



Course Title and Description

APBI 222 (3) "Introduction to Horticulture"

The cultivation of key temperate fruits, vegetables, greenhouse and ornamental/nursery crops in BC, integrated with scientific and practical aspects of their sustainable production and marketing.

Lecture: MCML 258 MWF 10-10:50 am

Lab/tutorial Horticulture Greenhouse rm 107 (or as advised) noon-3:00 pm

Instructor: Dr. David McArthur, rm 133 MCML Bldg, Teaching Assistant: Wei Yan

Office Hours: 11-noon Wednesdays & Fridays or by appointment, contact: david.mcarthur@ubc.ca

Pre-requisites: None, but any plant biology &/or experience in gardening/houseplants is very helpful/recommended

APBI 222 (3) "Introduction to Horticulture"

APBI 222 provides a short introduction to plant taxonomy/processes followed by an introduction and overview of significant temperate horticulture crops with consideration of select production agroecosystems used in North America (highlighting mainly BC and parts of the Pacific North-West) for

- i. Olericulture: vegetables (field & greenhouse),
- ii. Pomology: fruit (with a sub-unit on a. tree fruit & b. wine-growing - time permitting),
- iii. Landscape & nursery horticulture
- iv. Floriculture crops (field & greenhouse).

Each crop category is presented in a modular format and where possible, with guest speakers from UBC and/or the various horticulture industries (may be during field tours). Examples of scientific research (e.g. plant breeding) and practical methodologies (e.g. propagation, pruning etc.) utilized in horticulture crop production are presented and, where applicable, demonstrated. Examples of key economic factors, regulations and current trends in production are presented and discussed.

Course Structure and Operation

APBI 222 is a second year, 3-credit course with a 50-minute class three times a week (10:00 am to 10:50 am M/W/F) plus a lab/tutorial session Wednesdays at 12:00-3:00 pm.

Within the lab session, 4 field trips are planned (additionally, some UBC walk-about may be either in lecture or in the lab session). Field trips planned include 1. UBC (vegetable) Farm; 2. A commercial berry operation(s) Richmond, 3. An ornamental nursery landscape operation(s) Richmond/Delta, and 4. a winery(s) in Richmond/Langley (to be scheduled for a Saturday due to the distance/time factor). In addition, #5 will be a visit to apple trees at the Horticulture Greenhouse (some hands-on tree training/pruning) combined with a walkabout of small apple orchards on UBC campus. These will provide a first-hand look and an opportunity to meet with producers and illustrate salient features of representative food agroecosystems. Note that some lab periods (TBA) may be utilized for study purposes.

Intended Learning Outcomes

Upon completion of the course, students will be able to:

1. Recognize/describe distinguishing botanical-horticultural morphological traits in order to place example horticultural species into their taxonomic family
2. Describe a/some key feature(s) of specific horticulture crops and relate this to their economic & social importance
3. Describe cultural management for representative crops for each of the horticulture crop categories discussed (e.g. plan out a simple vegetable crop rotation plan; propagation);
4. Discuss how ecological and economic factors may affect the sustainability of select horticulture cropping systems;



5. Describe basic principles & benefits of genetic resource management & how to apply these in horticulture
6. Demonstrate an ability to reflect on and connect empirical experiences/knowledge (e.g. from labs, farmers/guest experts) to theoretical learning for an enhanced understanding of horticulture systems and sustainable crop production.

Course format and Evaluation:

Quizzes (introduction module (5%) & 4 crop modules (10% each) 45% dates: see schedule below
Field reports/worksheets (1% each): 5% Due dates: 9 am Monday after field trip^z
(^zexcept wine tour - TBA)

Final Exam: 40% December TBA

Participation*/attendance* (2% each field trip incl apple walk-about) 10%

(note: marks will be deducted for lack of participation/attendance - exceptions where a medical document is provided, but a makeup component will be assigned)

Quizzes (45%)

Quizzes will be based upon lecture & assigned online readings/videos and this will include information on terminology, plant structure, growth, growing requirements/systems, species/varieties. These quizzes are meant to assess student understanding of the principles and terminology/content introduced for that module.

Field Trip Reports/Worksheets (5%):

Field trips (and apple trees/orchard tour) are organized so that learning outcomes will include the ability to describe the component plant species & essential structure/processes of each agroecosystem visited. Where applicable, students will also be required to comment on learning outcomes related to the lecturer/farmer's discussion of example successes, challenges, industry trends and sustainability – to be gained from their interactions (student questions) with the industry representative/farmer.

