RHS Qualifications Awarding Body

RHS Level 3 Advanced Certificate in Horticulture

General Guidance Notes and Syllabus

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The Royal Horticultural Society, Qualifications Section,
Wisley, Woking, Surrey GU23 6QB

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1 BACKGROUND STATUS

1.1 The RHS Level 3 Advanced Certificate in Horticulture was established in 2000 as part of a progressive programme of primarily vocational horticultural examinations run by the Royal Horticultural Society. These examinations are as follows:-

RHS Level 2 Certificate in Horticulture
RHS Level 3 Advanced Certificate in Horticulture
RHS Level 3 Diploma in Horticulture
Master of Horticulture (RHS) Award

The RHS Level 3 Advanced Certificate in Horticulture is a modular qualification involving both theoretical and practical elements. It comprises the first half of the RHS Level 3 Diploma in Horticulture, and in academic terms equates to two GCE 'A/S ' levels or Year One of an Edexcel National Diploma in Horticulture.

Candidates who successfully complete the RHS Level 3 Advanced Certificate in Horticulture will be eligible to register as candidates for the RHS Level 3 Diploma award.

The RHS Level 3 Certificate in Horticulture is an accredited award granted through the Office of the Qualifications and Examinations Regulator (Ofqual). **Accreditation No. 100/5844/8**.

2 AIMS OF THE AWARD

2.1 Success in the RHS Level 3 Advanced Certificate in Horticulture recognises achievement in theoretical and practical aspects of horticulture.

2.2 As a result of success in the examination, candidates will be able to:-

2.2.1 Apply a broad range of horticultural skills and understanding to practical horticulture;

2.2.2 Relate the practices of horticulture to their underlying scientific principles;

2.2.3 Devise reasoned solutions to horticultural problems.

2.3 Candidates who are successful in the award will hold a valuable vocational qualification with which to support job applications, achieve career enhancement and progress to the RHS Level 3 Diploma in Horticulture.

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3 COURSE OF STUDY

3.1 To give full coverage of the syllabus, a minimum of **180 tutor-led** taught hours is recommended.

In devising a programme of study, it will be helpful for students to have a course running over an academic year, or more, in order that a wide range of seasonal operations can be seen in practice.

Particular attention should be given to the range of practical skills required by the examination. Such skills may be gained in a variety of ways and centres should consider regular practical sessions, short courses or workshops to ensure that candidates are well prepared for the practical examination.

4 INTERPRETATION OF THE SYLLABUS (See Appendix 1)

4.1 The syllabus is the basis for the written and practical examinations.

4.2 Candidates are not expected to have a detailed knowledge of unusual plants, crops or specialist techniques. Preparing candidates for the examination should involve providing a firm foundation in horticultural science and a good knowledge of horticultural practices. Candidates should understand and be able to apply current horticultural techniques and provide relevant examples of their use.

The content section of the syllabus for each unit will indicate the depth and breadth of knowledge required.

4.3 The RHS Level 3 Advanced Certificate in Horticulture examination will assume a knowledge of topical horticultural issues. Candidates should have an understanding of planning, legislation, protection and enhancement of the environment, and other matters that affect the horticultural industry generally. The ability to provide objective, critical appraisal of such issues will be an advantage.

4.4 Candidates should be aware that only **metric units** will be used, and all answers must be given using metric units.

4.5 Candidates will benefit from an appreciation of recent research work and developments that have been applied to horticultural practice.

4.6 The written examinations comprise a range of short answer and structured questions designed to cover the whole syllabus. A choice of structured questions is provided and the emphasis is on the opportunity for candidates to display their skills and understanding, rather than to seek out shortcomings or weaknesses. Candidates should be given regular practice in answering written examination questions, preferably using examples from relevant sections of previous RHS Level 3 Diploma in Horticulture papers, and Level 3 Advanced Certificate papers, as they become available.

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4.7

4.7.1 The practical examination is a free-standing module which tests a range of common practical skills. Candidates need to develop basic proficiency and should be encouraged to practice for such tests.

4.7.2 The practical examinations involve a selection of the following types of test:

- practical tasks involving bench and plotwork;
- identification of plants, pests, diseases, disorders and materials;
- laboratory-orientated tests in fundamental techniques; oral questions.

4.7.3 Requirements of the practical examination are set out within the syllabus. (See Appendix 1).

5 THE EXAMINATIONS

5.1 The three written examinations are of modular format, with each examination lasting two hours. Each module will comprise 10 short answer questions, to be completed in half an hour, and 6 structured questions from which three must be answered including one from each component unit. All modules may be taken in one year or they may be taken individually. For one module, a choice must be made from three optional modules. There will be two written examination periods annually, in February and early July.

5.2 The 3 hour practical examination module may be taken at approved regional centres usually in September/October. Success in the written modules is **not** a requirement of entry.

6 SCRIPT MARKING

6.1 RHS Examiners consider the most positive answers to be those which fulfil the following criteria:

a) Relate specifically to the question set, and in the case of structured answers are illustrated by clearly labelled diagrams where appropriate;

b) Include appropriate factual information;

c) Are presented legibly, clearly and logically, with appropriate headings and paragraphs in the case of structured questions.

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7 ELIGIBILITY

7.1 There is no minimum academic entry requirements for the RHS Level 3 Advanced Certificate examination. Registration is open to school leavers, mature students, junior professionals, and dedicated amateurs.

7.2 The examination is intended for junior professionals embarking on a career in horticulture, mature students and dedicated amateurs. Those who have no previous experience of horticulture will benefit from taking the RHS Level 2 Certificate in Horticulture prior to studying for the RHS Level 3 Advanced Certificate in Horticulture.

7.3 Candidates should be made aware of the need for broad practical experience in horticulture, and of the fact that progression from the RHS Level 2 to the RHS Level 3 Advanced is a considerable step.

8 REGISTRATION REQUIREMENTS

8.1 The closing dates for entry of the written examinations are **30 November 2010** for the February 2011 examination session and **6 May 2011** for the July 2011 examination session, and for the practical examination **31 March 2011**.

8.2 Registration may be by module or for the complete RHS Level 3 Advanced Certificate.

8.3 To enrol for the Examinations, entries will normally be made through the candidate's centre of study, to arrive no later than the closing date.

8.4 Candidates will normally pay their fee direct to the centre of study. The fee is £45.00 (£ Sterling) per written unit and £80.00 (£ Sterling) for the practical unit. The fee is **not refundable**.

8.5 The written examinations will normally be taken at the Centre where a course of study is being followed. The practical examination will be held at regional centres approved by the RHS. The Society reserves the right to nominate where the candidate should attend.

8.6 Candidates needing to re-sit either the written or practical modules should enter through their centre and pay the fee per module in the same way as the first registration.

8.7 It is the candidate's responsibility to ensure that they have been entered for the examination.

8.8 Candidates who wish to defer their entry to another date may do so without incurring any penalties; provided RHS Qualifications is notified up to **6 weeks** prior to the examination. Inside of six weeks, candidates will lose the fee unless exceptional circumstances prevail (medical grounds or similar).

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8.9 Candidates following distance-learning courses towards this examination should contact and enrol through the Examinations office at their local approved centre. If candidates require further information, they should contact RHS Qualifications on 01483 226500.

8.10 Candidates not enrolled on courses at their chosen Examination Centre may be subject to a nominal fee, payable directly to the college.

8.11 In exceptional circumstances, the Examination may be taken at a place other than the approved centre, under the supervision of a person acceptable to The Royal Horticultural Society. In such cases, an Exceptional Supervision Application Form should be requested from the RHS Qualifications section.

8.12 Candidates entered for the examination **must** bring photograhic proof of identity before being allowed to sit the examination (driving licence or similar photo ID).

8.13 In order to avoid loss or delay in the post, your examination centre must be notified of any change of surname, address, or telephone number.

8.14 Candidates must be punctual for the examination and make allowances for unfamiliar journeys, car parking etc.

9 NOTIFICATION OF RESULTS

9.1 The results of the examination will be notified to centres during April for the February Examination session and September for the July session. The Practical results will be sent within four weeks of taking the examination. The results will be sent to candidates by their nominated centre. Candidates who pass the written and practical modules will receive a certificate indicating the grade of Pass. The regulatory authorities' logos on the certificates issued for the qualification, indicate that the qualification is accredited for England, Wales and Northern Ireland.

9.2 Centres will be notified by post, of their candidates' results in the Examination.

9.3 Centres will also be sent a list of their candidates' results which will include the overall mark gained by each candidate.

9.4 Candidates who are unsuccessful or who consider that their result was not as good as they expected should be aware that Examination Papers including the Examiners' Reports are available to download from the RHS website.

As well as the examination results in summary it will give general guidance, based on candidates' performance in that examination, on how higher marks might be achieved with specific comments on each question.

Please refer to Enquiries About Result Service, item 13, (page 8) for further information about the options for the clerical checking and remarking for individual candidates scripts.

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10 QUALIFYING AND GRADING REQUIREMENTS

10.1 **Written Modules**.

A **Pass** will be awarded to candidates who achieve an average mark between 50% and 69% for each of the written modules.
A Pass with Commendation will be awarded to candidates who achieve an average mark of 70% or more for each written module.

10.2 **Practical Modules**

A **Pass** will be awarded to candidates who achieve an overall mark of 55%, **and** who achieve a mark of 50% or more in each section of the examination.
A Pass with Commendation will be awarded to candidates who achieve an average mark of 70% and above.

11 PRIZES

11.1 In 2002 the Society inaugurated The Hector Harrison Award, donated by his family, to be awarded annually at a special presentation ceremony to the candidate obtaining the highest number of marks in the examination.

12 PREVIOUS EXAMINATION PAPERS

12.1 Past examination papers are available to download free-of-charge from the RHS website. Alternatively, printed copies can be ordered for a fee from the Society's Qualifications Section.

13 ENQUIRIES ABOUT RESULTS SERVICE

13.1 An Enquiry about Results Service administered by the RHS Qualifications Section is available to candidates.

13.2 The service provides two options which will be at a cost to the candidate, payable to the Society. Re-mark £40.00 per unit. Re-mark and Report £60.00 per unit.

13.3 Should the findings result in a change of grade, the candidate's fee will be refunded.

13.4 Applications for this service should be made through the examination centre. All centres have been provided with full details of this service.

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14 REASONABLE ADJUSTMENTS

14.1 Applications for Reasonable Adjustments should be made through the centre providing the course of study.

14.2 Evidence should be provided at the time of entry for the examination. However, if this is not available at the time of entry, it must be submitted no later than 31 December for the February examination and 29 May for the July examination.

14.3 All centres have been provided with full details and application forms for this service.

15 RHS QUALIFICATIONS POLICIES

15.1 The conduct of RHS Examinations is covered by the RHS Qualifications Equal Opportunities policy, Customer Service Statement and Appeals Policy. Copies of the above policies are available from RHS Qualifications on request. Alternatively, copies can be obtained through our website:
. http://www.rhs.org.uk/Courses/Qualifications/RHS-qualification-policies

15.2 The Council of the Royal Horticultural Society reserves the right to modify the Regulations. In any question of interpretation the decision of the Council is final.

16 COMMUNICATION

16.1 Requests for information about the Royal Horticultural Society's other qualifications and any correspondence relating to RHS Qualifications should be addressed to:

RHS Qualifications,
The Royal Horticultural Society,
Wisley, Woking, Surrey
GU23 6QB.
Telephone: 01483 226500 email: qualifications@rhs.org.uk

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Appendix 1

RHS Level 3 Advanced Certificate in Horticulture Syllabus

Index to Units

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Module A (Compulsory)

Unit Title: Understanding of Plant Propagation

Unit Code: H/103/5804

Unit Value: 1

Unit Level: Advanced Certificate

Description of Unit:

This unit requires students to use underpinning knowledge from other units to develop an understanding of propagation techniques. Propagation by seed and by vegetative methods are examined and compared together with the equipment required for both. The unit will enable students to understand working practices in relation to plant propagation.

Summary of outcomes

1. Relate scientific principles to horticultural practices.
2. Relevance of plant anatomy and physiology to propagation by seed.
3. Seed treatments.
4. Environmental factors affecting the germination of seeds.
5. Propagation by seed.
6. Relevance of plant anatomy and physiology to vegetative propagation.
7. Care of stock plants.
8. Use of propagation equipment.
9. Vegetative propagation.
10. Risk assessments.

Content

Identifying safe health and working practices at all times:

1. Relate scientific principles to horticultural practices.

Wherever possible, horticultural science should be related to horticultural practice.

2. Relevance of plant anatomy and physiology to propagation by seed.

Importance of the testa, radicle, plumule, cotyledons and hypocotyl to propagation from seed. Importance of physiological processes of water uptake, osmosis and respiration to the germination of seed. Dormancy.

3. Importance of seed treatments.

Relevance to propagators of grading, chitting, priming, coating, dusting, soaking, heat treatment, acid treatment, scarification, stratification, vernalisation and rubbing of seeds.

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4. Environmental factors affecting the germination of seeds.

Importance of hygiene and optimum storage and germination conditions for successful germination and maximum viability. The avoidance of plant pathogens. Explanation of effects of environmental factors to include light, temperature and moisture on selected named species.

5. Propagation by seed.

Using appropriate named examples, state: specification of appropriate media for seed sowing according to type and size of seed (large, medium and fine seed). Explanation of sowing and aftercare techniques for seeds, sown in the open and under protection.

6. Relevance of plant anatomy and physiology to vegetative propagation.

The importance of the cambium, node, petiole, stem, leaf, root and axillary bud to vegetative propagation. Importance of physiological processes of transpiration, respiration and photosynthesis to vegetative propagation.

7. Care of stock plants.

Need for juvenility of stock plants to ensure rootability of cutting material. Factors to be considered when selecting material for propagation, stage of growth, freedom from pests and diseases, trueness to type.

8. Use of propagation equipment.

Explanation of the role of mist and fogging units, sunframes, plastic covers, and heated bins in plant propagation. Explanation of how their use optimises rooting or germination potential. Names of three distinct plants propagated using each of the above facilities.

