DEPARTMENT OF VITICULTURE AND ENOLOGY

HANDBOOK OF ACADEMIC PROGRAMS

Department of Viticulture and Enology
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This booklet contains a large amount of information carefully compiled and organized. It should answer most of your questions. Please read thoroughly.

Revised 9/27/04
OVERVIEW

Viticulture (*vitis* [Latin - vine] + *cultura* = vine cultivation) and Enology (*oenos* [Greek - wine] + *logy* = wine study) are specialized fields of study which are offered at few institutions, and which can be found combined within a single department in even fewer. Enologists study wine and fermented beverage technology, taking specialized courses to understand the various aspects of food in general and wines in particular after preparation in the fundamental sciences related to fermentation and foods (chemistry, math, physics, biochemistry, microbiology, molecular and cellular biology). Viticulturists study all aspects of grape production after preparatory work in the biological sciences (plant biology, plant pathology, plant physiology, entomology, meteorology and soil science). In general, undergraduate programs (leading to a B.S.) include the basic preparatory courses, while graduate programs (leading to the M.S. or Ph.D.) require completion of preparatory work before admission.

Our instructional programs in viticulture and enology are designed to teach students the scientific principles that underlie growing grapes and making wine, and the basic skills needed to apply these principles. It is **not** designed to teach a particular style of winemaking, winery management, grape cultivation or vineyard management. However, based on their detailed understanding of the process, graduates are expected to develop their own style with some tutelage and experience. Students are advised to seek out additional business management skills if they expect to manage a business. In some cases, this can be incorporated into the B.S. degree program.

The teaching programs provided by the Department of Viticulture and Enology produce two types of university-educated personnel to meet the needs of the grape, wine, raisin, brandy, brewing, and fermentation industries:

1. Broadly educated graduates with a scientific and technical background, managerial promise, and thorough understanding of processing operations.

2. Highly specialized graduates with a solid background in science, fully capable of carrying out basic research and teaching at the university level.

To train these personnel, UC Davis provides:

1. The largest teaching and research staff dedicated to grapes and wine in the nation, with a worldwide reputation for firsthand knowledge of the sciences and technology of wine making, brandy production, grape growing, raisin making, brewing, and fermentation.

2. Well-equipped chemical and microbiological laboratories in Wickson Hall adjacent to a small scale winery and distillery.
3. The Tyree vineyard (eighty acres for on-campus instruction) and the Oakville Experimental Vineyard (forty acres of prime vineyard land in Napa Valley, associated with the Harry E. Jacob Research Facility).

4. Some of the world's most complete collections of grape varieties and wine microorganisms.

5. The Peter J. Shields Library, which houses the world's finest collection of foreign and domestic literature on grapes, wines and brandies.

6. Degree programs at both the undergraduate (B.S.) and graduate (M.S. or Ph.D.) levels allowing specialization in viticulture, enology or one of the related fundamental sciences.

**CAREER PROSPECTS**

Graduates of this department hold a significant number of technical positions in the California and United States grape and wine industries. Many international students have returned to their countries to take up key positions within the grape and wine industries or at universities. Enologists may find positions as cellar workers, lab technicians, winemakers, wine consultants, wine critics, fermentation researchers or managers in wineries and other wine-related businesses, such as cooperages and cork producers. Viticulturists may find positions as vineyard managers, crop researchers, pest control advisers, grower relations consultants, fruit negociants, or agricultural loan officers in vineyards and crop-related businesses. The demand for graduates in these areas has been in balance with the supply. The employment future is bright in enology and viticulture in view of the size of the industry, ongoing modernization, and expansion into new areas. At present, our enology graduates are able to find appropriate employment within a few months of graduation if they are willing to consider employment throughout California or outside of the state. Many students take temporary crush positions immediately after graduation, either here or in Europe, and some will gain additional experience in Australia (or elsewhere in the Southern hemisphere) during the crush six months later before seeking full-time employment. In a survey of the wine industry, the Wine Business Monthly (June 28, 2001) reports that salaries can vary widely, ranging from a low of $16,000 for unskilled workers in the cellar or vineyard to highs of over $175,000 for top winemakers and other executives at some larger wineries.

**WORK EXPERIENCE AND INTERNSHIPS**

Many of our students have no previous experience making wine or growing grapes. However, most obtain at least some practical experience while they are students by taking a short leave to work at a winery or vineyard. We strongly encourage this and, if arranged properly, students can receive academic credit for their experience via the Internship Program. Individuals outside UC Davis with previous academic preparation or work experience can also find wineries willing to accept interns through the Internship and Career Center. The annual Internship Career Fair, held in early February is one of many ways students can contact prospective employers. For more information on the Internship Program, and other career services, visit the web site of the Internship and Career Center (ICC - http://icc.ucdavis.edu/) and/or contact Nancy Tibbitts, ICC Coordinator: (530) 752-2861, FAX: (530) 752-0411, e-mail: nrtibbitts@ucdavis.edu.
ACADEMIC STUDY OPTIONS

Summary of Options to Study at UC Davis:
All academic programs offered through the department are built around a central set of core courses. Depending on the emphasis, a program may require one or both sets of courses. Since our courses are unique, classrooms are shared by graduate and advanced undergraduate students.

The enology core consists of an ordered sequence of six courses which can be taken in a single year. The sequence can only be initiated in the fall:

- VEN 123 - Analysis of Musts & Wines (Fall)
- VEN 123L – Analysis of Musts & Wines Lab (Fall)
- VEN 124 - Wine Production (Fall)
- VEN 124L – Wine Production Lab (Fall)
- VEN 125 - Wine Types and Sensory Evaluation (Spring)
- VEN 125L – Sensory Evaluation of Wine Lab (Spring)
- VEN 126 - Wine Stability (Winter)
- VEN 126L – Wine Stability Lab (Winter)
- VEN 128 - Wine Microbiology (Winter)
- VEN 128L – Wine Microbiology Lab (Winter)
- VEN 135 - Wine Processing Equipment (Spring)

The viticulture core consists of six courses which can be taken in any order:

- VEN 101A - Viticultural Practices (Fall)
- VEN 101B - Viticultural Practices (Winter)
- VEN 101C - Viticultural Practices (Spring)
- VEN 110 - Grapevine Growth and Physiology (Winter)
- VEN 118 - Grapevine Pests, Diseases and Disorders (Fall)
- VEN 115 - Raisin and Table Grape Production (Fall-every other year)

Brief descriptions of these and other courses offered by the department, including unit value and prerequisites, are presented in a later section of this brochure. At present, the core courses are only available to students at the UC Davis campus. There are no immediate plans to make them available via correspondence or distance learning.

There are three ways in which one can take these and other courses at UC Davis:

1. Be admitted to a B.S. program.
2. Be admitted to a M.S. program.
3. Be admitted to a Ph.D. program.

Note that for all programs, students must, at minimum, meet the prerequisites for each individual course, as noted in the course descriptions and in the UC Davis General Catalog. This can be a particular problem for the enology core courses which are taught in a year-long sequence beginning in the fall. Students must have completed general and organic chemistry, as well as at least one quarter of biochemistry, before initiating the enology sequence. (See the Academic
Preparation Table that follows for more details). A brief description of each option is provided below. For more detailed information on any of these options, please consult the UC Davis General Catalog or an adviser for the specific program/major you are interested in. Application information is provided later in this brochure.

**Option 1: Bachelor of Science (B.S.) Degree.**
Degree programs leading to a B.S. incorporate university requirements, General Education requirements, college requirements and major requirements. The first three govern requirements for scholarship, units, and residency and require classes in English Composition, American History & Institutions, writing experience, topical breadth and social-cultural diversity. Major requirements are divided into three categories: preparatory (usually lower-division classes in basic subjects), depth (upper division classes in areas directly related to the major) and restricted elective (courses in areas more peripherally related to the major). Students may also find time for a limited number of elective classes covering topics outside of their major field of study.

**Admission as a Freshman** - You should take college preparatory courses that will challenge you to work hard and will prepare you beyond minimum levels of competence in reading, writing and mathematics. A student who is well prepared for university work will have taken the “A to G” subject requirements: four years of English in high school, four years of mathematics, two to three years of foreign language, two to three years of laboratory science, two or more years of history/social science, and one or more years of art or humanities. Consult the UC Davis General Catalog for definitive information or [http://why.ucdavis.edu/index.cfm](http://why.ucdavis.edu/index.cfm). Counselors in California high schools can also advise you on UC admissions requirements.

