

cultures of African American, Asian American, Chicano/Latino, and Native American ethnic groups. E. Native American History and Research; F. Asian American Studies; G. Chicano Psychology; K. Chicano Sociology; N. Chicano Literature: A Comparative Approach; R. Research Methodology; S. Black Aesthetics. *E, G, and K fulfill the Social Sciences requirement, F, N, and S fulfill the Humanities requirement, and R fulfills no requirement for the College of Humanities, Arts, and Social Sciences.*

ETST 192H. Junior Honors Seminar (4) Seminar, 3 hours; term paper, 3 hours. Prerequisite(s): junior standing or consent of instructor. Advanced research in various fields of faculty interest and expertise. Students are required to complete a research paper utilizing primary and secondary documents and other sources. Seminar focus varies from year to year. Course is repeatable to a maximum of 12 units. *Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences, but not both.*

ETST 193. Senior Research Seminar (4) Seminar, 3 hours; term paper, 3 hours. Prerequisite(s): senior standing or consent of instructor. Advanced research in various fields of faculty interest. Students are required to complete a research paper and present their results in the seminar. Topics vary from year to year. Course is repeatable to a maximum of 8 units. *Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences, but not both.*

ETST 198G. Group Internship (1-12) Internship, 2-24 hours; outside research, 1-12 hours. Prerequisite(s): upper-division standing; consent of instructor. On- or off-campus internship related to the interests of core ethnic-group students under the joint direction of an on- or off-campus supervisor and an Ethnic Studies faculty member. Course is repeatable to a maximum of 16 units. *Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.*

ETST 198-I. Individual Internship (1-12) Internship, 2-24 hours; outside research, 1-12 hours. Prerequisite(s): upper-division standing; consent of instructor. On- or off-campus internship related to the ethnic community, conducted under the joint direction of an on- or off-campus supervisor and an Ethnic Studies faculty member. Requires a report based on the experience. Course is repeatable to a maximum of 16 units. *Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.*

Graduate Courses

ETST 202. Sociocultural Theories in Ethnic Studies (4) Seminar, 3 hours; outside research, 3 hours. Prerequisite(s): graduate standing. Examines theoretical approaches to the study of race and ethnicity in the United States. Assesses the relative strengths and weaknesses of key theoretical paradigms. Instructor will select from symbolic interaction, phenomenology, class analysis, sovereignty, literary criticism, feminism, psychoanalysis, racial formation, critical race theory, postmodernism, or global or transnational perspectives. May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.

ETST 255. Critical Issues in Asian American Studies (4) Seminar, 3 hours; individual study, 3 hours. Prerequisite(s): graduate standing. Examines and seeks to develop a critical appreciation of research literature on Asians in America and to develop alternative interpretations of the Asian American

experience. Topics include Asian American history, economic, political, social, and psychological issues.

ETST 256. Critical Issues in Asian Pacific American Communities (4) Seminar, 3 hours; practicum, 3 hours. Prerequisite(s): graduate standing. Examines contemporary issues facing Asian Pacific American communities. Students engage in active research in these communities.

ETST 289. Colloquium in Ethnic Studies (1) Colloquium, 1 hour. Prerequisite(s): graduate standing or consent of instructor. Lectures and discussions by students, faculty, and invited scholars on selected topics. Graded Satisfactory (S) or No Credit (NC). Course is repeatable to a maximum of 6 units.

ETST 290. Directed Studies (1-6) scheduled research, 3-18 hours. Prerequisite(s): graduate status and consent of instructor. Research and special studies in Ethnic Studies. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

Professional Course

ETST 302. Teaching Practicum (1-4) Practicum, 3-12 hours. Prerequisite(s): limited to teaching assistants; graduate standing. Supervised teaching in lower- and upper-division courses. Required of all Ethnic Studies teaching assistants. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

Evolution, Ecology, and Organismal Biology

[See Biology \(Graduate Program\)](#)

Genetics, Genomics, and Bioinformatics

Subject abbreviation: GEN
College of Natural and Agricultural Sciences

Isgouhi Kaloshian, Ph.D., Director
Program Office, 1140 Batchelor Hall
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Professors

