



Government of **Western Australia**
School Curriculum and Standards Authority

PLANT PRODUCTION SYSTEMS

GENERAL COURSE

Year 11 syllabus

This syllabus is effective from 1 January 2017.

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Rationale

The Plant Production Systems General course enables students to develop knowledge and skills related to the sustainable use of resources and to the production and marketing of a range of plants and their products. Students explore ways that people manage natural resources, such as plants, animals, soil and water, to meet personal and community needs. They evaluate food and fibre production systems, sustainable practices, new technologies, consumer-driven economics and product marketing.

Plant production systems are a fundamental component of agriculture, which has never been more important than in the twenty-first century. Agricultural output and productivity are expected to continue to increase as the world's population reaches an estimated nine billion by 2050. International demand for high quality and safe food and fibre products, particularly from Asia, predicts a positive outlook for the State's agriculture and food sector, while managing biosecurity risks and minimising the impact of climate variability have become more important in order to remain sustainable and globally competitive. Other challenges include ever-increasing competition for natural resources, environmental degradation and food safety issues.

Australia is well positioned to maintain its reputation for 'clean and green' products, and to be a world leader in agricultural production. There will continue to be a demand for people skilled in combining scarce resources and for innovative methods of production.

Course outcomes

The Plant Production Systems General course is designed to facilitate achievement of the following outcomes.

Outcome 1 – Investigating plant production

Students use investigative processes to address plant production challenges.

In achieving this outcome, students:

- investigate issues, needs and opportunities related to plant production challenges
- generate proposals to address plant production challenges
- collect evidence from own or others' investigations, evaluate solutions and processes, and communicate findings.

Outcome 2 – Plant production principles

Students understand the principles and practices underpinning efficient and sustainable plant production systems.

In achieving this outcome, students:

- understand the structure and function of a range of plants or production systems
- understand the interdependence of the elements of natural systems, and plant production systems
- understand management strategies underpinning plant production systems.

Outcome 3 – Plant production practices

Students apply skills and technologies to achieve efficient and sustainable plant production and marketing.

In achieving this outcome, students:

- select and use safely, technologies and skills for plant production
- apply skills to manage production in a sustainable manner
- apply economic and management practices to optimise viable plant production.

Outcome 4 – Agriculture, society and environment

Students understand the relationships between agriculture, society and the environment.

In achieving this outcome, students:

- understand the role of agriculture in shaping the environment and its involvement in developing Australian societies
- understand that economic and technological trends and cultural beliefs and values impact on plant production systems.

Organisation

This course is organised into a Year 11 syllabus and a Year 12 syllabus. The cognitive complexity of the syllabus content increases from Year 11 to Year 12.

Structure of the syllabus

The Year 11 syllabus is divided into two units, each of one semester duration, which are typically delivered as a pair. The notional time for each unit is 55 class contact hours.

Unit 1

In this unit, students learn about the basic structure and function of plants, plant processes and the types and features of plant enterprises.

Unit 2

In this unit, students learn about plant production through the provision of an optimum growing environment.

Each unit includes:

- a unit description – a short description of the focus of the unit
- unit content – the content to be taught and learned

Organisation of content

This course has nine content areas:

- Systems ecology
- Plant structure and function
- Plant environment
- Plant health
- Breeding and improvement
- Economics, finance and markets
- Sustainable production
- Investigating plant production
- Produce for purpose

The content should be based around one or more plant production enterprises.

Safety

Learning experiences may involve the use of potentially hazardous substances and/or hazardous equipment. It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students and that school practices meet the requirements of the *Work Health and Safety Act 2011*, in addition to relevant state or territory health and safety guidelines.

Representation of the general capabilities

The general capabilities encompass the knowledge, skills, behaviours and dispositions that will assist students to live and work successfully in the twenty-first century. Teachers may find opportunities to incorporate the capabilities into the teaching and learning program for the Plant Production Systems General course. The general capabilities are not assessed unless they are identified within the specified unit content.

Literacy

Literacy is important in students' development of investigative skills and their understanding of content. Students gather, interpret, synthesise and critically analyse information presented in a wide range of forms. They evaluate information sources and compare and contrast ideas, information and opinions presented within and between texts. They communicate processes and ideas logically and fluently and structure evidence-based arguments, and employ appropriate methods to communicate for specific purposes and audiences.