**Transfer Students** - Your previous area of college study has no effect on your eligibility per se, but you must take the classes listed on the Academic Preparation Table to be prepared for entry into the program in which you are interested. Courses may be taken at any college or university, including UC Davis. *Students, including those in California Community Colleges should arrive with most of the preparatory classes completed to avoid delays in progress toward the degree.* Admission is limited to the fall quarter in most cases - applications are due the previous November. Junior status is preferred. At present, transfer applicants who are not California residents need a GPA = 2.8 to be competitive for admission and must have a minimum 3.0 GPA in all preparatory course work for the major. The UC Davis General Catalog should be consulted for definitive information. In addition, counselors in California Community and State Colleges can provide guidance to transfer students, especially in the matter of course equivalencies. Preliminary contact with an adviser in the relevant UC Davis program is also recommended to ensure that you are following an appropriate preparatory program. See current transfer requirements following major course requirements on page 29. Articulation of courses from California Colleges are viewable at [http://www.assist.org](http://www.assist.org).

**Second Baccalaureate** - If you have a bachelor's degree substantially equivalent to one that is granted by the University of California, you may be allowed to enroll as an undergraduate seeking a second bachelor's degree. Admission in this category will depend upon a superior academic record and clear evidence of a change in objective. A supplemental petition for a
second bachelor’s degree must be filed at the time of application (http://ugaos.ucdavis.edu/Second_Bacc_Petition.pdf). Academic preparation is similar to that for transfer students. Applicants must have completed all preparatory course work for the major with an average GPA of 3.0 or better with no grade lower than C-. See specific application procedures below (listed under Catalog and Application Information).

Option 2: Master of Science (M.S.) Degree.
The Master's program requires a stronger background (completed before admission) in comparable subjects, with additional course work at both the preparatory (lower division) and depth (upper division) levels. Consult the requirements for the specific program you are interested in (summaries are provided in the Academic Preparation Table). While some of the core courses in viticulture and enology are the same as those in the B.S. programs, there may be fewer classes required for the M.S. degree, although completion of the degree requires a student research project which leads to a thesis or report. This degree commonly takes 2 to 2.5 years for the thesis route.

Admission to graduate programs at UC Davis requires a bachelor's degree that is comparable to a degree from the University of California both in distribution of academic subject matter and in scholarship achievement. The primary requirement for admission to any program is evidence of intellectual achievement and promise. The University requires that all applicants have a minimum GPA of 3.0 or better in undergraduate coursework from an institution of acceptable standing to be considered for admission. International students must score at least 550 on the TOEFL exam. Graduate programs frequently require submission of additional materials such as a separate application form, Graduate Record Examination (GRE) scores and letters of recommendation to assist the faculty in selecting from among qualified applicants. Admission to graduate study is limited by the number of spaces available in each program. Not all eligible applicants will be admitted.

Option 3: Ph.D. Programs.
The background prerequisites are similar to those for the M.S. option, but each program has its own specific requirements. The university does not offer Ph.D. programs specifically tailored to either viticulture or enology. Instead, students enter a graduate program in a related basic or applied science and choose an affiliated faculty adviser with research interests in the desired field of interest (see Majors and Programs, Summary Chart for a partial listing of relevant graduate groups). Consult the UC Davis General Catalog and/or contact the individual graduate group for more details.

UC Davis Extension
Those students not able to come to campus for a full degree program could consider taking one or more "short courses" through University Extension. These range in duration from one day to three weeks and are completely separate from the courses offered through UC Davis. Note that most short courses do not carry university credit and thus could not be applied to a subsequent degree program. For current information describing either the concurrent courses program or short courses, contact:
### MAJORS and PROGRAMS

**Summary Chart:**

<table>
<thead>
<tr>
<th>B.S.</th>
<th>VITICULTURE</th>
<th>ENOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Viticulture &amp; Enology</td>
<td>Viticulture &amp; Enology</td>
</tr>
<tr>
<td></td>
<td>Plant Biology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ag &amp; Systems &amp; Environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crop Science &amp; Management</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M.S.</th>
<th>VITICULTURE</th>
<th>ENOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Horticulture &amp; Agronomy</td>
<td>Viticulture &amp; Enology</td>
</tr>
<tr>
<td></td>
<td>Viticulture &amp; Enology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ph.D.*</th>
<th>VITICULTURE</th>
<th>ENOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ecology</td>
<td>Agricultural and</td>
</tr>
<tr>
<td></td>
<td>Genetics</td>
<td>Environmental Chemistry</td>
</tr>
<tr>
<td></td>
<td>Plant Biology</td>
<td>Chemical Engineering</td>
</tr>
<tr>
<td></td>
<td>Plant Pathology</td>
<td>Food Science</td>
</tr>
<tr>
<td></td>
<td>Soil Science</td>
<td>Genetics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microbiology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Molecular &amp; Cellular Biology</td>
</tr>
</tbody>
</table>

*Note: Emphasis at the Ph.D. level is often determined by the choice of major professor and research topic.*
Academic Preparation Table
Students must complete required preparatory classes to enroll in viticulture or enology core courses regardless of which program you are enrolled. To ensure that you take classes which are appropriate preparation, please consult the UC Davis General Catalog. Compare the catalog course description for the classes listed below with the classes you anticipate taking. Note that this table lists the minimum requirements for each program. Optional courses in your program may require additional preparation. We strongly advocate mapping out a complete course of study to identify any additional preparatory work early in your course of study. Give careful thought to your future career goals and consult with an adviser while planning your coursework.

One quarter unit is based on one hour of lecture and/or discussion per week for a quarter (10 weeks), or three hours per week of laboratory time. Unit transferability from California Community Colleges is based on standard articulation agreements with California institutions viewable at http://www.assist.org. International coursework will be evaluated when an application is received.

### Academic Preparation Table for Viticulture & Enology Students

<table>
<thead>
<tr>
<th>Course Description</th>
<th>UCD Equivalent - see UCD General Catalog</th>
<th>Quarter Units*</th>
<th>B.S. Viticulture &amp; Enology</th>
<th>M.S. Viticulture &amp; Enology</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry**</td>
<td>CHE 2A, 2B, 2C</td>
<td>15</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>CHE 8A, 8B‡</td>
<td>6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>BIS 102‡</td>
<td>3</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>BIS 103</td>
<td>3</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Calculus</td>
<td>MAT 16A, 16B</td>
<td>6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Physics</td>
<td>PHY 1A, 1B, or 7A</td>
<td>4-6</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>General Biology &amp; Plant Biology</td>
<td>BIS 1A, 1C</td>
<td>10</td>
<td>X</td>
<td>1C only</td>
</tr>
<tr>
<td>Computer Literacy</td>
<td>AMR 21‡</td>
<td>3</td>
<td>X</td>
<td>X or equiv.</td>
</tr>
<tr>
<td>Microbiology</td>
<td>MIC 102, 102L</td>
<td>6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Statistics (ANOVA) - This class may be taken at UC Davis</td>
<td>AMR 120 or STA 100 or STA 106‡</td>
<td>3-4</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* Multiply semester units by 1.5 to determine equivalence.

** The Chemistry courses must be taken in sequence, which usually takes 1.5 - 2 years. Thus, transfer and re-entry students are urged to initiate this sequence as soon as possible.

‡ **Essential prerequisite** to begin taking enology classes which *must* be started in the Fall quarter.
Viticulture & Enology Major - The Viticulture and Enology major provides an interdisciplinary education in the biological and physical principles underlying grape and wine production as well as practical knowledge of grape growing (viticulture) and wine making (enology). The curriculum builds upon a foundation in chemical, mathematical and biological sciences with a core of specialized courses which provide a knowledge base for problem-solving and decision-making in commercial grape and wine production. To complete the program, students can choose to emphasize viticulture, enology or economics and credit may also be earned for foreign language study and internships. Assistance in identifying domestic and international internship opportunities and in developing course plans which accommodate internship timing is provided.

Graduates qualify for a variety of vineyard and winery positions, including production management, quality control and research. Additionally they may work in related fields such as pest management, nursery production and analytical services. The major can also provide the basis for preparation for graduate study in food science, microbiology, agricultural chemistry and plant biology, provided that the student chooses course options which fulfill both major requirements and graduate program entrance requirements.