9. Vegetative propagation.

Description of the following techniques of vegetative propagation including pre-treatment where appropriate: Stem cuttings: soft tip, greenwood, half ripe and hard wood. Root cuttings and root-bud cuttings. Leafbud, leaf petiole and leaf lamina/sections cuttings. Layering and runners. Division. Grafting and budding. Scaling of bulbs. Scoring and scooping of bulbs. Growing point of corms. Specification of appropriate rooting medium and facilities for a range of vegetatively propagated species. Aftercare of plants raised by the above methods up to successful regeneration. Appropriate named examples should be used to support each method of propagation.

10. Risk assessments.

Risk assessment of plant propagation practices. Safe working practices. Identification of appropriate personal safety clothing and equipment.

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Understanding of Plant Propagation

Level: **Advanced Certificate**

Unit Value: **1**

Learning outcomes:	**Assessment criteria**
1. Understand the relationship between scientific principles of this unit and horticultural practices.	1.1 Relate the scientific principles to horticultural practices.
2. Explain the relevance of anatomy and physiology in relation to propagation from seed.	2.1 Describe the importance of a range of anatomical features in the development of germinating seeds.
	2.2 Relate the importance of the main physiological processes to the successful germination of seed.
3. Evaluate a range of seed treatments.	3.1 Evaluate the relevance to propagators of a range of chemical and physical seed treatments.
4. Describe the environmental factors affecting the germination of seeds.	4.1 Explain the importance of hygiene and optimum storage and germination conditions on the maximum viability in the germination of seeds.
	4.2 Explain the importance of the avoidance of plant pathogens in the germination of seeds.
	4.3 Explain the effects of environmental conditions on the germination of some species of seed.
5. Describe the propagation of a range of plants from seed.	5.1 State the appropriate propagating media for a range of seeds.
	5.2 Describe the sowing and aftercare of a range of seed types sown in containers.
	5.3 Describe the sowing and aftercare of seed in the open ground.
6. Explain the relevance of anatomy and physiology in relation to propagation.	6.1 State the importance of a range of anatomical features to successful plant propagation.
	6.2 Explain the importance of the main physiological processes to successful plant propagation.

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7.	Evaluate stock plant care in the provision of propagation materials.	7.1	Relate the routine care of stock plants to juvenility and the quality and rootability of propagation material.
		7.2	Explain the critical factors to be considered when selecting cutting material from stock plants.
8.	Explain the use of a range of propagation equipment.	8.1	Identify the components of a range of propagation facilities.
		8.2	Explain how the use of these facilities optimises rooting/germination potential.
		8.3	Name three distinct examples of plants propagated using each of the facilities.
9.	Describe the vegetative propagation for a range of plants.	9.1	Select the appropriate technique and medium for vegetatively propagating a range of plants.
		9.2	Describe the propagation of a range of plants (using a range of techniques).
		9.3	Describe the aftercare of the plants raised by the methods described.
10.	Undertake risk assessments for all operations.	10.1	Determine the element of risk in all plant propagation operations.
		10.2	Identify safe working practices for the above range of construction tasks to include personal protective equipment and clothing.

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Module A (Compulsory)

Unit Title: Processes and Application of Soils, Growing Media and Plant Nutrition

Unit Code K/103/5805

Unit Value: 2

Unit Level: Advanced Certificate

Description of Unit:

This unit provides the underpinning knowledge required for the understanding of the processes and applications in horticulture associated with the nature of growing media and plant nutrition.

Summary of outcomes

1. Relate scientific principles to horticultural practices.
2. Physical properties of soils and other growing media.
3. Role of living organisms in the soil processes.
4. Chemistry of soils and other growing media.
5. Role of nutrients in plant growth.
6. Scientific principles underpinning processes involved in preparation of soil and other growing media.
7. Water in the soil and other growing media.
8. Alternative growing media.
9. Environmental issues associated with growing media and major plant nutrients.
10. Risk assessment.

Content

Identifying safe health and working practices at all times:

1. Relate scientific principles to horticultural practices.

Wherever possible, horticultural science should be related to horticultural practice.

2. Physical properties of soils and other growing media.

The nature of UK soils; development, formation, types, classifications, mapping, workability/suitability for horticultural uses, effects of cultivating, compaction. Texture and structure of soils (to include mechanical analysis), colloids, change of soil structure (to include weather and biological factors). Evaluation of soil types: sandy, silt, fine sand, clay, chalky, gravel and organic.

3. Role of living organisms in the soil processes.

Origins of soil organic matter. The effect of soil organisms on plant remains. Biological activity including the carbon and nitrogen cycles, mycorrhiza, and nitrogen fixing organisms.

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4. Chemistry of soils and other growing media.

Cation and anion interactions. Materials and methods for changing pH. Factors affecting the availability of plant nutrients. Mineral and nutrient disorders. Nutrient loss from the growing media.

5. Role of nutrients in plant growth.

Function of nutrients in plants. Major and minor elements; symptoms, causes and controls of deficiencies and toxicities, monitoring and control of pH, salinity/conductivity levels, nutrient status. Types of fertiliser; organic, inorganic, slow and quick release, controlled release fertilisers, frits, chelates. Bulky organic manures. Sampling and chemical analysis of growing media; the interpretation of results; role of sap, leaf and tissue analysis.

6. Scientific principles underpinning processes involved in preparation of soil and other growing media.

Effects of cultivations, machinery and cropping systems on soil structure. Restoration of reclaimed soils. Measurement of compaction, bulk density in soils and other growing media. Techniques for soil improvement, structure maintenance and improvement of fertility.

7. Water in the soil and other growing media.

Wetting and drying growing media; porosity, pore space/air capacity, saturation/waterlogging; water availability, soil moisture deficit, field capacity, temporary and permanent wilting, drainage and drainage systems. Effect of water on plant growth. Water-holding capacity of soils and its effect on workability and crop production. Maintenance of soil moisture content.

8. Alternative growing media.

Characteristics of growing media components and mixes. Alternatives to soils for use in horticulture; composts/mixes, coir, bark, rockwool, perlite, vermiculite, expanded clay, lightweight aggregate, aeroponics, gel hydroponics, nutrient film technique. Evaluation for horticultural purposes, cultivation of plants on/in inert substances.

9. Environmental issues associated with growing media and major plant nutrients.

Fertilisers and manures; leaching, surface run-off, pollution, erosion and methods of prevention, to include windbreaks and shelter belts. Peat alternatives to include; coir, bark, garden compost, leafmould, recycled landfill, seaweed, sewage sludge, spent mushroom compost, straw.

10. Risk Assessment.

Carry out risk assessment, and determine safe working practices and select appropriate personal safety clothing and equipment.

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Processes and Application of Soils, Growing Media and Plant Nutrition

Level: **Advanced Certificate**

Unit value: **2**

Learning outcomes:	**Assessment criteria**
1. Understand the relationship between scientific principles of this unit and horticultural practices.	1.1 Relate the scientific principles to horticultural practices.
2. Evaluate the physical properties of soils and other growth media and explain their effects on plant growth.	2.1 Explain the process of soil formation and development.
	2.2 Interpret features of soil horizons.
	2.3 Relate soil types to The Soil Survey and to HMSO maps.
	2.4 Review the properties of soil organic matter, soil colloids, and mineral components.
	2.5 Describe and classify the range of soil structures, and explain the change of soil structure.
	2.6 Explain soil air and water relationships and evaluate drainage characteristics.
	2.7 Evaluate a range of soils for use in horticulture.
	2.8 Describe the natural agents, which affect the structure of the soil.
3. Examine the role of living organisms in soil processes.	3.1 Summarise biological activity in soils and growing media.
	3.2 Describe the nitrogen cycle and summarise the role of nitrogen-fixing organisms.
	3.3 Compare the roles of the rhizosphere and mycorrhiza in aiding healthy plant growth.
	3.4 Explain the origin of soil organic matter and describe changes in plant remains due to the activities of soil organisms.

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4.	Investigate the chemistry of soils and other growth media.	4.1	Summarise processes involved in cation exchange and anion interactions.
		4.2	Compare materials for and methods of changing pH to obtain optimum growing conditions.
		4.3	Identify the factors that affect the availability of plant nutrients from growth media.
		4.4	Describe the role of the soil as a source of plant nutrients, compare factors controlling nutrient availability and review ways in which nutrients are lost from the soil.
5.	Determine the role of nutrients in plant growth.	5.1	Explain the role of mineral elements in plant nutrition and metabolism.
		5.2	Differentiate between the need of the plant for major and minor elements.
		5.3	Describe the symptoms of major nutrient deficiencies and toxicities.
		5.4	State the cause and method of control of major nutrient deficiencies and toxicities in a range of growth media and situations.
		5.5	Relate nutrient uptake to the physiological status of the plant and status of growing medium.
		5.6	Explain how nutrients are gained held and lost from growing media in a variety of situations.
		5.7	Explain how growing media pH, nutrient status and salinity can be monitored and controlled.
		5.8	Review alternative methods of determining the nutrient status of a plant.
		5.9	Relate nutrient deficiencies and excesses to the antagonism between nutrient elements.
		5.10	Review the range of fertilisers and bulky organic materials available for use in horticulture and compare formulation and mode of nutrient release.
		5.11	Interpret and apply analytical data.
6.	Explain the scientific principles	6.1	Assess the effects of cultivations, machinery

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	underpinning processes involved in preparation of soil and growth media.		and cropping systems on soil structure and review techniques for the restoration of reclaimed soils.
		6.2	Measure compaction and bulk density in soils and growing media and discuss the significance of results.
		6.3	Describe a range of techniques used to improve and maintain structure and fertility in soils.
7.	Relate water in the soil and other growth media to plant growth.	7.1	Relate Soil Moisture Deficit, Available Water Content, Field capacity to soil types.
		7.2	Describe the changes that occur as water is added to a dry growing medium.
		7.3	Describe the changes that occur as a growing medium dries from being saturated to its permanent wilting point.
		7.4	Explain the effect of water moisture content on the performance of the growing medium and the growth of plants.
		7.5	Relate water-holding capacity of soils to workability and crop production.
		7.6	Describe management techniques for helping to maintain soil moisture at appropriate levels.
		7.7	Describe a range of drainage systems for different soil types.
8.	Review the range of alternative growing media.	8.1	Identify materials used in alternative growing media.
		8.2	Evaluate media ingredients and mixes used to grow plants in containers and units.
		8.3	Review the alternatives to peat for a range of horticultural uses.
		8.4	Describe the cultivation of plants on/in inert substances.
		8.5	Describe hydroponic methods for the cultivation of plants.

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9.	Discuss the major environmental issues associated with horticultural growing media and major plant nutrients.	9.1	Explain the effects of leaching and surface run off and relate to pollution.
		9.2	Identify the causes of pollution and erosion and methods of prevention.
		9.3	Evaluate the environmental and health implications of the use of peat and its alternatives.
		9.4	Explain the importance of selecting the correct fertiliser and applying at the correct rate.
10.	Undertake risk assessments.	10.1	Determine the elements of risk in all of the practical operations associated with this unit.
		10.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module B (Compulsory)

Unit Title: Principles of Plant Taxonomy, Morphology and Anatomy

Unit Code: M/103/5806

Unit Value: 1

Unit Level: Advanced Certificate

Descriptions of Unit:

This unit will enable students to understand the principles of plant classification and nomenclature and to identify the role and function of higher plants' anatomical and morphological features.

Summary of outcomes

1. Relate scientific principles to horticultural practices.
2. Knowledge of Plant Kingdom and understanding of taxonomic hierarchy.
3. Identification and description of plant cells and tissues, their structure and function.
4. Role and function of specific vegetative parts of the plant.
5. Role of flowers and fruit.
6. Role and function of seed and developing embryo.
7. Risk assessment.

Content

Identifying safe health and working practices at all times:

1. Relate scientific principles to horticultural practices.

Wherever possible horticultural science should be related to horticultural practice.

2. Knowledge of Plant Kingdom and understanding of taxonomic hierarchy.

Divisions, Classes, Orders. Family, genus, species, subspecies, variety, cultivar. Reasons for botanical/horticultural nomenclature. Local, national, international, specific meaning relative to country, colour, shape, person. Glossary of botanical terms, plant keys.

3. Identification and description of plant cells and tissues, their structure and function.

Structure/function: The basic cell and its components, parenchyma, sclerenchyma, collenchyma, epidermis, cortex, phloem, xylem, cambium, endodermis, pericycle. Changes in woody plants: lignification, cork, lenticels, medullary rays. Differences between monocotyledon and dicotyledon structure. Development of root initials in plant propagation.

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4. Role of specific vegetative parts of the plant.

Roots: tap roots, root tips, root cap, root hairs, lateral roots, adventitious roots, root adaptations: aerial, tuber and tap. Stem: nodes, internodes, lateral/axillary buds, apical buds, stem adaptations: tuber, rhizome and corm. Leaf: petiole, lamina, midrib, shape, colour, hairs, leaf adaptations: bulbs, thorns, tubular leaves, tendrils.

5. Role of flowers and fruit.

Inflorescences and flower characteristics. Sepals, petals, tepals, calyx, corolla, nectaries, androecium, anther, filament, gynaecium, stigma, style, ovary, ovule. Fruits: hard, dry, fleshy, succulent, dehiscent. Indehiscent, colour, shape.

6. Role and function of seed and developing embryo.

Importance of testa, hilum, plumule, hypocotyl, radicle, cotyledon(s), micropyle and endosperm to germination from seed. Monocotyledon/dicotyledon examples.

7. Risk Assessment.

Risk assessment practices. Identification of appropriate safe working practices, safety clothing and equipment.

