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 interdisciplinary 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 (subdisciplinary) 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/PLPA120, 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 or 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
Committee Office, 3116 CHASS
Interdisciplinary Building South (951) 827-5524

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)
Major

Global Studies is a broad-based study of processes and problems that transcend national boundaries, preparing students to become global thinkers and problem solvers 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 (6 courses [at least 24 units] plus foreign language):
   a) GBST 001, GBST 002
   b) Two introductory courses (courses numbered 001–099) in each of two different disciplines.
   c) Proficiency in a foreign language at the sixth-quarter level
   d) Two courses in world history

2. Upper-division requirements (10 courses [at least 40 units])

   Students must select eight courses with significant global content in at least two different disciplines and two courses in a single area.

   ART 135/MCS 135
   AHS 102/ANTH 102, AHS 113, AHS 115/LNST 115, AHS 118, AHS 186/MCS 186, AHS 187/MCS 187
   BPSC 170/ANTH 170
   BUS 153/ECON 153, BUS 158/ANTH 147
   CHE 171
   CPAC 131/AST 131/CHN 131/CLA 131, CPAC 141/CLA 141/AST 145/CHN 141/POS 140 CPLT 141, CPLT 143/FREN 143, CPLT 163/AST 163, CPLT 173 (E-Z)/MCS 173 (E-Z), CPLT 187/CRTW 187
   DNCE 128/ANTH 128/AST 128/MUS 128/THEA 176, DNCE 130/ANTH 130, DNCE 172 (E-Z), DNCE 173 (E-Z)
   GEO 157, GEO 167
   ECON 124, ECON 143A/ENSC 143A, ECON 143B/ENSC 143B, ECON 143C/ENSC 143C, ECON 146/URST 146, ECON 153/BSAD 153, ECON 156, ECON 171, ECON 175, ECON 178/BSAD 178, ECON 180, ECON 181, ECON 182, ECON 185/LNST 185, ECON 187/LNST 187
   EDUC 114
   ENGL 121 (E-Z), ENGL 142 (E-Z), ENGL 144 (E-Z)/MCS 144 (E-Z)
   ENSC 101, ENSC 143A/ECON 143A, ENSC 143B/ECON 143B, ENSC 143C/ECON 143C, ENSC 146/GGSC 146, ENSC 153/BSAD 153, ECON 156, ECON 171, ECON 175, ECON 178/BSAD 178, ECON 180, ECON 181, ECON 182, ECON 185/LNST 185, ECON 187/LNST 187
   ETST 100, ETST 102, ETST 104, ETST 105A, ETST 105B, ETST 109G, ETST 109-I, ETST 117 (E-Z)/HIST 137 (E-Z)
   ETST 118/MUS 129, ETST 133, ETST 148/ANTH 168/LNST 168, ETST 157, ETST 161, ETST 170/WRLT 170, ETST 172/ANTH 176/AST 127/DNCE 127/MUS 127, ETST 175/WMST 175
   MCS 103/ANTH 103, MCS 144 (E-Z)/ENGL 144 (E-Z), MCS 173 (E-Z)/CPLT 173 (E-Z)
   HIST 108, HIST 109, HIST 137 (E-Z)/ETST 117 (E-Z), HIST 181, HIST 182, HISA 161/LNST 171, HISA 162/LNST 172, HISA 164A, HISA 164B, HISE 145, HIFE 146
   LNST 164/ANTH 164/LNST 164, LNST 168/ANTH 168/ETST 148, LNST 185/ECON 185, LNST 187/ECON 187
   MATH 121
   ME 100A, ME 100B
   MUS 120, MUS 124/AST 124, MUS 125, MUS 126/ANTH 177/WMST 126, MUS 128/ANTH 128/AST 128/DNCE 128/THEA 176, MUS 129/ETST 118
   POSC 109/RLST 173, POSC 110, POSC 111, POSC 116, POSC 120, POSC 124, POSC 125, POSC 126, POSC 127, POSC 129, POSC 150, POSC 152, POSC 153, POSC 154, POSC 155, POSC 157, POSC 158/LNST 148, POSC 159, POSC 160, POSC 162/LNST 142, POSC 169, POSC 182
   PSYC 140, PSYC 165
   RLST 111, RLST 115, RLST 118, RLST 124 (E-Z), RLST 138/LNST 138, RLST 139, RLST 150, RLST 151, RLST 160/WMST 160, RLST 170, RLST 174, RLST 175
   SOC 120, SOC 122, SOC 123, SOC 133, SOC 134/SOC 135, SOC 137, SOC 139/MCS 139, SOC 143/URST 143, SOC 150, SOC 151, SOC 156, SOC 157, SOC 161, SOC 181, SOC 182/URST 182, SOC 184
   STAT 100A, STAT 100B, ECON 101
   THEA 176/ANTH 176/AST 128/DNCE 128/MUS 128
   WMST 100, WMST 101, WMST 103/ANTH 145, WMST 108/PHIL 108, WMST 109/ANTH 109, WMST 126/ANTH 177/MUS 126, WMST 140/ANTH 147, WMST 141/PHIL 168, WMST 149/ANTH 149, WMST 150/ANTH 148, WMST 155/ECON 155, WMST 156, WMST 160/RLST 160, WMST 161, WMST 164/ANTH 164/LNST 164, WMST 175/ETST 175, WRIT 170/ETST 170
   3. Capstone requirement (at least 4 units)

