competences**

Carry out planned tasks and activities:

Engagement in tasks e.g. projects, routine duties, operational issues, formal training, legal compliance, process development

People management and leadership

Application of problem solving, contingency planning, coordinating tasks, teamwork

Professional conduct and behaviours to display whilst working, presenting a brand identity, the importance of uniformity in presentation.

LO4 **Evaluate personal skills and competences developed during practical work experiences.**

Recording of actions and activities in suitable formats:

Methodical record of experiences gained during work, linked to skills to be developed

Recorded in appropriate methods e.g. journal, logbook, diary, portfolios, online records

Creation of evidence in appropriate formats.

Reviewing and evaluating progress:

Reflection of career development and learning within the work environment in areas e.g. systems, interpersonal skills, problem-resolution, incidents and accidents, teamwork and management practices

Recommendations on how to enhance future development plans e.g. different work context, alternative roles and titles, locations, preparation methods, time management.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Investigate the value and benefits of practical work experience for career and personal development		
P1 Explore and discuss different learning theories that could be used to inform a suitable work experience. **P2** Examine the benefits of practical work experience for professional skills and career development.	**M1** Evaluate a range of different learning theories in practice, to highlight and emphasise the benefits of action-learning for career development.	**D1** Critically evaluate the benefits of practical action learning to underpin theory and approaches in the work environment.
LO2 Plan suitable and relevant work experience in an appropriate service sector organisation		
P3 Construct a development plan for skills and career advancement within a chosen service sector context. **P4** Explain a range of tools and techniques that can be used to acquire appropriate work experience within a service sector organisation.	**M2** Devise an in-depth development plan that provides a detailed outline of the approaches, tools and techniques applied to gain appropriate work experience within a service sector organisation.	**D2** Analyse and interpret actions, activities and approaches adopted within a structured development plan to gain appropriate work experience within a service sector organisation.
LO3 Undertake appropriate work experience to develop professional skills and competences		
P5 Conduct appropriate work experience to develop specific skills for career development whilst producing ongoing evidence of work performance.	**M3** Examine the development processes within a work context to maximise growth opportunities within the work experience.	**D3** Critically reflect on development processes within the workplace to establish strengths and weaknesses of the different approaches adopted.
LO4 Evaluate personal skills and competences developed during practical work experiences.		
P6 Evaluate skills, performance and career development to identify areas for future advancement. **P7** Recommend methods and techniques to enhance development processes within the given service sector work environment.	**M4** Produce an evidence-based evaluation of work experiences, making actionable and tangible recommendations for enhanced development processes.	**D4** Justify the evaluation and recommendations of different approaches to enhancing development in practice.

Recommended resources

Textbooks

COSTLEY, C., ELLIOT, G. and GIBBS, P. (2010) *Doing Work Based Research: Approaches to Enquiry for Insider-Researchers.* London: SAGE.

DONE, J. and MULVEY, R. (2011) *Brilliant Graduate Career Handbook.* Essex: Prentice Hall.

KIRTON, B. (2012) *Brilliant Workplace Skills for Students & Graduates.* Harlow: Prentice Hall.

ROOK, S. (2016) *Work Experience, Placements & Internships.* London: Palgrave.

Websites

www.cipd.co.uk	Chartered Institute of Personnel and Development Homepage (General reference)
www.mindtools.com	Mind Tools Career Support Resources (General reference)
www.nationalcareersservice.direct.gov.uk	National Careers Service CVs, Skills Health Check (General reference)

Unit 34: Automation, Robotics and Programmable Logic Controllers (PLCs)

Unit code	**K/615/1489**
Unit level	**4**
Credit value	**15**

Introduction

The word automation was not used until the 1940s and it originated in the automotive manufacturing sector as a method designed to reduce labour costs and improve the quality, accuracy and precision of the finished products. We are all now very familiar with the sight of dancing robots, not only in the production of cars but in everything from washing machines to pharmaceuticals. As a result of this technology the products we purchase may have never been touched by human hands and we all benefit from a reduction in costs and improvement in quality.

The aim of this unit is for students to investigate how Programmable Logic Controllers (PLCs) and industrial robots can be programmed to successfully implement automated engineering solutions.

Among the topics included in this unit are: PLC system operational characteristics, different types of programming languages, types of robots and cell safety features.

On successful completion of this unit students will be able to program PLCs and robotic manipulators to achieve a set task, describe the types and uses of PLCs and robots available, write simple PLC programs, and program industrial robots with straightforward commands and safety factors.

Learning Outcomes

By the end of this unit students will be able to:

1. Describe the design and operational characteristics of a PLC system.
2. Design a simple PLC program by considering PLC information, programming and communication techniques.
3. Describe the key elements of industrial robots and be able to program them with straightforward commands to perform a given task.
4. Investigate the design and safe operation of a robot within an industrial application.

Essential Content

LO1 **Describe the design and operational characteristics of a PLC system**

System operational characteristics:

Modular, unitary and rack mounted systems

Characteristics, including speed, memory, scan time, voltage and current limits

Input and output devices (digital, analogue)

Interface requirements

Communication standards (RS-232, RS-422, RS-485, Ethernet)

Internal architecture

Different types of programming languages (IEC 61131-3)

LO2 **Design a simple PLC program by considering PLC information, programming and communication techniques**

Programming language:

Signal types

Number systems (binary, octal, hexadecimal)

Allocation lists of inputs and outputs

Communication techniques

Network methods

Logic functions (AND, OR, XOR)

Associated elements (timers, counters, latches)

Test and debug methods:

Systematic testing and debugging methods

Proper application of appropriate testing and debugging methods

LO3 **Describe the key elements of industrial robots and be able to program them with straightforward commands to perform a given task**

Element considerations:

Types of robots

Mobile robotics

Tools and end effectors

Programming methods

Robot manipulators (kinematics, design, dynamics and control, vision systems, user interfaces)

LO4 **Investigate the design and safe operation of a robot within an industrial application**

Safety:

Cell safety features

Operating envelope

Operational modes

User interfaces

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Describe the design and operational characteristics of a PLC system		
P1 Describe the key differences of PLC construction styles and their typical applications **P2** Determine the types of PLC input and output devices available **P3** Describe the different types of communication links used with PLCs	**M1** Explain the different types of PLC programming languages available	**D1** Analyse the internal architecture of a typical PLC to determine its operational applications
LO2 Design a simple PLC program by considering PLC information, programming and communication techniques		
P4 Design and describe the design elements that have to be considered in the preparation of a PLC programme program **P5** Explain how communication connections are correctly used with the PLC	**M2** Examine the methods used for testing and debugging the hardware and software	**D2** Produce all elements of a PLC program for a given industrial task and analyse its performance

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO3 Describe the key elements of industrial robots and be able to program them with straightforward commands to perform a given task</td><td rowspan="2">D3 Design and produce a robot program for a given industrial task</td></tr>
<tr><td>P6 Describe the types of industrial robots and their uses in industry
P7 Describe the types of robot end effectors available and their applications</td><td>M3 Investigate a given industrial robotic system and make recommendations for improvement</td></tr>
<tr><td colspan="2">LO4 Investigate the design and safe operation of a robot within an industrial application</td><td rowspan="2">D4 Design a safe working plan for an industrial robotic cell in a given production process to include a full risk assessment</td></tr>
<tr><td>P8 Investigate the safety systems used within an industrial robotic cell</td><td>M4 Analyse how the systems in place ensure safe operation of a given industrial robotic cell</td></tr>
</table>

Recommended Resources

Textbooks

BOLTON, W. (2015) *Programmable Logic Controllers*. 5th Ed. Elsevier.

DAWKINS, N. (ed.) (2014) *Automation and Controls: A guide to Automation, Controls, PLCs and PLC Programming*.

PEREZ ANDROVER, E. (2012) *Introduction to PLCs: A beginner's guide to Programmable Logic Controllers*.

Websites

http://www.plcmanual.com/	PLC Manual (General Reference)
http://www.plcs.net/	PLC Programming Info (General Reference)
http://www.learnaboutrobots.com/	Learn About Robots Industrial Robots (General Reference)

Links

This unit links to the following related units:

Unit 6: Mechatronics

Unit 42: Further Programmable Logic Controllers (PLCs)

Unit 35: Electro, Pneumatic and Hydraulic Systems

Unit code	**L/615/1498**
Unit level	**4**
Credit value	**15**

Introduction

Hydraulics and pneumatics incorporate the importance of fluid power theory in modern industry. This is the technology that deals with the generation, control, and movement of mechanical elements or systems with the use of pressurised fluids in a confined system. In respect of hydraulics and pneumatics, both liquids and gases are considered fluids. Oil hydraulics employs pressurised liquid petroleum oils and synthetic oils, whilst pneumatic systems employ an everyday recognisable process of releasing compressed air to the atmosphere after performing the work.