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Principles of Plant Taxonomy, Morphology and Anatomy

Level: **Advanced Certificate**

Unit value: **1**

Learning outcomes:	Assessment criteria
1. Understand the relationship between the scientific principles of this unit and horticultural practices.	1.1 Relate scientific principles to horticultural practices.
2. Demonstrate a knowledge of the Plant Kingdom and understanding of the taxonomic hierarchy.	2.1 Investigate and describe the major divisions of the Plant Kingdom. 2.2 Specify the characteristics of seed bearing plants. 2.3 State the basic hierarchical units and explain how and when they are used. 2.4 Evaluate the importance of botanical and horticultural nomenclature and demonstrate the practical application of each. 2.5 Identify how species nomenclature can relate its meaning to particular plant characteristics.
3. Identify and describe the different types of plant cells and tissues, their structure and function.	3.1 Explain the function of the major components of the typical plant cell. 3.2 Identify and explain the role of plant tissues, and explain their function within the plant. 3.3 Investigate and describe the cell and tissue changes, which occur during secondary thickening.
4. Determine the role and function of specific vegetative parts of the plant.	4.1 Identify and describe the component parts of the root, root systems and root adaptations. 4.2 Identify and describe the component parts of leaves and leaf adaptations. 4.3 Identify and describe the component parts of stems and stem adaptations. 4.4 Identify and explain the function of the features described above.

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5.	Determine the role of function or the reproductive parts of the plant.	5.1	Identify and describe the types of inflorescence and the characteristics of the flower.
		5.2	Explain the role of the components of the flower.
		5.3	Identify and describe the types of fruit, and their characteristics.
6.	Demonstrate an understanding of the role and function of the seed in life cycle of the plant .	6.1	Identify and describe the parts of the seed.
		6.2	Explain the function of the parts of the seed.
		6.3	Identify and describe the parts of the developing embryo.
		6.4	Explain the function of the parts of the developing embryo.
7.	Undertake risk assessments.	7.1	Determine the elements of risk in all of the practical operations associated with this unit.
		7.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module B (Compulsory)

Unit Title: Knowledge of Plant Health

Unit Code: T/103/5807

Unit value: 1

Unit Level: Advanced Certificate

Descriptions of Unit:

This unit provides the underpinning knowledge which will be applied in the practice units. It develops the background knowledge and understanding of pest, disease and weed life cycles and modes of infestation. Cultural, biological, chemical and integrated pest management systems are investigated. Legislation and safe handling practices relating to pesticides and their use are reviewed. Construction and calibration of pesticide application equipment is described.

Summary of outcomes

1. Relate scientific principles to horticultural practices.
2. Characteristics of pests, diseases and disorders of horticultural importance.
3. Characteristics of horticulturally important weeds.
4. Methods of pest, disease and weed control.
5. Pesticide legislation.
6. Construction and calibration of pesticide application equipment.
7. Risk assessment.

Content

Identifying safe health and working practices at all times:

1. Relate scientific principles to horticultural practices.

Wherever possible horticultural science should be related to horticultural practices.

2. Characteristics of pests, diseases and disorders of horticultural importance.

Identification and classification of pests, diseases and disorders to include: insects, mites, mollusc, nematodes, fungi, bacteria and viruses. (See practical unit for range). Classification of symptoms and damage. Life cycles of pests and diseases including viruses with emphasis on their survival, spread and transmission (see practical unit for range). An examination of the causes of physiological disorders and the symptoms of environmental stress (see practical unit for range). Causes of pest and disease outbreaks.

3. Characteristics of horticulturally important weeds.

Identification of a range of weeds, to include ephemeral, annual, biennial and perennial weeds appropriate to all aspects of horticulture. Their significance in horticulture. Success of weeds. (See practical unit for range).

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4. Methods of pest, disease and weed control.

Current developments in pest, disease and weed management methods; cultural biological and integrated control; economic thresholds; pest and disease forecasting and warning methods. Phytosanitary controls, quarantine and legislation. Pesticides types, formulations and methods of action including contact, systemic, residual, translocated, stomach poisons, biological pesticides, partial soil pasteurisation and hot water treatments of plants, persistence and long term effects of pesticides. Resistance to chemicals by pests, diseases and weeds. Thermal death points of soil pathogens. Introduction of genetically modified plants.

5. Pesticide legislation.

Statutory requirements relating to use and storage of pesticides at work, Control of Substances Hazardous to Health (COSHH) and Food and Environment Protection Act (FEPA) legislation. Selection of pesticides. Safe use of pesticides in relation to residues and areas open to the public.

6. Construction and calibration of pesticide application equipment.

Selection of equipment, construction and use of hand operated or mounted sprayers and controlled droplet applicators. Design and use of nozzles. Calibration of application equipment.

7. Risk assessment.

Carry out risk assessment and determine safe working practices and selection of appropriate personal safety clothing and equipment.

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Knowledge of Plant Health

Level: **Advanced Certificate**

Unit value: **1**

Learning outcomes:	**Assessment criteria**
1. Understand the relationship between scientific principles of this unit and horticultural practice.	1.1 Relate scientific principles to horticultural practices.
2. Demonstrate a knowledge of the characteristics of a range of pests, diseases and disorders of horticultural importance.	2.1 Identify and classify a range of pests, diseases and disorders using diagnostic features and evaluate their significance in horticulture.
	2.2 Classify symptoms and damage caused by pests, diseases and disorders and state appropriate method of control.
	2.3 Compare the life cycles of a range of plant pests and diseases with emphasis on survival, spread and transmission.
	2.4 Describe methods by which viruses can be transmitted.
3. Demonstrate a knowledge of the characteristics of a range of horticulturally important weeds.	3.1 Identify a range of weeds and review their significance to horticulture.
	3.2 Explain the success of weeds in competition with other plants.
4. Evaluate current methods of pest, disease and weed control for their effectiveness and suitability.	4.1 Report on current developments in chemical, cultural, biological control and integrated pest management methods.
	4.2 Assess the effectiveness of phytosanitary controls and legislation aimed at preventing distribution of pests and diseases by trade and plant movement.
	4.3 Compare a range of pesticide types, formulations, and activities and explain their modes of action, their persistence and long-term effects.
	4.4 Discuss resistance to chemicals by pests, diseases and weeds.
	4.5 Compare and contrast alternative methods of partial soil sterilisation.

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		4.6	State the physical and biological effects of partial soil sterilisation.
5.	Review the requirements and regulations pertaining to storage, handling and safe use of chemicals used for plant protection and weed control.	5.1	Review current pesticide legislation and statutory requirements relating to health and safety at work and to substances hazardous to health.
		5.2	Select a range of pesticide chemicals using appropriate sources.
		5.3	Describe the safe use of pesticides in relation to residue levels and areas to which the public has access.
6.	Describe the construction and calibration of pesticide application equipment.	6.1	Name suitable equipment for the application of pesticide chemicals.
		6.2	Describe the construction and use of a spray applicator.
		6.3	Compare the design and construction of a range of sprayer nozzles and state the purpose of each.
		6.4	Describe how to calibrate a spray applicator.
7.	Undertake risk assessments.	7.1	Determine the elements of risk in all of the practical operations associated with this unit.
		7.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module B (Compulsory)

Unit Title: Process of Plant Physiology I

Unit Code; A/103/5808

Unit Value: 1

Unit Level: Advanced Certificate

Description of Unit:

This unit examines the fundamental life processes of photosynthesis, respiration and movement of water through a plant. In all cases links are made with other sciences and practise units. Links are also made with the relevant parts of the Plant Taxonomy, Morphology and Anatomy unit.

Summary of outcomes

1. Relate scientific principles to horticultural practices.
2. Photosynthesis and growing plants.
3. The mechanisation and role of respiration in the metabolism of plants.
4. The role of water in the plant.
5. Movement of water and assimilates through a plant.
6. Understand effects of growth movements on plant growth and development.
7. Risk assessment.

Content

Identifying safe health and working practices at all times:

1. Relate scientific principles to horticultural practices.

Wherever possible horticultural science should be related to horticultural practices.

2. Photosynthesis and growing plants.

The biochemical process of photosynthesis (in outline only), the role of chloroplasts, law of limiting factors and the manipulation of environmental conditions in protected structures for maximum photosynthetic efficiency.

3. The mechanism and role of respiration in the metabolism of plants.

The role of respiration in the metabolic pathway; anaerobic and aerobic respiration in horticulture; links between photosynthesis and respiration.

4. The role of water in the plant.

Characteristics of water, which make it essential to life. The role of water in the plant, osmosis, ex osmosis and soluble salt content. Diffusion and properties of semi permeable membranes. Water potential (pressure and pressure gradients).

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5. The movement of water and assimilates through a plant.

Movement of water and solutes through the plant; effect of environmental conditions on transpiration to include evaporative cooling, stomatal movement, turgidity and wilting. Movement of metabolic products.

6. Understand effects of growth movements on plant growth and development.

Positive and negative responses of plant growth to factors such as; water, light, gravity, touch, temperature and other factors. Relationship of these to horticultural practices e.g. plant propagation, irrigation, harvesting and storage of cut flowers.

7. Risk Assessment.

Carry out risk assessment and determine safe working practices and select appropriate personal safety clothing and equipment.

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Processes of Plant Physiology I

Level: **Advanced Certificate**

Unit value: **1**

Learning outcomes:	**Assessment criteria**
1. Understand the relationship between scientific principles of this unit and horticultural practices.	1.1 Relate the scientific principles to horticultural practices.
2. Explain the mechanism and the role of photosynthesis in the metabolism of plants and relate to plant growth in controlled environments .	2.1 Describe the biochemical process of photosynthesis.
	2.2 Explain the role of chloroplasts in photosynthesis.
	2.3 Discuss the manipulation of environmental conditions in protected structures in relation to photosynthetic efficiency.
3. Explain the mechanism and the role of respiration in the metabolism of plants.	3.1 Explain the central role of respiration in metabolic pathways.
	3.2 Compare aerobic with anaerobic respiration.
	3.3 Describe the links between photosynthesis and respiration.
4. Demonstrate an understanding of the role of water in the plant.	4.1 Explain the processes of osmosis and diffusion and state the properties of a semi permeable membrane.
	4.2 Describe the role of water in the plant.
	4.3 Describe the implications of water potential.
5. Review the movement of water, solutes and assimilates through the plant.	5.1 Explain how water and solutes enter and move through the plant.
	5.2 Describe the effects of environmental conditions on transpiration.
	5.3 Explain how metabolic products move from their source to where they are used or stored, including energy dissipation.

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6.	Understand the effects of tropisms and other plant movements on growth and development.	6.1	Define: ‘tropisms’.
		6.2	Describe a range of positive and negative tropisms.
		6.3	Relate various tropisms and other plant movements to sound horticultural practices.
		6.4	Describe the physiological processes, which cause the different forms of tropism and other plant growth movements.
7.	Undertake risk assessments.	7.1	Determine the elements of risk in all of the practical operations associated with this unit.
		7.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module C (Compulsory)

Unit Title: Practical Horticulture I

Unit Code:- F/103/5809

Unit Value: 1

Unit Level: Advanced Certificate

Description of Unit:

This unit requires students to develop a capability in a range of practical horticultural skills.

Summary of outcomes

1. Identify soil texture and measure pH.
2. Sow seeds in open ground.
3. Sow seeds in containers.
4. Prick off/out seedlings.
5. Propagate a range of plants vegetatively.
6. Carry out aftercare on young plants.
7. Plant a range of plant material.
8. Maintain a range of established plants.
9. Identify a range of plants (including weeds), plant pests, diseases and disorders.
10. Risk assessment.

Content

Identifying safe health and working practices at all times:

1. Identify soil textures and measure pH.

Identify sandy loam, silty loam and clay loam soils by feel. pH testing by soil indicator and relate to plant selection.

2. Sow seeds in open ground.

Set out and prepare drills, or sowing tilths, using rakes and hoes, marking rods, lines and stakes. Sow seed in drills and broadcast in open ground. Label and cover drills, or rake in broadcast seed.

3. Sow seeds in containers.

Prepare sow and cover trays, pots or modules using medium provided. Sow large seeds e.g. sweet pea, marrow or cucumber. Sow medium seeds e.g. Marigold, Lettuce or Tomato. Sow fine seeds e.g. Lobelia or Begonia semperflorens. Label and indicate appropriate location for germination.

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4. Prick off/out seedlings.

Prick off/out seedlings into trays and modules (clumps and single seedlings). Carry out aftercare by labelling, watering and selection of location for growing on.

5. Propagate a range of plants vegetatively.

Propagate a range of plants vegetatively: Using the materials provided, take stem cuttings, leaf cuttings and root cuttings and insert. Label all work and indicate location for rooting.

6. Carry out aftercare on young plants.

Carry out aftercare on young plants: Pot up and pot on a range of rooted cuttings and/or established seedlings in 8/9cm pots. Stop a range of established cuttings (e.g. Fuchsia), stake/support and tie in young planted out plants (e.g. sweet peas).

7. Plant a range of plant material.

Plant bare root and container grown plant material in open ground and containers (to include woody, herbaceous, hardy and half hardy annuals, vegetable plants and fruit). Mulch, stake, support, protect as appropriate.

8. Maintain a range of established plants.

Prune a range of established plants including bush fruit and ornamental shrubs. Train plants e.g. climbers or tomatoes.

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9.	Identify a range of plants (including weeds), plant pests, diseases and disorders.