   Students must complete a capstone experience consisting of an advanced seminar in a topic of global significance, a major research paper supervised by a Global Studies faculty member or a study abroad program approved by the Chair of Global Studies.

Minor

1. Lower-division requirements (4 courses [at least 16 units])
   a) GBST 001, GBST 002
   b) Two courses in world history

2. Upper-division requirements (6 courses)
   a) Six upper-division courses with significant global content in at least two different disciplines and two in a single geographic area.
ANTH 102/ARCH 102, ANTH 103/MCS 103, ANTH 104/ARCH 104, ANTH 105/BUS 105, ANTH 107, ANTH 109/WEST 109, ANTH 112, ANTH 118, ANTH 122, ANTH 127, ANTH 128/AST 128/DCN 128
MUS 128, THEA 176, ANTH 130/DANCE 130, ANTH 132, ANTH 135, ANTH 139, ANTH 140/ETST 140, ANTH 149/WEST 149, ANTH 158, ANTH 159, ANTH 160, ANTH 161/LNST 161, ANTH 162, ANTH 163, ANTH 164/LNST 164/WMST 164, ANTH 168/ETST 148/WMST 164
MCS 103/ANTH 103, MCS 144/E-Z/ENGL 144/E-Z, MCS 173/E-Z/CPLT 173/E-Z
MATH 121 ME 100A, ME 100B
MUS 120, MUS 124/ANTH 124, MUS 125, MUS 126/ANTH 177/WMST 126, MUS 128/ANTH 128/AST 128/DCN 128/THEA 176, MUS 129/ETST 118
POSC 109/RLST 173, POSC 110, POSC 111, POSC 116, POSC 120, POSC 124, POSC 125, POSC 126, POSC 127, POSC 129, POSC 150, POSC 152, POSC 153, POSC 154, POSC 155, POSC 157, POSC 158/LNST 148, POSC 159, POSC 160, POSC 162/LNST 142, POSC 169, POSC 182
PSYC 140, PSYC 165
RLST 111, RLST 116, RLST 118, RLST 124/E-Z, RLST 138/LNST 138, RLST 139, RLST 150, RLST 151, RLST 160/WMST 160, RLST 170, RLST 174, RLST 175
SOC 120, SOC 122, SOC 123, SOC 133, SOC 134, SOC 135, SOC 137, SOC 139/MCS 139, SOC 143/URST 143, SOC 150, SOC 151, SOC 156, SOC 157, SOC 161, SOC 181, SOC 182/URST 182, SOC 184
STAT 100A, STAT 100B, ECON 101 THEA 176/ANTH 128/AST 128/DCN 128/MUS 128
WRIT 170/ETST 170

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 080. 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

**BST 110. Global Migrations and Movements (4)**
Lecture, 3 hours; field, 3 hours. Prerequisite(s): BST 001 or BST 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.

**BST 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.

**BST 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.

**BST 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.

**BST 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 (BST 195A, BST 195B, BST 195C). Graded In Progress (IP) until the last quarter is completed, at which time a final grade is assigned.

**BST 195B. Senior Thesis (4)**
Thesis, 12 hours. Prerequisite(s): BST 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 (BST 195A, BST 195B, BST 195C). Graded In
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.

Students with college-level course credit for Spanish foreign language cannot take the Spanish placement exam.

University Requirements
See Undergraduate Studies section.

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

Major Requirements
The major requirements for the B.A. degree in Spanish are as follows:

Option Requirements — Choose one option

Cultural Studies Option

Upper-division requirements (11 courses [at least 44 units]):

1. SPN 101A and SPN 101B, or SPN 109A and SPN 109B
2. SPN 110 (prerequisite for all upper-division literature courses)
3. SPN 102A, SPN 102B or SPN 103
4. One course from SPN 120A, SPN 120B, SPN 120C/LNST 120
5. Two courses from SPN 120A, SPN 120B, SPN 120C/LNST 120
6. Two courses from the following survey courses: SPN 180A, SPN 180B, SPN 181A, SPN 181B
7. One additional course in Spanish or Latin American literature
8. SPN 193

Minor Requirements for the minor in Spanish are as follows:

1. SPN 101A and SPN 101B or SPN 109A and SPN 109B