Final examination (40%):

The final examination will be composed of a mix of multiple choice, short answer and paragraph questions related to the principles covered in the modules throughout the course – for example on crop-specific terminology and methodologies. Date and time will be as scheduled by Registrar.

Textbook Readings – required readings (see Canvas Lecture notes for study purposes)

On reserve &/or free internet (TBA – Connect link):

1. Plant Systematics A Phylogenetic Approach 3rd Ed. Judd WS, Campbell CS, Kellogg EA, Stevens PF, Donoghue MJ Sinauer Associates Inc CHAPTER 4 pp 53-102
2. Raven Biology of Plants (2013) 8th Ed Evert RF, Eichhorn SE, WH Freeman and Co NY CHAPTER 7 pp 122-149 and CHAPTER 21 pp 501-523

Assigned sections of online books/guides and online information sites (some selected readings TBA)

3. Berry production guide Beneficial Management Practices for Berry Growers in BC Current edition, Province of B.C., Ministry of Agriculture, Fisheries and Food; [Free Access](#)
4. Best Practices Guide for Grapes for BC Growers, current edition, Province of B.C., Ministry of Agriculture, Fisheries and Food, BC Wine Grape Council (access TBA)
5. Integrated Fruit Production Guide for commercial tree fruit growers interior of BC, current edition, Province of B.C., Ministry of Agriculture, Fisheries and Food, BC Fruit Growers Association (access TBA)
6. Vegetable production guide Beneficial Management Practices for Vegetable Growers in BC Current edition, Province of B.C., Ministry of Agriculture, Fisheries and Food; [Free Access](#)
7. Floriculture Production Guide: Current edition, Province of B.C., Ministry of Agriculture, Fisheries and Food; [Free Access](#)
8. Nursery Production Guide -Guide to best management outdoor ornamental plants; [Free Access](#)
9. Planning for Profit websites; [Free Access](#)

Tentative Course Schedule (schedule may be altered due to environmental/field-crop production issues and in consultation with students)

Week 1

W Lec 1. **Welcome:** overview of horticulture and course requirements. An overview on the development of value and diversity in horticulture - locally and globally;

Learning objectives: discuss/provide an overview of the scope, magnitude & value of horticulture.

W Lab – noon to 1:30 pm - a walk-about to view horticulture in our UBC backyard



F Lec 2. A brief **history** on the development of horticulture & related sciences – some significant steps along the way. chapter Biology of Plants Chpt 21 pp 501-523; also example online <http://milestones.aspb.org>
http://www.labtimes.org/labtimes/issues/lt2013/lt03/lt_2013_03_16_21.pdf

Learning objectives: gain an appreciation of when & how horticulture developed; outline scientific developments that advanced horticulture.

Week 2

M Lec 3. Plant taxonomy in horticulture

Learning objectives: Recognize/describe distinguishing botanical-horticultural morphological traits in order to place example horticultural species into their taxonomic/horticulture family; Describe a/some key feature(s) of specific horticulture crops and relate this to their economic & social importance

W Lec 4. Plant taxonomy in horticulture-continued; Plant processes/physiology; class notes based on Raven Biology of Plants Chpt 7 pp122-149;

Learning objectives: name the principal pigments involved in photosynthesis; list the main products of the light reaction and also those of the dark reactions – explain how these fit into horticulture

W Lab 1: noon- 2:30 pm Walk about – possible tour of Horticulture Greenhouse

F Lec 5. Plant processes/physiology-continued; class notes based on Raven Biology of Plants Chpt 28: 660-682 & Chpt 27: 638-659

Learning objectives: name 6 major groups of plant hormones – describe a typical effect of each on plant growth regulation – how this is important in horticulture; outline the effect of day-length on flowering; describe what phytochrome is & its influence on flowering, seed germination and stem growth; describe plant dormancy and its link to environmental conditions.

Review of Week 1-2 lectures

Week 3

Tentative: Sept. TBA Quiz 1 on Week 1-2 background lectures (30 min)

MODULE 1 ON VEGETABLE PRODUCTION:

M Lec 6.