Numeracy

Numeracy is key to students' ability to apply a wide range of skills, including making and recording observations; ordering, representing and analysing data; and interpreting trends and relationships. They employ numeracy skills to interpret spatial and graphic representations, and to appreciate the ways in which agricultural systems are structured, interact and change. They engage in analysis of data, including issues relating to reliability and probability, and they interpret and manipulate mathematical relationships to calculate and predict values. In the Plant Production Systems General course, students also use numeracy skills in the form of budgets and marketing decision-making.

Information and communication technology capability

Students apply information and communication technology (ICT) skills in a contemporary agricultural context. Students use a range of strategies to locate, access and evaluate information from multiple digital sources; to collect, analyse and represent data; to model and interpret concepts and relationships; and to communicate and share ideas, processes and information. Students assess the impact of ICT on the productivity, efficiency and sustainability of agricultural systems.

Critical and creative thinking

Critical and creative thinking is particularly important in the investigative process. This requires the ability to construct, review and revise questions and hypotheses about increasingly complex and abstract scenarios and to design related investigation methods. Students interpret and evaluate data; interrogate, select and cross-reference evidence; and analyse processes, interpretations, conclusions and claims for validity and reliability, including reflecting on their own processes and conclusions. Students devise innovative solutions to problems, predict possibilities, envisage consequences and speculate on possible outcomes. They also appreciate the role of critical and creative individuals and the central importance of critique and review.

Personal and social capability

Students develop and practise skills of communication, teamwork, decision-making, and self-discipline with increasing confidence and sophistication. Students develop skills in both independent and collaborative investigation; they employ self-management skills to plan effectively, follow procedures efficiently, work safely, share research and discuss ideas. Students also recognise the role of their own beliefs and attitudes in their response to issues and applications, consider the perspectives of others, and gauge how these can affect people's lives.

Ethical understanding

Students evaluate the ethics of experimental science, codes of practice, and the use of scientific information and science applications. They explore what integrity means in science, and they understand, critically analyse and apply ethical guidelines in their investigations. They use scientific information to evaluate the claims and actions of others and to inform ethical decisions about a range of social, environmental and personal issues and applications of science.

Intercultural understanding

Students appreciate the contributions of diverse cultures to developing science understanding and the challenges of working in culturally diverse collaborations. They develop awareness that raising some debates within culturally diverse groups requires cultural sensitivity, and they demonstrate open-mindedness to the positions of others. Students also develop an understanding that cultural factors affect the ways in which science influences and is influenced by society.

Representation of the cross-curriculum priorities

The cross-curriculum priorities address contemporary issues which students face in a globalised world. Teachers may find opportunities to incorporate the priorities into the teaching and learning program for the Plant Production Systems General course. The cross-curriculum priorities are not assessed unless they are identified within the specified unit content.

Aboriginal and Torres Strait Islander histories and cultures

Through an investigation of contexts that draw on Aboriginal and Torres Strait Islander histories and cultures, students could investigate the importance of Aboriginal and Torres Strait Islander Peoples' knowledge in developing a richer understanding of the Australian environment. Students develop an appreciation of the unique Australian biota and its interactions, the impacts of Aboriginal and Torres Strait Islander Peoples on their environments and the ways in which the Australian landscape has changed over tens of thousands of years. They could examine the ways in which Aboriginal and Torres Strait Islander knowledge of ecosystems has developed over time and the spiritual significance of Country/Place.

Asia and Australia's engagement with Asia

Contexts that draw on Asian scientific research and development and collaborative endeavours in the Asia Pacific region provide an opportunity for students to investigate Asia and Australia's engagement with Asia. Students explore the diverse environments of the Asian region and develop an appreciation that interaction between human activity and these environments continues to influence the region, including Australia, and has significance for the rest of the world. By examining developments in agriculture, students appreciate that the Asian region plays an important role in such areas as natural resource management, biosecurity and food security.