Peter W. Atkinson, Ph.D. (Entomology)
Julia N. Bailey-Serres, Ph.D. (Botany and Plant Sciences)
Nancy E. Beckage, Ph.D. (Entomology/Cell Biology and Neuroscience)
Katherine A. Borkovich, Ph.D. (Plant Pathology)
James Borneman, Ph.D. (Plant Pathology)
Timothy J. Close, Ph.D. (Botany and Plant Sciences)
Donald A. Cooksey, Ph.D. (Plant Pathology)
David E. Crowley, Ph.D. (Environmental Sciences)
Darleen A. DeMason, Ph.D. (Botany and Plant Sciences)
Shou-Wei Ding, Ph.D. (Plant Pathology)
David A. Eastmond, Ph.D. (Cell Biology and Neuroscience)

Norman C. Ellstrand, Ph.D. (Botany and Plant Sciences)
Brian A. Federici, Ph.D. (Entomology)
Daniel R. Gallie, Ph.D. (Biochemistry)
Theodore Garland, Ph.D. (Biology)
Sarjeet S. Gill, Ph.D. (Cell Biology and Neuroscience)
Manuela Martins-Green, Ph.D. (Cell Biology and Neuroscience)
Cheryl Hayashi, Ph.D. (Biology) John M. Heraty, Ph.D. (Entomology)
Jodie S. Holt, Ph.D. (Botany and Plant Sciences)
Anthony H. C. Huang, Ph.D. (Botany and Plant Sciences)
Bradley C. Hyman, Ph.D. (Biology)
Tao Jiang, Ph.D. *President's Chair* (Computer Science)
Howard S. Judelson, Ph.D. (Plant Pathology)
Bai-Lian "Larry" Li, Ph.D. (Botany and Plant Sciences)
Keh-Shin Lii, Ph.D. (Statistics)
Xuan Liu, Ph.D. (Biochemistry)
Dmitri A. Maslov, Ph.D. (Biology)
Leonard P. Nunney, Ph.D. (Biology)
Alexander S. Raikhel, Ph.D. (Entomology)
Natasha Raikhel, Ph.D. (Botany and Plant Sciences)
A.L.N. Rao, Ph.D. (Plant Pathology)
David Reznick, Ph.D. (Biology)
Mikeal L. Roose, Ph.D. (Botany and Plant Sciences)
Neal L. Schiller, Ph.D. (Biomedical Sciences)
Frances M. Sladek, Ph.D. (Cell Biology and Neuroscience)
Stephen R. Spindler, Ph.D. (Biochemistry)
Mark S. Springer, Ph.D. (Biology)
Daniel S. Straus, Ph.D. (Biomedical Sciences)
Jolinda A. Traugh, Ph.D. (Biochemistry)
J. Giles Waines, Ph.D. (Botany and Plant Sciences)
Linda L. Walling, Ph.D. (Botany and Plant Sciences)
Shizhong Xu, Ph.D. (Botany and Plant Sciences)
Zhenbiao Yang, Ph.D. (Botany and Plant Sciences)
Jian-Kang Zhu, Ph.D. *President's Chair* (Botany and Plant Sciences)

Associate Professors

Xuemei Chen, Ph.D. (Botany and Plant Sciences)
Isgouhi Kaloshian, Ph.D. (Nematology)
Paul B. Larsen, Ph.D. (Biochemistry)
Stefano Lonardi, Ph.D. (Computer Science)
Morris F. Maduro, Ph.D. (Biology)
Ernest Martinez, Ph.D. (Biochemistry)
Frank Sauer, Ph.D. (Biochemistry)
Patricia S. Springer, Ph.D. (Botany and Plant Sciences)