The aim of this module is to develop students' knowledge and appreciation of the applications of fluid power systems in modern industry. Students will investigate and design pneumatic, hydraulic, electro-pneumatic and electro-hydraulic systems. This unit offers the opportunity for students to examine the characteristics of fluid power components and evaluate work-related practices and applications of these systems.

On successful completion of this unit students will be able to explain applications of hydraulic and pneumatic systems in the production industry, determine the fundamental principles and practical techniques for obtaining solutions to problems, appreciate real-life applications of pneumatic and hydraulic systems, and investigate the importance of structured maintenance techniques.

Learning Outcomes

By the end of this unit students will be able to:

1. Calculate the parameters of pneumatic and hydraulic systems.
2. Identify the notation and symbols of pneumatic and hydraulic components.
3. Examine the applications of pneumatic and hydraulic systems.
4. Investigate the maintenance of pneumatic and hydraulic systems.

Essential Content

LO1 **Calculate the parameters of pneumatic and hydraulic systems**

Pneumatic and hydraulic theory:

Combined and ideal gas laws: Boyle's Law, Charles' Law and Gay-Lussac's Law

Fluid flow, calculation of pressure and velocity using Bernoulli's Equation for Newtonian fluids

System performance, volumetric operational and isothermal efficiency

Dynamic and Kinematic Viscosity

Methods of measuring viscosity including Stokes' Law

Navier Stokes Equations

LO2 **Identify the notation and symbols of pneumatic and hydraulic components**

Performance of hydraulic and pneumatic components:

The use and importance of International Standards, including relative symbols and devices

Fluid power diagrams

Pneumatic and hydraulic critical equipment and their purpose

Circuit diagrams, component interaction and purpose

Dynamics of modern system use

LO3 **Examine the applications of pneumatic and hydraulic systems**

System applications:

Calculation of appropriate capacities and specifications

Applied functions of control elements

Design and testing of hydraulic and pneumatic systems

Fluid power in real-life examples

Valued component choice

LO4 **Investigate the maintenance of pneumatic and hydraulic systems**

Efficiency of systems:

Efficient maintenance: accurate records and procedures to ensure efficiency

Functional inspection, modern techniques to limit production problems, quality control

Testing, efficient procedures to enable component longevity, recommendations

Fault finding, diagnostic techniques, effects of malfunctions, rectification of faults

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Calculate the parameters of pneumatic and hydraulic systems		
P1 Determine the change in volume and pressure in pneumatic systems **P2** Determine the change in volume and pressure in hydraulic systems	**M1** Using Bernoulli's Equation, calculate values at stationary incompressible flow	**D1** Produce a presentation analysing fluid viscosity using Stokes' Law and validate how this relates to Navier–Stokes equations
LO2 Identify the notation and symbols of pneumatic and hydraulic components		
P3 Identify the purpose of components on a given diagram **P4** Explain the use of logic functions used within circuits **P5** Illustrate the use of advanced functions and their effect on circuit performance	**M2** Assess the different factors that impact on actuator choice for a given application	**D2** Stating any assumptions, compare the applications of practical hydraulic and pneumatic systems

Pass	Merit	Distinction
LO3 Examine the applications of pneumatic and hydraulic systems		
P6 Investigate and analyse the design and function of a simple hydraulic or pneumatic system in a production environment **P7** Define the purpose and function of electrical control elements in a given hydraulic or pneumatic system	**M3** Justify the measures taken to improve circuit design in respect of performance	**D3** Evaluate the design modifications that can be introduced to improve the functionality and maintenance of pneumatic and hydraulic systems without creating reliability issues
LO4 Investigate the maintenance of pneumatic and hydraulic systems		
P8 Recognise system faults and potential hazards in pneumatic and hydraulic systems **P9** Determine regular testing procedures to ensure efficient maintenance of pneumatic and hydraulic systems	**M4** Compare construction and operation of hydraulic and pneumatic systems with regards to legislation and safety issues	**D4** Evaluate the importance of maintenance, inspection, testing and fault finding in respect of improved system performance

Recommended Resources

Textbooks

PARR, A. (1999) *Hydraulics and Pneumatics: A Technician's Guide*. 2nd Ed. Butterworth-Heinemann.

ROHNER, R. (1995) *Industrial Hydraulic Control*. John Wiley & Sons.

STACEY, C. (1997) *Practical Pneumatics*. Elsevier.

TURNER, I. (1996) *Engineering Applications of Pneumatics and Hydraulics*. Butterworth-Heinemann.

Links

This unit links to the following related units:

Unit 11: Fluid Mechanics

Unit 64: Thermofluids

Unit 36: Engineering Maths

Unit code	**M/615/1476**
Unit level	**4**
Credit value	**15**

Introduction

The mathematics that is delivered in this unit is that which is directly applicable to the engineering industry, and it will help to increase students' knowledge of the broad underlying principles within this discipline.

The aim of this unit is to develop students' skills in the mathematical principles and theories that underpin the engineering curriculum. Students will be introduced to mathematical methods and statistical techniques in order to analyse and solve problems within an engineering context.

On successful completion of this unit students will be able to employ mathematical methods within a variety of contextualised examples, interpret data using statistical techniques, and use analytical and computational methods to evaluate and solve engineering problems.

Learning Outcomes

By the end of this unit students will be able to:

1. Identify the relevance of mathematical methods to a variety of conceptualised engineering examples.
2. Investigate applications of statistical techniques to interpret, organise and present data.
3. Use analytical and computational methods for solving problems by relating sinusoidal wave and vector functions to their respective engineering applications.
4. Examine how differential and integral calculus can be used to solve engineering problems.

Essential Content

LO1 **Identify the relevance of mathematical methods to a variety of conceptualised engineering examples**

Mathematical concepts:

Dimensional analysis

Arithmetic and geometric progressions

Functions:

Exponential, logarithmic, trigonometric and hyperbolic functions

LO2 **Investigate applications of statistical techniques to interpret, organise and present data**

Summary of data:

Mean and standard deviation of grouped data

Pearson's correlation coefficient

Linear regression

Charts, graphs and tables to present data

Probability theory:

Binomial and normal distribution

LO3 **Use analytical and computational methods for solving problems by relating sinusoidal wave and vector functions to their respective engineering application.**

Sinusoidal waves:

Sine waves and their applications

Trigonometric and hyperbolic identities

Vector functions:

Vector notation and properties

Representing quantities in vector form

Vectors in three dimensions

LO4 **Examine how differential and integral calculus can be used to solve engineering problems**

Differential calculus:

Definitions and concepts

Definition of a function and of a derivative, graphical representation of a function, notation of derivatives, limits and continuity, derivatives; rates of change, increasing and decreasing functions and turning points

Differentiation of functions

Differentiation of functions including:

- standard functions/results
- using the chain, product and quotient rules
- second order and higher derivatives

Types of function: polynomial, logarithmic, exponential and trigonometric (sine, cosine and tangent), inverse trigonometric and hyperbolic functions

Integral calculus:

Definite and indefinite integration

Integrating to determine area

Integration of functions including:

- common/standard functions
- using substitution
- by parts

Exponential growth and decay

Types of function: algebraic including partial fractions and trigonometric (sine, cosine and tangent) functions

Engineering problems involving calculus:

Including: stress and strain, torsion, motion, dynamic systems, oscillating systems, force systems, heat energy and thermodynamic systems, fluid flow, AC theory, electrical signals, information systems, transmission systems, electrical machines, electronics

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Identify the relevance of mathematical methods to a variety of conceptualised engineering examples</td><td rowspan="5">LO1 & LO2

D1 Present data in a method that can be understood by a non-technical audience</td></tr>
<tr><td>P1 Apply dimensional analysis techniques to solve complex problems