Program office: 1023 Wickson Hall, Department of Viticulture & Enology
Phone: (530) 752-0380
Fax: (530) 752-0382

Advising Associate: Judy Blevins, 2114 Wickson, (530) 752-8035
e-mail: jblevins@ucdavis.edu

Advisors:
Mark Matthews, 1001 Wickson, (530) 752-2048
e-mail: mamatthews@ucdavis.edu, Fax: (530) 752-2275
David Block, 3015 Wickson, (530) 754-6046
e-mail: deblock@ucdavis.edu
Andrew Waterhouse, 2015 Wickson, (530) 752-4777
e-mail: alwaterhouse@ucdavis.edu

Student Peer Advisor: Gillian Sutherland, 2102 Wickson, e-mail: gmsutherland@ucdavis.edu

For more details on other undergraduate programs, consult the UC Davis General Catalog (http://registrar.ucdavis.edu/UCDWebCatalog/) or contact the program office.
This program offers advanced studies in viticulture and enology, ranging from the genetics, physiology and biochemistry of grapevines to the chemistry, microbiology and sensory science of wines and the chemical engineering of winemaking. Graduate students will usually work on a project that requires at least two of these fields of science and may involve grapevines, grapes, wine or wine distillates. Topics can vary; examples include the molecular biology of grapevines, bacteria or yeast, the grape and wine chemistry associated with fermentation and aging and the correlation of analytical and sensory analyses.

Special Requirements: Three letters of recommendation, GRE (Graduate Record Examination) scores, including the Analytical section, Transcripts, the Graduate Studies Application.

Application Deadline: **January 15** (domestic and international applications).

For More Information,
Check the General Catalog’s listing of faculty and courses or Viticulture and Enology Graduate Group (http://wineserver.ucdavis.edu/academic/ms/masters.htm)

**Program Liaison in Graduate Studies:** Puriie Conley, (530) 752-8761, paconley@ucdavis.edu
and Wave Armijo, (530) 754 5886, wmarmijo@ucdavis.edu.

**Chair:** Susan Ebeler, Viticulture and Enology, (530) 752-0696, seebeler@ucdavis.edu

**Advisers:** Hildegarde Heymann Viticulture and Enology, (530) 754-4816, hheymann@ucdavis.edu
David A. Mills, Viticulture and Enology, (530) 754-7821, damills@ucdavis.edu

**Graduate Staff:** Judy Blevins, Viticulture and Enology, (530) 752-8035, jblevins@ucdavis.edu
## Background Courses

<table>
<thead>
<tr>
<th>Course Name (Quarter Offered)</th>
<th>Background V&amp;E Courses</th>
<th>Course Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viticultural Practices (2 of 3 required=6 units) 101A (Fall), 101B (Winter), or 101C (Spring)</td>
<td>VEN 101A,B,C</td>
<td>3</td>
</tr>
<tr>
<td>Analysis of Musts and Wines (Fall)</td>
<td>VEN 123</td>
<td>2</td>
</tr>
<tr>
<td>Wine Production (Fall)</td>
<td>VEN 124</td>
<td>2</td>
</tr>
<tr>
<td>Wine Types and Sensory Evaluation (Spring)</td>
<td>VEN 125</td>
<td>2</td>
</tr>
<tr>
<td>Wine Stability (Winter)</td>
<td>VEN 126</td>
<td>3</td>
</tr>
<tr>
<td>Wine Microbiology (Winter)</td>
<td>VEN 128</td>
<td>2</td>
</tr>
</tbody>
</table>

**Lab Experience:**
- Analysis of Musts and Wines Lab (Fall) VEN123L 2
- Wine Production Lab (Fall) VEN 124L 3
- Sensory Evaluation Of Wine Lab (Spring) VEN 125L 2
- Wine Stability Lab (Winter) VEN 126L 2
- Wine Microbiology Lab (Winter) VEN 128L 2

*1 course per quarter can be taken Pass/No Pass*

## Master of Science Depth Courses

<table>
<thead>
<tr>
<th>Required Depth Courses:</th>
<th>Depth Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wine Technology and Winery Systems (Spring)</td>
<td>VEN 135</td>
<td>4</td>
</tr>
<tr>
<td>Introduction to Scientific Methods (Spring)</td>
<td>VEN 200*</td>
<td>2</td>
</tr>
<tr>
<td>Advances in the Science of Winemaking (Spring)</td>
<td>VEN 224</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective Depth Courses:**
- Graduate and Upper Division Courses approved by Advisor

**Depth courses cannot be Pass/No Pass**
- Department Seminar (Fall, Spring-3 quarters enrolled with one Oral Presentation) VEN 290 3
- Research Units (minimum of 27 units required) VEN 299 1-12

*Course may not be offered-Substitute VEN 298 with Major Prof.*

**Total:**
- 49 Units for Plan I Thesis
- 40 Units for Plan II by Exam/Written Report
For more details on any program, consult the UC Davis General Catalog (http://registrar.ucdavis.edu/UCDWebCatalog/) or contact the program office. Note that academic programs frequently do not precisely coincide with departments. Thus, the programs described below have administrative "homes" outside of the Department of Viticulture & Enology. Many graduate programs at UC Davis are administered through graduate groups, composed of faculty members with similar disciplinary or research interests, regardless of departmental affiliation. Various graduate groups offer programs of study leading to advanced degrees allowing specialization in one or more areas relevant to the fields of viticulture and enology. Consult the UC Davis General Catalog or the relevant program office for more information on Ph.D. programs, which are generally too specialized to allow extensive coursework in either enology or viticulture. All addresses have the same general format: (program name), University of California, Davis, CA 95616. All of these programs also have information available on the world wide web. You may either use the UC Davis search engine (accessible from the UC Davis home page; http://www.ucdavis.edu/) and/or browse through the Graduate Studies pages: http://gradstudies.ucdavis.edu/.

At the end of each program description, there is a list of affiliated Department of Viticulture & Enology faculty. Research interests and contact information are noted elsewhere in this brochure. Prospective students are encouraged to contact the faculty/specialists whose interests are most compatible with their own and discuss the possibilities for graduate study and research.

University Requirements for the Master of Science Degree (M.S.).

The M.S. degree may be pursued under one of two plans:

   Plan I: Thirty units* of upper division and graduate courses and a research thesis are required.
   Plan II: Thirty-six* units of upper division and graduate course work and a comprehensive final examination are required. (No Plan II in Agricultural and Environmental Chemistry).

* These are the minimum requirements for the Master of Science degree.

Master of Science Degree in Horticulture and Agronomy (http://ggha.ucdavis.edu/) - Graduate study leading to a M.S. degree in Horticulture allows students to pursue their studies in the areas of Agronomy, Environmental Horticulture, Pomology, Vegetable Crops, Viticulture and Weed Science with overall supervision by the Graduate Group in Horticulture and Agronomy. The programs provide opportunities for specialized study of the production, management, and utilization of horticultural plants and the post-harvest handling of horticultural commodities. A level of competence equivalent to that of a sound undergraduate degree program in plant science is required. Limited deficiencies in these areas can be made up after admission to the graduate program, but will not count toward the master’s degree unit requirements.

Program Office: 1224 Plant & Env. Sciences, Dept. of Plant Sciences
Fax: (530) 752-4361 (Attn: Lisa Brown)
Program Coordinator: Lisa Brown, 1224 Plant & Env. Sciences. (530) 752-7738; e-mail: lfbrown@ucdavis.edu
Program Chair: Andy Walker, 1106 Wickson, (530) 752-0902; e-mail: awalker@ucdavis.edu.

The following faculty/specialists within the Department of Viticulture & Enology are qualified to direct student research toward the M.S. in Horticulture:

D.O. Adams  M.A. Matthews  D.R. Smart
L.E. Williaijms  M.A. Walker  J.A. Wolpert

Master of Science Degree in Agricultural & Environmental Chemistry, http://agchem.ucdavis.edu. Agricultural and Environmental Chemistry is an interdisciplinary graduate program in applied chemistry. This graduate program provides the opportunity to apply fundamental principles of chemistry and biochemistry in current agricultural and environmental research. Graduate study in agricultural and environmental chemistry prepares students for careers in industry, government and academia relating to the chemical and environmental aspects of food, fibers and polymers, pesticides, soil constituents, pollution and similar fields. Areas of research may include problems in basic and applied analytical, inorganic, organic, physical and biological chemistry. This degree is not designed for training to be a winemaker.

