

## 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 160B, STAT 161 (STAT 161 may be taken concurrently). Introduces modern data analysis concepts and algorithms used in bioinformatics and cheminformatics. Covers biological databases, sequence/genome analysis, phylogenetics, microarray/deep-sequencing approaches, clustering techniques, network analysis, and drug discovery methods. **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

Susan Ossman, Ph.D., Director  
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Interdisciplinary Building South  
(951) 827-5524

### Committee in Charge

Juliann Allison, Ph.D. (Political Science)  
Veronica Benet-Martinez, Ph.D. (Psychology)  
Chrisopher Chase-Dunn, Ph.D. (Sociology)  
Marcelle Chauvet, Ph.D. (Economics)  
Walter Clark, Ph.D. (Music)  
Anil B. Deolalikar, Ph.D. (Economics)  
Alessandro Fornazzi, Ph.D. (Hispanic Studies)  
V.P. Franklin, Ph.D. (History)  
Miriam Lam, Ph.D. (Comparative Literature and Foreign Languages)  
Bronwyn Leebow, Ph.D. (Political Science)  
Perry Link, Ph.D. (Comparative Literature and Foreign Languages)

Henk Maier, Ph.D. (Comparative Literature and Foreign Languages)

Alan McHughen (CNAS, Botany and Plant Sciences)

Toby Miller, Ph.D. (Media and Cultural Studies)  
Kurt Schwabe, Ph.D. (Environmental Sciences)

Stephen E. Cullenberg, Ph.D.  
*Dean, College of Humanities, Arts, and Social Sciences, ex officio*

## Major

Global Studies is a broad-based study of processes and problems that transcend national boundaries, preparing students to become global thinkers and problemsolvers for the twenty-first century. Global Studies crosses disciplines, drawing on the fine arts, social sciences, humanities, and sciences. The Global Studies major includes the study of global historical processes that have made the world more interconnected, as well as contemporary issues of global politics, violence, security, global migrations, travel, social movements, global literature, arts and media, the global economic system of trade, finance and labor, global health and disease, and environmental change and sustainability. Students are grounded in two disciplines, as well as a single geographic area of study and a foreign language.

Global Studies is a way to give powerful support to re-conceptualize the meaning of place in the contemporary world and to retool faculty and students to become global thinkers. It focuses on transnational processes rather than relations among nations.

## University Requirements

See Undergraduate Studies section.

## College Requirements

See College of Humanities, Arts, and Social Sciences, Colleges and Programs section.

## Major Requirements

1. Lower-division requirements (7 courses [at least 24 units] plus foreign language):

- GBST 001, GBST 002
- Two introductory courses (courses numbered 001–099) in each of two different disciplines.
- Proficiency in a foreign language at the sixth-quarter level
- Two courses in world history

2. Upper-division requirements (45 units)

Students must select eight courses with significant global content in at least two different disciplines and two courses in a single area, and at least one 100-level GBST course.

ANTH 108, ANTH 109/WMST 109, ANTH 119, ANTH 126, ANTH 128/AST 128/DNCE 128/MUS 128/THEA 176, ANTH 136, ANTH 140G, ANTH 140I, ANTH 140P, ANTH 163, ANTH 164/LNST 164/WMST 164, ANTH 168/ETST 148/LNST 168, ANTH 170/BPSC 170, ANTH 176

AHS 115/LNST 115, ANTH 143

AST 123, AST 127/ANTH 176/DNCE 127/ETST 172/MUS 127, THEA 176, BPSC 170/ANTH170, BUS 114, BUS 138, BUS 154B, BUS 164, BUS 178, BUS 185

CPLT 112, CPLT 121, CPLT 125, CPLT 141, CPLT 160, CRWT 143

DNCE 123, DNCE 127, DNCE 128/ANTH 128/AST 128/MUS 128/THEA 176, DNCE 173 (E-Z)