Sustainability

The Sustainability cross-curriculum priority is explicitly addressed in the Plant Production Systems General course. Agriculture provides authentic contexts for exploring, investigating and understanding the function and interactions of agricultural systems across a range of spatial and temporal scales. By investigating the relationships between agricultural systems and system components, and how systems respond to change, students develop an appreciation for the interconnectedness of the biosphere. Students appreciate that agriculture provides the basis for decision making in many areas of society and that these decisions can impact the Earth system. They understand the importance of using agricultural science to predict possible effects of human and other activity, and to develop management plans or alternative technologies that minimise these effects and provide for a more sustainable future.

Unit 1

Unit description

In this unit, students learn about the basic structure and function of plants, plant processes and the types and features of plant enterprises. The teaching and learning is based around one or more plant enterprises. Students learn about the types of crops and plant pests common to Western Australia, as well as the safe, efficient and effective use of equipment and resources used in plant production. Students use basic economic concepts associated with plant production to guide decision-making and investigate aspects of plant production.

The content should be based around one or more plant production enterprises.

Unit content

This unit includes the knowledge, understandings and skills described below.

Knowledge and management of plant production systems

Systems ecology

- structure of natural, urban and agricultural ecosystems

Plant structure and function

- major agricultural and horticultural crops of Western Australia
- life cycles of plants, including annuals and perennials
- reproductive and vegetative parts of plants
- photosynthesis process (inputs and outputs) and its purpose

Plant environment

- influences on the location of plant production, including climate and growing system
- determinants of growing seasons of a region
- macro- and micro-nutrients required for growth
- indicators of soil health and fertility

Plant health

- identification of selected pests and diseases and their impact
- interpretation of information provided on labels for safe and effective use of registered products

Breeding and improvement

- natural selection and plant adaptation
- selection of plant types for specific purposes

Economics, finance and markets

- farming as a business
- identify resources used in production, including land, labour, capital
- recording production costs and incomes
- identification of inputs and outputs

Sustainable production

- efficient use of resources without compromising the environment
- renewable and non-renewable resources

Investigating plant production

- conduct an investigation considering aspects of experimental design
- interpret data, including calculating means
- present data using appropriate methods
- draw conclusions based on experimental data

Produce for purpose

- identify types and features of plant enterprises
- select equipment and resources when working with plants
- comply with occupational safety and health requirements (OSH)
- monitor the physical environment, including the weather

Unit 2

Unit description

In this unit students learn about plant production through the provision of an optimum growing environment. They identify market specifications for plant products, develop a calendar of operations and calculate profit.

Students learn about natural resources used in agriculture and the importance of protecting natural ecosystems. They interpret information concerning chemical use and how to comply with industry codes of practice. Students will be involved in an investigation and will learn to identify the elements of valid experimental design.

The content should be based around one or more plant production enterprises.

Unit content

This unit builds on the content covered in Unit 1.

This unit includes the knowledge, understandings and skills described below.

Knowledge and management of plant production systems

Systems ecology

- natural resources used in agriculture, including soils, water and air
- water cycles in landscapes

Plant structure and function

- requirements for growth, including nutrients, water, light, heat and gases
- response of growth to temperature and nutrients
- water use by evapotranspiration
- propagation by seeds and vegetative parts, including tubers, cuttings, buds and grafts

Plant environment

- factors affecting soil fertility
- soil profiles and textures
- function of macro nutrients in plants and symptoms of deficiency
- symptoms of water stress

Plant health

- interpret agricultural chemical labels to determine which product to select
- application of codes of practice concerning chemical use

Breeding and improvement

- cultivars and their characteristics
- plant types, their origins and development into current cultivars

Economics, finance and markets

- farming systems and enterprises
- available markets
- calculation of costs, returns and profits

Sustainable production

- identification of market requirements to be met for selected products
- the role of quarantine in preventing pests, diseases and weeds
- prevention of the spread of pests, diseases and weeds to natural ecosystems

Investigating plant production

- conduct an investigation, considering aspects of experimental design
- interpret data, including calculating means
- present data using appropriate methods
- draw conclusions based on experimental data

Produce for purpose

- develop a calendar of operations for an enterprise production cycle
- identify quality criteria for selected plant products
- monitor growth and development of plants
- monitor the impact of the weather on plant enterprises
- perform routine care of plants
- select and use equipment for a given enterprise

School-based assessment

The Western Australian Certificate of Education (WACE) Manual contains essential information on principles, policies and procedures for school-based assessment that needs to be read in conjunction with this syllabus.