Program Office:  126 Cruess Hall, Department of Food Science & Technology
Fax:  (530) 752-4759
Program Coordinator: Peggy Royale, 126 Cruess Hall, (530) 752-1415, Fax (530)752-4759
e-mail: pbroyale@ucdavis.edu
Program Chair: Andrew Clifford, 3147 Meyer Hall, (530) 752-3376
e-mail: ajclifford@ucdavis.edu
Advisor: Doug Adams, 1003 Wickson, (530) 752-1902
e-mail: doadams@ucdavis.edu

The following faculty/specialists within the Department of Viticulture & Enology are qualified to direct research toward the M.S. in Agricultural & Environmental Chemistry:

D.O. Adams  S.E. Ebeler
R.B. Boulton  A.L. Waterhouse

PhD studies are offered through one of the Graduate groups listed below:
Agricultural Chemistry (http://agchem.ucdavis.edu/);
Chemical Engineering (http://www.chms.ucdavis.edu/);
Dept. of Food Science & Technology (http://foodscience.ucdavis.edu);
Genetics (http://www-ggc.ucdavis.edu/ggc/ggg/);
Microbiology (http://microbiology.ucdavis.edu/);
Plant Biology (http://www-plb.ucdavis.edu/pbgg/)
Ph.D. PROGRAMS

The faculty and specialists in the department also participate in the Ph.D. programs offered by several graduate groups as follows:

**Agricultural & Environmental Chemistry:**

**Chemical Engineering:**
- R.B. Boulton, D.E. Block

**Food Science:**

**Genetics:**
- L.F. Bisson, M.A. Walker

**Microbiology:**
- L.F. Bisson, D.A. Mills

**Plant Biology:**
- D.O. Adams, M.W. Fidelibus, M.A. Matthews, M.A. Walker, L.E. Williams

Research interests and contact information for Viticulture & Enology faculty are noted in the Faculty section of this file that follows. Prospective students are encouraged to contact faculty/specialists whose interests are most compatible with their own and discuss the possibilities for graduate study and research. Viticulture & Enology Graduate Group Faculty listing is also available and soon to be posted on the Department website at wineserver.ucdavis.edu. The FAX number in the Dept. of Viticulture and Enology is: (530) 752-0382.

**CATALOG and APPLICATION INFORMATION**

**UC Davis General Catalog:** Copies of the UC Davis General Catalog, which contains descriptions of general admissions requirements, as well as brief descriptions of all courses and programs offered on the UC Davis campus, may be obtained from either the Registrar’s Office (530) 752-2973 or the UC Davis Bookstore (530) 752-2952. Contact either one for current pricing, postage and handling. The UC Davis Bookstore accepts credit card orders (Visa and Master Card). Your local college library may also have a copy available. This catalog is also viewable in Adobe Acrobat format at: http://registrar.ucdavis.edu/UCDWebCatalog/.

**Where to Apply for Degree Programs.**

**Bachelor of Science:**
Undergraduate Admissions & Outreach Services, 175 Mrak Hall, One Shields Avenue, University of California, Davis, CA 95616-8507, (530) 752-2971. Applications for the fall quarter are accepted during the month of November of the previous year. Students currently in a California high school,
community or state college may obtain applications directly from their counseling office. Applicants may apply via the World Wide Web at http://www.ucop.edu/pathways.

Second Baccalaureate:
Submit an undergraduate application (hard copy) and all materials, including letters of recommendation, application fee, second baccalaureate petition (http://ugaos.ucdavis.edu/Second_Bacc_Petition.pdf), and official transcripts to Judy Blevins, Department of Viticulture & Enology, One Shields Avenue, University of California Davis, Davis, CA 95616. The application filing period is November 1-30 for entrance the following fall.

Master of Science & Ph.D.: (Only M.S. available through Viticulture & Enology)
Graduate Admissions, 252 Mrak Hall, One Shields Avenue, University of California, Davis, CA 95616, (530) 752-0655 or contact the program coordinator of the program you are interested in (see contact information previously listed). Graduate application deadlines vary by program but are generally by January 15th (few exceptions) for the fall quarter of the same year and admission is limited to the fall quarter in nearly all cases. Applicants may apply via the World Wide Web at http://gradstudies.ucdavis.edu/homepage.htm.

UC Davis Extension: For concurrent course enrollment (not a degree program) and wine related short courses call (800) 752-0881 or (530) 757-8777, or visit their website at http://www.unex.ucdavis.edu/ or http://www.universityextension.ucdavis.edu/.

FINANCIAL INFORMATION AND RESOURCES

Fees and Financial Aid: Fees for 2004-2005 can be found at http://studentaccounting.ucdavis.edu/. Tuition is approximately $7,500/year for California residents, but non-resident graduate students pay an additional $5,492 quarter (approx. $16,500/year). US residents can qualify as California residents after one year if they follow the guidelines established by the Registrar, but international visitors without a residence permit (“green card”) cannot. See the General Catalog for details. Financial aid is available to our students either through the Financial Aid office which can help arrange both grants and loans (more of the latter) (530) 752-2390, or by scholarships through the Department of Viticulture and Enology.

To be considered for financial aid, or for any need-based award, you must file a “Free Application for Federal Student Aid” (FAFSA) as early as possible, but no later than the March 2 deadline, prior to the fall quarter enrollment. This form, submitted directly to the Federal Student Aid Program Office, Iowa City, Iowa, is used to determine financial need only, a component of the eligibility criteria for students receiving federal financial aid funds, including Work-Study. This information is also used to determine eligibility for other “need-based” fellowships. The FAFSA can be obtained from the Financial Aid Office, Dutton Hall, UC Davis, beginning December 1 or by going to their website at http://www.fafsa.ed.gov/.

Viticulture and Enology Scholarships: Numerous scholarships are available to qualified students through applications to the Department of Viticulture and Enology and are specifically for students in
enology and viticulture. Scholarship awards are based on a student’s scholastic record and promise. Application forms can be obtained from the Department of Viticulture and Enology (beginning in late December) and available online at wineserver.ucdavis.edu. **Application Deadline: February 11, 2005.**

**University of California Fellowships and Scholarships:** Scholarships are available to qualified students through applications to the Undergraduate or Graduate Scholarship offices. Awards are based on scholastic record. Apply to the Committee on Undergraduate Scholarships (http://why.ucdavis.edu/finances.cfm) by the first week of **December**. Graduate students apply to: Associate Dean of Graduate Studies, University of California, Davis, CA 95616 (http://gradstudies.ucdavis.edu/). **Application Deadline: January 15.**

**American Society for Enology and Viticulture Scholarships:** Numerous scholarships in varying amounts awarded to worthy undergraduate or graduate students in viticulture, enology or related fields. Scholastic achievement and some financial need are basic criteria. Request application forms from ASEV, PO Box 1855, Davis, CA 95617 or download at (http://www.asev.org/). **Application Deadline: March 1.**

**NOTE: SEPARATE APPLICATION FORMS ARE REQUIRED FOR SCHOLARSHIPS FROM EACH OF THE SOURCES LISTED ABOVE.**
FACULTY

Adams, Douglas O., Ph.D., Associate Professor of Viticulture and Associate Biochemist, 1003 Wickson, (530) 752-1902, e-mail: doadams@ucdavis.edu. Characterization of biochemical pathways and enzyme systems that influence maturation and metabolism of grapes and grapevines. Particular emphasis is given to elucidation of pathways producing important end-products in vinifera grapes, and biochemical changes that occur in table and raisin grapes after harvest.

Bisson, Linda F., Ph.D., Professor of Enology and Genetics, Endowed Amerine Chair, 3011 Wickson, (530) 752-3835, e-mail: lfbisson@ucdavis.edu. Regulation of glycolysis in the yeast Saccharomyces cerevisiae and related organisms, specifically hexose transport and its control. Genetic construction and physiological analysis of improved yeast strains for wine production, including investigation of expression of foreign genes in yeasts.

Block, David E., Ph.D., Associate Professor of Enology and Associate Biochemical Engineer, 3015 Wickson, (530) 754-6046, e-mail: deblock@ucdavis.edu. Knowledge-based optimization methods for wine processing and industrial fermentations; neural network analysis of archival processing data for fermentation improvement. Conversion of wine processing waste streams. Biological control of grape plant pathogens.

Boulton, Roger B., Ph.D., Professor of Enology and Chemical Engineer, Stephen Sinclair Scott Endowed Chair, 1005 Wickson, (530) 752-0900, e-mail: rbboulton@ucdavis.edu. Chemical engineering aspects of fermentation and wine processing. Winemaking equipment selection, winery design, and the economics of investment and operation. Fermentation kinetics, mathematical modeling, computer simulation and control of enological operations. Physical and chemical stability of wines.

Dewey, Frances M. “Molly”, Ph.D., Professional Research Scientist, 3017 Wickson, (530) 752-9356, e-mail: fmdewey@ucdavis.edu. Development of immunological methods for detection and quantification of Botrytis and other fungi involved in Bunch rot decay of grape berries and production of dessert wines (Noble rot).

