

# HERBAL CONSTITUENTS

## Interactive Distance Learning Course with Lisa Ganora

### COURSE DESCRIPTION

This interactive distance-learning course is designed for the advanced medical herbalism student, graduated clinical herbalist, and other complementary / integrative health care students and practitioners. Those working in the herbal products industry will also benefit. *Herbal Constituents* provides a comprehensive, 24-week study of the relevant principles of descriptive medicinal phytochemistry; synergy and variability in herbs and formulas; polarity, solubility, and herbal extractions; hierarchy and classification of constituents; safety, toxicology and herb/drug interactions; and applications for medicinal plant constituents in a therapeutic context.

The course focuses on herbs and constituents from the Western *Materia Medica* and the medicinal compounds in health-promoting foods. It consists of 24 lessons and more than 20 hours of pre-recorded classroom lectures with Lisa Ganora, accompanied by extensive detailed and illustrated PowerPoint presentations; 48 hours of live, participatory webinars with Lisa (2 hours for each lesson – also recorded so students can review them later); weekly corresponding independent study assignments (optional: complete for Honors); reading assignments from the *Herbal Constituents* textbook and handouts; and unit quizzes plus graded mid-term and final exams. A monitored forum is also provided for student questions and peer-group sharing or projects and assignments. Student support is available throughout the course by dedicated faculty and staff who are available to answer your questions on curriculum and procedures.

Students meet every week for the live webinar and can access the recorded version; and are able to complete the other parts of the course on their own schedules, within the designated time frames for the different sections of the course. Quizzes and exams are scheduled regularly.

### LEARNING OBJECTIVES

This course is designed to provide complementary and natural health care students, practitioners and educators, and those working in the herbal supplements, functional foods, and natural products industries, with working competency in relevant aspects of basic medicinal phytochemistry; the synergy and variability of constituents in medicinal plants and formulas; the theory and practice of polarity and herbal extractions; and the hierarchy and classification, safety and toxicology, and therapeutics and applications for the major categories of phytochemical constituents in the plants which are most commonly used in the practice of Western medical herbalism.

For practitioners: this course will help you understand the natural products, herbal supplements and phytonutrients that you use in practice on a much deeper level. You'll learn what the active constituents are, how they affect one another, and how to use them more effectively with your patients. You will gain tools to judge quality, safety, food/drug and herb/drug interactions, and important aspects of how the constituents in herbs and health-promoting foods affect human physiology.

## TOPICS AND DATES

Semester / Week	Webinar Date - Thurs	Topics
1/1	Sept 12, 2019	<p><b>Course Orientation</b>  <b>Introduction to Herbal Constituents in Botanical Medicine</b>  <b>The Colors of Vitality</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Orientation; Introduction to constituents &amp; health – the big picture; Colors of Vitality - medicinal constituents in foods &amp; culinary herbs; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Course introduction and overview; Introduction to phytochemicals and herbal energetics: patterns of energy in relationship (~ 30 min)</li> <li>● <b>PowerPoint Presentation:</b> The Colors of Vitality</li> <li>● <b>Study Guides:</b> N/A for this week</li> <li>● <b>Assignment:</b> Evaluation of colorful antioxidant &amp; anti-inflammatory phytochemicals in the diet</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, A Phytochemical Folk Tale, pp. 167-8</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/2	Sept 19	<p><b>The Foundations of Phytochemistry I</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Foundations of herbal chemistry I – basics of phytochemical structure &amp; function relevant to understanding constituents &amp; herbal actions; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Foundations of herbal chemistry; Phytochemical bonding; Polarity and solubility (~ 90 min)</li> <li>● <b>PowerPoint Presentations:</b> Descriptive phytochemistry for practitioners &amp; educators: elements, molecules, &amp; bonds in phytochemicals; Determinants &amp; consequences of polarity in extractions &amp; actions</li> <li>● <b>Study Guides:</b> 1-2-1, 1-2-2, 1-2-3, 1-2-4</li> <li>● <b>Assignment:</b> Understanding molecular representations &amp; line drawings - what they do and don't tell us</li> </ul>