Trees

Acer griseum	*Aceraceae*
Acer japonicum	*Aceraceae*
Acer platanoides	*Aceraceae*
Aesculus hippocastanum	*Hippocastanaceae*
Alnus incana	*Betulaceae*
Amelanchier lamarckii	*Rosaceae*
Arbutus unedo	*Ericaceae*
Betula pendula	*Betulaceae*
Carpinus betulus	*Corylaceae*
Castanea sativa	*Fagaceae*
Catalpa bignonioides	*Bignoniaceae*
Cercidiphyllum japonicum	*Cercidiphyllaceae*
Cercis siliquastrum	*Caesalpiniaceae*
Crataegus monogyna	*Rosaceae*
Crataegus persimilis 'Prunifolia'	*Rosaceae*
Eucalyptus gunnii	*Myrtaceae*
Fagus sylvatica	*Fagaceae*
Ilex aquifolium	*Aquifoliaceae*
Laburnum x *watereri* 'Vossii'	*Papilionaceae*
Liquidambar styraciflua	*Hamamelidaceae*
Liriodendron tulipifera	*Magnoliaceae*
Magnolia x *soulangeana*	*Magnoliaceae*
Malus floribunda	*Rosaceae*
Malus 'John Downie'	*Rosaceae*
Malus tschonoskii	*Rosaceae*
Pittosporum tenuifolium	*Pittosporaceae*
Platanus x *hispanica*	*Platanaceae*
Prunus avium 'Plena'	*Rosaceae*
Prunus cerasifera 'Pissardii'	*Rosaceae*
Prunus x *subhirtella* 'Autumnalis'	*Rosaceae*
Pyrus calleryana 'Chanticleer'	*Rosaceae*
Pyrus salicifolia 'Pendula'	*Rosaceae*
Quercus ilex	*Fagaceae*
Quercus robur	*Fagaceae*
Robinia pseudoacacia	*Papilionaceae*
Salix x *sepulcralis* var.*chrysocoma*	*Salicaceae*
Sorbus aria	*Rosaceae*
Sorbus aucuparia	*Rosaceae*
Tilia cordata	*Tiliaceae*

Conifers

Abies koreana	*Pinaceae*
Araucaria araucana	*Araucariaceae*
Cedrus deodara	*Pinaceae*
Chamaecyparis lawsoniana	*Cupressaceae*
Chamaecyparis pisifera 'Boulevard'	*Cupressaceae*
Cryptomeria japonica 'Elegans Group	*Cupressaceae*
x *Cupressocyparis leylandii*	*Cupressaceae*
Cupressus macrocarpa	*Cupressaceae*
Ginkgo biloba	*Ginkgoaceae*
Juniperus horizontalis	*Cupressaceae*
Juniperus x *pfitzeriana*	*Cupressaceae*
Juniperus scopulorum 'Skyrocket'	*Cupressaceae*
Larix decidua	*Pinaceae*
Metasequoia glyptostroboides	*Cupressaceae*
Picea pungens 'Koster'	*Pinaceae*
Pinus sylvestris	*Pinaceae*
Taxodium distichum	*Cupressaceae*
Taxus baccata	*Taxaceae*
Thuja occidentalis 'Rheingold'	*Cupressaceae*
Thuja plicata	*Cupressaceae*

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Shrubs

Abelia x *grandiflora*	*Caprifoliaceae*	*Lavatera olbia*	*Malvaceae*
Acer palmatum	*Aceraceae*	*Ligustrum ovalifolium*	*Oleaceae*
Aucuba japonica	*Aucubaceae*	*Magnolia grandiflora*	*Magnoliaceae*
Berberis darwinii	*Berberidaceae*	*Magnolia stellata*	*Magnoliaceae*
Berberis thunbergii	*Berberidaceae*	*Mahonia japonica*	*Berberidaceae*
Brachyglottis monroi	*Asteraceae*	*Olearia macrodonta*	*Asteraceae*
Buddleja davidii	*Buddlejaceae*	*Osmanthus delavayi*	*Oleaceae*
Buxus sempervirens	*Buxaceae*	*Pachysandra terminalis*	*Buxaceae*
Calluna vulgaris	*Ericaceae*	*Perovskia atriplicifolia*	*Lamiaceae*
Camellia japonica	*Theaceae*	*Philadelphus coronarius*	*Hydrangeaceae*
Caryopteris x *clandonensis*	*Verbenaceae*	*Phlomis fruticosa*	*Lamiaceae*
Carpenteria californica	*Hydrangeaceae*	*Phormium tenax*	*Phormiaceae*
Ceanothus thyrsiflorus	*Rhamnaceae*	*Photinia* x *fraseri* 'Red Robin'	*Rosaceae*
Ceratostigma willmottianum	*Plumbaginaceae*	*Potentilla fruticosa*	*Rosaceae*
Chaenomeles speciosa	*Rosaceae*	*Prunus* x *cistena*	*Rosaceae*
Choisya ternata	*Rutaceae*	*Prunus laurocerasus*	*Rosaceae*
Cistus x *cyprius*	*Cistaceae*	*Prunus lusitanica*	*Rosaceae*
Cornus alba	*Cornaceae*	*Pyracantha rogersiana*	*Rosaceae*
Cornus sanguinea	*Cornaceae*	*Rhododendron ponticum*	*Ericaceae*
Corylus avellana	*Corylaceae*	*Rhus typhina*	*Anacardiaceae*
Cotinus coggygria	*Anacardiaceae*	*Ribes sanguineum*	*Grossulariaceae*
Cotoneaster dammeri	*Rosaceae*	*Rosa glauca*	*Rosaceae*
Cotoneaster frigidus 'Cornubia'	*Rosaceae*	*Rosa moyesii*	*Rosaceae*
Cotoneaster horizontalis	*Rosaceae*	*Rosa rugosa*	*Rosaceae*
Cytisus x *praecox*	*Papilionaceae*	*Rosmarinus officinalis*	*Lamiaceae*
Daphne x *burkwoodii*	*Thymelaeaceae*	*Salvia officinalis*	*Lamiaceae*
Daphne odora	*Thymelaeaceae*	*Sambucus nigra*	*Caprifoliaceae*
Deutzia gracilis	*Hydrangeaceae*	*Santolina chamaecyparissus*	*Asteraceae*
Elaeagnus x *ebbingei*	*Elaeagnaceae*	*Sarcococca confusa*	*Buxaceae*
Erica carnea	*Ericaceae*	*Skimmia japonica*	*Rutaceae*
Escallonia 'Iveyi'	*Escalloniaceae*	*Spartium junceum*	*Papilionaceae*
Euonymus fortunei	*Celastraceae*	*Spiraea thunbergii*	*Rosaceae*
Euphorbia characias	*Euphorbiaceae*	*Symphoricarpos orbiculatus*	*Caprifoliaceae*
Ficus carica	*Moraceae*	*Syringa vulgaris*	*Oleaceae*
Forsythia suspensa	*Oleaceae*	*Thymus vulgaris*	*Lamiaceae*
Fuchsia magellanica	*Onagraceae*	*Ulex europaeus*	*Papilionaceae*
Garrya elliptica	*Garryaceae*	*Viburnum carlesii*	*Caprifoliaceae*
Genista lydia	*Papilionaceae*	*Viburnum davidii*	*Caprifoliaceae*
Hebe albicans	*Scrophulariaceae*	*Viburnum farreri*	*Caprifoliaceae*

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Hebe salicifolia	*Scrophulariaceae*	*Viburnum opulus*	*Caprifoliaceae*
Helianthemum nummularium	*Cistaceae*	*Viburnum tinus*	*Caprifoliaceae*
Hydrangea macrophylla	*Hydrangeaceae*	*Vinca major*	*Apocynaceae*
Hypericum calycinum	*Clusiaceae*	*Vinca minor*	*Apocynaceae*
Jasminum nudiflorum	*Oleaceae*	*Weigela florida*	*Caprifoliaceae*
Kerria japonica 'Pleniflora'	*Rosaceae*	*Yucca filamentosa*	*Agavaceae*
Kolkwitzia amabilis	*Caprifoliaceae*		
Laurus nobilis	*Lauraceae*		
Lavandula angustifolia	*Lamiaceae*		

Climbers

Actinidia kolomikta	*Actinidiaceae*	*Lonicera japonica*	*Caprifoliaceae*
Akebia quinata	*Lardizabalaceae*	*Lonicera periclymenum*	*Caprifoliaceae*
Campsis radicans	*Bignoniaceae*	*Parthenocissus henryana*	*Vitaceae*
Clematis armandii	*Ranunculaceae*	*Parthenocissus quinquefolia*	*Vitaceae*
Clematis montana	*Ranunculaceae*	*Passiflora caerulea*	*Passifloraceae*
Clematis tangutica	*Ranunculaceae*	*Rosa* 'Albertine'	*Rosaceae*
Clematis viticella	*Ranunculaceae*	*Rosa filipes* 'Kiftsgate'	*Rosaceae*
Eccremocarpus scaber	*Bignoniaceae*	*Rosa* 'New Dawn'	*Rosaceae*
Fallopia baldschuanica	*Polygonaceae*	*Solanum crispum* 'Glasnevin'	*Solanaceae*
Hedera colchica	*Araliaceae*	*Trachelospermum jasminoides*	*Apocynaceae*
Hedera helix	*Araliaceae*	*Vitis coignetiae*	*Vitaceae*
Humulus lupulus 'Aureus'	*Cannabaceae*	*Vitis vinifera* 'Purpurea'	*Vitaceae*
Hydrangea anomala subsp *petiolaris*	*Hydrangeaceae*	*Wisteria sinensis*	*Papilionaceae*
Jasminum officinale	*Oleaceae*		
Lathyrus latifolius	*Papilionaceae*		

Herbaceous perennials

Acanthus spinosus	*Acanthaceae*	*Hosta sieboldiana*	*Hostaceae*
Achillea millefolium	*Asteraceae*	*Iberis sempervirens*	*Brassicaceae*
Aconitum napellus	*Ranunculaceae*	*Iris pallida*	*Iridaceae*
Ajuga reptans	*Lamiaceae*	*Iris sibirica*	*Iridaceae*
Alchemilla mollis	*Rosaceae*	*Kniphofia citrina*	*Asphodelaceae*
Anaphalis triplinervis	*Asteraceae*	*Lamium galeobdolon*	*Lamiaceae*
Anemone hupehensis	*Ranunculaceae*	*Leucanthemum* x *superbum*	*Asteraceae*
Aquilegia vulgaris	*Ranunculaceae*	*Ligularia przewalskii*	*Asteraceae*

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Armeria maritima	*Plumbaginaceae*
Artemisia ludoviciana 'Silver Queen'	*Asteraceae*
Aster x *frikartii* 'Mönch'	*Asteraceae*
Aster thompsonii 'Nanus'	*Asteraceae*
Astilbe x *arendsii*	*Saxifragaceae*
Astrantia major	*Apiaceae*
Aubrieta deltoidea	*Brassicaceae*
Aurinia saxatilis	*Brassicaceae*
Bergenia cordifolia	*Saxifragaceae*
Caltha palustris	*Ranunculaceae*
Campanula carpatica	*Campanulaceae*
Campanula glomerata	*Campanulaceae*
Campanula persicifolia	*Campanulaceae*
Centaurea macrocephala	*Asteraceae*
Coreopsis verticillata	*Asteraceae*
Delphinium	*Ranunculaceae*
Dianthus deltoides	*Caryophyllaceae*
Dicentra formosa	*Papaveraceae*
Echinacea purpurea	*Asteraceae*
Echinops ritro	*Asteraceae*
Epimedium x *rubrum*	*Berberidaceae*
Erigeron 'Dignity'	*Asteraceae*
Eryngium variifolium	*Apiaceae*
Euphorbia polychroma	*Euphorbiaceae*
Filipendula ulmaria	*Rosaceae*
Gaura lindheimeri	*Onagraceae*
Geranium endressii	*Geraniaceae*
Geranium macrorrhizum	*Geraniaceae*
Geum 'Lady Stratheden'	*Rosaceae*
Gypsophila paniculata	*Caryophyllaceae*
Helenium autumnale'	*Asteraceae*
Helleborus x *hybridus*	*Ranunculaceae*
Hemerocallis lilioasphodelus	*Hemerocallidaceae*
Heuchera villosa 'Palace Purple'	*Saxifragaceae*
Hosta fortunei	*Hostaceae*

Liriope muscari	*Convallariaceae*
Lupinus Russell hybrids	*Papilionaceae*
Lysimachia nummularia	*Primulaceae*
Lythrum salicaria	*Lythraceae*
Macleaya cordata	*Papaveraceae*
Nepeta x *faassenii*	*Lamiaceae*
Oenothera macrocarpa	*Onagraceae*
Origanum vulgare	*Lamiaceae*
Paeonia lactiflora	*Paeoniaceae*
Papaver orientale	*Papaveraceae*
Penstemon barbatus	*Scrophulariaceae*
Persicaria bistorta 'Superba'	*Polygonaceae*
Phlox paniculata	*Polemoniaceae*
Polemonium caeruleum	*Polemoniaceae*
Polygonatum x *hybridum*	*Convallariaceae*
Potentilla recta	*Rosaceae*
Pulmonaria rubra	*Boraginaceae*
Ranunculus aconitifolius	*Ranunculaceae*
Rodgersia aesculifolia	*Saxifragaceae*
Rudbeckia fulgida var. *deamii*	*Asteraceae*
Salvia x *superba*	*Lamiaceae*
Saxifraga umbrosa	*Saxifragaceae*
Scabiosa caucasica	*Dipsacaceae*
Sedum spectabile	*Crassulaceae*
Sisyrinchium striatum	*Iridaceae*
Solidago virgaurea	*Asteraceae*
Stachys byzantina	*Lamiaceae*
Symphytum ibericum	*Boraginaceae*
Thalictrum aquilegiifolium	*Ranunculaceae*
Tradescantia Andersoniana Group	*Commelinaceae*
Veronica austriaca	*Scrophulariaceae*

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Grasses, Bamboos, Sedges and Ferns

Agrostis tenuis	*Poaceae*
Asplenium scolopendrium	*Aspleniaceae*
Calamagrostis x *acutiflora* 'Overdam'	*Poaceae*
Carex buchananii	*Cyperaceae*
Cortaderia selloana	*Poaceae*
Dactylis glomerata	*Poaceae*
Deschampsia cespitosa	*Poaceae*
Dryopteris filix-mas	*Dryopteridaceae*
Elymus repens	*Poaceae*
Festuca glauca	*Poaceae*
Festuca rubra	*Poaceae*
Helictotrichon sempervirens	*Poaceae*
Holcus lanatus	*Poaceae*
Lolium perenne	*Poaceae*
Matteuccia struthiopteris	*Woodsiaceae*
Miscanthus sinensis	*Poaceae*
Osmunda regalis	*Osmundaceae*
Pennisetum alopecuroides	*Poaceae*
Phalaris arundinacea var. *picta*	*Poaceae*
Pleioblastus viridistriatus	*Poaceae*
Poa annua	*Poaceae*
Poa pratensis	*Poaceae*
Polystichum setiferum	*Dryopteridaceae*
Pseudosasa japonica	*Poaceae*
Stipa gigantea	*Poaceae*