Ebeler, Susan E., Ph.D., Associate Professor of Enology and Assistant Analytical Chemist, 103 Enology, (530) 752-0696, e-mail: seebeler@ucdavis.edu. Analytical chemistry. Development of methods for analyses and identification of trace components in grape and wine products.

Heymann, Hildegarde, Ph.D., Professor and Sensory Scientist/Flavor Chemist, 3009 Wickson, (530) 754-4816, e-mail: hheymann@ucdavis.edu. Sensory evaluation of wine and food, focusing on descriptive analysis, consumer perceptions and the use of multivariate data analyses to unravel these very complex interactions. Investigation of effects of viticultural and enological treatments and of individual components on wine sensory properties.

Matthews, Mark A., Ph.D., Professor of Viticulture and Associate Plant Physiologist, 1001 Wickson, (530) 752-2048, e-mail: mamatthews@ucdavis.edu. Environmental control of growth, productivity, and
fruit quality emphasizing physiological mechanisms involved in responses to water deficits, fruit growth and ripening, irrigation, and nutrient/water interactions.

**Lapsley, James T.**, Ph.D., Adjunct Associate Professor, 252A University Extension Building, UC Davis Extension, (530) 757-8692, e-mail: jtlapsley@ucdavis.edu. Economics of wine production, wine marketing, and the history of California wine.

**Mills, David A.**, Ph.D., Assistant Professor of Enology and Assistant Microbiologist, 3001 Wickson, (530) 754-7821, e-mail: damills@ucdavis.edu. Molecular biology and microbial ecology of lactic acid bacteria.

**Smart, David R.**, Ph.D., Assistant Professor of Viticulture, 2005 Wickson, e-mail: drsmart@ucdavis.edu. Physiological ecology of plant nutrient acquisition, competition between roots and microbial organisms for nitrogen, leaf exchanges of nitrogen trace gases, environmental and biotic controls on nitrogen trace gas emissions from soils.

**Walker, M. Andrew**, Ph.D., Associate Professor of Viticulture and Associate Geneticist, Louis P. Martini Endowed Chair, 1106 Wickson, (530) 752-0902, e-mail: awalker@ucdavis.edu. Development of grape varieties emphasizing disease resistance and rootstocks. Genetics and mechanisms of resistance to grape pests and diseases. Evolution and taxonomy of *Viticeae*.

**Waterhouse, Andrew L.**, Ph.D., Professor of Enology and Assistant Chemist, Chancellor’s Fellow, John E. Kinsella Endowed Chair in Food, Nutrition and Health, 2015 Wickson, (530) 752-4777, e-mail: alwaterhouse@ucdavis.edu. Natural product chemistry of grapes and wine, especially those that affect their health or sensory properties; oak chemistries in wine and analytical chemistry aspects of winemaking.

**Williams, Larry E.**, Ph.D., Professor of Viticulture and Plant Physiologist, Kearney Agricultural Center, 9240 S. Riverbend Avenue, Parlier, CA 93648, (559) 646-6558, e-mail: williams@uckac.edu, [Davis: 2104 Wickson, (530) 752-0358]. Influence of microclimate on physiological processes of the grapevine. Cultural techniques of the grapevine associated with the production of raisins and table grapes. Carbon assimilation by and allocation in the vine; effect of senescence on gas exchange characteristics; whole plant physiology.

**COOPERATIVE EXTENSION SPECIALISTS**

**Fidelibus, Matthew.**, Ph.D., Assistant Cooperative Extension Viticulture Specialist, Kearney Agricultural Center, 9240 South Riverbend Avenue, Parlier, CA 93648, (559) 646-6510, Fax: (559) 646-6593, e-mail: mwf@uckac.edu. Development of methods for analyses and identification of trace components in grape and wine products. Research and Extension Topics: Raisin and wine grape production. Whole plant physiology and fruit quality.
Wolpert, James A., Ph.D., Department Chair and Specialist in Cooperative Extension (Viticulture), Marvin Sands Endowed Chair, 1021 Wickson, (530) 752-0381, e-mail: jawolpert@ucdavis.edu. Winegrape production in coastal and foothill counties, Sacramento and northern San Joaquin valleys.

FACILITIES

Enology Building (UC Davis) - Teaching and research winery, wine cellar, distillery.

Kearney Agricultural Center (Parlier, CA) - Research on table grapes, raisins and hot climate winegrapes.

Oakville Experimental Vineyard and the Harry E. Jacob Research Facility (Oakville, CA).

Peter J. Shields Library (UC Davis) - Amerine reading room housing the Viticulture & Enology collection.

Tyree Vineyards (UC Davis) - teaching and research vineyards.

Wickson Hall (UC Davis) - teaching and research facilities, Winkler Library conference room.
VITICULTURE AND ENOLOGY (VEN) UNDERGRADUATE COURSES

* Units  ** Offered in Fall (I), Winter (II), Spring (III) and/or Summer quarters.

2  
**Introduction to Viticulture** (2*) I**

Williams  
Lecture:  2 Hours  

Fundamental principles of biology and culture of the grapevine including taxonomy, morphology, physiology, distribution, domestication, utilization, propagation, production systems, harvesting, and storage and processing of grapes. Successful completion of the course should prepare students for upper division courses in viticulture.

3  
**Introduction to Winemaking** (3) I, II, III

Heymann, Waterhouse, Adams  
Lecture:  3 Hours  
Text(s):  VEN 3 Syllabus

Overview of the history of wine, viticulture, fermentation, winery operations, the physiology of wine consumption, wines produced in California and other major wine-producing regions and the sensory evaluation of wine.

99  
**Special Study for Undergraduates** (1-5) I, II, III

Staff  
P/NP grading only

101A  
**Viticultural Practices** (3) I  
Walker  
Discussion:  1 Hour  
Laboratory:  3 Hours  
Prerequisite: VEN 2  
Text(s):  Viticulture Practices, Coombe and Dry, Wine Titles Press, Adelaide (required)  
Grape Varieties and Rootstock varieties, Pierre Gallet, 1998 (Optional)

Provides information required to identify the major wine, raisin and table grape cultivars grown in California and elsewhere. Also provides practical experience in vineyard sampling techniques, and vine disease identification.

101B  
**Viticultural Practices** (3) II  
Walker  
Discussion:  1 Hour  
Laboratory:  3 Hours  
Prerequisite: VEN 2  
Text(s):  Viticulture Practices, Coombe and Dry, Wine Titles Press, Adelaide (required)  
VEN 101B Syllabus.

Field-oriented experience in the principles and practices of grapevine production, including pruning, propagation, weed identification and control, frost protection, and physical examination of soil profiles and root distribution patterns.

101C  
**Viticultural Practices** (3) III  
Smart  
Discussion:  1 Hour
Laboratory: 3 Hours  
Prerequisite: VEN 2  
Text(s): Viticulture Practices, Coombe and Dry, Wine Titles Press, Adelaide (required)  
VEN 101C Syllabus.

Field-oriented experience in the principles and practices of grapevine production, 
including vineyard establishment, vine training, trellising, canopy management practices, 
irrigation and water management, and methods of crop adjustment for improvement of 
fruit quality.

110  **Grapevine Growth and Physiology** (3) II  
Matthews  
Lecture:  3 Hours  
Prerequisite: VEN 2  
Text(s): VEN 110 Syllabus

Botanical aspects including morphology and domestication precede lectures covering 
flower development and energy budget concepts. The impact of physiological variables 
such as photosynthesis translocation, mineral nutrition, and water relations on fruit 
ripening and composition will be covered.

111  **World Viticulture** (3)  
Staff  
Not currently offered  
Lecture:  3 Hours  
Prerequisite: Upper division standing  
Text(s): VEN 111 Syllabus and class handouts

A study of the diversity of viticulture, both geographical and historical. The history of 
grape growing and its spread throughout the world will be covered, along with 
discussions of current viticultural practices in different parts of the world, including 
California.

111L  **Critical Evaluation of Wines of the World** (1)  
Staff  
Not currently offered  
Laboratory:  3 Hours  
Prerequisite: VEN 111, VEN 125

Critical analysis of wines produced in different parts of the world, with emphasis on the 
relationship between sensory properties of the wines and factors associated with their 
place of origin.

115  **Raisin and Table Grape Production** (2) I  
Williams  
Lecture:  2 Hours  
Prerequisite: VEN 2  
Text(s): Syllabus

Overview of the raisin and table grape industries in California and other production areas 
of the world. In addition, cultural practices associated with raisin and table grape 
production will be discussed.