		<ul style="list-style-type: none"> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 1: The Foundations of Herbal Chemistry, pp. 7-14</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/3	Sept 26	<p><b>The Foundations of Phytochemistry II</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Foundations of herbal chemistry II – recognizing &amp; understanding structure &amp; function of botanical constituents; demonstration of E-modeling; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Stereochemistry &amp; isomers; Functional groups; Rings &amp; ring systems in phytochemicals (~ 80 min)</li> <li>● <b>PowerPoint Presentations:</b> Descriptive phytochemistry for practitioners &amp; educators, stereochemistry &amp; isomers; Functional groups; Rings &amp; ring systems &amp; how they affect naming</li> <li>● <b>Study Guides:</b> 1-3-1, 1-3-2</li> <li>● <b>Assignment:</b> Understanding &amp; experimenting with E-modeling</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 1: The Foundations of Herbal Chemistry, pp. 14-37; Handout: <i>HC 1-3 Functional Groups</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/4	Oct 3	<p><b>Synergy &amp; Medicinal Plant Constituents</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Origins, types &amp; significance of synergy – how constituents work together in herbs, foods &amp; formulas; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Definition &amp; significance of synergy; Origin of synergy: co-evolutionary theory; Types of synergy 1 (~80 min)</li> <li>● <b>PowerPoint Presentation:</b> Synergy in Medicinal Plants</li> <li>● <b>Study Guides:</b> 1-4-1, 1-4-2, 1-4-3</li> <li>● <b>Assignment:</b> Synergy in the context of supplements &amp; formulas: interpreting labels &amp; comparing products</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 3: Synergy and Variability in Herbs and Formulas, pp. 53-56</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/5	Oct 10	<p><b>Variability of Constituents in Botanicals</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Variability, potency, standardization – traditional &amp; contemporary products &amp; ways of evaluating quality; organoleptics &amp; analyses; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Types of synergy 2; Synergy between constituents &amp; pharmaceuticals; Variability 1: environmental influences &amp; chemotypes; Variability 2: developmental factors; Standardization (~ 80 min)</li> <li>● <b>PowerPoint Presentation:</b> Synergy and Variability</li> <li>● <b>Study Guides:</b> 1-5-1, 1-5-2, 1-5-3</li> </ul>

		<ul style="list-style-type: none"> <li>● <b>Assignment:</b> Evaluating supplements for quality &amp; composition; Standardized vs. traditional preparations</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 3: Synergy and Variability in Herbs and Formulas, pp. 56-62</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/6	Oct 17	<b>Polarity, Solubility &amp; Herbal Extractions I</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Polarity &amp; solubility – principles; Matrix effects; Choice of solvents &amp; forms; Like-dissolves-like guidelines; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Solubility I &amp; II: Matrix effects; Influence of polarity on solubility; Non-toxic solvents for medicinal plants; Polarity of constituents &amp; solvents (~ 60 min)</li> <li>● <b>PowerPoint Presentation:</b> Solubility &amp; Extraction</li> <li>● <b>Study Guides:</b> 1-6-1, 1-6-2</li> <li>● <b>Assignment:</b> Herbal extractions, products &amp; pharmacy in practice</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 1: Polarity, pp. 13-14; Chapter 2, Solubility and Extraction of Herbal Constituents, pp. 38-52</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/7	Oct 24	<b>Polarity, Solubility &amp; Extractions II</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Water extractions – principles, calculations; Water-soluble constituents; Applications &amp; therapeutics; Demonstration; SCE extraction; other factors affecting solubility; precipitation; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Solubility III &amp; IV: Supercritical CO<sub>2</sub> extraction, Hydroethanolic solvents; the effects of pH, temperature, and glycoside vs. aglycone formats on extraction; precipitation (~ 60 min)</li> <li>● <b>PowerPoint Presentation:</b> Solubility &amp; Extraction</li> <li>● <b>Study Guides:</b> 1-7-1, 1-7-2</li> <li>● <b>Assignment:</b> Water extractions &amp; pharmacy in practice</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 2, Solubility and Extraction of Herbal Constituents, pp. 38-52; Handout: <i>HC 1-7 Water Extractions</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/8	Oct 31	<b>Polarity, Solubility &amp; Extractions III</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Hydroethanolic extractions (tinctures) – principles; concentration &amp; extraction ratios; maceration vs. percolation; calculations; applications; demonstration; Oil infusions &amp; salves; Q &amp; A (2 hours)</li> <li>● <b>Video Lesson:</b> Solubility demonstrations; Infused oils &amp; salves (~ 60 min)</li> </ul>