Bulbs, corms and tubers and rhizomes

Chionodoxa forbesii	*Hyacinthaceae*
Convallaria majalis	*Convallariaceae*
Crocosmia masoniorum	*Iridaceae*
Crocus speciosus	*Iridaceae*
Crocus tommasinianus	*Iridaceae*
Crocus vernus	*Iridaceae*
Cyclamen hederifolium	*Primulaceae*
Eranthis hyemalis	*Ranunculaceae*
Galanthus nivalis	*Amaryllidaceae*
Gladiolus spp	*Iridaceae*
Hyacinthoides non-scripta	*Hyacinthaceae*
Hyacinthus orientalis	*Hyacinthaceae*
Iris reticulata	*Iridaceae*
Iris unguicularis	*Iridaceae*
Leucojum aestivum	*Amaryllidaceae*
Lilium regale	*Liliaceae*
Muscari armeniacum	*Hyacinthaceae*
Narcissus pseudonarcissus	*Amaryllidaceae*
Nerine bowdenii	*Amaryllidaceae*
Scilla siberica	*Hyacinthaceae*
Tulipa tarda	*Liliaceae*

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Hardy Annuals and Biennials

Alcea rosea	*Malvaceae*
Borago officinalis	*Boraginaceae*
Calendula officinalis	*Asteraceae*
Campanula medium	*Campanulaceae*
Centaurea cyanus	*Asteraceae*
Clarkia elegans	*Onagraceae*
Consolida ambigua	*Ranunculaceae*
Dianthus barbatus	*Caryophyllaceae*
Digitalis purpurea	*Scrophulariaceae*
Erysimum cheiri	*Brassicaceae*
Eschscholzia californica	*Papaveraceae*
Lathyrus odoratus	*Papilionaceae*
Limnanthes douglasii	*Limnanthaceae*
Lobularia maritima	*Brassicaceae*
Myosotis sylvatica	*Boraginaceae*
Nigella damascena	*Ranunculaceae*
Oenothera biennis	*Onagraceae*
Papaver somniferum	*Papaveraceae*
Primula vulgaris	*Primulaceae*
Tropaeolum majus	*Tropaeolaceae*
Verbascum bombyciferum	*Scrophulariaceae*
Viola x *wittrockiana*	*Violaceae*

Half Hardy and Tender Plants

Ageratum houstonianum	*Asteraceae*
Antirrhinum majus	*Scrophulariaceae*
Argyranthemum frutescens	*Asteraceae*
Begonia Semperflorens Cultorum Group	*Begoniaceae*
Begonia tuberhybrida	*Begoniaceae*
Bougainvillea glabra	*Nyctaginaceae*
Canna indica	*Cannaceae*
Chlorophytum comosum	*Anthericaceae*
Citrus limon	*Rutaceae*
Cyclamen persicum	*Primulaceae*
Dahlia 'Bishop of Llandaff'	*Asteraceae*
Dracaena marginata	*Dracaenaceae*
Euphorbia pulcherrima	*Euphorbiaceae*
Ficus benjamina	*Moraceae*
Fuchsia 'Thalia'	*Onagraceae*
Gardenia jasminoides	*Rubiaceae*
Helichrysum petiolare	*Asteraceae*
Heliotropium arborescens	*Boraginaceae*
Howea forsteriana	*Arecaceae*
Impatiens walleriana	*Balsaminaceae*
Kalanchoe blossfeldiana	*Crassulaceae*
Lobelia erinus	*Campanulaceae*
Nicotiana alata	*Solanaceae*
Pelargonium zonale	*Geraniaceae*
Petunia x *hybrida*	*Solanaceae*
Plumbago auriculata	*Plumbaginaceae*
Saintpaulia ionantha	*Gesneriaceae*
Salvia splendens	*Lamiaceae*
Solanum pseudocapsicum	*Solanaceae*
Solenostemon scutellarioides	*Lamiaceae*
Stephanotis floribunda	*Asclepiadaceae*
Streptocarpus hybridus	*Gesneriaceae*
Tagetes erecta	*Asteraceae*
Tagetes patula	*Asteraceae*
Tradescantia fluminensis	*Commelinaceae*
Verbena hybrida	*Verbenaceae*

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Seed List

Acer pseudoplatanus	*Aceraceae*
Agrostis tenuis	*Poaceae*
Allium cepa	*Alliaceae*
Antirrhinum majus	*Scrophulariaceae*
Begonia Semperflorens Cultorum Group	*Begoniaceae*
Beta vulgaris	*Chenopodiaceae*
Brassica oleracea	*Brassicaceae*
Coriandrum sativum	*Apiaceae*
Cucurbita pepo	*Cucurbitaceae*
Cupressus macrocarpa	*Cupressaceae*
Cyclamen persicum	*Primulaceae*
Digitalis purpurea	*Scrophulariaceae*
Echinacea purpurea	*Asteraceae*
Fagus sylvatica	*Fagaceae*
Festuca rubra	*Poaceae*
Helianthus annuus	*Asteraceae*
Helleborus × hybridus	*Ranunculaceae*
Lactuca sativa	*Asteraceae*
Lathyrus odoratus	*Papilionaceae*
Lolium perenne	*Poaceae*
Lycopersicon esculentum	*Solanaceae*
Ocimum basilicum	*Lamiaceae*
Pastinacea sativa	*Apiaceae*
Phacelia tanacetifolia	*Hydrophyllaceae*
Pinus sylvestris	*Pinaceae*
Quercus robur	*Fagaceae*
Rudbeckia hirta	*Asteraceae*
Tagetes erecta	*Asteraceae*
Tropaeolum majus	*Tropaeolaceae*

Weed List

Aegopodium podagraria	*Apiaceae*
Bellis perennis	*Asteraceae*
Capsella bursa-pastoris	*Brassicaceae*
Cardamine hirsuta	*Brassicaceae*
Cirsium arvense	*Asteraceae*
Convolvulus arvensis	*Convolvulaceae*
Equisetum arvense	*Equisetaceae*
Plantago major	*Plantaginaceae*
Prunella vulgaris	*Lamiaceae*
Ranunculus ficaria	*Ranunculaceae*
Ranunculus repens	*Ranunculaceae*
Rumex obtusifolius	*Polygonaceae*
Senecio vulgaris	*Asteraceae*
Stellaria media	*Caryophyllaceae*
Taraxacum officinale	*Asteraceae*
Trifolium repens	*Papilionaceae*
Urtica dioica	*Urticaceae*
Urtica urens	*Urticaceae*
Veronica chamaedrys	*Scrophulariaceae*

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Pest, diseases and disorders
Aphis spp, two spotted spider mite, whitefly, scale, slug, snail, vine weevil (adult and larvae), caterpillar; capsid, earwigs, flea beetle, mealy bug; powdery mildew, botrytis (grey mould), honey fungus, black spot, big bud, canker, rust, coral spot, common virus, high/low temperature damage, oedema, inter-veinal chlorosis, blossom end rot, fasciation, bolting.

10. Risk assessment.

Risk assessment of practical operations. Safe working practices and selection of appropriate personal safety clothing and equipment.

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Practical Horticulture I

Level: **Advanced Certificate**

Unit value: **1**

	Learning outcomes:		Assessment criteria:
1.	Assess soil texture and determine pH.	1.1	Determine soil texture by feel.
		1.2	Determine pH of a given soil sample.
		1.3	Relate pH results to plant choice.
2.	Sow seeds in open ground.	2.1	Prepare an area of land by hand cultivations for sowing.
		2.2	Sow a range of seeds by hand.
		2.3	Cover and finish as appropriate.
3.	Sow seeds into containers.	3.1	Prepare containers.
		3.2	Sow seeds.
		3.3	Cover where appropriate to size or species.
		3.4	Label appropriately.
		3.5	Indicate correct location/conditions for germination.
4.	Prick off/out seedlings.	4.1	Select and prick off seedlings into a range of containers.
		4.2	Indicate correct location for growing on.
5.	Propagate a range of plant vegetatively.	5.1	Select appropriate plant material and method in order to propagate the plant vegetatively.
		5.2	Prepare, insert and label a range of cuttings.
		5.3	Indicate correct location/conditions for rooting.
		5.4	Maintain stock plants as appropriate.

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6.	Carry out aftercare on young plants.	6.1	Pot up and pot on a range of plant material.
		6.2	Indicate correct location for growing on.
		6.3	Stop young plants.
7.	Plant a range of plant material.	7.1	Prepare ground for planting a range of plants.
		7.2	Plant by hand a range of bare root or container grown plants.
		7.3	Carry out post planting treatments where appropriate.
8.	Maintain a range of established plants.	8.1	Indicate how to prune a range of established plants.
		8.2	Support and train a range of plants.
9.	Identify a range of plants, weeds, seeds, pests, diseases and disorders.	9.1	Identify using genus and species where appropriate 40 plants.
		9.2	Identify 5 seeds.
		9.3	Identify 15 plant pests, diseases and disorders.
		9.4	Identify damage caused by the above pests, diseases and disorders.
		9.5	Identify using genus and species: 10 weeds.
10.	Undertake risk assessments.	10.1	Determine the elements of risk in all of the practical operations associated with this unit.
		10.2	Identify the safe working practices for the operations identified to include personal protective equipment and clothing.

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Module D (Option)

Unit Title: Outdoor Plant Production

Unit Code: Advanced T/103/5810 Diploma R/103/6012

Unit value: 2

Unit Level: Advanced Certificate or Diploma

Descriptions of Unit:

This unit requires students to use underpinning knowledge from other units to develop an awareness of the relationship between plant and soil science and outdoor plant production.

Summary of outcomes

1. Fruit crop production.
2. Vegetable crop production.
3. Nursery stock production.
4. Cut flower production.
5. Organic growing.
6. Risk assessment.

Content

Identifying safe health and working practices at all times.

1. Fruit crop production.

Principles and practices of production for one each of tree fruit, cane fruit, bush fruit and strawberries. Effect and selection of rootstocks on tree fruit. Field preparation; planting, spacing and establishment; pollination, fertilisation and fruit set; crop support and training; frost protection; pest, disease, disorder and weed control; irrigation and nutrition; pruning. Mechanisation of systems. Harvesting, grading, post harvest storage systems, including controlled atmosphere storage, marketing. Packhouse equipment.

2. Vegetable crop production.

Principles and practices of production for a brassica, root, allium, salad and legume crop. Techniques to include field preparation; propagation spacing and establishment; field factors and germination percentages; crop scheduling; bed systems; rotations; continuity; protection; irrigation and response periods; nutrition; pest, disease, disorder and weed control; harvesting and storage techniques (where appropriate). Grading standards and marketing. Crop shelf-life and post-harvest techniques. Production and harvesting and packhouse equipment.

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3. Nursery stock production.

Principles and practices of production for a range of hardy plants to include a climber, shrub, tree, conifer and herbaceous plant; two of which should be from seed. Techniques to include field preparation; propagation and establishment; bare root and container systems; growing media; pest, disease, disorder and weed control; nutrition and irrigation; maintenance of stock plants; harvesting systems; mechanisation of container systems, packhouse equipment, grading.

4. Cut flower production.

Principles and practices of production of an annual, biennial and a perennial cut flower in the open. Techniques to include propagation and plant raising; planting/sowing; irrigation and nutrition; pest, disease, disorder and weed control; plant support and training; maintenance and harvesting.

5. Organic growing.

Field conditions to be met to achieve 'organic' status. Advantages to consumer of organic produce, organic techniques to include rotation; manurial systems; composting; cultural and biological pest, disease and weed control.

6. Risk assessment.

Risk assessment of outdoor crop production, harvest and storage systems. Identification of appropriate safe working practices and selection of appropriate safety clothing and equipment.

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Outdoor Plant Production

Level: **Advanced Certificate or Diploma**

Unit value: **2**

Learning outcomes:	**Assessment criteria**
1. Describe the commercial production of a range of fruit crops.	1.1 Describe the effects of rootstocks and their selection for fruit growth.
	1.2 Describe the production, harvesting and storage of a range of fruit.
	1.3 State the optimum stage of harvesting for a range of fruit crops.
	1.4 For a range of fruit crops relate the production, harvesting and storage techniques to horticultural principles.
	1.5 Describe the EU grading schedule for one named tree fruit and one named soft fruit crop.
	1.6 Describe the mechanisation of the production and the harvesting systems for tree and soft fruit.
	1.7 Explain how shelf life can be affected by pre and post-harvest treatment of crops.
	1.8 State the main factors to be considered when equipping a packhouse to deal with tree fruit crops for storage and marketing purposes.
2. Describe the commercial production and harvesting of a range of vegetable crops.	2.1 Describe the production, harvesting and storage of a range of vegetable crops.
	2.2 State the optimum stage of harvesting for a range of vegetable crops.
	2.3 Relate the production, harvesting and storage techniques of a range of vegetable crops to horticultural principles.
	2.4 Describe the EU grading schedules for two named vegetable crops.
	2.5 Describe the mechanisation of the production and the harvesting systems for a range of vegetables.