P2 Generate answers from contextualised arithmetic and geometric progressions

P3 Determine solutions of equations using exponential, logarithmic, trigonometric and hyperbolic functions</td><td>M1 Use dimensional analysis to derive equations</td></tr>
<tr><td colspan="2">LO2 Investigate applications of statistical techniques to interpret, organise and present data</td></tr>
<tr><td>P4 Summarise data by calculating mean and standard deviation

P5 Calculate probabilities within both binomially distributed and normally distributed random variables</td><td>M2 Interpret the results of a statistical hypothesis test conducted from a given scenario</td></tr>
</table>

Pass	Merit	Distinction
LO3 Use analytical and computational methods for solving problems by relating sinusoidal wave and vector functions to their respective engineering application		
P6 Solve engineering problems relating to sinusoidal functions **P7** Represent engineering quantities in vector form, and use appropriate methodology to determine engineering parameters	**M3** Use compound angle identities to combine individual sine waves into a single wave	**D2** Model the combination of sine waves graphically and analyse the variation in results between graphical and analytical methods
LO4 Examine how differential and integral calculus can be used to solve engineering problems		
P8 Determine rates of change for algebraic, logarithmic and trigonometric functions **P9** Use integral calculus to solve practical problems relating to engineering	**M4** Formulate predictions of exponential growth and decay models using integration methods	**D3** Analyse maxima and minima of increasing and decreasing functions using higher order derivatives

Recommended Resources

Textbooks

SINGH, K. (2011) *Engineering Mathematics Through Applications*. 2nd Ed. Basingstoke: Palgrave Macmillan.

STROUD, K.A. and BOOTH, D.J. (2013) *Engineering Mathematics*. 7th Ed. Basingstoke: Palgrave Macmillan.

Websites

http://www.mathcentre.ac.uk/	Maths Centre (Tutorials)
http://www.mathtutor.ac.uk/	Maths Tutor (Tutorials)

Links

This unit links to the following related units:

Unit 39: Further Mathematics

Unit 37: Engineering Science

Unit code	**T/615/1477**
Unit level	**4**
Credit value	**15**

Introduction

Engineering is a discipline that uses scientific theory to design, develop or maintain structures, machines, systems, and processes. Engineers are therefore required to have a broad knowledge of the science that is applicable to the industry around them.

This unit introduces students to the fundamental laws and applications of the physical sciences within engineering and how to apply this knowledge to find solutions to a variety of engineering problems.

Among the topics included in this unit are: international system of units, interpreting data, static and dynamic forces, fluid mechanics and thermodynamics, material properties and failure, and A.C./D.C. circuit theories.

On successful completion of this unit students will be able to interpret and present qualitative and quantitative data using computer software, calculate unknown parameters within mechanical systems, explain a variety of material properties and use electromagnetic theory in an applied context.

Learning Outcomes

By the end of this unit students will be able to:

1. Examine scientific data using both quantitative and qualitative methods.
2. Determine parameters within mechanical engineering systems.
3. Explore the characteristics and properties of engineering materials.
4. Analyse applications of A.C./D.C. circuit theorems, electromagnetic principles and properties.

Essential Content

LO1 **Examine scientific data using both quantitative and qualitative methods**

International system of units:

The basic dimensions in the physical world and the corresponding SI base units

SI derived units with special names and symbols

SI prefixes and their representation with engineering notation

Interpreting data:

Investigation using the scientific method to gather appropriate data

Test procedures for physical (destructive and non-destructive) tests and statistical tests that might be used in gathering information

Summarising quantitative and qualitative data with appropriate graphical representations

Using presentation software to present data to an audience

LO2 **Determine parameters within mechanical engineering systems**

Static and dynamic forces:

Representing loaded components with space and free body diagrams

Calculating support reactions of beams subjected to concentrated and distributed loads

Newton's laws of motion, D'Alembert's principle and the principle of conservation of energy

Fluid mechanics and thermodynamics:

Archimedes' principle and hydrostatics

Continuity of volume and mass flow for an incompressible fluid

Effects of sensible/latent heat of fluid

Heat transfer due to temperature change and the thermodynamic process equations

LO3 **Explore the characteristics and properties of engineering materials**

Material properties:

Atomic structure of materials and the structure of metals, polymers and composites

Mechanical and electromagnetic properties of materials

Material failure:

Destructive and non-destructive testing of materials

The effects of gradual and impact loading on a material.

Degradation of materials and hysteresis

LO4 **Analyse applications of A.C./D.C. circuit theorems, electromagnetic principles and properties**

D.C. circuit theory:

Voltage, current and resistance in D.C. networks

Exploring circuit theorems (Thevenin, Norton, Superposition), Ohm's law and Kirchhoff's voltage and current laws

A.C. circuit theory:

Waveform characteristics in a single-phase A.C. circuit

RLC circuits

Magnetism:

Characteristics of magnetic fields and electromagnetic force

The principles and applications of electromagnetic induction

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Examine scientific data using both quantitative and qualitative methods		
P1 Describe SI units and prefix notation **P2** Examine quantitative and qualitative data with appropriate graphical representations	**M1** Explain how the application of scientific method impacts upon different test procedures	**D1** Analyse scientific data using both quantitative and qualitative methods
LO2 Determine parameters within mechanical engineering systems		
P3 Determine the support reactions of a beam carrying a combination of a concentrated load and a uniformly distributed load **P4** Use Archimedes' principle in contextual engineering applications **P5** Determine the effects of heat transfer on the dimensions of given materials	**M2** Determine unknown forces by applying d'Alembert's principle to a free body diagram	**D2** Compare how changes in the thermal efficiency of a given system can affect its performance.

Pass	Merit	Distinction
LO3 Explore the characteristics and properties of engineering materials		
P6 Describe the structural properties of metals and non-metals with reference to their material properties **P7** Explain the types of degradation found in metals and non-metals	**M3** Review elastic and electromagnetic hysteresis in different materials	**D3** Compare and contrast theoretical material properties of metals and non-metals with practical test data
LO4 Analyse applications of A.C./D.C. circuit theorems, electromagnetic principles and properties		
P8 Calculate currents and voltages in D.C. circuits using circuit theorems **P9** Describe how complex waveforms are produced from combining two or more sinusoidal waveforms. **P10** Solve problems on series RLC circuits with A.C. theory.	**M4** Explain the principles and applications of electromagnetic induction	**D4** Evaluate different techniques used to solve problems on a combined series-parallel RLC circuit using A.C. theory.

Recommended Resources

Textbooks

BIRD, J. (2012) *Science for Engineering*. 4th Ed. London: Routledge.

BOLTON, W. (2006) *Engineering Science*. 5th Ed. London: Routledge.

TOOLEY, M. and DINGLE, L. (2012) *Engineering Science: For Foundation Degree and Higher National*. London: Routledge.

Journals

International Journal of Engineering Science.

International Journal of Engineering Science and Innovative Technology.

Websites

https://www.khanacademy.org/	Khan Academy Physics (Tutorials)

Links

This unit links to the following related units:

Unit 9: Materials, Properties and Testing

Unit 3: Engineering Science

Unit 38: Quality and Process Improvement

Unit code	**H/615/1491**
Unit level	**4**
Credit value	**15**

Introduction

Quality has always been the key to business success and survivability, but it requires organisations to allocate a lot of effort and resources to achieve it. The key to providing quality services and designing top quality products lies in the strength and effectiveness of the processes used in their development; processes which must be constantly reviewed to ensure they operate as efficiently, economically and as safely as possible.

This unit introduces students to the importance of quality assurance processes in a manufacturing or service environment and the principles and theories that underpin them. Topics included in this unit are: tools and techniques used to support quality control, attributes and variables, testing processes, costing modules, the importance of qualifying the costs related to quality, international standards for management (ISO 9000, 14000, 18000), European Foundation for Quality Management (EFQM), principles, tools and techniques of Total Quality Management (TQM) and implementation of Six Sigma.

On successful completion of this unit students will be able to illustrate the processes and applications of statistical process, explain the quality control tools used to apply costing techniques, identify the standards expected in the engineering environment to improve efficiency and examine how the concept of Total Quality Management and continuous improvement underpins modern manufacturing and service environments.

Learning Outcomes

By the end of this unit students will be able to:

1. Illustrate the applications of statistical process control when applied in an industrial environment to improve efficiency.
2. Analyse cost effective quality control tools.
3. Determine the role of standards in improving efficiency, meeting customer requirements and opening up new opportunities for trade.
4. Analyse the importance of Total Quality Management and continuous improvement in manufacturing environments.