		<ul style="list-style-type: none"> <li>● <b>PowerPoint Presentation:</b> Solubility &amp; Extraction</li> <li>● <b>Study Guides:</b> 1-8-1, 1-8-2</li> <li>● <b>Assignment:</b> Tinctures &amp; oil pharmacy in practice</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 2: Solubility and Extraction of Herbal Constituents, pp. 38-52; Handouts: <i>HC 1-8 Hydroethanolic Extractions; HC 1-8 Hydroethanolic-Maceration Worksheet; HC 1-8 Solubility-EtOH-Percentages-Constituents; HC 1-8 Oil Infusions &amp; Salves</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/9	Nov 7	<p><b>Polarity, Solubility &amp; Extractions IV; Organization &amp; Solubility of Constituents</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Organization of constituents – origins (biosynthetic pathways); Relationships / hierarchy / classification; Solubility of classes; Intro to Carbohydrate constituents; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Major categories &amp; subcategories of constituents; Solubility of classes; Carbohydrate-type constituents I - overview &amp; first subcategories (~ 50 min)</li> <li>● <b>PowerPoint Presentation:</b> Organization of constituents - overview of group relationships &amp; solubility; Overview and first categories of carbohydrates: medicinal monosaccharides, disaccharides, oligosaccharides, polysaccharides</li> <li>● <b>Study Guides:</b> 1-9-1, 1-9-2</li> <li>● <b>Assignment:</b> Classification &amp; solubility of constituents in common herbal action groups (e.g., mucilaginous herbs, bitters, astringents)</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 4: Herbal Constituents Outline, pp. 63-72; Chapter 5: Carbohydrates in Medicinal Plants, pp. 73-78; Handouts: <i>HC 1-9 Outline of Constituents &amp; HC 1-9 Solubility of Constituents</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/10	Nov 14	<p><b>Carbohydrate Constituents &amp; their Health Effects</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Immunomodulating polysaccharides; Medicinal carbohydrates &amp; their physiological effects; Q &amp; A (2 hours)</li> <li>● <b>Video lessons:</b> Immunomodulating polysaccharides; Organic acids: ascorbic &amp; oxalic acids; <i>Symplocarpus</i> &amp; organoleptics; <i>Urtica</i> stinger fluid constituents &amp; effects (~ 75 min)</li> <li>● <b>PowerPoint Presentations:</b> Immunomodulating polysaccharides; Organic acids (derivatives of monosaccharides) - examples &amp; sources</li> <li>● <b>Study Guides:</b> 1-10-1, 1-10-2, 1-10-3, 1-10-4</li> <li>● <b>Assignment:</b> Dietary &amp; herbal sources of therapeutic carbohydrates; relationship to herbal actions &amp; health effects</li> </ul>

		<ul style="list-style-type: none"> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 5: Carbohydrates in Medicinal Plants, pp. 78-84</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
1/11	Nov 21	<p><b>Lipids &amp; Derivatives in Foods &amp; Herbs</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Introduction to lipids &amp; derivatives in medicinal plants &amp; foods; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Lipids 1 - fatty acids; Lipids 2: triglycerides; Lipids 3: phospholipids &amp; beeswax; Lipids 4: alkamides &amp; polyalkenes, polyacetylenes/polyalkynes (~ 90 min)</li> <li>● <b>PowerPoint Presentations:</b> Fatty acids, oils &amp; other lipids in herbs, fruits and seeds; FA, the eicosanoid cascade &amp; inflammation; Alkamides (including isobutylamides) &amp; polyalkenes/alkynes</li> <li>● <b>Study Guides:</b> 1-11-1, 1-11-2, 1-11-3, 1-11-4</li> <li>● <b>Assignment:</b> Researching, evaluating &amp; using FA from seeds, oils, &amp; medicinal foods</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 6: Lipids in Medicinal Foods and Herbs, pp. 85-100</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
---	Nov 28	<b>No Webinar – Thanksgiving Break</b>
1/12	Dec 5	<p><b>Amino Acid Derivatives in Medicinal Foods &amp; Herbs</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Overview of amino acid derivatives; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> AA1 - introduction to amino acid-based constituents &amp; amines; AA2 - glucosinolates; AA3 - sulfur compounds in <i>Allium</i>; AA4 - cyanogenic glycosides (~ 90 min)</li> <li>● <b>PowerPoint Presentations:</b> Glucosinolates; Sulfur compounds in <i>Allium</i>; Cyanogenic glycosides; Amino acid derivatives in relation to other categories: alkaloids, polyphenols, pseudoalkaloids, etc.; Medicinal amines</li> <li>● <b>Study Guides:</b> 1-12-1, 1-12-2, 1-12-3, 1-12-4</li> <li>● <b>Assignment:</b> Organoleptic evaluation of AA derivatives</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 7: Amino Acids and Derivatives, pp. 101-106</li> </ul>
<b>MID-TERM EXAM – to be completed by Thurs, Dec. 19, 2019</b>		