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		2.6	Explain how shelf life can be affected by pre and post-harvest treatment of crops.
		2.7	State the main factors to be considered when equipping a packhouse to deal with vegetable crops for storage and marketing purposes.
3.	Describe the commercial production of a range of nursery stock.	3.1	Describe the production of a range of crops grown from seed and by vegetative means.
		3.2	Relate the production, harvesting and storage of nursery stock to the underlying horticultural principles.
		3.3	Prepare a maintenance plan for the care of stock beds over the period of a year.
		3.4	State the optimum stage of growth to harvest the above range of crops.
		3.5	Describe the harvesting systems used for bare root transplants.
		3.6	Differentiate between production techniques used with container grown, containerised and open ground plants.
		3.7	Describe the mechanised systems that are available to the producer of container grown plants.
		3.8	State the factors to be considered when equipping a packhouse to deal with nursery stock.
4.	Describe the commercial production of a range of outdoor cut flowers.	4.1	Describe the production of a range of outdoor cut flowers.
		4.2	Relate the production, harvesting and storage of outdoor cut flowers to the underlying horticultural principles involved.
		4.3	Describe the harvesting systems.
		4.4	State the optimum stage of development for harvesting the above range of crops.
		4.5	Explain how the shelf life can be affected by pre and post-harvesting treatment of crops.

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5.	Assess the advantages and disadvantages of organic production systems.	5.1	State the conditions that must be met by a grower to qualify for 'organic' status.
		5.2	Assess the advantages to the consumer of organic produce.
		5.3	Describe a range of organic growing techniques and systems.
6.	Undertake risk assessments.	6.1	Determine the elements of risk in all of the practical operations associated with this unit.
		6.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module D (Option)

Unit Title: Protected Plant Production

Unit Code: Advanced A/103/5811 Diploma Y/103/6013

Unit value: 1

Unit level: Advanced Certificate or Diploma

Description of Unit:

This unit requires students to build upon aspects of the horticulture and science core to provide a broad overview of the practices and processes involved in successful protected cropping. It will enable students to have a clear understanding of environmental control and plant growth within a protective environment together with a practical knowledge of plant husbandry techniques.

Summary of outcomes

1. Structures for protected cropping.
2. Environmental control.
3. Cladding materials and their properties.
4. Irrigation and nutrition.
5. The relationship between production techniques and horticultural principles.
6. Harvesting and post harvest technology.
7. Risk assessment.

Content

Identifying safe health and working practices at all times:

1. Structures for protected cropping.

Single and multi-span greenhouses: venlo, widespan, mansard, plastics clad tunnels. Shape of structures to maximise natural light transmission. Suitability of different structures for specific cropping depending on natural light transmission.

2. Environmental Control.

Measurement of environmental factors including natural light, temperature of the growing media and air, moisture, plant nutrients and carbon dioxide. Control of the environment (including computer controlled systems): Heating and ventilation systems, thermal screens and blackout, shading, humidity, supplementary lighting, day-length manipulation, irrigation and nutrition, CO_2 enrichment. Link to external weather station. Ability of systems to record data.

3. Cladding Materials and their Properties.

Factors affecting light transmission: shape and orientation. Cladding materials including glass, rigid and film plastics. Heat insulation and cost effectiveness; light transmission properties.

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4. Irrigation and nutrition.

Methods of application. Systems to include: overhead spraylines, flood benches, capillary benches, trickle, seep hose. Liquid feed systems: injection and displacement.

5. The relationship between production techniques and horticultural principles.

Principles and practices of the production of tomatoes, lettuce, chrysanthemums, a named pot plant, bedding plants. To include planting and crop establishment, stopping, irrigation, spacing, disbudding, layering, trimming and training. Growth control: chemical and cultural. Chemical and cultural pest, disease and disorder control. Current legislation. Biological and Integrated Pest Management. Economic thresholds, beneficial agents, methods of introduction. To include major pests, diseases and disorders of crops identified. Crop Harvesting including stage of growth, shelf life, and post harvest treatments. Alternative systems to include nutrient film techniques and rock wool; plug raised and pricked-off bedding plants.

6. Harvesting and post-harvest technology.

EU Grading standards. Packaging, and marketing to include wholesale market, wholesaler, supermarkets, local retailers, export, contract. (as related to above crops).

7. Risk assessment.

Risk assessment of protected crop production, harvest and storage systems. Identification of appropriate safe working practices, clothing and equipment.

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Protected Plant Production

Level: **Advanced Certificate or Diploma**

Unit value: **1**

Learning outcomes:		**Assessment criteria**	
1.	Describe and evaluate the type and shape of modern growing structures.	1.1	Identify the main types of growing structures.
		1.2	Relate use of structures to shape and type of construction.
2.	Describe and evaluate the environmental controls in protected cropping.	2.1	Identify the range of environmental factors controlled within a growing structure.
		2.2	Describe the use of the equipment used to measure and monitor these factors.
		2.3	Name and describe a range of types of environmental control.
		2.4	Evaluate the use of IT facilities for environmental control.
3.	Explain the nature of solar radiation, transmission properties of glass and its substitutes.	3.1	Describe the meaning of ‘daylight’ and explain the role of sunlight and diffused light.
		3.2	Relate time of year to the quantity and quality of available light.
		3.3	Evaluate how the shape and orientation of a structure will affect light transmission.
		3.4	Assess the effectiveness of glass and cladding alternatives for light transmission.
		3.5	Describe the durability and insulation properties of glass and alternative materials.
4.	Determine the water requirements of a crop and methods of irrigation.	4.1	Select and describe appropriate systems of irrigation for plants grown in situ.
		4.2	Select and describe appropriate systems of irrigation for container grown plants.

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		4.3	Specify and evaluate systems for incorporating plant nutrients into the irrigation water.
5.	Relate horticultural principles to the production and harvesting of a range of crops.	5.1	Explain the effects of environmental control on the range of crops.
		5.2	Relate the essential features necessary for successful plant establishment and development to their underlying scientific principles.
		5.3	Describe the production of a range of crops under the following headings: Propagation and establishment. Crop development and maintenance. Control of pests, diseases and disorders and weed control where appropriate.
		5.4	State the optimum stage of growth for harvesting the range of crops.
		5.5	Describe the harvesting systems for protected crops.
		5.6	Explain how shelf life can be affected by pre and post harvesting treatment of the crop.
6.	Evaluate the factors involved in marketing protected crops.	6.1	State the factors to be considered when marketing crops.
		6.2	Evaluate alternative marketing outlets available to growers of protected crops.
		6.3	Relate packaging and presentation to marketing.
		6.4	Assess the benefits to the grower and the customer of grading a crop prior to marketing.
7.	Undertake risk assessment.	7.1	Determine the elements of risk in the practical operations associated with this unit.
		7.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module I (Option)

Unit Title: Planning Layout and Construction of Ornamental Gardens

Unit Code: Advanced F/103/5812 Diploma D/103/6014

Unit Value: 2

Unit Level: Advanced Certificate or Diploma

Description of Unit

This unit requires an understanding of basic garden planning principles and practical procedures for site assessment, plan drawing and interpretation, specification and construction of hard landscape features in ornamental gardens. It also requires an appreciation of the relationship and inter-dependency between site factors, function and purpose of hard landscape features and the overall layout of ornamental gardens.

Summary of outcomes

1. Site appraisal and interpretation.
2. Preparing site plans and specifications.
3. Influence of site characteristics.
4. The use of hard landscape features.
5. Setting out a site to scale plans and drawings.
6. Soil handling and storage.
7. Land drainage systems.
8. Ground preparation techniques.
9. Construction of paths and patios.
10. Construction of steps and ramps, dwarf walls and fences.
11. Risk assessment.

Content

Identifying safe health and working practices at all times.

1. Site appraisal and interpretation.

Site factors to include: dimensions, contours, orientation, aspect, altitude, exposure, shelter, soil, drainage, existing vegetation, structures, access, services, views, external factors.

2. Preparing site plans and specifications.

Preparation of simple working drawings based on examples measurements and survey data. Correct use of scale, graphic symbols. Interpretation of site plans and specifications. Specifications to include: quantity, dimensions, type of features, surfaces and materials. Garden features to include: grass areas, beds, borders, hedges, screens, specimen trees, paths, driveways, patios, decking, furniture, play areas, ramps, steps, walls, fences, gates, pergolas, archways.

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3. Influence of site characteristics.

Site factors as in 1. Design styles and themes to include: formal, informal, traditional, contemporary, low maintenance, wildlife conservation.

4. The use of hard landscape features.

The role and purpose of and the contribution made by hard landscape features to include: plant containers, screens, rock, scree, water, paths, driveways, patios, decking, furniture, lighting, play areas, ramps, steps, walls, fences, gates, pergolas, archways. Hard surface materials to include: concrete, gravel, cobbles, bricks, natural and artificial stone and paving, bark, shredded rubber, crushed glass and reinforced grass areas.

5. Setting out a site from scale plans and drawings.

Interpret scale drawings and describe transfer of details to site: setting out boundaries and spot features; setting out levels; marking out squares, rectangles, circles, diamonds, ellipses and curvilinear areas. Draw up a construction schedule from drawings and specifications provided.

6. Soil handling and storage.

Excavation, storage and re-distribution of topsoil, and treatment of subsoil, during contouring, levelling and construction works.

7. Land drainage systems.

The relationship between soil texture and structure and soil draining specification; type, depth, spacing and backfill. Transfer of levels from site plans to achieve required depth and fall to outflow. The site factors determining a suitable and adequate outflow for garden use. Site uses to include: formal lawns, grassed play areas, plant areas, paths and driveways, large areas of porous and non-porous surface materials for frequent use. The safe, practicable use of natural water in the design of gardens.

8. Ground preparation techniques.

The treatment and cultivation of soil for different landscape purposes: hard surfaces and structures, planted areas, seeded and turfed grass areas. Soil cultivations related to soil type and condition: sand, clay and loam soils, dry and waterlogged sites.

9. Construction of paths and patios.

Ground preparation, grading and foundations required for a range of path and patio materials to include: concrete, gravel, bricks, natural and artificial stone and paving. Procedures for laying surface and edging materials on prepared foundation.

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10. Construction of steps and ramps, dwarf walls and fences.

Foundations required for a range of materials to include: concrete, bricks, natural and artificial stone and paving; fencing materials to include post and rail, wire netting, close board and panels. Procedures for the construction on prepared foundations.

11. Risk assessment.

Risks associated with landscape site planning and construction practices. Use of safe working practices, adequate protective clothing and safe materials, machinery and equipment. Safety of visitors to site; identification of and exclusion from hazard areas.

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Planning Layout and Construction of Ornamental Gardens

Unit level: **Advanced Certificate or Diploma**

Unit value: **2**

	Learning outcomes:		Assessment criteria:
1.	Understand how to conduct a site appraisal and interpret the results.	1.1	State the main factors to be assessed for an overall site appraisal.
		1.2	Review the major attributes and limitations which site factors may impose on garden planning and layout.
2.	Produce and interpret site plans and specifications using basic survey measurements.	2.1	Produce scale drawings using survey data provided.
		2.2	Draft the specification for a range of garden features.
		2.3	Interpret scale drawings and specifications provided.
3.	Explain how site characteristics may influence choice of garden design style.	3.1	Explain the influence of soil type, contour, exposure and drainage on choice of design style.
		3.2	Explain how a given design style may be used to enhance the attributes and offset the limitations imposed by the site.
		3.3	Explain how the proximity of a building may affect the planning and design of a garden.
4.	Understand and evaluate the contribution made by hard landscape features to design and function.	4.1	Explain the role and purpose of a range of hard landscape features.
		4.2	Evaluate the contribution made by a range of hard landscape features to the overall design of a garden.
		4.3	Evaluate the use of a range of hard surface materials in the ornamental garden.
		4.4	Evaluate a range of surface materials for use in children's play areas.
		4.5	Evaluate a range of path, patio and driveway materials.

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5.	Describe the practical procedures for setting out a site to scale plans and drawings.	5.1	Describe how scale drawings are interpreted to set out the boundaries of a site and the major features to be incorporated.
		5.2	Describe how contour lines and plan sections are used to set out the required levels on site.
		5.3	Describe how to mark out a range of geometric outlines on the ground.
		5.4	Draft an outline construction schedule using data and information provided.
6.	Describe and explain the reasons for correct soil moving and storage during construction works.	6.1	Explain the importance of correct storage and re-instatement of topsoil during site construction.
		6.2	Review the range of tools and equipment used in contour adjustment.
		6.3	Explain the procedures involved in the levelling/contouring subsoil/topsoil.
7.	Explain the factors which determine the design and specification of land drainage systems and describe the procedures for setting out and installing land drainage.	7.1	Relate drain depth, type and spacing to soil structure and texture.
		7.2	Explain how the planned use of a site may affect the choice and specification of a land drainage system.
		7.3	Explain the factors which determine a suitable outlet for a land drainage system.
		7.4	Describe how scale drawings are interpreted in order to set out the position of drains.
		7.5	Describe the excavation of trenches in order to achieve the required falls to the main outlets.
		7.6	Describe the selection, installation and back filling for a specified drainage system.
		7.7	Describe how a suitable natural water supply may be incorporated into the design of a garden and explain the essential safeguards needed.

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8.	Understand the requirement for a range of ground preparation techniques for different landscape features.	8.1	Explain the requirements for the removal of topsoil and consolidation of areas for hard landscape features.
		8.2	Evaluate a range of primary ground preparation techniques required for different soft landscape features.
		8.3	Explain why methods of soil cultivation should take into account the soil type and soil condition.
9.	Specify a range of materials and outline the procedures for the construction of paths and patios.	9.1	Specify appropriate foundations for paths and patios under site conditions and uses.
		9.2	Outline the procedures for preparing the site and laying foundations for paths and patios under a range of site conditions.
		9.3	Specify a range of appropriate surface materials for paths and patios and relate to intended use and site conditions.
		9.4	Outline the procedures for laying a range of surface materials on prepared foundations.
		9.5	Specify appropriate edging materials to accompany a range of surfaces and situations and describe their installation.
10.	Specify a range of materials and outline the procedures for the construction of steps and ramps, dwarf walls and fences, for a range of site conditions and uses.	10.1	Specify appropriate foundations for steps and ramps, dwarf walls and fences, under a range of site conditions.
		10.2	Outline the procedures for preparing the site and laying foundations for steps and ramps, dwarf walls and fences, under a range of site conditions.
		10.3	Specify a range of appropriate materials for steps and ramps, dwarf walls and fences, and relate to intended use and site conditions.
		10.4	Outline the procedures for laying a range of materials for steps and ramps, dwarf walls and fences, on prepared foundations under a range of site conditions.