ECON 124, ECON 170, ECON 182, ECON 183, ECON 185/LNST 185, ECON 187/LNST 187

ENGL 121

ETST 100, ETST 104, ETST 109G, ETST 118/MUS 129, ETST 148/ANTH 168/LNST 168, ETST 166, ETST 175/WMST 175

MCS 125, MCS 139, MCS 145, MCS 171, MCS 174

GBST 090, GBST 191, GBST 195A, GBST 195B, GBST 195C, GBST 198-I

SPN 102A, SPN 122B, SPN 145, SPN 179, SPN 188

HIST 151

LNST 164/ANTH 164/WMST 164, LNST 168/ANTH 168/ETST 148, LNST 185/ECON 185, LNST 187/ECON 187

LAS 105, LAS 168, LAS 187

MUS 122, MUS 123, MUS 125, MUS 126/ANTH 177/WMST 126, MUS 127, MUS 129/ETST 118

POSC 107, POSC 110, POSC 120, POSC 124, POSC 126, POSC 128, POSC 133, POSC 150, POSC 160, POSC 267, POSC 268

PSYC 148

PBPL 191

RLST 175, RLST 246, RLST 246C

SOC 122, SOC 123, SOC 161, SOC 181, SOC 184

THEA 161, THEA 176/ANTH 128/AST 128/DNCE 128/MUS 128

URST 178, URST 182

WMST 108/PHIL 108, WMST 109/ANTH 109, WMST 126/ANTH 177/MUS 126, WMST 162, WMST 164/ANTH 164/LNST 164, WMST 175/ETST 175, WMST 179

3. Capstone requirement (5 units)

Students are required to complete their major with a capstone experience. The capstone must look at at least one global issue. It may be an advanced seminar on a topic of global significance, an independent major paper or research project supervised by a Global Studies faculty member, or a study abroad program approved by the Chair of Global Studies.

## Minor

1. Lower-division requirements (22 units)

- GBST 001, GBST 002
- Proficiency of a foreign language at the sixth quarter level
- One additional course in world history, taken in consecutive sequence with the first world history course (can be used to satisfy college breadth)

2. Upper-division requirements (7 courses, 45 units)

- Seven Upper-division requirements (45 units). Students must select seven (7) courses with significant global content in at least two different disciplines and two (2) courses in a geographic area. Students may focus on the humanities or social science, but no more than seven (7) courses may be exclusively in either humanities or social science.

ANTH 108, ANTH 109/WMST 109, ANTH 119, ANTH 126, ANTH 128/AST 128/DNCE 128/MUS 128, THEA 176, ANTH 136, ANTH 140G, ANTH 140-I, ANTH 140P, ANTH 163, ANTH 164/LNST 164/WMST 164, ANTH 168/ETST 148, LNST 168, ANTH 170/BPSC 170, ANTH 176

AHS 115/LNST 115, AHS 143

AST 123, AST 127/ANTH 176/DNCE 127/ETST 172/MUS 127,

BUS 114, BUS 138, BUS 154B, BUS 164, BUS 178, BUS 185

CPLT 112, CPLT 121, CPLT 125, CPLT 141, CPLT 160

CRWT 143

DNCE 123, DNCE 127, DNCE 128/ANTH 128/AST 128/MUS 128/THEA 176

ECON 124, ECON 170, ECON 182, ECON 183, ECON 185/LNST 185, ECON 187/LNST 187

ENGL 121

ETST 100, ETST 104, ETST 109G, ETST 118/MUS 129, ETST 148/ANTH 168/LNST 168, ETST 166, ETST 175/WMST 175

MCS 125, MCS 139, MCS 145, MCS 171, MCS 174

GBST 090, GBST 191, GBST 195A, GBST 195B, GBST 195C, GBST 198-I

SPN 102A, SPN 122B, SPN 145, SPN 179, SPN 188

HIST 151

LAS 105, LAS 168, LAS 187

LNST 164/ANTH 164/WMST 164, LNST 168/ANTH 168/ETST 148, LNST 185/ECON 185, LNST 187/ECON 187

MUS 122, MUS 123, MUS 125, MUS 126/ANTH 177/WMST 126, MUS 127, MUS 129/ETST 118

## 288 / Programs and Courses

POSC 109/RLST 173, POSC 110, POSC 120, POSC 124, POSC 125, POSC 126, POSC 128, POSC 133, POSC 150, POSC 160, POSC 268, POSC 267