SECOND SEMESTER		
2/1	Jan 9, 2020	<p><b>The Polyphenols (Phenolic Compounds) I</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Introduction to polyphenols; First categories, actions &amp; occurrence; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Polyphenols 1 - Intro, <i>Arctostaphylos</i>, <i>Toxicodendron</i>; P2 - phenolic acids, salicylic acid; P3 - phenylpropanoids - <i>Coffea</i>, <i>Rosmarinus</i>, <i>Prunella</i>; P4 - coumarins, dicoumarol &amp; anticoagulant drugs (~ 90 min)</li> <li>● <b>PowerPoint Presentations:</b> Phenolic acids &amp; phenylpropanoids; Coumarins &amp; furocoumarins</li> <li>● <b>Study Guides:</b> 2-1-1, 2-1-2, 2-1-3, 2-1-4</li> <li>● <b>Assignment:</b> Polyphenols in supplements vs. in foods</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 8: Polyphenols, pp. 107-111</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/2	Jan 16	<p><b>The Polyphenols II</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Lignans &amp; flavonolignans; phenylpropanoid derivatives, stilbenoids, xanthones, styrylpyrones (kavalactones)</li> <li>● <b>Video Lessons:</b> 'Detox Juice' demo; Polyphenols 5 - lignans &amp; flavonolignans; P6 - curcuminoids, gingerols, stilbenoids, xanthones, styrylpyrones (~ 60 min)</li> <li>● <b>PowerPoint Presentations:</b> Lignans &amp; flavonolignans; Curcuminoids, gingerols, capsaicinoids; Stilbenoids &amp; resveratrol; Xanthones, styrylpyrones (kavalactones &amp; kavapyrones)</li> <li>● <b>Study Guides:</b> 2-2-1, 2-2-2, 2-2-3</li> <li>● <b>Assignment:</b> Herbal constituents for detoxification</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 8: Polyphenols, pp. 111-116</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/3	Jan 23	<p><b>The Polyphenols III</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Flavonoids, OPCs, tannins; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Polyphenols 7 - overview of flavonoids; P8 - flavonoids, anthocyanins, OPCs, tannins</li> <li>● <b>PowerPoint Presentations:</b> Flavonoids &amp; oligomeric proanthocyanidins (OPCs); Condensed &amp; hydrolyzable tannins</li> <li>● <b>Study Guides:</b> 2-3-1, 2-3-2</li> <li>● <b>Assignment:</b> Flavonoids in the diet and "superfoods"</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 8: Polyphenols, pp. 116-123</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>

