

## SUBJECT OUTLINE



Subject Name:

### Herbal Botany and Manufacturing

Subject Code:

**WHMF121**

#### SECTION 1 – GENERAL INFORMATION

<b>Award/s:</b>	Bachelor of Health Science (Naturopathy)	<b>Total course credit points:</b>	128	<b>Level:</b>	1 <sup>st</sup> Year
<b>Duration:</b>	1 Semester				
<b>Subject Coordinator:</b>	Julie Wilkinson-Flores (Melbourne Campus)				
<b>Subject is:</b>	Core	<b>Subject Credit Points:</b>	4		

#### Student Workload:

<b>No. timetabled hours per week:</b>	<b>No. personal study hours per week:</b>	<b>Total hours per week:</b>
6	4	10

#### Delivery Mode:

Face to face	2 x 1 hour lecture	2 x 2 hours practical
Intensive Delivery	Details:	Summer School - contact hours are delivered over 6 weeks with 2 x 6.5 hour days delivered per week. Assessment: Attendance is assessed in class. Quizzes are offered in Weeks 4 & 6).
Full Time		
Part Time		

**Pre-requisites:** BIOB111

**Co-requisites:** Nil

#### SECTION 2 – ACADEMIC DETAILS

##### Subject Rationale

This foundational Herbal Medicine subject introduces students to the study of plant medicine via an exploration of botany and herbal manufacturing. Through an understanding of basic plant morphology, botanical terminology, taxonomy, and nomenclature, students learn to recognise similar and different physical characteristics of plants and to identify plant specimens. Students learn the theory and practice of herbal manufacturing and gain experience in the preparation of plants in various forms to achieve effective therapeutic results. Additionally, students are introduced to the legislative and regulatory frameworks that govern the manufacture and sale of botanical medicines in Australia. This subject serves as a foundation for the study of herbal pharmacy and pharmacology, *materia medica* and therapeutics.

##### Learning Outcomes

1. Identify plant specimens based on an understanding of plant morphology and botanical taxonomy.
2. Demonstrate an understanding of the environmental influences on the quality of plant materials used in clinical herbal practice.
3. Critically evaluate the various pharmaceutical forms for administration of herbs therapeutically and their appropriateness to different health conditions.
4. Discuss current Australian legislation as it relates to the growing, manufacture, dispensing and dosage of herbs for therapeutic administration.
5. Demonstrate the ability to produce various forms of herbal preparations for topical and internal administration.

Assessment Tasks				
Type	Learning Outcomes Assessed	Session Content Delivered	Session Due	Weighting
<b>Attendance</b> (80% required)	N/A	1-26	1-26	Pass/Fail
<b>Quizzes</b> (multiple choice questions and short answer questions – 40 mins each)	1-4	1-10, 11-24	11, 25	40% (20% each)
Botany & Manufacturing Project	1-5	1-18	20	40%
<b>Practical Skills Development</b> (combined Botany & Manufacturing Workbook)	1,5	1-24	26	20%

#### Prescribed readings:

- Adams, J., & Tan, E. (2011). *Herbal manufacturing: How to make medicines from plants* (2nd ed.). Melbourne, VIC: Eleanor Tan & Jenny Adams.
- Capon, B. (2010). *Botany for gardeners* (3rd ed.). Portland, OR: Timber Press. [ebook available]

#### Recommended readings:

- Blair, K. (2014). *Wild wisdom of weeds: 13 essential plants for human survival*. White River Junction, VT: Chelsea Green Publishing.
- Fisher, C. (2009). *Materia medica of western herbs*. Nelson, NZ: Vitex Medica.
- Green, J. (2000). *The herbal medicine-maker's handbook*. Berkeley, CA: Crossing Press.
- Grubb, A., & Raser-Rowland, A. (2012). *The Weed foragers handbook: A guide to edible and medicinal weeds in Australia*. Carlton, VIC: Hyland House Publishing.
- Mauseth, J. D. (2014). *Botany: An introduction to plant biology* (6th ed.). Burlington, MA: Jones & Bartlett Learning.
- Tan, E. (2013). *Botany of the flowering plants* (4th ed.). (n.p.): Author.
- Wink, M., & Van Wyk, B. (2008). *Mind-altering and poisonous plants of the world*. Portland, OR: Timber Press.