118  **Grapevine Pests, Diseases and Disorders** (3) I  
Williams  
Lecture  3 Hours
Prerequisite: VEN 2
Text(s): Grape Pest Management (Flaherty et al.) – UC DANR (Required); Compendium of Grape Diseases, Pearson & Goheen, APS Press (Required)
Describes various pests and diseases of vineyards throughout California. Pest/disease identification and control methods (including sampling techniques) are also discussed. An integrated management approach to pest control methods is emphasized.

123 Analysis of Musts and Wines (2) I
Lecture: 2 Hours
Prerequisite: Chemistry 2C and 8B or the equivalent; students not enrolled in 123L will be required to enroll in 1 unit of course 199/299; restricted to upper division students majoring in Viticulture & Enology; graduate students in Food Science.
Principles of grape juice and wine analysis and the reasons for use of each analysis. Analyses of a practical and useful nature are chosen for the laboratory exercises demonstrating various chemical, physical and biochemical methods.

123L Analysis of Musts and Wines Lab (2) I
Laboratory: 3 Hours
Independent: 3 Hours
Prerequisite: VEN 123
Fundamental principles of analytical chemistry as they related to specific analytical methods used in winemaking. Analyses of a practical and useful nature are chosen for the laboratory exercises demonstrating various chemical, physical and biochemical methods. Data will be analyzed and results interpreted in weekly lab reports; includes student-designed independent project and written report.

124 Wine Production (2) I
Lecture: 2 Hours
Prerequisite: VEN 3, VEN 123 (may be taken concurrently), Biological Sciences 102
Principles and practices of making the various standard types of wines, with special reference to the grape varieties used and the method of vinification required for each.

124L Wine Production Lab (3) I
Laboratory: 3 Hours
Independent: 3 Hours
Paper: 3 Hours
Prerequisite: Completion or concurrent enrollment in 124.

Hands-on experience with current technologies used in production of California table wines; analysis and monitoring of fermentation impact of fermentation variables on microbial performance and product quality; includes student-designed independent research project.

125 Wine Types and Sensory Evaluation (2) III
Lecture: 2 Hours
Prerequisite: AMR 120 or FST 117, or Statistics 100 or 106, VEN 124, and consent of instructor.
Text(s): VEN 125 Syllabus; Sensory Evaluation of Food, Principles and Practices, Lawless and Heymann, Chapman Hall (required)
Introduction to principles of sensory evaluation and application to wines. To investigate factors influencing wine flavor, data from sensory analysis of model solutions.

125L Wine Types and Sensory Evaluation Laboratory (2) III
Laboratory: 3 Hours
Independent: 3 Hours
Prerequisite: Previous or concurrent enrollment in VEN 125.
Sensory evaluation of wines and model systems using discrimination tests, ranking, Descriptive analysis and time-intensity analysis will be conducted in the laboratory. Data will be analyzed by appropriate statistical test and the results interpreted in extensive weekly lab reports.

126 Wine Stability (3) II
Lecture: 2 Hour
Discussion 1 Hour
Prerequisite: VEN 124.
Principles of equilibria and rates of various physical and chemical reactions in wines; treatment of unstable components in wines by adsorption, ion exchange, refrigeration, filtration, and membrane processes and protein, polysaccharide, tartrate, oxidative and color stabilities.

126L Wine Stability Lab (2) II
Laboratory: 3 Hours
Independent: 3 Hours
Prerequisite: Completion or concurrent enrollment in VEN 126 and consent of instructor.
This course is designed to provide practical application, illustrate physical and chemical changes in wines. The labs cover oxygen uptake, colloidal, protein and tartrate stabilities,
fining treatments and membrane filtration testing, must adjustments, wine instabilities & various unit operations. This requires students to develop understanding and expertise in stability testing of wines.

128 Wine Microbiology (2) II
Lecture: 2 Hours
Laboratory: 6 Hours
Prerequisite: VEN 123, 124, MIC 102, 102L or FST 104 and 104L (VEN 125, 126 recommended)
Nature, development, physiology, biochemistry and control of yeasts and bacteria involved in the making, aging, and spoilage of wines.

128L Wine Microbiology Lab (2) II
Laboratory: 6 Hours
Prerequisite: VEN 123, 124, 128L, MIC 102, 102L or FST 104 and 104L; (VEN 125, 126 recommended)
Nature, development, physiology, biochemistry and control of yeasts and bacteria involved in the making, aging, and spoilage of wines.

130 Management, Marketing & Economics of the California Wine Industry (9) Special Summer Session
Lecture: 24 Hours
Discussion: 4 Hours
Field Trips: 8 Hours
Prerequisite: VEN 124, Instructor Consent
Introduction to management, marketing and economics of wine in the United States with particular emphasis on California. Reviews market segmentation and explores alternative strategies for grape acquisition, production, brand development, distribution, and social policy formation. (Application forms for current UC students will be furnished by the Department; others must enroll through University Extension.)

135 Wine Processing Equipment (4) III
Lecture: 3 Hour
Discussion: 1 Hour
Prerequisite: VEN 124.
This course covers process technologies and process systems that are used in modern commercial wineries. The course will include lectures, demonstrations and three field trips. Overview of Winemaking Systems: Winemaking Operations and Equipment; Barrel Aging and Barrel Management; Membrane Separation Processes; Specialized Contacting Systems; Cleaning and Sanitation Systems; Process Control Systems; Refrigeration Systems; Air Conditioning and Humidity Systems; Electrical Systems; Waste Water Systems; Solid Waste Handling; Work Place Safety.
140 Distilled Beverage Technology (3) III (alternate years-next offered in 2006) Boulton
Lecture: 3 Hours
Prerequisite: Chemistry 8B, Food Science & Technology 110A
Text(s): VEN 140 Syllabus.
Distillation principles and practices; production technology of brandy, whiskey, rum, vodka, gin, and other distilled beverages; characteristics of raw materials, fermentation, distillation, and aging.

181 Readings in Enology (1) III Matthews
Discussion: 1 Hour
Prerequisite: VEN 3
Critical evaluation of selected monographs in enology. Monographs are usually recent publications with a historical perspective. Discussion leadership rotates among students. Intended to promote efficacy in group setting and broaden student experience and perspective beyond texts for understanding viticulture and enology.

190X Winemaking Seminar (1) III Staff
Lecture: 1 Hour
Discussion: 1 Hour
Prerequisite: VEN 3
Weekly seminar presented by outside speakers on a specific winemaking topic chosen for the quarter. Seminar is followed by a discussion with the speaker hosted by the faculty member in charge. May be taken three times for credit. A five page research paper will be required.

192 Internship (1-12) I, II, III, Summer Staff
Laboratory: 3 - 36 Hours
Prerequisite: Completion of 84 units P/NP grading only
Work-learn experience related to Fermentation Science (Enology) or Plant Biology (Viticulture) majors. Internships must be approved and supervised by a member of the department or major faculty, but are arranged by the student. (P/NP grading only)