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11. Undertake risk assessments.	11.1 Determine the elements of risk in all operations associated with this unit. 11.2 Identify safe working practices for any operations described above or relevant to include personal protective equipment and clothing as appropriate.

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Module I (Option)

Unit Title: Restoring Established Ornamental Gardens

Unit Code: Advanced J/103/5813 Diploma H/103/6015

Unit Value: 1

Unit Level: Advanced Certificate or Diploma

Description of Unit

This unit uses and builds on the understanding and practical knowledge contained in 'Planning, Layout and Construction', and will in general apply to ornamental gardens of one or two hectares or less. It requires an understanding of methods and criteria for the appraisal of the condition of established plantings and features, and a thorough knowledge of the practical procedures used in remedial work and the restoration of ornamental gardens. It also requires an outline of the history of the planting and design of ornamental gardens, and the importance of heritage gardens in the United Kingdom.

Summary of outcomes

1. Surveying and recording the dimensions, layout and content of a garden; site factors.
2. Assessment of the type and condition of plantings and features.
3. Selection of plantings and features for retention.
4. Analysis of findings and preparation of outline work programme.
5. Recognition and repair of faults in land drainage systems.
6. Renovation of a range of hard landscape features.
7. Improvement of plantings and their future maintenance.
8. Design styles and periods in the history of U.K. ornamental gardens; plantings and features of particular interest; heritage gardens and relevant organisations.
9. Risk assessment.

Content

Identifying safe health and working practices at all times.

1. Surveying and recording the dimensions, layout and content of a garden; site factors.

Survey problems: obstruction of site-lines by structures and vegetation; overgrown boundary hedges, beds and borders; obscured paths and grassed areas.
Preparation of simple scale-drawings based on example measurements and survey data.
Measurement and recording - tabulated and referenced lists of recorded measurements for: grassed areas, beds, borders, hedges, screens, shrubberies, group and specimen trees, paths, driveways, patios, terraces, ramps, steps, walls, fences, gates, pergolas, archways, rock gardens, water features, statuary, small structures.
Site factors: dimensions, contours, orientation, aspect, altitude, exposure, shelter, soil type and condition, drainage, access points, overhead and underground services, internal and external views.

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2. Assessment of the type and condition of plantings and features.

Criteria: correct planting situation for species; appropriate vegetative growth, flowering, size and shape; not over-mature; absence of suckers, reverted shoots; absence of competition from adjacent plants, invasive weeds, overhead branches; freedom from debilitating pests, diseases and disorders.
Condition of hard landscape features (as listed in 1. above): safe structure, not deteriorating; use(s), function and contribution to the garden retained; appearance satisfactory.

3. Selection of plantings and features for retention.

Original purpose and use: may be affected by plant growth or neglect; external and internal views may be lost; privacy may be lost; open recreational areas may be reduced or grown over; plant and feature losses may alter character.
Intended purpose and use: may differ from original; may require the removal of some plantings or features; may influence choice of plantings or features for retention. Collective contribution of plantings and features which can be retained, including those of high value, may not be satisfactory or permit easy renewal of those not retained.
Unintended losses of plantings and ornamental features: in all cases plot, record and clearly mark on site, be alert to dormant herbaceous species; protect if necessary, take action to ensure correct conditions prevail, confirm identification and rarity with competent authority, label correctly and record, consider propagation or removal to a safer location.
Examples (plantings): less common or particularly fine specimens of mature trees and shrubs, “Champion Trees”; collections of one genus or group - old shrub roses, lilac, rhododendron, dwarf conifers, iris x germanica, hemerocallis, primula, geranium, narcissus, ferns; hedges and topiary; fine lawns; established groups of naturalised and native wild plants.
Examples (ornamental features): fine statuary, ornamentation, natural stone paving, ironwork, wood carving, fountains, arches, seats.

4. Analysis of findings and preparation of outline work programme.

Temporary safeguards for plants and features: temporary removal to a safe position; provide protective fencing or wrapping; branch removal or tying back; cover hard surfaces and grassed areas as appropriate to the traffic crossing them; provide protective covering for steps, ramps, walls and structures.
Factors to be taken into account: existing and temporary access points, routes for the extraction of bulky waste, internal movement of bulky materials, avoidance of subsequent damage to features and planted areas already restored.
Seasonal factors: exposure to sun, drying or cold winds, risk of flooding, frost and ice, daylength.

5. Recognition and repair of faults in land drainage systems.

Symptoms: area generally badly drained; wet soil or ponding in patches; discoloured patches in turf.
Factors: silting; inadequate falls; rise in water table; obstruction at outflow or other locations; tile drains out of horizontal or vertical alignment; drains collapsed; soil water unable to reach drain; soil capping.

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6. Renovation of a range of hard landscape features.

Faults: stone or slab paths uneven; gravel driveways compacted and weedy; stone steps cracked and broken; dwarf walls out of vertical alignment; concrete ponds leaking; wood panel fences leaning; a pergola supporting climbing roses partly collapsed.

7. Improvement of plantings and their future maintenance.

Environmental problems: excessive shade from mature trees - cut back trees or replant with shade-bearers; soil acidity - correct pH; nutrient deficiency - restore correct levels; dry impoverished soils - apply organic matter or replant with suitable species.
Invasive species: sycamore, bramble, ivy, ground elder, creeping buttercup,
Plant health: Honey fungus, coral spot, rose mildew, powdery mildew, apple scab, rhododendron bud blast, bacterial canker, fairy ring fungus, woolly aphid, holly leaf miner, stem eelworm, brown scale, yew scale.
Pruning methods: removal of dead and diseased growth; shaping, reducing, hard cutting back, thinning crowded growth; renovation of yew hedges.
Maintenance techniques: installed trickle irrigation systems; bark, shingle and perforated plastic mulching; the use of strimmers, motorised hedge cutters, ride-on mowers.

8. Design styles and periods in the history of U.K. ornamental gardens; plantings and features of particular interest; heritage gardens and relevant organisations.

Development trends: formal/informal, knot garden, parterre, cottage garden, carpet bedding, herbaceous borders, rock garden, scree, wild garden, wildflower meadow, the 'garden room'.
Plant introductions: Horse chestnut (early 16th C.), Tulip tree (late 17th C.), Maidenhair tree (mid 18th C.), Lawson cypress (mid 19th C.), Dawn Redwood (mid 20th C.- 1947), *Rosa multiflora* (1816), *Choisya ternata* (1825), *Ribes sanguineum* (1826), *Clematis montana* (1831), *Viburnum plicatum* (1844), *Hydrangea paniculata* (1864).
Garden design styles: Tudor, Dutch, Italian, Victorian, Modern.
Organisations: English Heritage, Garden History Society, National Trust, Association of Garden Trusts (and County Gardens Trusts).

9. Risk assessment.

Risks associated with garden restoration and renovation practices. Use of safe working practices, adequate protective clothing and safe materials, machinery and equipment. Safety of visitors to site; identification of and exclusion from hazard areas.

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Restoring Established Ornamental Gardens

Unit level: Advanced Certificate or Diploma

Unit value: 1

Learning outcomes:	Assessment criteria:
1. Describe basic methods for the survey and recording of the layout and content of an established ornamental garden, and explain the importance of detailed information including assessment of site factors.	1.1 Describe the basic measurement, survey, and production of a scale drawing showing the layout of an established garden. Explain how the chief problems which may be encountered may be overcome.
	1.2 Describe the individual measurement and recording of a range of plantings and features.
	1.3 Explain how the assessment of a range of topographical and prevailing environmental factors, within and beyond the garden, can help restoration planning.
2. Understand the need for the assessment and recording of the type, condition and future potential of a range of plantings and features in an established ornamental garden.	2.1 Explain the need to draw up and record a complete and detailed list of plantings and features.
	2.2 Explain why it is necessary, at an early stage, to note mature trees and large structures, and to seek expert help in ensuring their safe condition.
	2.3 List and describe, using examples, the main criteria used in assessing the health, condition and future life expectancy of all plantings.
	2.4 Explain why it is necessary to assess the condition and safety of a range of hard landscape features in the garden.
3. Explain the main criteria used to select plantings and features for retention in the restored garden.	3.1 Explain why it is important to consider at an early stage, the intended purpose and uses of both the original and the restored garden.
	3.2 Explain why it is necessary to assess the contribution existing healthy plantings and sound or renovated hard landscape features will make in the restored garden.

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		3.3	Understand the high ornamental value of some mature plant species and explain the effect this may have on restoration plans.
		3.4	Using examples, explain the need for immediate action to avoid the unintended loss or destruction of rare plants and valuable garden ornaments.
4.	Understand the need to analyse the information collected and prepare an outline programme for the organisation of the garden restoration work.	4.1	Explain the need, before restoration work commences, to consider what safeguards may be necessary to protect all plantings and features to be retained.
		4.2	Describe the use and installation of a range of temporary safeguards and precautions commonly employed.
		4.3	Explain the importance of carefully determining the order in which restoration work is to be undertaken and give examples of factors which need to be taken into account.
		4.4	Explain the need to take seasonal factors into account.
		4.5	Prepare an outline schedule for the restoration work from information provided.
5.	Recognise and explain the visible signs of the failure of old land drainage systems and describe remedial measures.	5.1	Describe the visible symptoms and explain a range of factors which contribute to the ineffectiveness or failure of land drainage systems in gardens.
		5.2	Describe effective measures, for each of the factors, for the repair and improvement of existing land drainage systems.
6.	Understand and describe the practical procedures necessary for the restoration of a range of hard landscape features.	6.1	Explain the need to carefully examine and assess the condition of retained hard landscape features and describe a range of commonly encountered faults.
		6.2	Describe in outline an appropriate method for the correction and repair of these faults.

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7.	Understand the problems which may be encountered, and describe practical procedures for the improvement of retained hedges, plantings, and lawns. Evaluate the use of modern maintenance techniques in established gardens.	7.1	Explain the need to carefully examine and assess the condition of retained hedges, group plantings and individual plants.
		7.2	Describe a range of associated environmental problems and the ways in which they can be overcome.
		7.3	Explain the effect of competition between plants of the same type and those of different species and describe how these may be overcome.
		7.4	Explain the effect of a range of invasive species and describe how these may be controlled.
		7.5	Describe, using examples, a range of plant health problems commonly encountered in neglected gardens and their treatment.
		7.6	Describe methods used for pruning overgrown shrubs, including hedges.
		7.7	Explain the basic operations for the improvement of neglected herbaceous plantings and ornamental lawns.
		7.8	Explain the benefits and limitations of the use in restored gardens of a range of modern maintenance techniques.
8.	Outline the history of U.K. garden design and the influence of plant introductions; evaluate an established ornamental garden in order to determine any particular design style or period, or plants of interest; explain the role of heritage gardens and relevant organisations.	8.1	Outline the main trends in the development of ornamental gardens in the U.K. from the sixteenth century to the present day, and the influence of the introduction of new plant species.
		8.2	State the origin, period and one notable example in the U.K. of a range of generic garden design styles. Describe the main features of each, and the relative influence of contemporary plant introductions.
		8.3	Explain the reasons why an established ornamental garden should be evaluated to determine its design style and period and to assess the importance of its plantings and features.

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		8.4	Explain the terms ‘heritage garden’ and ‘listed garden’. Outline the work of some organisations in the U.K. for research into garden history or undertaking heritage garden restoration.
9.	Undertake risk assessment and identify safe working practices.	9.1	Identify a range of hazards, which may be encountered when working within a neglected and overgrown established garden and describe precautionary measures which should be taken.

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Module J (Option)

Unit Title: Establishment and Maintenance of Decorative Ornamental Turf

Unit Code: Advanced L/103/5814 Diploma K/103/6016

Unit Value: 1

Unit Level: Advanced Certificate or Diploma

Description of Unit

This unit assumes an understanding of the underpinning knowledge from other units to develop and apply turf maintenance practices. It will enable students to maintain both fine lawn and amenity grassed areas.

Summary of Outcomes

1. Establishment of grass from turf and seed.
2. Maintenance of turf areas.
3. Selection and use of turf machinery.
4. Turf weeds, pests and diseases.
5. Risk assessment.

Content

Identifying safe, healthy and environmentally sustainable working practices at all times.

1. Establishment of grass from turf and seed.

Selection, characteristics and suitability of grass species for a variety of uses include: fine and coarse amenity lawns, wildflower meadows. Advantages and disadvantages of establishing grass areas from turf and seed. Site drainage and preparation. Care during establishment period of newly seeded or turfed areas.

2. Maintenance of fine turf areas.

Annual maintenance programme to amenity turf to include: mowing, scarification and verti-cutting, aeration (surface and deep), feeding, irrigation, renovation, over-seeding, top dressing.

3. Selection and use of turf machinery.

Selection and use of a range of pedestrian and tractor mounted turf care equipment for both fine and coarse turf, to include: cylinder, rotary and flail mowers, fraise mowers, verti-cutters and scarfiers, sarrell rollers, drum spikers, deep aeration equipment, fertiliser distributors, top dressers, over-seeders, drag mats and brushes, sprayers, vacuums and blowers, rollers.

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4. Management of weeds, pests and diseases.

Identification of a range of turf weeds and moss (see practical unit for range). Their significance to the appearance and use of turfed surfaces, chemical, biological and cultural methods of control. Identification of a range of turf pests, diseases and weeds. Pest and disease life cycle and environmental conditions favouring spread.

5. Risk assessment.

Risk assessment of turf establishment and maintenance practices. Identification of appropriate safe working practices, safety clothing and equipment fulfilling statutory regulations.