Essential Content

LO1 **Illustrate the applications of statistical process control when applied in an industrial environment to improve efficiency**

Quality control:

The tools and techniques used to support quality control

Attributes and variables

Testing processes

Quality tools and techniques, including statistical process control (SPC)

Designing quality into new products and processes using Quality Function Deployment (QFD)

LO2 **Analyse cost effective quality control tools**

Quality costing:

Costing modules

The importance of qualifying the costs related to quality

How costs can be used to improve business performance

LO3 **Determine the role of standards in improving efficiency, meeting customer requirements and opening up new opportunities for trade**

Standards for efficiency:

The history of standards

The role of standards and their importance in enabling and supporting trade, business and industry

Standards for measurement

International Standards for management (ISO 9000, 14000, 18000)

European Foundation for Quality Management (EFQM) as an aid to developing strategic competitive advantage

LO4 **Analyse the importance of Total Quality Management and continuous improvement in manufacturing environments**

Overview and function of quality:

The importance of quality to industry: how it underpins the ability to improve efficiency, meet customer requirements and improve competitiveness

Principles, tools and techniques of Total Quality Management (TQM)

Understanding and implementation of Six Sigma

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Illustrate the applications of statistical process control when applied in an industrial environment to improve efficiency		
P1 Review the tools and techniques used to support quality control **P2** Describe the processes and applications of statistical process control in industrial environments	**M1** Explain the role and effectiveness of the quality tools and techniques used within an industrial environment	**D1** Suggest justified recommendations for the application of statistical process control in an industrial environment to improve efficiency
LO2 Analyse cost effective quality control tools		
P3 Analyse the effective use of quality control tools and techniques **P4** Analyse costing techniques used within industry	**M2** Determine with justification the quality control tools and techniques that could be used to improve business performance	**D2** Develop a process for the application of an extensive range of quality control tools and techniques with emphasis on costing
LO3 Determine the role of standards in improving efficiency, meeting customer requirements and opening up new opportunities for trade		
P5 Determine required standards to improve efficiency, meet customer requirements and open up new opportunities for trade	**M3** Discuss the importance of standards applied in the engineering environment	**D3** Illustrate a plan for the application of international standards that would improve efficiency, meet customer requirements and open up new opportunities for trade

Pass	Merit	Distinction
LO4 Analyse the importance of Total Quality Management and continuous improvement in manufacturing and service environments		
P6 Analyse the principles, tools and techniques of Total Quality Management and continuous improvement **P7** Analyse how the concept of Total Quality Management and continuous improvement could help in delivering high quality performance within businesses	**M4** Discuss how the appropriate application of Total Quality Management and continuous improvement in tools and techniques affect quality performance in the manufacturing and service environments	**D4** Analyse how the appropriate application of Total Quality Management and continuous improvement in tools and techniques affect quality performance in the manufacturing and service environments

Recommended Resources

Textbooks

OAKLAND, J.S. (2003) *Total Quality Management: Text with Cases*. 3rd Ed. Butterworth-Heinemann.

SLACK, N., CHAMBERS, S. and JOHNSTON, R. (2016) *Operations Management*. 8th Ed. Essex: Pearson Education Limited.

Links

This unit links to the following related units:

Unit 49: Lean Manufacturing

Unit 39: Electrical and Electronic Principles

Unit code	**M/615/1493**
Unit level	**4**
Credit value	**15**

Introduction

Electrical engineering is mainly concerned with the movement of energy and power in electrical form, and its generation and consumption. Electronics is mainly concerned with the manipulation of information, which may be acquired, stored, processed or transmitted in electrical form. Both depend on the same set of physical principles, though their applications differ widely. A study of electrical or electronic engineering depends very much on these underlying principles; these form the foundation for any qualification in the field, and are the basis of this unit.

The physical principles themselves build initially from our understanding of the atom, the concept of electrical charge, electric fields, and the behaviour of the electron in different types of material. This understanding is readily applied to electric circuits of different types, and the basic circuit laws and electrical components emerge. Another set of principles is built around semiconductor devices, which become the basis of modern electronics. An introduction to semiconductor theory leads to a survey of the key electronic components, primarily different types of diodes and transistors.

Electronics is very broadly divided into analogue and digital applications. The final section of the unit introduces the fundamentals of these, using simple applications. Thus, under analogue electronics, the amplifier and its characteristics are introduced. Under digital electronics, voltages are applied as logic values, and simple circuits made from logic gates are considered.

On successful completion of this unit students will have a good and wide-ranging grasp of the underlying principles of electrical and electronic circuits and devices, and will be able to proceed with confidence to further study.

Learning Outcomes

By the end of this unit students will be able to:

1. Apply an understanding of fundamental electrical quantities to evaluate circuits with constant voltages and currents.
2. Evaluate circuits with sinusoidal voltages and currents.
3. Describe the basis of semiconductor action, and its application to simple electronic devices.
4. Explain the difference between digital and analogue electronics, describing simple applications of each.

Essential Content

LO1 Apply an understanding of fundamental electrical quantities to analyse circuits with constant voltages and currents

Fundamental electrical quantities and concepts:

Charge, current, electric field, energy in an electrical context, potential, potential difference, resistance, electromotive force, conductors and insulators

Circuit laws:

Voltage sources, Ohm's law, resistors in series and parallel, the potential divider

Kirchhoff's and Thevenin's laws; superposition

Energy and power:

Transfer into the circuit through, for example, battery, solar panel or generator, and out of the circuit as heat or mechanical. Maximum power transfer

LO2 Analyse circuits with sinusoidal voltages and currents

Fundamental quantities of periodic waveforms:

Frequency, period, peak value, phase angle, waveforms, the importance of sinusoids

Mathematical techniques:

Trigonometric representation of a sinusoid. Rotating phasors and the phasor diagram. Complex notation applied to represent magnitude and phase

Reactive components:

Principles of the inductor and capacitor. Basic equations, emphasising understanding of rates of change (of voltage with capacitor, current with inductor). Current and voltage phase relationships with steady sinusoidal quantities, representation on phasor diagram

Circuits with sinusoidal sources:

Current and voltage in series and parallel RL, RC and RLC circuits. Frequency response and resonance

Mains voltage single-phase systems. Power, root-mean-square power quantities, power factor

Ideal transformer and rectification:

The ideal transformer, half-wave and full-wave rectification. Use of smoothing capacitor, ripple voltage

LO3 **Describe the basis of semiconductor action, and its application to simple electronic devices**

Semiconductor material:

Characteristics of semiconductors; impact of doping, p-type and n-type semiconductor materials, the p-n junction in forward and reverse bias

Simple semiconductor devices:

Characteristics and simple operation of junction diode, Zener diode, light emitting diode, bipolar transistor, Junction Field Effect Transistor (FET) and Metal Oxide Semiconductor FET (MOSFET). The bipolar transistor as switch and amplifier

Simple semiconductor applications:

Diodes: AC-DC rectification, light emitting diode, voltage regulation

Transistors: switches and signal amplifiers

LO4 **Explain the difference between digital and analogue electronics, describing simple applications of each**

Analogue concepts:

Analogue quantities, examples of electrical representation of, for example, audio, temperature, speed, or acceleration

The voltage amplifier; gain, frequency response, input and output resistance, effect of source and load resistance (with source and amplifier output modelled as Thevenin equivalent)

Digital concepts:

Logic circuits implemented with switches or relays

Use of voltages to represent logic 0 and 1, binary counting

Logic Gates (AND, OR, NAND, NOR) to create simple combinational logic functions

Truth Tables

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Apply an understanding of fundamental electrical quantities to analyse circuits with constant voltages and currents		
P1 Apply the principles of circuit theory to simple circuits with constant sources, to explain the operation of that circuit	**M1** Apply the principles of circuit theory to a range of circuits with constant sources, to explain the operation of that circuit	**D1** Evaluate the operation of a range of circuits with constant sources, using relevant circuit theories.
LO2 Analyse circuits with sinusoidal voltages and currents		
P2 Analyse series RLC circuits, using the principles of circuit theory with sinusoidal sources.	**M2** Analyse series and parallel RLC circuits, using the principles of circuit theory with sinusoidal sources.	**D2** Analyse the operation and behaviour of series and parallel RLC circuits, including resonance and using the principles of circuit theory with sinusoidal sources.
LO3 Describe the basis of semiconductor action, and its application to simple electronic devices		
P3 Describe the behaviour of a p-n junction in terms of semiconductor behaviour **P4** Demonstrate the action of a range of semiconductor devices	**M3** Explain the operation of a range of discrete semiconductor devices in terms of simple semiconductor theory	**D3** Analyse the performance of a range of discrete semiconductor devices in terms of simple semiconductor theory, and suggest applications for each.