198 Directed Group Study (1-5) I, II, III Staff
Prerequisite: Consent of instructor; P/NP grading only

199 Special Study for Advanced Undergraduates (1-5) I, II, III Staff
P/NP grading only
### VITICULTURE AND ENOLOGY (VEN) GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
<th>Offering</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>200</td>
<td>Introduction to Scientific Methods</td>
<td>(2)</td>
<td>Not currently offered</td>
<td>Staff</td>
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<td></td>
<td>Lecture/Discussion: 1 Hour</td>
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<td>Prerequisite: Graduate standing or consent of instructor.</td>
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<td>Introduce beginning graduate students to the processes involved in conducting scientific research. Topics covered will include conducting literature review, formulating hypotheses, and analyzing and reporting results. Students will complete an annotated bibliography and complete a written and oral research proposal.</td>
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<tr>
<td>210</td>
<td>Grape Development and Composition</td>
<td>(4)</td>
<td>III (alternate years)</td>
<td>Adams</td>
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<td></td>
<td>Lecture: 3 Hours</td>
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<td>Polito</td>
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<td>Discussion: 1 Hour</td>
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<td></td>
<td>Prerequisite: Biological Sciences 102, 103</td>
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<td></td>
<td>The anatomy, physiology and biochemistry of grape berry development, with emphasis on the development of grape composition relevant to winemaking.</td>
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<tr>
<td>215</td>
<td>Sensometrics</td>
<td>(3)</td>
<td>I</td>
<td>Heymann</td>
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<td>Lecture: 3 Hours</td>
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<td>Prerequisite: FST 117 or equivalent, VEN 125 &amp; 125L or FST 107A or 107B.</td>
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<td>Experimental design and statistical analysis, including multivariate analysis for both sensory and instrumental data in enology and food related studies. Text(s): Selected Readings.</td>
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<tr>
<td>216</td>
<td>Vineyard Establishment and Development</td>
<td>(4)</td>
<td>I</td>
<td>Smart</td>
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<td></td>
<td>Lecture: 3 Hours</td>
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<td>Field Trips: 3 Hours</td>
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<td></td>
<td>Prerequisite: VEN 101A,B,C, 115 or 116, and 118, or consent of instructor. (VEN 110, SSC 100, ATM 133 and ARE 140 recommended)</td>
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<td>Text(s): VEN 216 Syllabus.</td>
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<td>Application of plant, meteorological, soil, water, and economic sciences to vineyard establishment and development. Preparation of a comprehensive study to determine the viticultural and economic feasibility of a given site for raisin, table, or wine grape production.</td>
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<tr>
<td>219</td>
<td>Natural Products of Wines</td>
<td>(3)</td>
<td>II</td>
<td>Waterhouse</td>
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<td>Lecture: 3 Hours</td>
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<td></td>
<td>Text(s): Chemistry of Wine Flavor, Ebeler and Waterhouse, Oxford Press</td>
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<td>Prerequisite: VEN 123, 124 or natural products background and consent of instructor.</td>
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Structure, occurrence and changes due to wine production to the natural products found in wine. Chemicals with a sensory impact will be emphasized and will include flavonoids and other phenolics, terpenes and norisoprenoids, prazines, oak volatiles and other wine constituents.

220  **Secondary Nutrients, Chemistry** (3)  Not currently offered  Staff
Lecture:  2 Hours  
Discussion:  1 Hour  
Prerequisite: CHE 8B, BIS 102  
Introduction to phytochemicals with possible health or nutritional effects, with a focus on chemical structure, reactivity and occurrence in foods, including phenolics, glucosinylates, carotenoids and fiber. Students will give oral reports.

223  **Instrumental Analysis of Must and Wine** (4)  Ebeler
Lecture:  2 Hours  
Laboratory:  3 Hours  
Discussion:  1 Hour  
Prerequisite: VEN 123 or FST 103 required. BIS 102, CHE 107B or CHE 115 recommended.  
Theory and practice of instrumental analysis of wines and musts. Emphasis on the principles of analytical techniques (e.g., CE, GC, HPLC, Mass Spectrometry) and factors determining correct choice of instrumental method.

224  **Advances in the Science of Winemaking** (3)  Mills
Lecture:  3 Hours  
Prerequisite(s): 125,126 and graduate student status or permission of instructor.  
By the completion of this class, students will have an in-depth knowledge of five current topics in the science of winemaking; be able to think more critically about experimental design and data analysis and be able to evaluate published scientific material more critically.

225  **Advanced Sensory Analysis of Wine** (3)  Heymann
Lecture:  2 Hours  
Laboratory:  4 Hours  
Prerequisite: VEN 124, 125 (or FST 107) and ASE 120 or equivalent.  
Text(s):  VEN 225 Syllabus and reserve reading.
Sensory descriptive analysis experiments will be designed and conducted using standard sensory science methods. Data will be analyzed by analyses of variance, principal component analyses and generalized procrustes analyses to evaluate the judge's performance and interpret the significance of the results.

235  **Winery Design and Economics** (4) II (alternate years)  
Boulton  
Lecture:  2 Hours  
Discussion:  1 Hour  
Prerequisite: VEN 124, 135 (FST 110A recommended)  
Text(s): VEN 235 Syllabus.  
Design of wineries. Includes process calculations, equipment selection, process layout and building choice and siting. Includes project scheduling, capital costs and ten-year cash flow analysis for the new winery venture. Design project is basis of assessment.

270  **Critical Evaluation of Scientific Literature** (2) II, III  
Bisson  
Discussion:  2 Hours  
Prerequisite: Consent of instructor  
S/U grading only  
Contemporary research topics in biological sciences. Students choose, present, and lead discussion of recent research articles in a special topic area chosen by instructor. Intended to develop skills in critical evaluation of scientific publications. May be repeated for credit.

290  **Seminar** (1) I, III  
Staff  
Seminar:  1 Hour  
Prerequisite: None  
S/U grading only  
Current research being conducted by students, staff, and faculty in the Department of Viticulture & Enology.

290C  **Advanced Research Conference** (1) I, II, III  
Staff  
Discussion:  1 Hour  
Prerequisite: Graduate standing and consent of instructor  
S/U grading only  
Planning and results of research programs, proposals and experiments. Discussion and critical evaluation of original research being conducted by the group. Discussion led by individual research instructors for research group. May be repeated for credit.

291  **Advances in Viticulture** (2) II (alternate years)  
Matthews  
Lecture/Discussion:  2 Hours  
Prerequisite: VEN 110, 124, 125; 210 recommended  
S/U grading only
Critical evaluation of scientific and popular literature on selected topics of current interest that relate viticulture to fruit or wine sensory attributes or quality

292 Advances in Enology (1) Staff
Discussion: 1.5 Hours (7 to 10 sessions)
Prerequisite: VEN 123, 124, 125, 126
S/U grading only
Discussions of previously assigned reading material, usually in the form of two to three reprints. Discussions led by faculty to acquaint students with their current research interests. May be repeated for credit.

297T Tutoring in Viticulture and Enology (1-5) I, II, III Staff
Prerequisite: Graduate standing and consent of instructor
S/U grading only
This course is intended for graduate students interested in a career of teaching Viticulture or Enology at the University, College or Extension level. It is designed to help students learn to communicate information to others.

298 Group Study (1-5) I, II, III Staff
S/U grading only

299 Research (1-12) I, II, III Staff
S/U grading only

396 Teaching Assistant Training Practicum (1-4) I, II, III Staff
Prerequisite: Graduate standing. May be repeated for credit.

SUGGESTED READING IN VITICULTURE AND ENOLOGY

In addition to the textbooks named in the section describing the department's courses, further books in the area of Viticulture & Enology can be found at the UCD Bookstore’s website, http://ucdbookstore.ucdavis.edu/ by selecting General Books. Under General Books (http://bookstore.ucdavis.edu/books) you’ll be able to select Viticulture & Enology.

NOTE: UC Davis Bookstore.
University of California, Davis, CA 95616
Telephone: (530) 752-6846

The University of California, in accordance with applicable Federal and State law and University policy, does not discriminate on the basis of race, color, national origin, religion, sex, disability, sexual orientation, or status as a Vietnam Veteran. The University also prohibits sexual harassment. This nondiscrimination policy covers admission, access, and treatment in University programs and activities. Inquiries regarding the University’s student-related nondiscrimination policies may be directed to Student Judicial Affairs Director Jeanne Wilson, Dutton Hall, 530-752-1128.
ADMISSION REQUIREMENTS FOR THE VITICULTURE & ENOLOGY MAJOR

I. ADMISSION

A. FRESHMEN

No special requirements

B. TRANSFER APPLICANTS

Requirements
1. Completion of UCD equivalents of the following preparatory courses for the major:
   - Chemistry 2A, 2B, 2C, 8A
   - Mathematics 16A
   - Physics 7A
   - Biological Sciences 1A

2. An average GPA in all preparatory courses for the major of 3.0 or better with no grade lower than C-.

Recommendations
1. Completion of UCD equivalents of the following preparatory courses for the major are not required for entry but are highly recommended. Failure to complete these will delay entry into required upper division courses and may thus delay graduation. Some may be available at UCD during Summer Session.
   - Chemistry 8B
   - Mathematics 16B
   - Physics 7B (Fermentation Science)
   - Biological Sciences 1C (Viticulture & Enology)
   - Biological Sciences 102

II. UCD STUDENTS ENTERING THE MAJOR

Requirements
1. Overall GPA of 2.25 or better.

2. Completion of the following preparatory courses:
   - Chemistry 2A, 2B, 2C
   - Mathematics 16A
   - Biological Sciences 1A

3. An average GPA in all preparatory courses for the major of 2.5 or better with no grade lower than C-.
VITICULTURE & ENOLOGY MAJOR

The Viticulture and Enology major provides an interdisciplinary education in the biological and physical principles underlying grape and wine production as well as practical knowledge of grape growing (viticulture) and wine making (enology). The curriculum builds upon a foundation in chemical, mathematical and biological sciences with a core of specialized courses which provide a knowledge base for problem-solving and decision-making in commercial grape and wine production. To complete the program, students can choose to emphasize viticulture, enology or economics and credit may also be earned for foreign language study and internships. Assistance in identifying domestic and international internship opportunities and in developing course plans which accommodate internship timing is provided.