Teachers design school-based assessment tasks to meet the needs of students. The table below provides details of the assessment types for the Plant Production Systems General Year 11 syllabus and the weighting for each assessment type.

Assessment table – Year 11

Type of assessment	Weighting
<p>Investigation</p> <p>An investigation is an activity in which ideas, predictions or hypotheses are tested and conclusions are drawn in response to a question or problem.</p> <p>Tasks include:</p> <ul style="list-style-type: none"> planning investigations, proposing hypotheses and predicting outcomes designing investigations, including the procedures to be followed, discussion of variables, type and amount of data to be collected, risk assessments and consideration of research ethics conducting investigations in a safe, competent and methodical manner to collect valid and reliable data processing, representing and interpreting data, and identifying relationships and limitations in the data communicating findings in an appropriate form, including written, oral, graphic or combinations of these. <p>Appropriate strategies should be used to authenticate student achievement of an investigation that has been completed as a group or outside of allocated class time.</p>	10%
<p>Production project</p> <p>Production projects involve the synthesis of theory and practice of a plant production system.</p> <p>Tasks can involve selecting and applying appropriate production concepts to existing or new situations; managing processes for optimal production and to meet industry standards, and proposing adaptations to improve the management of plant production systems.</p> <p>Tasks can take the form of specific questions based on a selected plant production system, related practical activities, and integration of relevant information from scientific or media sources.</p> <p>It is highly recommended that work completed out of class is authenticated using an in-class assessment task under test conditions.</p>	45%
<p>Test</p> <p>Tests are designed to assess knowledge and the application of concepts relating to plant production systems. Questions can involve comprehension, evaluation and application of information, and problem solving.</p> <p>Tests typically consist of multiple choice questions, as well as questions requiring short and extended answers.</p>	45%

Teachers are required to use the assessment table to develop an assessment outline for the pair of units (or for a single unit where only one is being studied).

The assessment outline must:

- include a set of assessment tasks
- include a general description of each task
- indicate the unit content to be assessed
- indicate a weighting for each task and each assessment type
- include the approximate timing of each task (for example, the week the task is conducted, or the issue and submission dates for an extended task).

In the assessment outline for the pair of units, each assessment type must be included at least twice, except Investigation, which must be included at least once. In the assessment outline where a single unit is being studied, each assessment type must be included at least once.

The set of assessment tasks must provide a representative sampling of the content for Unit 1 and Unit 2.

Assessment tasks not administered under test/controlled conditions require appropriate validation/authentication processes.

Grading

Schools report student achievement in terms of the following grades:

Grade	Interpretation
A	Excellent achievement
B	High achievement
C	Satisfactory achievement
D	Limited achievement
E	Very low achievement

The teacher prepares a ranked list and assigns the student a grade for the pair of units (or for a unit where only one unit is being studied). The grade is based on the student's overall performance as judged by reference to a set of pre-determined standards. These standards are defined by grade descriptions and annotated work samples. The grade descriptions for the Plant Production Systems General Year 11 syllabus are provided in Appendix 1. They can also be accessed, together with annotated work samples, through the Guide to Grades link on the course page of the Authority website at www.scsa.wa.edu.au

To be assigned a grade, a student must have had the opportunity to complete the education program, including the assessment program (unless the school accepts that there are exceptional and justifiable circumstances).

Refer to the WACE Manual for further information about the use of a ranked list in the process of assigning grades.

Appendix 1 – Grade descriptions Year 11

A

Understanding and applying concepts

Produces appropriately detailed and well-organised responses about production systems and processes, with accurate application to selected enterprises.

Describes key interrelationships between natural systems, production systems and society.

Explains concepts consistently, using appropriate technical language and representations.

Demonstrates logical and independent thinking skills.

Enterprise management skills

Demonstrates well-developed links between a broad range of theoretical concepts and practical skills.

Selects and uses appropriate resources and equipment to perform selected tasks in a confident, safe and effective manner.

Selects and accurately applies economic tools to operate a production system.

Displays initiative when making decisions about production practices.

Science inquiry skills

Formulates a testable hypothesis that states the relationship between dependent and independent variables.

Plans an investigation to collect appropriate data.

Identifies controlled variables with specific detail.