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Establishment and Maintenance of Decorative Ornamental Turf

Unit level: Advanced Certificate or Diploma

Unit value: 1

	Learning outcomes:		Assessment criteria:
1.	Describe the establishment of grass from turf and seed.	1.1	Describe the characteristics of grass species and evaluate these for a variety of uses.
		1.2	Specify grass species to be used in seed mixes for different situations or purposes.
		1.3	Evaluate the advantages and disadvantages of establishing grass areas from seed or turf.
		1.4	Describe different turf drainage systems and evaluate their efficiency in removing water from the turf surface.
		1.5	Relate the preparation and establishment of the seeded and turfed areas to underlying horticultural principles.
2.	Review the maintenance of established grassed areas for a range of purposes and soil conditions.	2.1	Relate the annual maintenance of a mown grassed area and fine lawn to underlying horticultural principles.
		2.2	Relate the end of season lawn renovation work required to usage and soil conditions.
		2.3	Programme and describe the annual maintenance of an amenity lawn area.
		2.4	Describe an annual fertiliser programme for fine and coarse turf, and explain how this may be affected by different uses and soil types.
3.	Review the selection and operation of a range of turf care machinery.	3.1	Evaluate a range of pedestrian and tractor mounted turf care equipment.
		3.2	Specify scarification reels for a range of uses. Specify aeration tines for a range of uses.

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		3.3	Evaluate the surfaces produced by a range of mowing equipment.
4.	Demonstrate an understanding of the effect of a range of turf weeds, pests and diseases.	4.1	Explain the significance of a range of turf weeds in relation to the quality of the grassed surface.
		4.2	Evaluate chemical and cultural methods of weed and moss control.
		4.3	Explain the significance for a range of turf pests and diseases in relation to the appearance and use of the grass surface.
		4.4	Relate the life cycles of a range of turf pests and diseases to environmental conditions.
		4.5	Evaluate chemical, cultural and biological methods in the control of turf pests and diseases.
5.	Undertake risk assessment.	5.1	Determine the elements of risk in the practical operations associated with the unit.
		5.2	Identify safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module J (Option)

Unit Title: Plant Selection, Establishment and Maintenance

Unit Code: Advanced R/103/5815 Diploma M/103/6017

Unit Value: 1

Unit Level: Advanced Certificate or Diploma

Description of Unit

The unit assumes an understanding of the underpinning knowledge from other units to develop and apply landscape maintenance practices. It will enable students to maintain a range of plants and borders.

Summary of Outcomes

1. Selection and establishment of plants.
2. Selection and maintenance of alpine plants.
3. Selection and maintenance of aquatic and marginal plants.
4. Selection and establishment of plants for seasonal display.
5. Maintenance of herbaceous plants and their environment.
6. Maintenance of woody plants and their environment.
7. Risk assessment.

Content

Identifying safe health and working practices at all times.

1. Selection and establishment of plants.

Selection, characteristics and prescriptive quality of plants suitable for specific effects, location or display: trees, shrubs, climbers, evergreens and herbaceous plants, groundcover, herbaceous borders, woodland gardens, colour effects, seasonal flowering, scent, berries and fruits. Planting techniques for woody plants to include trees, shrubs, climbers, evergreens and ground cover. Preparation of site for hedging and screens and relationship to cultural requirements. Planting and establishment techniques for a range of herbaceous/hardy perennial plants (to include bulbs, corms and tubers). Name 5 plants for each specific location to include: walls and fences, dry soils, damp soils, acid/alkaline soils, different aspects, shade, screening, coastal and exposed areas.

2. Selection and maintenance of alpine plants.

Selection, characteristics and prescriptive quality of plants suitable for specific effect or display: rock and alpine gardens, alpine meadows. Annual programme of work to include renovation, top dressing, planting, winter protection, pest, disease and weed control.

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3. Selection and maintenance of aquatic and marginal plants.

Selection, characteristics and prescriptive quality of aquatic and marginal plants. Maintenance of the garden pool, water, plants and associated features.

4. Selection and establishment of plants for seasonal display.

Selection, characteristics and prescriptive quality of bedding plants for colour and seasonal effect. Annual/seasonal bedding schemes and their uses in the garden. Work schedule for 12 month period for seasonal bedding schemes. Maintenance to include sowing and thinning, planting, dead-heading, irrigation, feeding, pest, disease and weed control, support. Half hardy and hardy annuals, biennials and tender perennials. Hanging baskets and containers. Bulbs, corms, rhizomes and tubers.

5. Maintenance of hardy herbaceous plants and their environment.

Annual maintenance of herbaceous perennials to include mulching, weed, pest and disease control, pruning, feeding, irrigation, lifting and dividing, and support. Relationship between cultural activities and horticultural principles.

6. Maintenance of woody plants and their environment.

Pruning systems and timings for a range of young and established woody plants to include ornamental trees and conifers, climbers, shrubs, hedging and screens, roses and ground cover. Renovation pruning and pruning equipment. Mulching, feeding, irrigation, weed, pest and disease control, support. Relationship between cultural activities and horticultural principles.

7. Risk assessment

Risk assessment of landscape maintenance practices. Identification of appropriate safe working practices, safety clothing and equipment.

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Plant Selection, Establishment and Maintenance

Unit level: Advanced Certificate or Diploma

Unit value: 1

	Learning outcomes:		Assessment criteria:
1.	Describe the selection and establishment of a range of plants.	1.1	Select and evaluate woody plants for a range of purposes and situations.
		1.2	Evaluate planting and establishment techniques for a range of woody plants.
		1.3	Relate the site preparation for a hedge to its cultural requirements.
		1.4	Describe 2 alternative planting and establishment techniques for hedges and screens.
		1.5	Select and evaluate herbaceous/hardy perennial plants for a range of purposes and situations.
		1.6	Evaluate planting and establishment techniques for a range of herbaceous/ hardy perennial plants.
2.	Describe the cultivation of alpine plants.	2.1	Select and evaluate alpine plants for a range of purposes and situations.
		2.2	Programme and describe the seasonal maintenance for a rock garden and scree bed.
3.	Describe the cultivation of plants in a water features.	3.1	Select and evaluate aquatic plants for a range of purposes and situations.
		3.2	Relate the maintenance problems of a garden pool to the plant/animal balance.
		3.3	Plan a maintenance programme for a water feature.
4.	Describe the cultural requirements of plants for seasonal display.	4.1	Select and evaluate seasonal bedding plants for a range of purposes and situations.
		4.2	Distinguish between hardy and half hardy bedding plants.

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		4.3	Define the terms dot plant, filler and carpet bedding.
		4.4	Produce a work schedule covering the period of a year for a seasonal bedding scheme.
		4.5	Programme and describe the routine maintenance of hanging baskets and containers for both summer and winter effects.
5.	Describe the maintenance of herbaceous plants.	5.1	Plan the annual programme of maintenance for an identified area of herbaceous plants.
		5.2	Relate the programme to the cultural requirements of herbaceous plants.
		5.3	Review a range of herbaceous plant support materials and devices.
6.	Relate the maintenance of woody plants to their mode of growth and/or their season of flowering.	6.1	Describe the maintenance of a range of young and established woody species of ornamental plants including hedges and screens.
		6.2	Relate the pruning systems used with young and established woody ornamental species to their growth patterns and season(s) of interest.
		6.3	Review the alternative methods of pruning to renovate old or overgrown woody species.
		6.4	Evaluate the range of pruning equipment available.
7.	Undertake risk assessments.	7.1	Determine the elements of risk in the practical operations associated with this unit.
		7.2	Identify the safe working practices for the operations identified, to include personal protective equipment and clothing.

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Module J (Option)

Unit Title: Hardy Ornamental Nursery Stock

Unit Code: Advanced Y/103/5816 Diploma T/103/6018

Unit Value: 1

Unit Level: Advanced Certificate or Diploma

Description of Unit

This unit requires students to build upon aspects of the horticulture and science core to provide a broad overview of the practices and processes involved in the successful propagation and production of hardy nursery stock. It will enable students to have a clear understanding of the use of protection and of seasonal requirements for specific tasks together with a practical knowledge of plant husbandry techniques.

Summary of Outcomes

1. Choice of site and equipment for hardy nursery stock production.
2. The production of liners from seed.
3. The production of liners from vegetative material**.**
4. The production of hardy nursery stock in the field.
5. The production of hardy nursery stock in containers.
6. Risk assessment.

Content

Identifying safe health and working practices at all times.

1. Choice of site and equipment for hardy nursery stock production.

Aspect, slope, shelter, soil, drainage, availability of water for irrigation, services, access to site and to markets. Greenhouses, plastics clad tunnels, double clad fogging tunnels, netting clad tunnels, frames, polythene cloches, fleece, bell-jars, closed cases, contact polythene, mist propagation, micro-propagation and shelter both artificial and natural.

2. The production of liners from seed.

The production of liners for **one of each** of the following: a hedging plant, a native tree species, *Rosa canina* for use as a rootstock and a named conifer.
Seed; provenance, availability (seasonal variation), storage, treatments to overcome dormancy, pre-sowing treatment, the calculation of germination rates. Seedbed preparation; weed treatment, soil amelioration, soil sterilization, fertilizer requirements, seedbed dimensions, seedbed formation and sowing timetable. Seedbed management; sowing and covering seed, irrigation, pest, disease and weed control, lifting and grading prior to lining out.
Small-scale production using containers; seed sowing methods, covering, watering requirements, protection from pests and from the weather.

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3. The production of liners by vegetative means.

Stock plant management: choice of stock plants, siting, planting and maintenance, availability of propagation material. Types of cutting, propagation method(s), propagation timetable, management and maintenance of the propagation area, lifting and grading the cuttings prior to containerizing or lining out in the field. Stool beds, layer beds and hedgerows; the production cycle and maintenance.

4. The field production of hardy nursery stock.

The production of bush roses and **one of each** of the following: conifers, shrubs, herbaceous plants, native trees on their own roots and trees budded or grafted onto a named rootstock. Preparation of the site; soil preparation, orientation of rows, setting out the rows, planting method including firming in, labelling and recording. Source of planting material; produced on site, bought in from specialist producers, virus tested stock. Quality; B.S. specifications, buyer's specifications, Plant Breeders' Rights. Crop management; planting by both hand and machine, overall production timetable, routine management of the crop including cultivations, supporting and tying in, trimming and pruning, pest, disease and weed control and irrigation. Budding and grafting in the field. Lifting field grown stock; undercutting prior to lifting, stage of plant development, field conditions, hand and mechanical methods, the treatment of bare root and root balled plants, grading, storage, labelling and packaging.

5. The container production of hardy nursery stock plants.

The production of **one of each** of the following: deciduous shrubs, evergreen shrubs, conifers, herbaceous plants, alpines and heathers. Growing-on area; siting, drainage, weather protection, irrigation, production system. Containerizing area (potting shed); preparation of plant material prior to potting, choice of compost and containers, work stations, potting procedure, efficient layout of the work area. Handling containerized plants; mechanization systems, setting out the plants, spacings and watering in. Management of container grown plants; watering, fertilizer applications, staking and tying, pruning and trimming, pest, disease and weed control. Preparing container grown stock for marketing; market specifications, selection and transport system, cleaning and labelling.

6. Risk assessment.

Risk assessment of hardy nursery stock production. Identification of appropriate safe working practices and selection of appropriate safety clothing and equipment. Meet statutory requirements for irrigation run off.

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Unit Title: Hardy Ornamental Nursery Stock

Unit level: Advanced Certificate or Diploma

Unit value: 1

	Learning outcomes:		Assessment criteria:
1.	Identify the site requirements and equipment needed for the production of hardy nursery stock.	1.1	Describe the requirements of a site to be used for hardy nursery stock production.
		1.2	Evaluate the range of propagation equipment.
		1.3	Evaluate a range of soils for the field production of HONS.
		1.4	Relate irrigation needs to the crop, weather and soil conditions.
2.	Describe the production of liners from seed.	2.1	Explain the importance of seed quality.
		2.2	Relate the storage and pre-sowing treatments for a range of seeds for the underlying horticultural principles.
		2.3	Calculate the seed sowing rate for a range of circumstances.
		2.4	Explain the requirements of outdoor seedbeds.
		2.5	Prepare a propagation timetable for a range of liners.
		2.6	Evaluate a range of methods available for sowing seed in prepared seedbeds.
		2.7	Prepare a plan for the management of outdoor seedbeds.
		2.8	Explain the processes for the lifting and grading seedlings in preparation for lining out.
3.	Describe the production of liners from vegetative material.	3.1	Explain the importance of quality and source of vegetative material.
		3.2	Explain the requirements of a stock bed.

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		3.3	Prepare a yearly management plan for an area of stock beds and stock hedgerows.
		3.4	Relate the preparation, treatment, insertion and aftercare of a range of cuttings to the underlying horticultural principles.
		3.5	Describe the efficient collection and storage of vegetative material.
		3.6	Evaluate a range of methods by which the propagation material can be extended.
		3.7	Explain the processes involved in the lifting and grading of cuttings in preparation for lining out or containerising.
4.	Describe the production of hardy nursery stock in the field.	4.1	Explain the processes involved in the preparation and maintenance of a site.
		4.2	Explain the importance of liner quality.
		4.3	Compare and contrast planting of liners by hand and machine.
		4.4	Compare and contrast the lifting of HONS by hand mechanical methods.
		4.5	List the grading requirements of HONS.
		4.6	Describe the production, harvesting and transportation of a range of HONS.
5.	Describe the production of hardy nursery stock in containers.	5.1	Explain the conditions required for growing on a range of containerised stock.
		5.2	Evaluate the range of compost ingredients and containers available for hardy nursery stock.
		5.3	Evaluate appropriate systems for containerising, handling and transporting stock within the nursery.
		5.4	Prepare a management plan for the maintenance of nursery stock on a standing out area.

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6.	Undertake risk assessment.	6.1	Determine the elements of risk in all of the practical operations associated with this unit.
		6.2	Identify the safe working practices for all the operations identified, to include personal protective equipment and clothing.

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