Subject Content		
Week	Lecture	Practical
1.	Session 1 <b>Introduction to plant taxonomy and botanical nomenclature:</b> What is botany? Why do we need to study it? What is taxonomy? Why do we need it? How was it developed? Phylogeny and the Theory of Evolution The 5 Kingdoms Plant diversity and the 10 Plant Divisions What is nomenclature? How is it applied to herbal medicine? Why is it so important?	Botany Discussion: Lecturer to explain the assessment pieces. Introduction to the set text and workbook. Group discussion on the importance of Plant taxonomy and nomenclature. Students to read the article by Darwin (1859), Chapter 4: Natural Selection, On the Origin of Species by Means of Natural Selection. Group work: Groups list 5 different physical adaptations, either from the Plant or Animal kingdoms that benefit the

		<p>chosen organism and how this adaptation achieves this.</p> <p>See activities and answer questions in Botany Workbook.</p>
	<p>Session 2</p> <p><b>Herbal Manufacturing</b></p> <p><b>Legislative considerations Part I:</b></p> <p>Introduction to the Therapeutic Goods Administration (TGA) and fundamental legislation pertinent to herbal medicines from a research perspective.</p> <p>The role and background of the TGA.</p> <p>TGA legislation: Therapeutic Goods Act, Australian Regulatory Guidelines for Complementary Medicines (ARGCM) and the Australian Register of Therapeutic Goods (ARTG)</p> <p>Extemporaneous dispensing and Practitioner-only products.</p> <p>Guidelines for Levels of evidence for Listed products</p> <p>Advertising Guidelines for Listed Medicines</p>	<p>Manufacturing Discussion:</p> <p>Examples of various Aust L and Aust R and Practitioner-only products are distributed through the class, and the tutor is to lead a discussion on the different legal requirements of each as stipulated by the TGA (including TGA set limits to active ingredient amounts etc.).</p> <p>Exploration of online TGA resources (where to find relevant documents and information).</p> <p>Class Debate:</p> <p>Students are divided into 2 groups (arguing for and against) and given time to argue the following question:</p> <p>“The TGA is seen as one of the strictest regulatory agencies in the world. Do you see this as being beneficial or potentially detrimental to the herbal medicine industry in Australia?”</p> <p>Lecturer mediates and provides feedback and correction as required.</p> <p>See activities and answer questions in Manufacturing Workbook.</p>
2.	<p>Session 3</p> <p><b>Plant morphology Part I:</b></p> <p>Definition of Monocotyledons (Monocots) and Dicotyledons (Dicots).</p> <p>The specific differences between Monocots and Dicots with specificity to plant morphological structures (seeds, roots, stems, leaves, flowers etc.).</p> <p>Seeds- Function and morphology</p>	<p>Botany Practical:</p> <p>Students to draw and label, dissect seed samples from pre-prepared specimens. (Broad beans are great).</p> <p>See activities and answer questions in Botany Workbook.</p>
	<p>Session 4</p> <p><b>Legislative considerations Part II:</b></p> <p>TGA legislation focusing on advertising codes, labeling, claims substantiation and the Standard for Uniform Scheduling of Medicines and Poisons (SUSMP).</p> <p>Qualitative and quantitative assessment of herbal raw materials and finished products.</p> <p>Different analytical, qualitative and quantitative techniques – cultivation, harvesting, drying &amp; wildcrafting of medicinal plants</p>	<p>Manufacturing Discussion:</p> <p>Levels of Evidence: Focus will be on comparing and contrasting between the differences in evidence requirements from both scientific and traditional perspectives.</p> <p>Lecturer leads discussion and poses questions and obtain student thoughts on current evidential requirements for claim substantiation</p> <p>Examples of Australian listed herbal products will be used for demonstration purposes.</p> <p>See activities and answer questions in Manufacturing Workbook.</p>
3.	<p>Session 5</p> <p><b>Plant morphology Part II:</b></p> <p>Definition of Fibrous and Tap root systems.</p> <p>Root anatomy.</p> <p>Root modifications.</p> <p>The concept of Geotropism.</p> <p>The functions of roots (support, absorption, hormone production, storage etc.).</p>	<p>Botany Practical:</p> <p>Students compare, draw and label pre-prepared Fibrous and Tap root specimens</p> <p>See activities and answer questions in Botany Workbook.</p>