Graduates qualify for a variety of vineyard and winery positions, including production management, quality control and research. Additionally they may work in related fields such as pest management, nursery production and analytical services. The major can also provide the basis for preparation for graduate study in food science, microbiology, agricultural chemistry and plant biology, provided that the student chooses course options which fulfill both major requirements and graduate program entrance requirements.

Program office: 1023 Wickson Hall, Department of Viticulture & Enology, Phone: (530) 752-0380; Fax: (530) 752-0382 http://wineserver.ucdavis.edu
Advising Associate: Judy Blevins, 2114 Wickson, (530) 752-8035, e-mail: jiblevins@ucdavis.edu
Advisors: Mark Matthews, 1001 Wickson, (530) 752-2048, e-mail: mamathews@ucdavis.edu, fax: (530) 752-2275
David Block, 1001 Wickson, (530) 754-6046, e-mail: deblock@ucdavis.edu
Andy Waterhouse, 2015 Wickson, (530) 752-4777, e-mail: alwaterhouse@ucdavis.edu
Student Peer Advisor: Gillian Sutherland, 2102 Wickson, e-mail: gmsutherland@ucdavis.edu.
VITICULTURE & ENOLOGY MAJOR

ENGLISH COMPOSITION REQUIREMENT
0-8
SEE CATALOG FOR CURRENT REQUIREMENTS
Subject A + two of the following courses, at least one of which must come from group "a."

a. ENL 1, 3, 18, 19, 101, 102A-G, 104A-F.
b. COM 1, 2, 3, 4; NAS 5; CMN 1

BREADTH/GENERAL EDUCATION
24
SEE CATALOG FOR CURRENT REQUIREMENTS
Social Sciences (3 courses required); Arts & Humanities (3 courses required); Writing Experience (3 courses required); Social-cultural Diversity (1 course required) (see current G.E. guidelines).

PREPARATORY SUBJECT MATTER (CANNOT BE TAKEN ON PASS/NO PASS) 41-51
BIOLOGICAL SCIENCES (Biological Sciences 1A, 1C) 10
CHEMISTRY (Chemistry 2A, 2B, 2C) 15
COMPUTER SCIENCE (AMR 21 or equivalent and advisor approval) 0-3
MATHEMATICS (Mathematics 16A, 16B) 6
ORGANIC CHEMISTRY (Chemistry 8A, 8B or more advanced series w/ lab) 6
PHYSICS (Physics 1A, 1B or Physics 7A) 4-6
VITICULTURE & ENOLOGY (Viticulture & Enology 2, 3 or equivalent and advisor approval) 0-5

DEPTH SUBJECT MATTER (CANNOT BE TAKEN PASS/NO PASS) 53-54
BIOCHEMISTRY (Biological Sciences 102, 103) 6
MICROBIOLOGY (Microbiology 102, 102L) 7
STATISTICS (AMR 120 or STA 100 or 106) 4
VITICULTURE & ENOLOGY (Viticulture & Enology 101A, 101B, 101C, 110, 118) 15
ENOLOGY (Viticulture & Enology 123, 124, 125, 126, 128, 135) 15
Three out of the following five labs are required: 123L, 124L, 125L, 126L, 128L 6-7
(If more than 3 labs are taken, the extra courses will count as Restricted Elective in Area B.)

RESTRICTED ELECTIVES (One letter graded course allowed to be taken Pass/No Pass) 28
In consultation with advisor, choose 28 units from 3 of the following 5 areas.
At least 12 units must be from one of A. Plant Science, B. Food Science & Microbiology or C. Economics & Business.
A. Plant Science Area
B. Food Science & Microbiology
C. Economics & Business.
D. Language Area
E. Internship Area

UNRESTRICTED ELECTIVES 15-34
TOTAL UNITS FOR THE DEGREE 180

Note that preparatory requirements indicate the minimum lower division course work necessary for this major and related careers. Students should carefully consider future plans and include other lower and upper division courses required for specific restricted elective classes and/or admission to graduate/professional schools. In particular, students specializing in enology should take PHY 7B, while those continuing to graduate school should take PHY 7B, 7C, MAT 16C and any other program specific requirements. Students planning to proceed to a health professional school should also take full year sequences of organic chemistry and biology.

A maximum of 8 units of Viticulture & Enology 190, 192, 198, 199, 290 or 298 may be counted as restricted electives by prior arrangement with advisor. May be increased to 12 units in exceptional circumstances.

Course List for Restricted Elective Areas:

A. Plant Science Area
The following lower division courses NOT listed among the pre-requisites for the major are required or recommended for one or more of the Restrictive electives in this area: ASE 2, BIS 1B, FST 2, GEL 50, PLS 10(PLB 10A). Unit designations follow each course 2000-2002 catalog.

Applied Biological Systems Technology 142(2), 145(2), 147(2), 175(3), 180 (3)
Atmospheric Science 133(4)
Biological Sciences 101 (4)
Entomology 110 (5)
Hydrologic Science 110 (3), 117 (3), 124 (4)
Molecular & Cellular Biology 126 (3)
Nematology 100 (4)
Plant Pathology 120 (4)
Soil Science 100 (5), 102 (5), 109 (5), 118(4)
Viticulture & Enology 111 (3), 115 (2) graduate viticulture courses.

B. Food Science & Microbiology Area
The following lower division courses NOT listed among the pre-requisites for the major are required or recommended for one or more of the Restrictive electives in this major: BIS 1B, PHY 7B, 7C.

Biological Sciences 101 (4)
Microbiology 140 (3), 150 (3), 155L (3)
Viticulture & Enology 140 (3), graduate enology courses
Viticulture & Enology 123L(2), 124L(3), 125L(2), 126L(2), 128L (2) (whichever not used as depth).

C. Economics & Business Area
Agricultural & Resource Economics 100A (4), 112 (4), 113 (4), 118 (4), 130 (4), 140 (5), 150 (4)
Economics 1A (5), 1B (5)
Management 11A (4), 11B (4)
Viticulture & Enology 111 (3), 130 (9)

D. Language Area
Maximum 12 units, not counting Course 1, of one of the following languages: French, German, Italian, Portuguese or Spanish. At least one course counted towards the major must be Intermediate or Conversational (qualifying Intermediate or Conversational courses are listed below). Courses taught in English will not count as restricted electives in this major.

French 8, 21, 22, 23, 38
German 6, 11, 20, 21, 22
Italian 4, 5, 8A, 8B
Spanish 8, 21, 22, 28, 31, 32, 33
ITA 8A may not be repeated for restricted elective credit.

E. Internship Area

Revised 09/27/04
Students pursuing a **second baccalaureate** degree in Viticulture & Enology must meet the following requirements to be considered into the major.

**Requirements**

1. Completion of UCD equivalents of the following preparatory courses for the major:
   - Chemistry 2A, 2B, 2C (general chemistry), 8A, 8B (organic chemistry)
   - Mathematics 16A, 16B (calculus)
   - Physics 7A (general physics)
   - Biological Sciences 1A, 1C (general biology, botany)

2. An average GPA in all preparatory courses for the major of 3.0 or better with no grade lower than C-.

Our program is so heavily enrolled that we are only able to select those applicants who have convinced us that they will succeed in the wine industry. The applicant’s personal statement is also considered in the decision making as well as letters of recommendation. It is strongly recommended that applicants have worked in the industry (i.e. harvest). The second baccalaureate degree program will take approximately 2 years to complete once a person has gained admission status.

Applicants must complete an undergraduate application (hard copy) as well as the second baccalaureate petition ([http://ugaos.ucdavis.edu/Second_Bacc_Petition.pdf](http://ugaos.ucdavis.edu/Second_Bacc_Petition.pdf)). The undergraduate application filing deadline is the month of November for entrance the following fall quarter. Please submit all application materials, including undergraduate application, letters of recommendation (two), official transcripts, second baccalaureate petition, and application fee ($40 payable to UC Regents) to the Department of Viticulture & Enology, C/O Judy Blevins, University of California, One Shields Avenue, Davis, CA 95616. Useful web sites are listed below.

Viticulture and Enology
http://wineserver.ucdavis.edu

UC Davis Home Page
http://www.ucdavis.edu

UCD General Catalog:
http://registrar.ucdavis.edu/UCDWebCatalog/

California Student Course Transfer Information
http://www.assist.org/