Assistant Professors

Jeffrey B. Bachant, Ph.D. (Cell Biology and Neuroscience)
Chia-en Angelina Chang, Ph.D. (Chemistry)
Xingping Cui, Ph.D. (Statistics)
Sean Cutler, Ph.D. (Botany and Plant Sciences)
Greg W. Douhan, Ph.D. (Plant Pathology)
Thomas Eulgem, Ph.D. (Botany and Plant Sciences)
Thomas Girke, Ph.D. (Botany and Plant Sciences)
Venugopala R. Gonehal, Ph.D. (Botany and Plant Sciences)
Hailing Jin, Ph.D. (Plant Pathology)
Seung-Chul Kim, Ph.D. (Botany and Plant Sciences)
Karine G. Le Roch, Ph.D. (Cell Biology and Neuroscience)
Renyi Lui, Ph.D., (Botany and Plant Sciences)
Wenbo Ma, Ph.D. (Plant Pathology)
Changxuan Mao, Ph.D. (Statistics)
James Ng, Ph.D. (Plant Pathology)
Constance I. Nugent, Ph.D. (Cell Biology and Neuroscience)
Anandasankar Ray, Ph.D., (Entomology)
Joel Sachs, Ph.D., (Biology)
Harley Smith, Ph.D. (Botany and Plant Sciences)

Graduate Program

The Genetics, Genomics, and Bioinformatics Graduate Program (GGB) administers a program leading to the Ph.D. in Genetics, Genomics, and Bioinformatics. The GGB is an interdepartmental program that includes faculty from the departments of Biochemistry, Biology, Botany and Plant Sciences, Cell Biology and Neuroscience, Computer Science and Engineering, Entomology, Environmental Sciences, Nematology, Plant Pathology and Microbiology, and Statistics, as well as the Division of Biomedical Sciences.

The three fields of specialization (subdisciplines) are as follows:

1. Molecular genetics
2. Evolution and population genetics
3. Genomics and bioinformatics

The program is structured to allow maximum flexibility in the design of an individual student course program and research goals. A primary objective is to allow students to develop a capability in research as rapidly as possible, consistent with the student's initial preparation.

Students are expected to meet all general requirements of the Graduate Division as printed in the Graduate Studies section of this catalog.

Admission Submission of GRE scores (verbal, quantitative and analytical) is mandatory for admission. Applicants with any B.A. or B.S. degree and an adequate background in the biological and physical sciences will be considered. The specific entry requirements for the three areas of specialization (Molecular Genetics, Evolution and Population Genetics, and Genomics and Bioinformatics) vary somewhat but include courses in genetics, biology, chemistry, calculus, computer science, and statistics. Please refer to the Program Guidelines for details. The GGB evaluates applications on a continual basis from October to May, however, it normally considers applications for teaching and research assistantships at the same time as fellowships; therefore, students are strongly encouraged to complete their applications for admission and support as early as possible. Normally, fellowships are awarded in January, for students entering the following fall quarter.

The GGB has been identified as the graduate training "home" for UCR's Institute for Integrative Genome Biology. The GGB faculty, partnering with colleagues in UCR's Computer Science and Statistics departments, has developed a contemporary curriculum in the broad area of genomics, proteomics, and bioinformatics. Unique to this curriculum is the melding of microbial, animal, and plant genomics and bioinformatics within a single program. The curriculum was designed to interface with the molecular genetics and evolution and population genetics tracks.

Doctoral Degree

The program offers the Ph.D. degree in Genetics, Genomics, and Bioinformatics.

Course Work All students choose a genetics subdiscipline for specialization (either molecular genetics, evolution and population genetics, or genomics and bioinformatics). Specific course requirements are selected on the basis of the subdiscipline and the student's particular needs and objectives. The Ph.D. is a research degree, and, accordingly, the goal of the program is to train students in the theoretical and experimental foundations of modern genetics. Students are strongly encouraged to participate in lab rotations, select a major professor and begin research work early in their training (during the first year of residence).

Written and Oral Qualifying Examinations

Students are advanced to candidacy following successful completion of a written preliminary examination and an oral qualifying examination.

Dissertation and Final Oral Examination

Successful completion of a final oral dissertation defense is also required.

Foreign Language Requirement

None

Teaching Requirement

Each student must have at least one quarter of teaching experience. This requirement may be satisfied by serving as a teaching assistant in a genetics-related course.