Pass	Merit	Distinction
LO4 Explain the difference between digital and analogue electronics, describing simple applications of each		
P5 Explain the difference between digital and analogue electronics **P6** Explain amplifier characteristics **P7** Explain the operation of a simple circuit made of logic gates	**M4** Explain the benefits of using analogue and digital electronic devices using examples	**D4** Evaluate the use of analogue and digital devices and circuits using examples.

Recommended Resources

Textbooks

BIRD, J. (2013) *Electrical Circuit Theory and Technology*. Routledge.

HUGHES, E., HILEY, J., BROWN, K. and MCKENZIE-SMITH, I. (2012) *Electrical and Electronic Technology*. Pearson.

SINGH, K. (2011) *Engineering Mathematics through Applications*. Palgrave.

Pearson BTEC Higher Nationals Study Guide (2011) Custom Publishing. Pearson.

Links

This unit links to the following related units:

Unit 20: Digital Principles

Unit 22: Electronic Circuits and Devices

Unit 52: Further Electrical, Electronic and Digital Principles

Unit 40: Further Control Systems Engineering

Unit code	**Y/615/1522**
Unit level	**5**
Credit value	**15**

Introduction

Control engineering is usually found at the top level of large projects in determining the engineering system performance specifications, the required interfaces, and hardware and software requirements. In most industries, stricter requirements for product quality, energy efficiency, pollution level controls and the general drive for improved performance, place tighter limits on control systems.

A reliable and high performance control system depends a great deal upon accurate measurements obtained from a range of transducers, mechanical, electrical, optical and, in some cases, chemical. The information provided is often converted into digital signals on which the control system acts to maintain optimum performance of the process.

The aim of this unit is to provide the student with the fundamental knowledge of the principles of control systems and the basic understanding of how these principles can be used to model and analyse simple control systems found in industry. The study of control engineering is essential for most engineering disciplines, including electrical, mechanical, chemical, aerospace, and manufacturing.

On successful completion of this unit students will be able to devise a typical three-term controller for optimum performance, grasp fundamental control techniques and how these can be used to predict and control the behaviour of a range of engineering processes in a practical way.

Learning Outcomes

1. Discuss the basic concepts of control systems and their contemporary applications.
2. Analyse the elements of a typical, high-level control system and its model development.
3. Analyse the structure and behaviour of typical control systems.
4. Explain the application of control parameters to produce optimum performance of a control system.

Essential Content

LO1 **Examine the basic concepts of control systems and their contemporary applications**

Background, terminology, underpinning principles and system basics:

Brief history of control systems and their industrial relevance, control system terminology and identification, including plant, process, system, disturbances, inputs and outputs, initial time, additivity, homogeneity, linearity and stability

Basic control systems properties and configurations, classification and performance criteria of control systems

Block diagram representation of simple control systems and their relevance in industrial application

Principles of Transfer Function (TF) for open and closed loop systems, use of current computational tools for use in control systems (e.g. Matlab, Simuliunk, Labview)

LO2 **Explore the elements of a typical, high-level control system and its model development**

Developing system applications:

Simple mathematical models of electrical, mechanical and electro-mechanical systems

Block diagram representation of simple control systems

Introduction of Laplace transform and its properties, simple first and second order systems and their dynamic responses

Modelling and simulation of simple first and second order control system using current computational tool (e.g. Matlab/Simulink)

LO3 **Analyse the structure and behaviour of typical control systems**

System behaviour:

Transient and steady behaviour of simple open loop and closed loop control systems in response to a unit step input

Practical closed loop control systems and the effect of external disturbances

Poles and zeros and their role in the stability of control systems, steady-state error. Applicability of Routh-Hurwitz stability criterion

Use of current computational tools (e.g. Matlab, Simulink) to model, simulate and analyse the dynamic behaviour of simple open and closed loop control systems

LO4 **Explain the application of control parameters to produce optimum performance of a control system**

Control parameters and optimum performance:

Introduction to the three-term PID controller, the role of a Proportional controller (P), Integral controller (I) and the Derivative controller (D)

General block diagram representation and analysis, effects of each term, P-I-D, on first and second order systems

Simple closed loop analysis of the different combinations of the terms in PID controllers, effect of the three terms on disturbance signals and an introduction to simple PID controller tuning methods

Modelling and simulation using current computational tools (e.g. Matlab, Simuliunk, Labview) to analyse the effects of each P-I-D term, individually and in combination on a control system

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Examine the basic concepts of control systems and their contemporary applications</td><td rowspan="2">D1 Evaluate the performance of a PID controller to demonstrate basic control system techniques</td></tr>
<tr><td>P1 Examine the basic concepts of control systems using block diagram representation and simplifications

P2 Model simple open and closed loop control systems simulation software</td><td>M1 Apply advanced modelling techniques using commercially available control software

M2 Develop the block diagram of a closed loop system for the position control of DC motor using a PID controller</td></tr>
<tr><td colspan="2">LO2 Explore the elements of a typical, high-level control system and its model development</td><td rowspan="2">D2 Perform high-level self-tuning control system techniques using mathematical modelling and computer simulation</td></tr>
<tr><td>P3 Explore the main building blocks for high-level electrical and mechanical control systems

P4 Apply Laplace transforms to basic mechanical or electrical control problems</td><td>M3 Analyse Electrical, Mechanical and Electro-Mechanical control systems using appropriate mathematical models and computer simulation</td></tr>
</table>

Pass	Merit	Distinction
LO3 Analyse the structure and behaviour of typical control systems		
P5 Analyse the behaviour and response of first and second order systems **P6** Analyse the external effects on the stability of PID control systems and the techniques used to maintain stability in these systems	**M4** Evaluate using analytical techniques how the stability of a dynamic PID control system is maintained	**D3** Analyse the performance of an electro-mechanical control system when subjected to external disturbances
LO4 Examine the application of control parameters to produce optimum performance of a control system		
P7 Examine the role and implementation of the PID controllers in a simple electrical and mechanical control system **P8** Examine the effects of the P, I, and D parameters on the dynamic responses of the first and second order systems	**M5** Analyse dynamic responses of PID controllers in terms of position control, tracking and disturbance rejection	**D4** Analyse the behaviour of a control system when P, I, D terms are changed individually and in combination using modelling and computer simulation techniques

Recommended Resources

Textbooks

DABNEY, J.B. and HARMAN, T.L. (2003) *Mastering Simulink*. Prentice Hall.

DORF, R.C. and BISHOP, R.H. (2014) *Modern Control Systems*. 12th Ed. Pearson.

NISE, N.S. (2011) *Control Systems Engineering*. 6th Ed. John Wiley & Sons.

Links

This unit links to the following related units:

Unit 41: Distributed Control Systems

Unit 16: Instrumentation and Control Systems

Unit 41: Further Mathematics

Unit code	**H/615/1507**
Unit level	**5**
Credit value	**15**

Introduction

The understanding of more advanced mathematics is important within an engineering curriculum to support and broaden abilities within the applied subjects at the core of all engineering programmes. Students are introduced to additional topics that will be relevant to them as they progress to the next level of their studies, advancing their knowledge of the underpinning mathematics gained in *Unit 2: Engineering Maths*.

The unit will prepare students to analyse and model engineering situations using mathematical techniques. Among the topics included in this unit are: number theory, complex numbers, matrix theory, linear equations, numerical integration, numerical differentiation, and graphical representations of curves for estimation within an engineering context. Finally, students will expand their knowledge of calculus to discover how to model and solve engineering problems using first and second order differential equations.

On successful completion of this unit students will be able to use applications of number theory in practical engineering situations, solve systems of linear equations relevant to engineering applications using matrix methods, approximate solutions of contextualised examples with graphical and numerical methods, and review models of engineering systems using ordinary differential equations.

Learning Outcomes

By the end of this unit students will be able to:

1. Use applications of number theory in practical engineering situations.
2. Solve systems of linear equations relevant to engineering applications using matrix methods.
3. Approximate solutions of contextualised examples with graphical and numerical methods.
4. Review models of engineering systems using ordinary differential equations.