Overview of major vegetable crops grown commercially – what do the plants look like – what is the edible portion; what is their economic importance (some focus on BC);

Learning objective: recognize & describe plant (with marketable portion) attributes of commercially important & representative vegetable species for important plant families - [e.g. Brassicaceae (broccoli/kale), Solanaceae (tomato versus potato), Fabaceae (beans/peas), Asteraceae (lettuce/salad crops), Apiaceae (carrot/root crops), Cucurbitaceae (squash)].

W Lec 7. **Continued** - Overview of major vegetable crops [e.g. Brassicaceae (broccoli/kale), Solanaceae (tomato versus potato)] grown commercially; Vegetable culture: site suitability, propagation and planting, management, marketing considerations.

Learning objective: Identify and describe plant and environmental factors that influence the selection of species and varieties, cultural techniques and crop shelf-life. Discussion of field trip learning outcomes

W Lab 1: noon- 2:50 pm – Sept 19th To be confirmed - Field Trip #1: meet at UBC Farm for tour of vegetable & fruit production agroecosystems; discussion of field trip assignment

F Lec 8. **Continued** - Vegetable culture (Solanaceae (tomato versus potato)- continued; Fabaceae (beans/peas): site suitability, propagation and planting, management, marketing considerations.

Week 4

MODULE 1 ON VEGETABLES [e.g. Brassicaceae (broccoli/kale), Solanaceae (tomato), Fabaceae (beans/peas), Asteraceae (lettuce/salad crops), Apiaceae (carrot/root crops), Cucurbitaceae (squash)] - **continued**:

M Lec 9. Fabaceae (beans/peas)- continued, Asteraceae (lettuce/salad crops): vegetable culture: site suitability, propagation and planting, management, marketing considerations

W Lec 10. Continued - vegetable culture - Apiaceae (carrot/root crops), Learning objective: describe economic success/opportunities, constraints, market factors influencing sustainability

W Lab TBA

F Lec 11. Continued-vegetable culture - Cucurbitaceae (squash)]; Learning objective: describe economic success/opportunities, constraints, market factors influencing sustainability.

Possible guest speaker



Review of Week 3-4 lectures

Week 5

Tentative: TBA Quiz 2 on Week 3-4 lectures (30 min)

MODULE 2A: SMALL FRUIT PRODUCTION

M Lec 12 Overview of major temperate zone berry crops grown commercially – what do the plants look like – what is the edible portion; what is their economic importance (some focus on BC);

Learning objective: recognize & describe plant (with marketable portion) attributes of commercially important & representative fruit species for important plant families - [e.g. Ericaceae (highbush blueberry), Ericaceae (cranberry), Rosaceae (raspberry/blackberry), Rosaceae (strawberry), (other misc berry crops)]

W Lec 13. **Continued** - Overview of major fruit crops e.g. Ericaceae (highbush blueberry & cranberry), fruit culture: site suitability, propagation and planting, management, marketing considerations. Discussion of field trip learning outcomes and assignment

Learning objective: describe plant attributes that are significant to berry culture - essential biological/morphological features, and growth patterns. What factors most influence the selection of species and varieties, cultural techniques and marketing (e.g. shelf-life)?

W To be confirmed Oct. TBA - Field Trip #2: Meet at MCML for bus pickup and trip to blueberry & cranberry farms in Richmond.

F Lec 14. **Continued** - Overview of major fruit crops e.g. Ericaceae (cranberry), fruit culture: site suitability, propagation and planting, management, marketing considerations.

Small fruit culture: site suitability, propagation and planting, management, marketing considerations. Possible guest speaker

Week 6

MODULE 2A: SMALL FRUIT PRODUCTION

M no lecture Monday Oct. Canadian Thanksgiving

W Lec 15. **Continued** - Overview of major fruit crops e.g. Rosaceae (raspberry/blackberry), fruit culture: site suitability, propagation and planting, management, marketing considerations.

W Lab make up lecture 16 **Continued rm 258/107**- Overview of major fruit crops e.g. Rosaceae (strawberry), fruit culture: site suitability, propagation and planting, management, marketing considerations.

F Lec 16. Overview of misc fruit crops and their culture: site suitability, propagation and planting, management, marketing considerations.