	Session 6 <b>Manufacturing: Pills and capsules:</b> Definitions, advantages and disadvantages of pills and capsules as a dosage form. General physiological conditions/situations that would benefit from the use of pills and capsules and conversely, where usage should be avoided.	<b>Manufacturing practical:</b> Lecturer demonstrates the preparation of medicinal herbal pills and capsules Students prepare medicinal herbal pills and capsules (using capsule making kit), under lecturer supervision, and answer the required questions in Manufacturing Workbook.
4.	Session 7 <b>Plant morphology Part III:</b> Stem anatomy (nodes, internodes). Stem modifications (stolons, rhizomes, tubers, corms and cladodes). The function of the Stem The theory of Phototropism and Apical dominance.	<b>Botany practical:</b> Students compare, draw and label pre-prepared woody and herbaceous stem and stem modification specimens. Students examine (both macroscopically and microscopically if possible), draw and label a Celery stem or other sample. See activities and answer questions in Botany Workbook.
	Session 8 <b>Manufacturing: Succi, infusions and decoctions:</b> Discussion of the various solvents (water, ethanol etc.) and the pros and cons of each. Definitions, advantages and disadvantages of succi, infusions and decoctions as a dosage form. General physiological conditions/situations that would benefit from the use of succi, infusions and decoction and conversely, where usage should be avoided.	<b>Manufacturing practical:</b> Lecturer discusses the importance of accurate labelling. Why is this so important? Students prepare medicinal succus, infusion and decoction under lecturer supervision. See activities and answer questions in Manufacturing Workbook.
5.	Session 9 <b>Plant morphology Part IV:</b> Leaf anatomy (Lamina, petiole, axis, mid-rib etc.) Leaf characteristics (Structure, attachment, arrangement, shape, venation and margin). The functions of leaves. Leaf modifications (tendrils, spines, bracts). The theory behind Photosynthesis.	<b>Botany practical:</b> Students compare, draw and label various pre-prepared leaf specimens* and answer questions in Botany Workbook.
	Session 10 <b>Manufacturing: Tinctures:</b> Definitions, advantages and disadvantages of tinctures as a dosage form. General physiological conditions/situations that would benefit from the use of tinctures and conversely, where usage should be avoided.	<b>Manufacturing practical:</b> Lecturer discusses a variety of menstruum ratios for specific active constituent classes (e.g. Tannins etc.). <b>Group Discussion:</b> Lecturer discusses the preparation of a Fresh Plant tincture, and how to calculate the moisture content of a herbal specimen. Students to calculate the moisture content of various pre-prepared herbal specimens, and then apply knowledge learnt in the lecture to calculate the solvent ration and ethanol percentage. Students manufacture a fresh plant and a dried plant tincture under lecturer supervision. See activities and answer questions in Manufacturing Workbook.
6.	Session 11 <b>Plant morphology Part V:</b> The anatomy of flowers and inflorescences. Floral structures and their associated functions.	<b>Botany practical:</b> Students examine (both macroscopically and microscopically if possible), draw and label pre-prepared flower and inflorescence specimens.

	Flower pollination. The evolutionary advantage of Flowering plants.	See activities and answer questions in Botany Workbook.
	<p>Session 12</p> <p><b>Manufacturing: Fluid Extracts and glycerol extracts:</b> Definitions, advantages, disadvantages of fluid extracts and glycerol extracts as dosage forms. General physiological conditions/situations that would benefit from the use of fluid extracts, glycerol extracts and conversely, where usage should be avoided.</p>	<p><b>Manufacturing practical:</b> Lecturer demonstrates the preparation of medicinal fluid extract using a percolator (On campuses where a percolator is not available, the multiple maceration method is demonstrated). <b>Group Discussion:</b> Cold percolation methods (e.g. Simple, Reserve, re-percolation or multiple maceration). Use of glycerine as a solvent in recent times. Explore the advantages and disadvantages of this when compared to fluid extracts based on available evidence. Visit to clinic dispensary to compare labelling, sample extracts and see examples of differing ratios etc. See activities and answer questions in Manufacturing Workbook.</p>
7.	<p>Session 13</p> <p><b>Field trip to a Herb Garden (each state)</b> Where convenient this may be combined with a visit to the State Herbarium.</p>	<p><b>Botany practical:</b> The practical component of this session will include a walk through the Botanic Gardens Herb Garden (or similar facility). Where the State Herbarium is in close proximity to the Herb Garden an optional guided tour of the Herbarium may be pre-arranged. This can include instructions on their processing techniques of specimens.</p>
	<p>Session 14</p> <p><b>Manufacturing: Infused oils:</b> Definitions, advantages, disadvantages of infused oils as a dosage form. General physiological conditions/situations that would benefit from the use of infused oils and conversely, where usage should be avoided.</p>	<p><b>Manufacturing practical:</b> <b>Group Discussion -</b> Uses of infused oils (e.g. in creams and ointments etc.) as well as the issue of rancidity and what can be done to avoid this (e.g. add antioxidants, use herbs of known antimicrobial action etc.) Students manufacture a cold infused and a warm infused oil under lecturer supervision. See activity and answer questions in Manufacturing Workbook.</p>
<p><b>NON-TEACHING WEEK</b> (note that make up classes may be scheduled in this week)  <b>Semester 1</b> - This aligns with the week after Easter so it may fall between weeks 6 to 8.  <b>Semester 2</b> - The break week falls between Weeks 7 and 8.</p>		
8.	<p>Session 15</p> <p><b>Plant morphology Part VI:</b> Fruit formation and structure. The functions of fruit. The types of fruit. Methods of dispersal (Air, water, animal etc.).</p>	<p><b>Botany practical:</b> Students examine (both macroscopically and microscopically if possible), draw and label prepared fruit specimens*. See activities and answer questions in Botany Workbook.</p>
	<p>Session 16</p> <p><b>Manufacturing: Oxymels, syrups and lozenges:</b> Definitions, advantages and disadvantages of oxymels, syrups and lozenges as dosage forms. Sugar as a preservative.</p>	<p><b>Manufacturing practical:</b> Students prepare a medicinal herbal oxymel, syrup and lozenges (although time allows better to make lozenges in Session 10.2) under lecturer supervision, and document the process. See activity and answer questions in Manufacturing</p>