2/4	Jan 30	<p><b>The Polyphenols IV</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Isoflavonoids/Phytoestrogens; Remaining polyphenol subcategories; Terpenophenolics Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> P9 - hormonally active flavonoids &amp; isoflavonoids; P10 - benzofurans (<i>Usnea</i>), quinones, phloroglucinol derivatives &amp; terpenophenolics (<i>Cannabis</i>) (~ 90 min)</li> <li>● <b>PowerPoint Presentations:</b> Isoflavonoids, phytoestrogens; Benzofurans (in <i>Usnea</i>), chromones, quinones &amp; anthraquinone glycosides</li> <li>● <b>Study Guides:</b> 2-4-1, 2-4-2</li> <li>● <b>Assignment:</b> Practical uses of phytoestrogens in foods, herbs &amp; supplements</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 8: Polyphenols, pp. 123-126; Chapter 8: Terpenophenolics, p. 127</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/5	Feb 6	<p><b>The Terpenoids I &amp; II</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Overview of the terpenoids; Essential oils, oleoresins &amp; herbalism; EO Toxicology; Interview with a Certified Aromatherapist; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Terpenoids I - overview; Monoterpenes &amp; sesquiterpenes in EO; T2 - EO safety &amp; toxicology (~ 60 min)</li> <li>● <b>PowerPoint Presentations:</b> Essential Oil Chemistry I</li> <li>● <b>Study Guides:</b> 2-5-1, 2-5-2</li> <li>● <b>Assignment:</b> Terpenophenolics: CBD and synergists</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 9: Mono- &amp; sesquiterpenes, pp. 133-135</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/6	Feb 13	<p><b>The Terpenoids III, IV, V</b></p> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Antiseptic, Digestive &amp; Citrus EO; Monoterpene lactones/Iridoids; Sesquiterpenes &amp; sesquiterpene lactones; Diterpenes Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> <b>Terpenoids 3</b> - EO constituents in <i>Citrus</i> spp.; T4 - sesquiterpene lactones; T5 - diterpenes (<i>Grindelia</i>) (~ 30 min)</li> <li>● <b>PowerPoint Presentations:</b> Antiseptic, Digestive &amp; Citrus EO; Monoterpene lactones/Iridoids; Sesquiterpene lactones; Diterpenes; Resins &amp; oleoresins</li> <li>● <b>Study Guides:</b> 2-6-1, 2-6-2, 2-6-3</li> <li>● <b>Assignment:</b> Aromatherapy &amp; terpenoid constituents</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 9: Terpenoids: Sesquiterpene Lactones, Essential Oils and Oleoresins, Diterpenes, pp. 135-140</li> </ul>

		<ul style="list-style-type: none"> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
---	Feb 20	Early Spring Break – No Class
2/7	Feb 27	<b>The Terpenoids VI &amp; VII</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Triterpenes; triterpenoid saponins; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Terpenoids 6 - triterpenes &amp; <i>Actaea</i>; T7 - Saponins (~ 40 min)</li> <li>● <b>PowerPoint Presentations:</b> Triterpenes &amp; triterpenoid saponins; Steroidal saponins</li> <li>● <b>Study Guides:</b> 2-7-1, 2-7-2</li> <li>● <b>Assignment:</b> Dietary &amp; herbal sources of triterpenes &amp; saponins</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 9: Terpenoids: Triterpenes &amp; Triterpenoid Saponins, pp. 140-143</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/8	Mar 5	<b>The Terpenoids VIII &amp; IX</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Steroidal constituents in herbs; tetraterpenes (carotenoids) &amp; xanthophylls; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Steroidal constituents - cardiac glycosides &amp; drug analogs; Terpenoids 9: tetraterpenes (carotenoids) &amp; xanthophylls (~ 45 min)</li> <li>● <b>PowerPoint Presentations:</b> Steroidal constituents, phytosterols &amp; cholesterol; Cardiac glycosides; Tetraterpenes (carotenoids)</li> <li>● <b>Study Guides:</b> 2-8-1, 2-8-2</li> <li>● <b>Assignment:</b> Steroidal constituents &amp; carotenoid sources</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 9: Steroidal Saponins, pp. 143-144; <i>Botanical Steroids</i>, pp. 144-146; <i>Tetraterpenes (Carotenoids)</i>, pp. 147-150</li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/9	Mar 12	<b>Alkaloids in Medicinal Plants I</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Overview of the alkaloids; Solubility; Pseudoalkaloids; Betalain alkaloids; Isoquinoline alkaloids Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> Alkaloids I - overview; A2 - betalain alkaloids &amp; food / herbal sources (~ 35 min); Alkaloids 3 - isoquinoline alkaloids, berberines &amp; botanical sources</li> <li>● <b>PowerPoint Presentations:</b> Alkaloids I &amp; II: Naming, Solubility, Piperidine alkaloids &amp; <i>Lobelia</i>; Pseudoalkaloids, Betalain alkaloids; Alkaloids III: Isoquinoline alkaloids (incl. berberine)</li> <li>● <b>Study Guides:</b> 2-9-1, 2-9-2, 2-9-3</li> </ul>