Essential Content

LO1 **Use applications of number theory in practical engineering situations**

Number theory:

Bases of a number (Denary, Binary, Octal, Duodecimal, Hexadecimal) and converting between bases

Types of numbers (Natural, Integer, Rational, Real, Complex)

The modulus, argument and conjugate of complex numbers

Polar and exponential forms of complex numbers

The use of de Moivre's Theorem in engineering

Complex number applications e.g. electric circuit analysis, information and energy control systems

LO2 **Solve systems of linear equations relevant to engineering applications using matrix methods**

Matrix methods:

Introduction to matrices and matrix notation

The process for addition, subtraction and multiplication of matrices

Introducing the determinant of a matrix and calculating the determinant for a 2x2 and 3x3 matrix

Using the inverse of a square matrix to solve linear equations

Gaussian elimination to solve systems of linear equations (up t 3x3)

LO3 **Approximate solutions of contextualised examples with graphical and numerical methods**

Graphical and numerical methods:

Standard curves of common functions, including quadratic, cubic, logarithm and exponential curves

Systematic curve sketching knowing the equation of the curve

Using sketches to approximate solutions of equations

Numerical analysis using the bisection method and the Newton–Raphson method

Numerical integration using the mid-ordinate rule, the trapezium rule and Simpson's rule

LO4 **Review models of engineering systems using ordinary differential equations**

Differential equations:

Formation and solutions of first-order differential equations

Applications of first-order differential equations e.g. RC and RL electric circuits, Newton's laws of cooling, charge and discharge of electrical capacitors and complex stresses and strains

Formation and solutions of second-order differential equations

Applications of second-order differential equations e.g. mass-spring-damper systems, information and energy control systems, heat transfer, automatic control systems and beam theory and RLC circuits

Introduction to Laplace transforms for solving linear ordinary differential equations

Applications involving Laplace transforms such as electric circuit theory, load frequency control, harmonic vibrations of beams, and engine governors

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Use applications of number theory in practical engineering situations		
P1 Apply addition and multiplication methods to numbers that are expressed in different base systems **P2** Solve engineering problems using complex number theory **P3** Perform arithmetic operations using the polar and exponential form of complex numbers	**M1** Solve problems using de Moivre's Theorem	**D1** Test the correctness of a trigonometric identity using de Moivre's Theorem
LO2 Solve systems of linear equations relevant to engineering applications using matrix methods		
P4 Calculate the determinant of a set of given linear equations using a 3x3 matrix **P5** Solve a system of three linear equations using Gaussian elimination	**M2** Determine the solution to a set of given engineering linear equations using the Inverse Matrix Method for a 3x3 matrix	**D2** Validate solutions for the given engineering linear equations using appropriate computer software

Pass	Merit	Distinction
LO3 Approximate solutions of contextualised examples with graphical and numerical methods		
P6 Estimate solutions of sketched functions using a graphical estimation method **P7** Calculate the roots of an equation using two different iterative techniques **P8** Determine the numerical integral of engineering functions using two different methods	**M3** Solve engineering problems and formulate mathematical models using graphical and numerical integration	**D3** Critically evaluate the use of numerical estimation methods, commenting on their applicability and the accuracy of the methods
LO4 Review models of engineering systems using ordinary differential equations		
P9 Formulate and solve first order differential equations related to engineering systems **P10** Formulate and solve second order homogeneous and non-homogeneous differential equations related to engineering systems **P11** Calculate solutions to linear ordinary differential equations using Laplace transforms	**M4** Demonstrate how different models of engineering systems using first-order differential equations can be used to solve engineering problems	**D4** Critically evaluate first and second-order differential equations when generating the solutions to engineering situations using models of engineering systems

Recommended Resources

Textbooks

BIRD, J. (2014) *Higher Engineering Mathematics*. 7th Ed. London: Routledge.

SINGH, K. (2011) *Engineering Mathematics Trough Applications*. Basingstoke, Palgrave Macmillan.

STROUD, K.A. and BOOTH, D.J. (2013) *Engineering Mathematics*. 7th Ed: Basingstoke, Palgrave Macmillan.

Journals

Communications on Pure and Applied Mathematics. Wiley.

Journal of Engineering Mathematics. Springer.

Journal of Mathematical Physics. American Institute of Physics.

Websites

http://www.mathcentre.ac.uk/	Maths Centre (Tutorials)
http://www.mathtutor.ac.uk/	Maths Tutor (Tutorials)

Links

This unit links to the following related unit:

Unit 2: Engineering Maths

11 Appendices

Appendix 1: Mapping of HND in Agriculture against FHEQ Level 5

Key	
KU	Knowledge and Understanding
CS	Cognitive Skills
AS	Applied Skills
TS	Transferable Skills

The qualification will be awarded to students who have demonstrated:

FHEQ Level 5 descriptor		Agriculture HND Programme Outcome
Knowledge and critical understanding of the well-established principles of their area(s) of study, and of the way in which those principles have developed.	KU1	Knowledge and understanding of the fundamental principles and practices of the contemporary global horticultural industry.
	KU2	Knowledge and understanding of the external agricultural industrial environment and its impact upon local, national and global levels of strategy, behaviour, management and sustainability.
	KU3	Understanding and insight into different agricultural practices, their diverse nature, purposes, structures and operations and their influence upon the external environment.
	KU4	A critical understanding of the ethical, legal, professional, and operational frameworks within which the agricultural industries operate.
	KU5	A critical understanding of processes, procedures and practices for effective management of products, services and people.
	KU6	A critical understanding of the evolving concepts, theories and models within the study of agriculture across a range of practical and hypothetical scenarios.
	KU7	An ability to evaluate and analyse a range of concepts, theories and models to make appropriate agricultural decisions.

FHEQ Level 5 descriptor		Agriculture HND Programme Outcome
	KU8	An appreciation of the concepts and principles of CPD, staff development, leadership and reflective practice as methods and strategies for personal and people development.
Ability to apply underlying concepts and principles outside the context in which they were first studied, including, where appropriate, the application of those principles in an employment context.	CS1	Apply knowledge and understanding of essential concepts, principles and models within the contemporary global agricultural industries.
	AS1	Evidence the ability to show client relationship management and develop appropriate policies and strategies to meet stakeholder expectations.
	AS2	Apply innovative agricultural ideas to develop and create new products or services that respond to the changing nature of the agricultural industries.
	AS3	Integrate theory and practice through the investigation and examination of practices in the workplace.
	AS4	Develop outcomes for clients/businesses using appropriate practices and data to make justified recommendations.
	CS2	Develop different strategies and methods to show how resources (human, financial and information) are integrated and effectively managed to successfully meet objectives.
Knowledge of the main methods of enquiry in the subject(s) relevant to the named award, and ability to evaluate critically the appropriateness of different approaches to solving problems in the field of study.	CS3	Critically evaluate current principles of the agricultural industries, and their application to problem-solving.
	CS4	Apply project management tools/techniques for reporting and planning, control and problem-solving.
	KU9	Knowledge and understanding of how the agricultural industries influence the development of people and businesses.
	CS5	Critique a range of horticultural technology systems and operations, and their application, to maximise and successfully meet strategic objectives.
	KU10	An understanding of the appropriate techniques and methodologies used to resolve real-life problems in the workplace.

FHEQ Level 5 descriptor		Agriculture HND Programme Outcome
An understanding of the limits of their knowledge, and how this influences analysis and interpretations based on that knowledge.	TS1	Develop a skill-set to enable the evaluation of appropriate actions taken for solving problems in a specific agricultural context.
	TS2	Self-reflection, including self-awareness; the ability to become an effective independent student and appreciate the value of the self-reflection process.