	<p>Vinegar as a solvent.</p> <p>General physiological conditions/situations that would benefit from the use of oxymels, syrups and lozenges and conversely, where usage should be avoided.</p>	<p>Workbook.</p>
9.	<p>Session 17</p> <p><b>Plant families:</b></p> <p>Examine the various spotting characteristics of members of the <i>Xanthorrhoeaceae</i>, <i>Melanthiaceae</i>, <i>Zingiberaceae</i>, <i>Gramineae/Poaceae</i>, <i>Pinaceae</i> and <i>Equisetaceae</i> families.</p> <p>Identify the various medicinal herbs of each family.</p> <p>Authentication / identification via botanical keys (where applicable) of the medicinal herbs within each family.</p>	<p>Botany practical:</p> <p>Students examine, draw and label various plant samples from the <i>Melanthiaceae</i>, <i>Zingiberaceae</i> &amp; <i>Gramineae/Poaceae</i>, <i>Pinaceae</i> and <i>Equisetaceae</i> families* and practice identification using their knowledge of plant morphology and botanical keys.</p> <p>See activity and answer questions in Botany Workbook.</p>
	<p>Session 18</p> <p><b>Manufacturing: Creams and ointments:</b></p> <p>Definitions, advantages and disadvantages of creams and ointments as a dosage form.</p> <p>General physiological conditions/situations that would benefit from the use of creams and ointments and conversely, where usage should be avoided.</p>	<p>Manufacturing practical:</p> <p>Students prepare a medicinal herbal cream and ointment, under lecturer supervision, and document the process.</p> <p>These will utilise the infused oils made in earlier session.</p> <p>See activity and answer questions in Manufacturing Workbook.</p>
10.	<p>Session 19</p> <p><b>Plant families (Dicots Part I):</b></p> <p>Examine the various spotting characteristics of members of the <i>Ranunculaceae</i>, <i>Myrtaceae</i>, <i>Papaveraceae</i>, <i>Brassicaceae</i>, <i>Asteraceae</i> and <i>Apiaceae</i> families.</p> <p>Identify the various medicinal herbs of each family.</p> <p>Authentication / identification via botanical keys (where applicable) of the medicinal and indigenous herbs within each family.</p>	<p>Botany practical:</p> <p>Students examine, draw and label various plant samples from the <i>Ranunculaceae</i>, <i>Myrtaceae</i>, <i>Papaveraceae</i>, <i>Brassicaceae/Cruciferae</i>, <i>Asteraceae</i> and <i>Apiaceae</i> families* and practice identification using their knowledge of plant morphology and botanical keys.</p> <p>See activities and answer questions in Botany Workbook.</p>
	<p>Session 20</p> <p><b>Manufacturing: Lotions:</b></p> <p>Definitions, advantages and disadvantages of lotions as a dosage form.</p> <p>General physiological conditions/situations that would benefit from the use of lotions and conversely, where usage should be avoided.</p>	<p>Manufacturing practical:</p> <p>Lecturer led discussion about various oil-in-water and water-in-oil emulsifiers.</p> <p>Students prepare two medicinal herbal lotions from recipes in textbook, under lecturer supervision, and document the process.</p> <p>See activity and answer questions in Manufacturing Workbook.</p>
11.	<p>Session 21</p> <p><b>Plant families (Dicots Part II):</b></p> <p>Examine the various spotting characteristics of members of the Perigynous (<i>Leguminosae</i>, <i>Rosaceae</i>) and Hypogynous (<i>Lamiaceae</i>, <i>Plantaginaceae</i>, <i>Solanaceae</i> and <i>Polygonaceae</i>) families.</p> <p>Identify the various medicinal herbs of each family.</p> <p>Authentication / identification via botanical keys (where applicable) of the medicinal herbs within each family.</p>	<p>Botany practical:</p> <p>Students examine, draw and label various plant samples from the <i>Leguminosae</i>, <i>Rosaceae</i>, <i>Lamiaceae</i>, <i>Plantaginaceae</i>, <i>Solanaceae</i> and <i>Polygonaceae</i> families* and practice identification using their knowledge of plant morphology and botanical keys.</p> <p>See activity and answer questions in Botany Workbook.</p>
	<p>Session 22</p> <p><b>Manufacturing: Pessaries and suppositories:</b></p> <p>Definitions, advantages and disadvantages of</p>	<p>Manufacturing practical:</p> <p>Students prepare a medicinal herbal pessary, under lecturer supervision, and document the process.</p>

