### 52. Field Equipment Welding (2)
- Lecture: 1 hour; laboratory: 3 hours. Prerequisite: course 16 or consent of instructor. Intermediate welding to include facing and inert gas welding. Class projects on repair and fabrication by welding. Troubleshooting and major repair of field equipment. (P/NP grading only.) GE credit: QL, SE, VL. — W. (W.) Shafii

### 98. Directed Group Study (1-5)
- Prerequisite: consent of instructor. (P/NP grading only.) GE credit: SE.

### 99. Special Study for Lower Division Students (1-5)
- Prerequisite: consent of instructor. (P/NP grading only.) GE credit: SE.

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### Upper Division

#### 101. Engine Technology (3)
- Lecture: 2 hours; laboratory: 3 hours. Prerequisite: upper division standing or consent of instructor. Principles of 2-stroke cycle, 4-stroke cycle gasoline and 4-stroke cycle diesel engine construction and operation. Engine systems, performance, troubleshooting, and overhaul. GE credit: SciEng|QL, SE, VL. — W. (W.) Jenkins, Vougioukas

#### 110L. Experiments in Food Engineering (2)
- Laboratory: 6 hours. Prerequisite: Food Science and Technology 100A (to be taken concurrently). Use of temperature sensors; measurement of thermal conductivity and heat transfer in foods; refrigeration, freezing, concentration and dehydration of foods. GE credit: SciEng|QL, SE, VL, WE. — S. (S.) Bornhorst

#### 121. Animal Housing and Environment Management (2)
- Lecture: 2 hours. Prerequisite: Animal Science 1 or 2. Optimal structures and environments for animal growth and comfort; heat and moisture transfer principles; heating, cooling, ventilating principles and equipment; animal housing design; environmental regulations and waste management practices. Offered in alternate years. GE credit: SciEng|SE. — W. (W.) Zhang

#### 142. Equipment and Technology for Small Farms (2)
- Lecture: 1 hour; laboratory: 3 hours. Types and characteristics of agricultural equipment and technologies appropriate for small commercial farming. Adjustment and calibration of equipment. Selection of and budgeting for equipment. (Same course as International Agricultural Development 142.) GE credit: SciEng|QL, SE, VL. — S. (S.) Shafii

#### 150. Introduction to Geographic Information Systems (4)
- Lecture: 3 hours; laboratory: 3 hours. Prerequisite: Plant Sciences 21 or equivalent with consent of instructor. Priority given to College of Agricultural and Environmental Science majors. Basic concepts, principles and methods of GIS are presented. Data structures, database design, GIS data creation, GPS, and spatial analysis techniques are emphasized. Lab topics include: online data sources, aerial photography, GPS and GIS input, suitability analysis, cartographic design and graphic communication. Not open for credit to students who have completed Applied Biological Systems Technology 180/Plant Sciences 180 or Applied Biological Systems Technology 181N. [Same course as Landscape Architecture 150.] GE credit: SciEng|QL, SE, VL. — F. (F.) Greco, Upadhyaya

#### 161. Water Quality Management for Aquaculture (3)
- Lecture: 3 hours. Prerequisite: Biological Sciences 18, Mathematics 168, Chemistry 28. Basic principles of water chemistry and water treatment processes as they relate to aquacultural systems. Offered in alternate years. GE credit: SciEng|QL, SE, VL, W. (W.) Hung

#### 163. Aquaculture Systems Engineering (3)
- Lecture: 3 hours. Prerequisite: course 161. Design of aquacultural systems: design methodology, principles of fluid mechanics, site selection and facility planning, management operations, computer modeling. Offered in alternate years. GE credit: SciEng|QL, QL, SE, VL. — W. (W.) Shafii

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### 165. Irrigation Practices for an Urban Environment (2)
- Lecture: 2 hours. Prerequisite: Physics 1A or 5A. Basic design, installation, and operation principles of irrigation systems for turf and landscape: golf courses, parks, highways, public buildings, etc. Emphasis on hardware association with sprinkler and drip/trickle systems. GE credit: SciEng|QL, SE, VL. — W. (W.) Gnim

#### 181N. Concepts and Methods in Geographic Information Systems (4)
- Lecture/laboratory: 8 hours. Prerequisite: course 180 or Agricultural Management and Rangeland Resources 180 or Landscape Architecture 50 or consent of instructor. Data representation and analysis in geographic information systems (GIS). Creation of spatial data sets from analog and digital sources such as aerial images. Analysis of digital vector and raster data sets, data management, database design, georeferencing, geocodification, surface models, analysis, and spatial data visualization. Offered in alternate years. GE credit: SciEng|QL, SE, VL. — W. (W.) Gnim

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### 290C. Graduate Research Conference (1)
- Discussion—1 hour. Prerequisite: consent of instructor. (P/NP grading only.) GE credit: SciEng|QL, SE, SL, VL, WE.