Typically, holders of the qualification will be able to:

FHEQ Level 5 descriptor		**Agriculture HND Programme Outcome**
Use a range of established techniques to initiate and undertake critical analysis of information, and to propose solutions to problems arising from that analysis.	TS3	Competently use digital literacy to access a broad range of research sources, data and information.
	CS6	Interpret, analyse and evaluate a range of data, sources and information to inform evidence-based decision-making.
	CS7	Synthesise knowledge and critically evaluate strategies and plans to understand the relationship between theory and real-world horticultural industry scenarios.
Effectively communicate information, arguments and analysis in a variety of forms to specialist and non-specialist audiences, and deploy key techniques of the discipline effectively.	TS4	Communicate confidently and effectively, both orally and in writing, internally and externally, with agricultural industry professionals and other stakeholders.
	TS5	Communicate ideas and arguments in an innovative manner using a range of digital media.
	AS5	Locate, receive and respond to a variety of information sources (e.g. textual, numerical, graphical and computer-based) in defined contexts.
	TS6	Demonstrate strong interpersonal skills, including effective listening and oral communication skills, as well as the associated ability to persuade, present, pitch and negotiate.
Undertake further training, develop existing skills and acquire new competences that will enable them to assume significant responsibility within organisations.	TS7	Identify personal and professional goals for Continuing Professional Development to enhance competence to practise within a chosen agricultural field.
	TS8	Take advantage of available pathways for Continuing Professional Development through higher education and Professional Body Qualifications.

Holders will also have:

FHEQ Level 5 descriptor		Agriculture HND Programme Outcomes
The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision-making.	TS9	Develop a range of skills to ensure effective team working, independent initiatives, organisational competence and problem-solving strategies.
	TS10	Reflect adaptability and flexibility in approach to Agriculture, showing resilience under pressure and meeting challenging targets within given deadlines.
	TS11	Use quantitative skills to manipulate data, evaluate and verify existing theory.
	CS8	Evaluate the changing needs of the agricultural industries and have confidence to self-evaluate and undertake additional CPD as necessary.
	TS12	Emotional intelligence and sensitivity to diversity in relation to people and cultures.

Appendix 2: HNC/HND Agriculture Programme Outcomes for Students

	Knowledge and Understanding										Cognitive skills								Applied skills					Transferable skills											
Unit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	X	X	X				X				X				X	X			X		X	X	X	X		X	X					X	X		X
2	X				X		X			X		X		X		X	X		X		X	X		X		X	X				X		X		
3	X	X	X	X		X	X	X		X	X	X	X	X		X	X		X	X	X		X		X	X	X	X	X	X		X	X		
4	X	X	X	X			X		X		X		X		X	X	X				X		X	X		X	X	X	X			X	X		
5	X	X	X	X		X	X				X		X		X	X	X				X		X			X	X	X	X			X	X		X
6	X	X	X	X			X				X		X		X	X	X				X		X	X		X	X	X	X			X	X		
7	X	X	X	X			X		X		X		X		X	X	X				X		X	X		X	X	X	X			X	X		
8	X	X	X	X		X	X			X	X		X			X	X			X	X		X	X		X	X	X	X			X	X	X	X
9	X	X	X	X	X		X			X	X		X	X	X	X	X				X		X			X	X		X	X		X	X		X
10	X				X		X			X		X		X		X	X		X		X	X		X		X	X				X				X
11	X	X		X	X	X	X	X	X	X		X				X	X	X			X					X	X				X	X		X
12	X					X	X				X		X		X		X		X	X	X	X	X			X	X			X		X			
13	X	X	X	X	X	X	X		X		X		X	X	X	X	X			X	X	X	X	X		X	X	X	X			X	X		
14	X	X	X	X	X	X	X				X		X		X	X	X			X	X		X			X	X	X	X			X	X		X
15	X	X	X	X	X	X	X	X			X	X	X		X	X	X			X	X		X	X		X	X	X	X			X	X		X
16	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X			X	X		X	X		X	X	X				X	X		X
17	X		X	X			X	X				X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
18	X		X	X	X	X	X		X	X	X		X	X	X	X	X		X		X	X	X	X		X	X	X	X	X		X	X	X	X
19	X	X	X		X	X	X		X			X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X			X	X		X
20	X	X	X	X	X	X	X				X		X		X	X	X			X	X		X			X	X	X	X			X	X		
21	X	X	X	X	X	X	X			X	X	X	X	X		X	X		X		X	X	X	X		X	X					X	X	X	X
22	X	X	X	X	X	X	X				X		X		X	X	X			X	X		X			X	X	X	X			X	X		X
23	X	X	X	X	X	X	X				X		X			X	X				X		X			X	X		X			X	X		X
24	X		X			X	X	X			X		X			X	X	X		X	X	X	X	X	X	X	X				X	X	X	

	Knowledge and Understanding										Cognitive skills								Applied skills					Transferable skills											
Unit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
25	X		X	X		X	X				X		X			X	X				X		X			X	X	X	X			X	X		X
26	X	X	X			X	X		X		X		X			X	X				X		X			X	X	X	X			X	X	X	X
27	X		X			X	X				X		X		X	X	X				X		X	X		X	X		X			X	X		
28	X		X			X	X				X		X		X	X	X				X		X	X		X	X		X			X	X		
29	X		X	X		X	X			X	X		X			X	X			X	X		X	X		X	X	X	X			X	X		X
30	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X		X		X	X	X	X		X	X		X		X	X	X	X	
31	X		X	X		X	X				X		X			X	X				X		X			X	X		X			X	X		X
32	X		X	X		X	X				X		X		X	X	X				X		X			X	X	X	X			X	X		X
33	X	X	X	X		X	X		X		X		X			X	X				X		X			X	X		X			X	X		X
34	X					X	X										X								X										
35	X										X						X															X			
36	X										X						X				X			X			X									
37	X										X						X				X			X			X									
38	X																X								X		X					X				
39	X	X	X		X	X	X		X	X														X							X		X		X
40	X	X	X		X	X	X														X			X									X			
41	X										X						X				X			X			X						X			

Appendix 3: Glossary of terms used for internally assessed units

This is a summary of the key terms used to define the requirements within units.

Term	Definition
Analyse	Present the outcome of methodical and detailed examination either: • breaking down a theme, topic or situation in order to interpret and study the interrelationships between the parts and/or • of information or data to interpret and study key trends and interrelationships. Analysis can be through activity, practice, written or verbal presentation.
Apply	Put into operation or use. Use relevant skills/knowledge/understanding appropriate to context.
Arrange	Organise or make plans.
Assess	Offer a reasoned judgement of the standard/quality of a situation or a skill informed by relevant facts.
Calculate	Generate a numerical answer with workings shown.
Compare	Identify the main factors relating to two or more items/situations or aspects of a subject that is extended to explain the similarities, differences, advantages and disadvantages. This is used to show depth of knowledge through selection of characteristics.
Compose	Create or make up or form.
Communicate	Convey ideas or information to others. Create/construct skills to make or do something, for example a display or set of accounts.
Create/ Construct	Skills to make or do something, for example, a display or set of accounts.
Critically analyse	Separate information into components and identify characteristics with depth to the justification.
Critically evaluate	Make a judgement taking into account different factors and using available knowledge/experience/evidence where the judgement is supported in depth.
Define	State the nature, scope or meaning.
Describe	Give an account, including all the relevant characteristics, qualities and events.

Term	Definition
Discuss	Consider different aspects of a theme or topic, how they interrelate, and the extent to which they are important.
Demonstrate	Show knowledge and understanding.
Design	Plan and present ideas to show the layout/function/workings/object/system/process.
Develop	Grow or progress a plan, ideas, skills and understanding
Differentiate	Recognise or determine what makes something different.
Discuss	Give an account that addresses a range of ideas and arguments.
Evaluate	Work draws on varied information, themes or concepts to consider aspects, such as: • strengths or weaknesses • advantages or disadvantages • alternative actions • relevance or significance. Students' inquiries should lead to a supported judgement showing relationship to its context. This will often be in a conclusion. Evidence will often be written but could be through presentation or activity.
Explain	To give an account of the purposes or reasons.
Explore	Skills and/or knowledge involving practical research or testing.
Identify	Indicate the main features or purpose of something by recognising it and/or being able to discern and understand facts or qualities.
Illustrate	Make clear by using examples or provide diagrams.
Indicate	Point out, show.
Interpret	State the meaning, purpose or qualities of something through the use of images, words or other expression.
Investigate	Conduct an inquiry or study into something to discover and examine facts and information.
Justify	Students give reasons or evidence to: • support an opinion • prove something is right or reasonable.
Outline	Set out the main points/characteristics.
Plan	Consider, set out and communicate what is to be done.
Produce	To bring into existence.
Reconstruct	To assemble again/reorganise/form an impression.