Collects data logically and presents it in a range of forms, including appropriate graphs and tables to reveal patterns and relationships.

Accurately calculates averages.

Uses evidence to make and justify conclusions.

Recognises inconsistencies in data and suggests specific ways to improve the design of an investigation.

B

Understanding and applying concepts

Produces responses addressing key aspects of production systems and processes, with mostly accurate application to selected enterprises.

Describes some interrelationships between natural systems, production systems and society.

Explains concepts using appropriate technical language and representations.

Demonstrates predominantly independent thinking skills.

Enterprise management skills

Makes connections between a range of theoretical concepts and practical skills.

Uses equipment and resources to perform selected tasks safely and effectively.

Applies economic tools to operate a production system with minor inaccuracies.

Makes decisions concerning production practices based on own and suggested strategies.

Science inquiry skills

Formulates a testable hypothesis, that includes dependent and independent variables.

Plans an investigation to collect appropriate data.

Identifies some controlled variables without detail.

Presents data in a range of forms, including appropriate graphs, tables and charts to reveal patterns and relationships.

Uses evidence to make conclusions.

Recognises inconsistencies in data and makes general suggestions to improve the design of an investigation.

C

Understanding and applying concepts

Produces simple responses about production systems and processes, showing varied accuracy in application to selected enterprises.

Recognises elements of production systems, natural systems and society, drawing some links between them.

Explains concepts, without detail, using representations and some technical language.

Shows the emergence of independent thinking skills.

Enterprise management skills

Makes connections between certain theoretic concepts and practical skills, but with limited attention to detail.

With some guidance, uses equipment and resources to perform selected tasks safely.

Uses economic tools to operate a production system with some errors.

Makes decisions concerning production practices, sometimes relying on guidance.

Science inquiry skills

Identifies independent and dependent variables, and predicts a general outcome for an investigation.

Plans an investigation to collect appropriate data.

Inconsistently identifies some controlled variables.

Presents data using simple tables and graphs.

Draws simple conclusions that may not be supported by experimental data.

Describes difficulties experienced in conducting the investigation and suggests general improvements.

D

Understanding and applying concepts

Produces responses showing limited understanding of production systems and processes, with minimal and/or inaccurate application to selected enterprises.

Recognises a few elements of production systems, natural systems and society.

Presents incomplete data using simple techniques; includes irrelevant or incorrect information.

Explains concepts using simple representations and everyday language.

Uses technical language inconsistently and/or inaccurately.

Responses are often incomplete.

Draws broad conclusions, with little evidence of independent thinking skills.

Enterprise management skills

Displays a limited connection between theory and practical skills.

Applies very few safety procedures.

Identifies simple economic tools to operate a production system.

Displays limited decision-making skills regarding production practices.

Science inquiry skills

Follows a set experimental procedure to collect data.

Confuses variables.

Presents data that is unclear, insufficient and lacks appropriate processing.

Incorrectly identifies or overlooks trends in data.

Offers simple conclusions that are not supported by the data.

Identifies difficulties experienced in conducting the investigation.

E

Does not meet the requirements of a D grade and/or has completed insufficient assessment tasks to be assigned a higher grade.

Appendix 2 – Glossary

This glossary is provided to enable a common understanding of the key terms in this syllabus.

Hypothesis	A scientific statement based on the available information that can be tested by experimentation. When appropriate, the statement expresses an expected relationship between the independent and dependent variables for observed phenomena.
Natural systems	Comprise ecological and physiological systems that exist without human intervention.
Plant production systems	Are those based on natural systems that have been managed, manipulated, adapted and refined to meet human needs for food, fibre, shelter and lifestyle.
Skills	Include handling plants, harvesting plant products, applying plant health remedies, testing and plant improvement methods.
Social systems	Are those based on natural systems that have been managed, manipulated, adapted and refined to meet human needs for food, fibre, shelter and lifestyle.
Sustainability	Can be considered as meeting the needs of current and future generations through integration of environmental protection, social advancement and economic prosperity.
Systems	Can include plant production and marketing systems, management systems, value-adding systems, service and maintenance systems, biotic systems and abiotic systems.
Technologies	Including genetic engineering, new plant production techniques, specialised equipment and machinery, global positioning systems, and information and communication technology (ICT).