	<p>pessaries and suppositories as dosage forms. Douches and sitz baths are also discussed.</p> <p>General physiological conditions/situations that would benefit from the use of pessaries and suppositories and conversely, where it should be avoided.</p>	<p>See activity and answer questions in Manufacturing Workbook.</p>
<b>12.</b>	<p>Session 23</p> <p><b>Poisonous and restricted (Scheduled) medicinal plants:</b></p> <p>Discuss what makes a plant poisonous.</p> <p>Examine the traditional uses of the selected poisonous plants.</p> <p>Examine the various spotting characteristics of a number of poisonous plants and fungi.</p>	<p>Botany practical:</p> <p>Students examine, draw and label various poisonous and scheduled plant samples and practice identification using their knowledge of plant morphology and botanical keys.</p> <p>Group discussion:</p> <p>Students explain what might have been the motivating factors behind the creation of the GACP document. Students should examine both the sustainability of the herbal industry and any environmental/ecological factors also.</p>
	<p>Session 24</p> <p><b>Manufacturing: Liniments, poultices and compresses:</b></p> <p>Definitions, advantages and disadvantages of liniments, poultices and compresses.</p> <p>General physiological conditions/situations that would benefit from the use of liniments, poultices and compresses and conversely, where usage should be avoided.</p>	<p>Manufacturing practical:</p> <p>Lecturer demonstrates the preparation of a medicinal herbal liniment, poultice and compress.</p> <p>Students prepare a medicinal herbal liniment, under lecturer supervision, and document the process.</p> <p>See activity and answer questions in Manufacturing Workbook.</p>
<b>13.</b>	<p>Session 25</p> <p><b>Wild Weeds:</b></p> <p>Weeds as medicines.</p> <p>Examine the traditional uses of the selected medicinal weeds.</p> <p>Examine the various spotting characteristics of a number of wild weeds.</p>	<p>Botany practical:</p> <p>Students examine, draw and label various wild weeds used medicinally and practice identification using their knowledge of plant morphology and botanical keys.</p> <p>See activity and answer questions in Botany Workbook.</p>
	<p>Session 26</p> <p><b>Manufacturing: Infants and Children's Remedies:</b></p> <p>Discuss the use of herbal preparations (internal and topical) for treating conditions in infants and children</p> <p>Challenges and solutions to herbal prescribing for infants and children – dosage, compliance, palatable forms of herbal preparations (cordials, syrups, lozenges, glycerol extracts, etc).</p>	<p>Manufacturing practical:</p> <p>Lecturer demonstrates the preparation of herbal products suitable for use by infants and children – cordials, jellies.</p> <p>Students prepare jellies, cordials under lecturer supervision, and document the process.</p>
<b>14.</b>	<b>Non-Teaching Week/Practical Exam Week 1. Note that make-up classes may be scheduled in this week.</b>	
<b>15.</b>	<b>Non-Teaching Week/Practical Exam Week 2. Note that make-up classes may be scheduled in this week.</b>	
<b>16.</b>	<b>Final Exam Week 1</b>	
	There is no final exam for this subject.	
<b>17.</b>	<b>Final Exam Week2</b>	
	There is no final exam for this subject.	

\*Plant specimens for the practical sessions will vary depending on the campus location and seasonal availability, and will include indigenous plants where possible.