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### Professional

#### 317. Teaching Agricultural Mechanics (2)
- Lecture: 1 hour; laboratory: 3 hours. Prerequisite: a course in physics; 6 units related to agricultural mechanics; enrolled in Agricultural Education Teacher Credential Program. Preparation of the teacher to plan, organize, and conduct an agricultural mechanics program in secondary schools. Development of and presentation of lesson plans and teaching aids. Review of subject matter in metal fabrication, power and machinery and agricultural structures areas. — F. (F.) Shafii

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### Applied Computing and Information Systems

[College of Agricultural and Environmental Sciences]

This minor is for students interested in applying modern computer technology to management problems in agriculture, resource management, and other areas. Course work provides knowledge of the use of information technology and the methodology of applied quantitative and systems analysis. The minor is offered by the Department of Plant Sciences.

#### Minor Program Requirements:

<table>
<thead>
<tr>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>18</td>
</tr>
</tbody>
</table>

### Applied Computing and Information Systems

Two or three of the following courses: Plant Sciences 120, 121, Animal Science 128, Engineering: Computer Science 167. (The third course may be taken in substitution for a course from either of the elective groups.) Remainder of the units to be made up of courses in one or both of the following groups:

- Resources: 3-6

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Minor Adviser: T. R. Famula (Animal Science)
Applied Mathematics (A Graduate Group)

Group Office. 1130 Mathematical Sciences Bldg. 530-752-8130
studentservices@math.ucdavis.edu; http://math.ucdavis.edu/grad/ggam

Faculty. The Group includes approximately 90 faculty members, of whom about one-third are in the Department of Mathematics. Membership comprises chemists, biologists, physicists, geologists, statisticians, computer scientists, and engineers. Research interests include biology, atmospheric sciences, mechanics, solid and fluid dynamics, optimization and control, theoretical chemistry, computer and engineering sciences, mathematical statistics and image processing, harmonic analysis, numerical analysis and nonlinear partial differential equations. A complete list of faculty and their research areas are available at http://math.ucdavis.edu/grad/ggam/faculty.

Graduate Study. Students prepare for careers where mathematics is applied to problems in the physical and life sciences, engineering, and management. The degree requirements consist of rigorous training in applied mathematics, including course work and a research dissertation under the direction of a member of the Graduate Group in Applied Mathematics. The M.S. degree provides preparation for further study in applied mathematics or an application area, or for a career in industry or public service. The Ph.D. degree provides preparation for a career in research and/or teaching, or in industrial or national research laboratories. For further information, please contact studentservices@math.ucdavis.edu or 530-752-8130.

New applicants are admitted to the fall quarter only.

Preparation. The program admits qualified students with a bachelor’s degree in mathematics, physics, chemistry, engineering, economics, the life sciences and related fields. General and advanced mathematics GRE scores are required, and applicants should display evidence of strong quantitative skills. Undergraduate courses should include calculus (including vector calculus), linear algebra, and ordinary differential equations. Advanced calculus (introduction to real analysis) is strongly recommended. Additional background in probability, partial differential equations, and/or numerical analysis is a plus. The ability to program in a high-level computer programming language (e.g., C, Fortran, MATLAB, Python, R, etc.) is assumed.

Graduate Advisers. Contact the Student Services Office at 530-752-8130 or by email at studentservices@math.ucdavis.edu or 530-752-8130.

Courses. For a list of the courses in applied mathematics and mathematics, see Mathematics, on page 419.

Applied Physics

See Physics, on page 503.

Aquaculture

See Animal Biology, on page 160; Animal Science, on page 162; Applied Biological Systems Technology, on page 174; and Wildlife, Fish, and Conservation Biology, on page 587.

Arabic

See Classics, on page 211.

Art History

(College of Letters and Science)
Department Office. 101 Art Building 530-752-0105; http://arthistory.ucdavis.edu

Faculty
Katharine Burnett, Ph.D., Associate Professor
Talinn Grigor, Professor
Lynn Roller, Ph.D., Professor
Diana Strazzes, Ph.D., Associate Professor
Hegnar Watenaough, Ph.D., Associate Professor

Emeriti Faculty
Robert J. Grigg, Ph.D., Professor Emeritus
Seymour Howard, Ph.D., Professor Emeritus
Jeffrey Ruda, Ph.D., Professor Emeritus
Dianne Sachiko Macleod, Ph.D., Professor Emerita

The Major Program
Art History studies the changing visual expression of values, beliefs and experiences across diverse cultures and over time. It provides training in historical, social and aesthetic understanding, critical thinking, scholarly research, and lucid, thoughtful analysis and writing. More than any other discipline art history sharpens its students’ visual acuity and deepens their visual literacy. In so doing, it prepares them to face the increasingly complex visual world we find ourselves in today.