Normative Time to Degree

15 quarters

Graduate Courses

GEN 205. Signal Transduction Pathways in Microbes and Plants (4) W Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): graduate standing in the biological sciences, BIOL 107A or BIOL 113 or BIOL 114 or CBNS 101; or consent of instructor. Advanced topics in signal transduction pathways that regulate growth and development in plants and prokaryotic and eukaryotic microbes. Areas covered include two-component regulatory systems; quorum sensing; signaling via small and heterotrimeric G proteins; mitogen-activated protein kinase cascades; cAMP signaling; photoreceptors; plant hormone signaling; responses to low-oxygen stress; calcium signaling; and plant pathogenesis. Cross-listed with BCH 205, BPSC 205, CMDB 205, MCBL 205, and PLPA 205. **Borkovich**

GEN 206. Gene Silencing (3) Lecture, 2 hours; discussion, 1 hour. Prerequisite(s): graduate standing, BIOL 107A or CBNS 101; or consent of instructor. An in-depth coverage of mechanisms, functions, and applications of RNAi and related gene regulatory pathways guided by small RNAs such as siRNAs and miRNAs in plants and animals. Cross-listed with CMDB 206 and MCBL 206. **Ding, Zhu**

GEN 230. Molecular Plant-Microbial Interactions (3) Lecture, 2 hours; discussion, 1 hour. Prerequisite(s): BCH 100, BIOL 120/MCBL 120/PLPA 120, or equivalents. A study of the physiology of host-pathogen interactions with emphasis on the metabolism of diseased plants, nature of pathogenicity, and defense mechanisms in plants. Cross-listed with BPSC 230, CMDB 230, and PLPA 230. **Eulgem, Jin, Kaloshian**

GEN 240A. Advances in Bioinformatics and Genomics (4) S Lecture, 4 hours. Prerequisite(s): BCH

110C or BIOL 107A; BIOL 102. Introduces current concepts and technologies in bioinformatics and genomics. Covers genomics foundations and gene discovery, functional genomics, macromolecules, and gene and genome evolution. **Judelson**

GEN 240B. Advances in Bioinformatics and Genomics (4) Lecture, 4 hours. Prerequisite(s): GEN 240A, STAT 160A, STAT 160B, STAT 161 (STAT 161 may be taken concurrently). Introduces current concepts and technologies in bioinformatics and genomics. Covers phylogenetics, sequence comparisons and genomics databases, and genetic mapping and single nucleotide polymorphisms and introduces biological data modeling. **Girke**

GEN 261. Seminar in Genetics, Genomics, and Bioinformatics (1) Seminar, 1 hour. Prerequisite(s): graduate standing or consent of instructor. Oral reports by visiting scholars, faculty, and students on current research topics in Genetics, Genomics, and Bioinformatics. Graded Satisfactory (S) or No Credit (NC). Course is repeatable. Cross-listed with BCH 261, BIOL 261, BPSC 261, ENTM 261, and PLPA 261.

GEN 290. Directed Studies (1-6) Outside research, 3-18 hours. Prerequisite(s): graduate standing and consent of instructor and graduate advisor. Faculty-directed individual study on specially selected topics in genetics, genomics, and bioinformatics. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

GEN 297. Directed Research (1-6) Outside research, 3-18 hours. Prerequisite(s): graduate standing. Directed research in genetics, genomics, and bioinformatics performed prior to advancement to candidacy in preparation for dissertation projects. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

GEN 299. Research for the Dissertation (1-12) Outside research, 3-36 hours. Prerequisite(s): graduate standing. Original research in genetics, genomics, and bioinformatics for preparation of the dissertation. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

Global Studies

Subject abbreviation: GBST
College of Humanities, Arts, and Social Sciences

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Committee in Charge

Anne Sutherland, Ph.D. (Anthropology)
Veronica Benet-Martinez, Ph.D. (Psychology)
David Biggs, Ph.D. (History)
Christopher Chase-Dunn, Ph.D. (Sociology)
Feryal Cherif, Ph.D. (Political Science)
Lucille Chia, Ph.D. (History)
Peter J. Graham, Ph.D. (Philosophy)
Steven Helfand, Ph.D. (Economics)
Miriam Beevi-Lam, Ph.D. (Comparative Literature and Foreign Languages)
Bronwyn Leebaw, Ph.D. (Political Science)
Rene Lysloff, Ph.D. (Music)
Justin McDaniel, Ph.D. (Religious Studies)
Toby Miller, Ph.D. (English/Sociology/
Women's Studies)