Possible guest speaker

Review of Week 5-6 lectures

Week 7

Tentative: TBA Quiz 3 on Week 5-6 lectures (30 min)

MODULE 3: ORNAMENTAL/NURSERY LANDSCAPE CROPS

M Lec 17 Overview of representative major temperate zone ornamental/nursery crops grown commercially – what species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC);

Learning objective: recognize & describe plant attributes of commercially important & representative landscape species and relate these to their plant families - [e.g. herbaceous perennials such as in Ranunculaceae (e.g. hellebores) and Asparagaceae (e.g. hostas); deciduous shrubs such as in Lamiales (e.g. Callicarpa-Beauty-Berry) and Cornaceae (e.g. shrub dogwood), evergreen shrubs/groundcovers such as in Ericaceae (e.g. Rhododendron), Adoxaceae (e.g. Viburnum) and Rosaceae (e.g. cotoneaster); deciduous trees such as in Sapindaceae (e.g. Japanese maple) & Cercidiphyllaceae (e.g. Katsura); and evergreen trees such as in Magnoliaceae (e.g. Magnolia grandiflora note some magnolias are deciduous) & Aquifoliaceae (e.g. holly)]

W Lec 18. – continued - review of representative major temperate zone ornamental/nursery crops grown commercially – what species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC)

W Lab: Oct. Field trip # 3 (TBA) - Meet in back of MCML for bus pickup and trip to landscape/nursery farm(s) in Richmond/Delta.



F Lec 19. – continued - review of representative major temperate zone ornamental/nursery crops grown commercially – what species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC). Discussion of field trip learning outcomes
Possible guest speaker

Week 8

MODULE 3 continued: ORNAMENTAL/NURSERY LANDSCAPE CROPS

M Lec 20 Overview of representative major temperate zone ornamental/nursery crops grown commercially – what species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC);

Learning objective: recognize & describe plant attributes of commercially important & representative landscape species and relate these to their plant families - [e.g. herbaceous perennials such as Ranunculaceae (e.g. hellebores) and Asparagaceae (e.g. hostas); deciduous shrubs such as in Lamiales (e.g. Calliopsis-Beauty-Berry) and Cornaceae (e.g. shrub dogwood), evergreen shrubs/groundcovers such as in Ericaceae (e.g. Rhododendron), Adoxaceae (e.g. Viburnum) and Rosaceae (e.g. cotoneaster); deciduous trees such as in Sapindaceae (e.g. Japanese maple) & Cercidiphyllaceae (e.g. Katsura); and evergreen trees such as in Magnoliaceae (e.g. Magnolia grandiflora note some magnolias are deciduous) & Aquifoliaceae (e.g. holly)

W Lec 21. – continued - review of representative major temperate zone ornamental/nursery crops grown commercially – what species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC)

W Lab: TBA - UBC local walk-about

F Lec 22. – continued - review of representative major temperate zone ornamental/nursery crops grown commercially – what species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC).

Possible guest speaker

Review of Week 8-9 lectures

Week 9

MODULE 4 GREENHOUSE FLORICULTURE/VEGETABLE CROPS:

M Lec 23 - Overview of representative major greenhouse crops grown commercially – including floriculture (cut flowers, potted flowering plants e.g. seasonals such as Easter lily) and vegetables (e.g. tomatoes, cucumbers, peppers). What species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC)

Overview of representative main flowering and ornamental herbaceous crops grown commercially.

Learning objective: describe the controlled environment conditions used to regulate plant growth & development (e.g. manipulation of photoperiod to induce flowering in some species) and relate these to physiology of plant species types (short day/long day). Relate the environmental conditions to the development of other plant attributes that are significant to propagation &/or culture and the commercial market.

W Lec 24. Flowering and ornamental herbaceous crops; Type of controlled environment conditions required for product development, propagation, management, marketing considerations

W Lab: Nov. TBA Field trip # 4 meet outside back of MCML– TBA: visit LFS Horticulture greenhouse or van trip to a commercial floriculture/vegetable greenhouse operation(s)

F Lec 25. Flowering and ornamental herbaceous crops: Learning objective: describe economic success/opportunities/trends, constraints, market factors influencing sustainability. Discussion of field trip learning outcomes.

Possible guest speaker

Week 10

MODULE 4 GREENHOUSE FLORICULTURE/VEGETABLE CROPS:

M Lec 26 - continued - Overview of representative major greenhouse crops grown commercially – mainly floriculture (cut flowers, potted flowering plants e.g. seasonals such as Easter lily), but a brief return to vegetables (e.g. tomatoes, cucumbers, peppers). What species are involved and what do the plants look like – what is the marketed product; what is their economic importance (some focus on BC)

Overview of representative main flowering and ornamental herbaceous crops grown commercially.