		<ul style="list-style-type: none"> <li>● <b>Assignment:</b> Evaluating the safety of <i>Lobelia</i></li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 10, Alkaloids: pp. 154-157 and 159-163; Handouts: <i>HC 2-9 Lobelia: A Morality Tale</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/10	Mar 19	<b>Alkaloids in Medicinal Plants II</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Pyrrolizidine alkaloids, PA safety &amp; toxicology; Blue Cohosh alkaloids; Methylxanthines; Steroidal alkaloids; Tropane alkaloids; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> A4 - pyrrolizidine alkaloids, sources &amp; toxicology (~ 35 min)</li> <li>● <b>PowerPoint Presentations:</b> Alkaloids IV: Pyrrolizidine alkaloids, PA safety &amp; toxicology; Blue Cohosh alkaloids; Methylxanthines; Steroidal alkaloids; Tropane alkaloids</li> <li>● <b>Study Guide</b> 2-10</li> <li>● <b>Assignment:</b> Researching &amp; evaluating pyrrolizidine alkaloids</li> <li>● <b>Readings:</b> <i>Herbal Constituents</i> textbook, Chapter 10: Alkaloids, pp. 157-159 (Pyrrolizidines), p. 155 (Methylxanthines), and pp. 163-164 (Tropans); Handout: <i>HC 2-10 Comfrey Toxicity Revisited</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/11	Mar 26	<b>Safety &amp; Toxicology of Herbal Constituents in Practice</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Safety &amp; toxicology of herbal constituents – dosage &amp; detoxification; attenuating synergy &amp; matrix effects; Q &amp; A (2 hours)</li> <li>● <b>Video Lessons:</b> no video for this class</li> <li>● <b>PowerPoint Presentation:</b> Adverse effects &amp; side effects; Herb/drug interactions</li> <li>● <b>Study Guide:</b> 2-11</li> <li>● <b>Assignment:</b> Side effects / adverse effects in commonly used Western herbs</li> <li>● <b>Readings:</b> Handout: <i>HC 2-11 Adverse-Effects-Interactions</i></li> <li>● <b>Unit Quiz</b> (to be completed before next Webinar)</li> </ul>
2/12	Apr 2	<b>Final Exam Preparation &amp; Review</b> <ul style="list-style-type: none"> <li>● <b>Live Webinar:</b> Course Review, Q &amp; A (2 hours)</li> <li>● <b>Final Exam Study Guide Posted</b></li> </ul>
<b>Thursday, April 9, 2020: Final Exam</b>  <b>Exams and Make-Up Work all Due by April 16, 2020</b>		

## GRADUATION REQUIREMENTS

In order to earn a **Certificate of Graduation** for this course, you must:

- View all the videos before the final course due date of **April 16, 2020**.
  - It is strongly recommended to view videos weekly, before each webinar. Our system records when each video is viewed.
- Complete each weekly quiz, the mid-term exam, and the final exam with a grade of 80% or better. Quizzes and exams are regularly scheduled.
  - Study guides are provided for each exam so that you know exactly what you will be tested on.
  - Exams are multiple choice, matching, and true-false.
  - You must pass each weekly quiz before moving on to the next module.
  - Exams are automatically graded by our system, and your grade is available upon completion of the exam.
- Pay your HMA tuition in full by the given date.
- Live webinar attendance: this is not mandatory for graduation (you can also view the recorded webinars), but attending the webinars greatly enhances your experience of the course and gives you an opportunity to interact with your instructor.

In order to earn a **Certificate of Graduation with Honors** for this course, you must:

- Turn in all assignments before the final due date of **April 16, 2020**.
  - It is strongly recommended to turn in assignments weekly.
  - A template is provided for each assignment.
  - All assignments are graded complete / incomplete.