The Program. The major begins with a series of courses that surveys major landmarks in the history of visual culture, art and architecture in Asia, Europe, and the United States. More advanced lecture courses and seminars focus on particularly important periods and issues. Students are encouraged to personalize their training with internships, independent study, and focused upper-division study. Top students considering graduate study are encouraged to engage in more advance study in the Honors program.

Career Options. A major in Art History develops critical thinking and the integration of research, interpretation and understanding. It provides an excellent liberal arts basis for professions as far ranging as advertising, law, medicine, politics and business. The major prepares students for advanced study in Art History, Architecture, Museum Studies and Cultural Studies. It also serves as the foundation for careers in teaching, arts, administration, museums, galleries, historiographic, curatorial, publishing, journalism, advertising, art conservation, and art investment. As the world becomes increasingly flooded with images, the critical visual literacy gained through art history becomes more important for a wide variety of careers.

A.B. Major Requirements:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory Subject Matter</td>
<td>20</td>
</tr>
<tr>
<td>Any four of the following courses: Art History 1A, 1B, 1C, 1D, 1DY, 1E, 5, and 25</td>
<td>16</td>
</tr>
<tr>
<td>Any lower division Art Studio course except Art 10 or 30</td>
<td>4</td>
</tr>
<tr>
<td>Depth Subject Matter</td>
<td>40</td>
</tr>
<tr>
<td>Four courses, one each in four of the following six areas. Two courses must be from areas a, b, c, and two courses must be from areas d, e, f</td>
<td>16</td>
</tr>
</tbody>
</table>

(e) Western Art 1700-1900: Art History 110, 116, 182, 183A, 183B, 183C, 188A, 188B 188C
(f) Art after 1900: Art History 110, 148, 163D, 183C, 184, 185, 186, 187, 189

Undergraduate Seminar Art History 190A-L | 4 |

Electives | 20 |

Five additional upper-division Art History courses to be chosen in consultation with the major adviser. Appropriate course substitutions may be made with the consent of the major adviser. Art History 401 and 402 may be counted among the elective units.

Total Units for the Major | 60 |

Emphasis in Architectural History

Art History | 60 |

Emphasis in Architectural History follows the same requirements as for the Art History major above, applying at least six of the following courses to their respective required areas or as electives: Art History 22, 110, 120A, 155, 163A, 168, 172A, 172B, 173, 175, 176A, 176B, 176C, 178B, 178C, 184, 188A, 188B.

Fulfilling the undergraduate seminar requirement (Art History 190AH) through an architectural topic is highly recommended.

Minor Program Requirements:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art History</td>
<td>20</td>
</tr>
<tr>
<td>Three courses chosen from the following six areas with at least one course in area a, b, c, or d, one course in area e, f, or</td>
<td>12</td>
</tr>
<tr>
<td>Islamic Art: Art History 120A, 155, 156</td>
<td>12</td>
</tr>
<tr>
<td>European Art before 1700: Art History 177B, 178C, 179</td>
<td>12</td>
</tr>
<tr>
<td>Western Art 1700-1900: Art History 110, 130, 168, 182A, 183A, 183B, 188A, 188B, 188C</td>
<td>12</td>
</tr>
<tr>
<td>Art History 110, 184, 185, 186, 189</td>
<td>12</td>
</tr>
<tr>
<td>Two additional Art History courses which may include 401, 402, Undergraduate Seminar, Art History 190AH are highly recommended</td>
<td>12</td>
</tr>
<tr>
<td>One lower division course may be substituted for upper-division study in any of these areas. Other appropriate substitutions may be made for the course options listed above with the prior consent of the major adviser.</td>
<td>12</td>
</tr>
</tbody>
</table>

Honors Program. The Honors Program is encouraged for Art History majors who are considering attending graduate school. To be eligible for the program, a student must have a grade point average of 3.700 in the major or consent of the major adviser. In addition to meeting the standard major requirements, the honors student completes one undergraduate seminar course (100 or 190A-L), and writes an honors thesis (course 194H) after completing Art History 100 or equivalent. This allows preparing a preliminary thesis draft through a preparatory special study (Art History 199), supervised by the prospective thesis adviser. Students participating in this Program are candidates for Departmental recommendation for graduation with High or Highest Honors. See the Academic Information chapter, Letters and Science honors section, of this catalog and consult the department website for more information.

Teaching Credential Subject Representative. Department Chairperson; see the Teacher Education program.

Fall 2011 and on Revised General Education (GE) Areas: Arts and Humanities; SE=Science and Engineering; SS=Social Sciences; AGCH-American Cultures; DD=Dominic Diversity; ESL=Eskimo/Indian Programs; Visual; WC=World Cultures; WE=Writig Experience

Pre-Fall 2011 General Education (GE): AR=Humanities; ScL=Science and Engineering; SoS=Social Sciences; DI=Dominic Diversity; WR=Writig Experience

Quarter Offered: F=Fall, W=Winter, S=Spring, Su=Summer; 2017-2018 offering in parentheses