Term	Definition
Report	Adhere to protocols, codes and conventions where findings or judgements are set down in an objective way.
Review	Make a formal assessment of work produced. The assessment allows students to: • appraise existing information or prior events • reconsider information with the intention of making changes, if necessary.
Show how	Demonstrate the application of certain methods/theories/concepts.
Stage and manage	Organisation and management skills, for example, running an event or a [Sector] pitch.
State	Express.
Suggest	Give possible alternatives, produce an idea, put forward, for example, an idea or plan, for consideration.
Undertake/ carry out	Use a range of skills to perform a task, research or activity.

This is a key summary of the types of evidence used for BTEC Higher Nationals:

Type of evidence	Definition
Case study	A specific example to which all students must select and apply knowledge.
Project	A large scale activity requiring self-direction of selection of outcome, planning, research, exploration, outcome and review.
Independent research	An analysis of substantive research organised by the student from secondary sources and, if applicable, primary sources.
Written task or report	Individual completion of a task in a work-related format, for example, a report, marketing communication, set of instructions, giving information.
Simulated activity/role play	A multi-faceted activity mimicking realistic work situations.
Team task	Students work together to show skills in defining and structuring activity as a team.
Presentation	Oral or through demonstration.
Production of plan/business plan	Students produce a plan as an outcome related to a given or limited task.
Reflective journal	Completion of a journal from work experience, detailing skills acquired for employability.
Poster/leaflet	Documents providing well-presented information for a given purpose.

Appendix 4: Assessment methods and techniques for Higher Nationals

Assessment technique	Description	Transferable skills development	Formative or Summative
Academic graphic display	This technique asks students to create documents providing well-presented information for a given purpose. Could be a hard or soft copy.	Creativity Written communication Information and communications technology Literacy	Formative Summative
Case study	This technique present students with a specific example to which they must select and apply knowledge.	Reasoning Critical thinking Analysis	Formative Summative
Discussion forum	This technique allows students to express their understanding and perceptions about topics and questions presented in the class or digitally, for example, online groups, blogs.	Oral/written communication Appreciation of diversity Critical thinking and reasoning Argumentation	Formative
Independent research	This technique is an analysis of research organised by the student from secondary sources and, if applicable, primary sources.	Information and communications technology Literacy Analysis	Formative
Oral/Viva	This technique asks students to display their knowledge of the subject via questioning.	Oral communication Critical thinking Reasoning	Summative

Assessment technique	Description	Transferable skills development	Formative or Summative
Peer review	This technique asks students to provide feedback on each other's performance. This feedback can be collated for development purposes.	Teamwork Collaboration Negotiation	Formative Summative
Presentation	This technique asks students to deliver a project orally or through demonstration.	Oral communication Critical thinking Reasoning Creativity	Formative Summative
Production of an artefact/ performance or portfolio	This technique requires students to demonstrate that they have mastered skills and competencies by producing something. Some examples are [Sector] plans, using a piece of equipment or a technique, building models, developing, interpreting, and using maps.	Creativity Interpretation Written and oral communication Interpretation Decision-making Initiative Information and Communications Technology Literacy, etc.	Summative
Project	This technique is a large scale activity requiring self-direction, planning, research, exploration, outcome and review.	Written communication Information Literacy, Creativity, Initiative.	Summative

Assessment technique	Description	Transferable skills development	Formative or Summative
Role playing	This technique is a type of case study, in which there is an explicit situation established, with students playing specific roles, understanding what they would say or do in that situation.	Written and oral communication Leadership Information literacy Creativity Initiative.	Formative
Self-reflection	This technique asks students to reflect on their performance, for example, to write statements of their personal goals for the course at the beginning of the course, what they have learned at the end of the course and their assessment of their performance and contribution; completion of a reflective journal from work experience, detailing skills acquired for employability.	Self-reflection Written communication Initiative Decision-making Critical thinking	Summative
Simulated activity	This technique is a multi-faceted activity based on realistic work situations.	Self-reflection Written communication Initiative Decision-making Critical thinking	Formative Summative
Team assessment	This technique asks students to work together to show skills in defining and structuring an activity as a team. All team assessment should be distributed equally, each of the group members performing their role, and then the team collates the outcomes, and submits it as a single piece of work.	Collaboration Teamwork Leadership Negotiation Written and oral communication	Formative Summative

Assessment technique	Description	Transferable skills development	Formative or Summative
Tiered knowledge	This technique encourages students to identify their gaps in knowledge. Students record the main points they have captured well and those they did not understand.	Critical thinking Analysis Interpretation Decision-making Oral and written communication	Formative
Time constrained assessment	This technique covers all assessment that needs to be done within a centre-specified time constrained period on-site.	Reasoning Analysis Written communication Critical thinking Interpretation	Summative
Top ten	This technique asks students to create a 'top ten' list of key concepts presented in the assigned reading list.	Teamwork Creativity Analysis Collaboration	Formative
Written task or report	This technique asks students to complete an assignment in a structured written format, for example, a [Sector] plan, a report, marketing communication, set of instructions, giving information.	Reasoning Analysis Written communication Critical thinking, interpretation.	Summative

Appendix 5: Transferable skills mapping

Level 4 Higher National Certificate in Agriculture: mapping of transferable employability and academic study skills

Skill Set	Cognitive skills						Intra-personal Skills				Interpersonal Skills			
Unit	Problem Solving	Critical Thinking/Analysis	Decision Making	Effective Communication	Digital Literacy	Numeracy	Creativity	Plan Prioritise	Self-Management	Independent learning	Self-Reflection	Team Work	Leadership	Cultural Awareness
1	X	X	X	X	X	X		X	X	X	X	X		X
2	X	X	X	X	X	X		X	X	X	X	X	X	
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X		X	X	X	X	X		X
5	X	X	X	X	X		X	X	X	X		X		X
6	X	X	X	X	X	X		X	X	X				X
7	X	X	X	X	X	X		X	X	X		X	X	X
8	X	X	X	X	X			X	X	X	X	X		X
9	X	X	X	X	X	X	X	X	X	X	X	X	X	
10	X	X	X	X		X		X	X	X	X		X	X

Skill Set	Cognitive skills						Intra-personal Skills				Interpersonal Skills			
Unit	Problem Solving	Critical Thinking/Analysis	Decision Making	Effective Communication	Digital Literacy	Numeracy	Creativity	Plan Prioritise	Self-Management	Independent learning	Self-Reflection	Team Work	Leadership	Cultural Awareness
11	X	X	X	X	X		X	X	X	X	X	X	X	X
12	X	X	X	X	X		X	X	X	X	X	X	X	X
13	X		X	X	X	X		X	X	X		X	X	
14	X	X	X	X	X			X	X	X	X			X
15	X	X	X	X	X	X		X	X	X	X	X		X
16	X	X	X	X		X		X	X	X	X	X	X	X
17	X	X	X	X	X		X	X	X	X	X			X
34	X					X	X	X	X	X				
35	X	X		X	X	X			X	X				
36	X	X		X	X	X			X	X				
37	X	X		X	X	X			X	X				
38	X	X	X		X	X		X	X	X	X			
39	X	X	X	X	X	X		X	X	X	X	X		

Level 5 Higher National Diploma in Agriculture: mapping of transferable employability and academic study skills

Skill Set	Cognitive skills						Intra-personal Skills				Interpersonal Skills			
Unit	Problem Solving	Critical Thinking/Analysis	Decision Making	Effective Communication	Digital Literacy	Numeracy	Creativity	Plan Prioritise	Self-Management	Independent learning	Self-Reflection	Team Work	Leadership	Cultural Awareness
18	X	X		X	X	X		X	X	X	X			
19	X	X	X	X	X	X	X	X	X	X	X	X	X	
20	X		X	X	X			X	X	X	X			X
21	X	X		X	X			X	X	X	X			X
22	X	X		X	X	X		X	X	X	X			X
23	X	X		X	X	X		X	X	X	X			X
24	X		X	X			X	X	X	X	X	X	X	X
25	X	X	X	X	X	X		X	X	X	X			X
26	X			X	X			X	X	X	X	X		X
27	X	X	X	X			X	X	X	X	X	X	X	X
28	X	X		X	X	X		X	X	X	X			X
29	X	X	X	X		X		X	X	X	X	X	X	X
30	X		X	X			X	X	X	X	X			X
31			X	X	X		X	X	X	X	X			X
32	X	X	X	X			X	X	X	X	X		X	X
33	X	X	X	X		X	X	X	X	X	X	X	X	X
40	X	X	X		X	X		X	X	X	X			
41	X	X	X	X	X	X		X	X	X	X			

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