Learning objective: describe the controlled environment conditions used to regulate plant growth & development (e.g. manipulation of photoperiod to induce flowering in some species) and relate these to physiology of plant species types (short day/long day). Relate the environmental conditions to the development of other plant attributes that are significant to propagation &/or culture and the commercial market.

W Lec 27. Flowering and ornamental herbaceous crops; Type of controlled environment conditions required for product development, propagation, management, marketing considerations

W Lab: TBA - meet outside back of MCML– TBA: visit LFS Horticulture greenhouse or bus trip to a commercial floriculture/vegetable greenhouse operation(s)

F Lec 28. Continued Flowering and ornamental herbaceous crops; Type of controlled environment conditions required for product development, propagation, management, marketing considerations

Review of Week 9-10 lectures

Week 11

Tentative: Nov. TBA Quiz 4 on Week 7-10 lectures (25 min)

MODULE 2B: TREE FRUIT CROPS & WINE-GROWING

M Lec 29 Overview of major temperate zone tree fruit crops & wine grapes grown commercially – what do the plants look like – what is the edible portion; what is their economic importance (some focus on BC);

Learning objective: recognize & describe plant (with marketable portion) attributes of commercially important & representative fruit species for important plant families – [e.g. Rosaceae (e.g. apple, cherry), Vitaceae (wine-grapes), (other misc tree fruit/vine crops)]

W Lec 30. **Continued** - Overview of major tree fruit crops e.g. Rosaceae (e.g. apple, cherry) and their fruit culture: site suitability, propagation and planting, management, marketing considerations. Learning objective: describe plant attributes that are significant to fruit culture - essential biological/morphological features, and growth patterns. What factors most influence the selection of species and varieties, cultural techniques and marketing (e.g. shelf-life)?

***W Lab: To be confirmed Field Trip #4 *** **moved to Saturday Nov. TBA** for trip to Langley vineyard winery - meet outside back of MCML;

F Lec 31. **Continued** – Overview of major tree fruit crops e.g. Rosaceae (e.g. apple, cherry) and their fruit culture: site suitability, propagation and planting, management, marketing considerations.

Possible guest speaker. Discussion of field trip learning outcomes and assignment

Week 12

MODULE 2B: TREE FRUIT CROPS & WINE-GROWING

M Lec 32 Overview of major temperate zone tree fruit crops & wine grapes grown commercially – what do the plants look like – what is the edible portion; what is their economic importance (some focus on BC);

Learning objective: recognize & describe plant (with marketable portion) attributes of commercially important & representative fruit species for important plant families – [e.g. Rosaceae (e.g. apple, cherry), Vitaceae (wine-grapes), (other misc tree fruit/vine crops)]

W Lec 33. **Continued** - Overview of major wine grape varieties e.g. Vitaceae (e.g. Chardonnay, Bacchus, Pinot Noir, Syrah) and their fruit culture: site suitability, propagation and planting, management, marketing considerations. Learning objective: describe plant attributes that are significant to grape culture - essential biological/morphological features, and growth patterns. What factors most influence the selection of varieties and varieties, cultural techniques and marketing (e.g. processing issues)?

W Lab: To be confirmed Field Trip #4 (if not completed already) may substitute this time for a Saturday field trip to Langley winery/vineyard.

F Lec 34. **Continued** - Overview of major wine grape varieties e.g. Vitaceae (e.g. Chardonnay, Bacchus, Pinot Noir, Syrah) and their fruit culture: site suitability, propagation and planting, management, marketing considerations.

Possible guest speaker. Discussion of field trip learning outcomes and assignment

Review of Week 11-12 lectures

Week 13

Tentative: Nov. TBA Quiz 5 on Week 11-12 lectures (30 min)



The big picture: the horticulture industry

Learning objective: gain an appreciation of the local to global scope and magnitude of horticulture and the demand for its products. Learning objective: be able to describe the economic impact of horticulture at various levels and where to access reliable statistical information.

M Lec 35. Recap and general discussion of the big picture: the horticulture industry in BC today. The bigger picture: the horticulture industry in Canada and globally today. An overview on the value, diversity and opportunities of horticulture - locally and globally. Challenges

W Lec 36. and opportunities in horticulture today - climate change – what impact?

W Lab – optional tutorial for study review

W Lec 37. Advances in horticulture research and biotechnology today. Where to go from here?