PSYC 148

PBPL 191

RLST 113, RLST 144, RLST 145, RLST 149, RLST 175, RLST 246, RLST 246C

SOC 122, SOC 123, SOC 161, SOC 181, SOC 184

THEA 161, THEA 176/ANTH 128/AST 128/DNCE 128/MUS 128

URST 178

WMST 108/PHIL 108, WMST 109/ANTH 109, WMST 126/ANTH 177/MUS 126, WMST 162, WMST 164/ANTH 164/LNST 164, WMST 175/ETST 175, WMST 179

## Lower-Division Courses

### GBST 001. Global History, Culture, and Ideas (5)

Lecture, 3 hours; discussion, 1 hour; extra reading, 3 hours. A survey of the historical and cultural processes that have made the world more interconnected.

### GBST 002. Global Socioeconomic and Political Processes (5)

Lecture, 3 hours; discussion, 1 hour; extra reading, 3 hours. Prerequisite(s): GBST 001 with a grade of "B" or better is recommended for freshmen. A survey of the economic, political, and physical processes that have made the world more interconnected.

### GBST 090. Special Studies (1-3)

Individual study, 3-9 hours. Prerequisite(s): consent of program chair. Individual study, directed by a faculty member, to meet special curricular needs. Course is repeatable to a maximum of 8 units.

## Upper-Division Courses

**GBST 100. Global Cities (4)** Lecture, 3 hours; field, 3 hours. Prerequisite(s): GBST 001 or GBST 002. A study of urban life as it has emerged in various parts of the world through application of theories of space and the city. Considers how colonialism, urban planning, migration, and trade have influenced contemporary urban environments. Projects explore the city as representation and lived experience in Riverside and Southern California.

### GBST 110. Global Migrations and Movements (4)

Lecture, 3 hours; field, 3 hours. Prerequisite(s): GBST 001 or GBST 002. Examines migration and mobility (both global and interregional). Also addresses economic development and displacement of populations and issues of identity and subjectivity in the context of recent theories of mobility and globalization to understand how migration is reshaping borders, ideas of self, political and social entities, and transnational issues.

### GBST 169. From the Maghreb to the Middle East (4)

Lecture, 3 hours; written work, 1 hour; individual study, 1 hour; extra reading, 1 hour. Prerequisite(s): ANTH 001 or ANTH 001H or GBST 001 or GBST 002 or consent of instructor. An introduction to the peoples and societies of North Africa and the Middle East. Follows the travels of Ibn Battutah, Ibn Khaldun, and Rafik al Tahtawi. Topics include religion, migration, gender, political organization, the global Middle East, Orientalism, and cultural production. Cross-listed with ANTH 169.

**GBST 190. Special Studies (1-5)** Individual study, 3-15 hours. Prerequisite(s): consent of program chair. Individual study, directed by a faculty member, to meet special curricular needs. Course is repeatable to a maximum of 15 units.

**GBST 191. Seminar in Global Studies (4)** Seminar, 3 hours; outside research, 3 hours. Prerequisite(s): upper-division standing or consent of instructor. Examines contemporary issues and topics in global studies that are not part of the regular curricular offerings. Content of the course varies and is announced as the course is offered. Course is repeatable to a maximum of 16 units.

**GBST 195A. Senior Thesis (4)** Thesis, 12 hours. Prerequisite(s): senior standing; consent of instructor. Preparation of a substantial paper based on original research. The student works independently with a faculty member. May be undertaken as a one-, two-, or three-quarter course (GBST 195A, GBST 195B, GBST 195C). Graded In Progress (IP) until the last quarter is completed, at which time a final grade is assigned.

**GBST 195B. Senior Thesis (4)** Thesis, 12 hours. Prerequisite(s): GBST 195A. Preparation of a substantial paper based on original research. The student works independently with a faculty member. May be undertaken as a one-, two-, or three-quarter course (GBST 195A, GBST 195B, GBST 195C). Graded In Progress (IP) until the last quarter is completed, at which time a final grade is assigned.

**GBST 195C. Senior Thesis (4)** Thesis, 12 hours. Prerequisite(s): GBST 195B. Preparation of a substantial paper based on original research. The student works independently with a faculty member. May be undertaken as a one-, two-, or three-quarter course (GBST 195A, GBST 195B, GBST 195C).

### GBST 198-I. Individual Internship in Global Studies (1-12)

Internship, 2-24 hours; term paper, 1-12 hours. Prerequisite(s): consent of instructor. Internship in a public or quasi-public agency or business concern in matters relating to global studies. Requires a summary paper. Graded Satisfactory (S) or No Credit (NC). Course is repeatable to a maximum of 16 units.

## Hispanic Studies

**Subject abbreviations: SPN and PORT**  
**College of Humanities, Arts, and Social Sciences**

David K. Herzberger, Ph.D., Chair  
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and Social Sciences  
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### Professors

David K. Herzberger, Ph.D.  
James A. Parr, Ph.D.  
Marina Pianca, Ph.D.  
Raymond L. Williams, Ph.D.

### Professors Emeriti

Cándido Ayllón, Ph.D.  
Ana Mariá Fagundo, Ph.D.  
Philip O. Gericke, Ph.D.  
William W. Megenney, Ph.D.  
Hugo Rodríguez-Alcalá, Ph.D., J.D.

### Associate Professor

Benjamin Liu, Ph.D.

### Assistant Professors

Alessandro Fornazzari, Ph.D.  
Marta Hernandez-Salvan, Ph.D.

\* \*

### Visiting Assistant Professor

Michele Back, Ph.D.

### Cooperating Faculty

Freya Schiwy, Ph.D. (Media & Culture Studies)

### Lecturers

Mari Carmen Ballester, M.A.  
Martín Navarro, M.A.  
Luis H. Paredes, Ph.D.  
Teresa Toscano, Ph.D.  
Mirta Vargas, Ph.D.

### Foreign Language Placement Examination A

placement examination is required of all freshmen entering the College of Humanities, Arts, and Social Sciences who wish to meet the foreign language requirement with the same language taken in high school. Consult the quarterly Schedule of Classes and **placementtest.ucr.edu** for date and time. Transfer students who have taken a college-level language course cannot take the placement examination and should consult with their advisors. No college-level credit may be duplicated. See college placement examination policy.

## Major

The Department of Hispanic Studies offers a B.A. degree in Spanish. A student may major in Spanish by specializing in one of three undergraduate areas.

The **Literature Option** is intended for students who are primarily interested in a liberal arts education in general and literary studies in Spanish specifically. Students who choose the Literature Option can pursue high school teaching, graduate study in Latin American or Spanish literature, or other professional careers, as well as advanced study.

The **Linguistics Option** is designed for students who are especially interested in the Spanish language or Hispanic linguistics. Students follow this option as preparation for elementary, middle school, or high school language teaching, as a second major in fields where bilingualism is useful, and as preparation for advanced study in Hispanic linguistics.

The **Cultural Studies Option** is intended for students with an interest in the intersections of society, power, and culture. It offers a unique opportunity to acquire critical interdisciplinary skills in cultural analysis from a Hispanic perspective. It explores numerous forms of Spanish, Latin American and transatlantic cultural practices including film, television, music, visual arts, performance, literature, testimonials, essays, and cultural critique. The Cultural Studies Option is relevant for students considering careers in high school teaching, media work, advertising, creative arts, multimedia projects, international studies, and graduate studies.

All of the above options should be considered with double majors, particularly majors such as Anthropology, Classics, English, History, Latin American Studies, Linguistics, or Media and Cultural Studies.