UCLA Undergraduate Admission

ARTICULATION GUIDE

2019-2020

College of Letters & Science `NEW MAJORS`

Major	Description of Major	Major Requirements
Data Theory B.S.	UCLA's new **Data Theory** major will be the first in the world, both in name and content. The goal of the major is to develop knowledge and skills in the mathematical and statistical foundations of data science. Graduates of this program will be able to: • Understand the mathematical and statistical bases of the most common methods of data science and be able to explain in writing, with examples, how concepts of statistics and mathematics together solve real-world problems involving data. • Manage (curate) data with skill. • Solve problems by developing, comparing, and testing data-driven models. • Understand and explain variability when fitting and interpreting models of real-world systems. • Carry out a reproducible data analysis using accepted practices of there search community. • Communicate findings of analyses in written and verbal form. • Identify areas of active research in data science • Address with insight problems concerning the ethics of data use and storage, including data privacy and security. • Demonstrate mastery of concepts and skills of machine learning, modeling and supervised learning, dimension reduction and unsupervised learning, and deep learning. • Demonstrate familiarity with numerous software tools used in statistical and data science work and research. • Demonstrate knowledge of mathematical foundations, including pure and applied linear algebra, basic analysis, probability, and optimization theory. • Study and evaluate proofs of mathematical and statistical results employed in data theory • Work effectively in a team on a problem of data science. • Demonstrate eligibility for graduate study in applied mathematical science or statistical science. One key academic difference from the Data Science majors proposed by peer universities is the presence in our major of substantial upper division proof-based mathematics. Overall, in view of the academic strength of the major, we expect that top graduates will be prepared for either graduate studies in a field related to data science, or an initial technical position with leadership potential.	**Required:** • **Math 31A** (Differential and Integral Calculus) **Math 31B** (Integration and Infinite Series) **Math 32A** (Calculus of Several Variable) M**ath 32B** (Calculus of Several Variables), **Math 33A**, (Linear Algebra with Applications), **Math 42** (Introduction to Data Driven Mathematical Modeling: Life, The Universe and Everything), and **Math 115A** (Linear Algebra-UD); • One course from *Stats 10-13*) (Introduction to Statistical Reasoning), **Stats 12** (Introduction to Statistical Methods for Geography and Environmental Studies), S**tats 13** (Introduction to Statistical Methods for Life and Health Sciences) , and **Stats 20** (Introduction to Statistical Programming with R) • **Computing PIC 10A** (Introduction to Programming). Transfer applicants to the Data Theory major are admitted to the pre-major. Transfer students must pass Math 42 with a grade of B, have completed all pre-major coursework, and must have passed at least 8 units of upper division coursework required for this major with at least a 3.3 GPA in it, in order to be eligible to petition to enter the major. Transfer students must petition to enter the major no later than the Spring Quarter of their first year at UCLA *All students must take **Math 42** and **Math 115A** at UCLA.

Herb Alpert School of Music `NEW MAJORS`

Major	Description of Major	Major Requirements
Music Composition, B.A.	The **Bachelor of Arts in Composition** is specifically interested in welcoming composers who demonstrate extraordinary intellectual curiosity and whose primary goal is to communicate with others on a profoundly human level. The program emphasizes the collaborative relationship between composers and performers in such a way that a simulated professional experience is achieved. The school's renowned composition faculty expect students to acquire and master basic skills, which involves an intensive study of: music theory (written and oral), counterpoint, orchestration, analysis, technology, performance, the traditional Western canon and its history, in tandem with the study of popular, jazz, rock, folk, and non-Western traditions. Students who successfully complete the B.A. at UCLA are prepared to enter the professional world as practicing artists, film composers, or to continue with graduate studies at the highest level.	Admission to this major is very competitive. Transfer applicants begin the admissions process by completing the University of California Application for Undergraduate Admission. All students must have a 3.0 GPA at the time of application. Completion of IGETC is not required, but strongly recommended. Only applicants who have indicated Music Composition as their first choice major for UCLA on the UC Application will be considered for admission to the major. **Supplemental requirements.** All applicants to the Music Composition major are also required to submit a supplemental application. Access to the supplemental application will be provided to applicants via email on a rolling basis following the submission of the UC Application. The supplemental application includes the following components: • Personal statement • Unofficial transcripts • Performance resume (optional) • Letters of recommendation (optional) • Pre-screening portfolio **Interviews -** The Department of Music's composition faculty will review all portfolios and eligible applicants will be selected for a campus interview appointment. On-campus interviews are encouraged. Applicants who are unable to attend on-campus interviews may interview via video call. For more information visit: https://schoolofmusic.ucla.edu/admissions/undergraduate/composition/.

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
AMERICAN LITERATURE AND CULTURES	**Required:** • **English 3** (English Composition, Rhetoric, and Language) • **English 4W** (Critical Reading and Writing) • **English 10A** (Literature in English to 1700) • **English 10B** (Literature in English, 1700 to 1850) • **English 10C** (Literatures in English, 1850 to present)	**Required:** • **English 3** (English Composition, Rhetoric and Language) • **English 4W** (Critical Reading and Writing) • **English 11** (Intro to American Culture) • **English 87** (Topics in American Cultures) **Summary of major changes:** • **English 10ABC** are no longer acceptable preparation courses for this major. • **Effective Fall 2020, English 11 and 87** are now <u>required</u> prep courses for this major
ATMOSPHERIC AND OCEANIC SCIENCES	**Required:** • **Atmospheric & Oceanic Sciences 51** (Fundamentals of Climate Science), **90** (Introduction to Undergraduate Research in Atmospheric and Oceanic Sciences), • **Chemistry 14A** (Atomic & Molecular Structure, Equilibria, Acids & Bases), **14B** (Thermodynamics, Electrochemistry, Kinetic & Organic Chemistry), or **20A** (Chemical Structure) and **20B** (Chemical Energetics & Change); • **Earth & Planetary Sciences 71** (Introduction to Computing for Geoscientists) (preferred) or **C& EE 20** (Intro to Computer Programming with MATLAB) or Program in **Computing 10A** (Intro to Programming); • **Mathematics 3A** (Calculus for Life Sciences Students), **3B** (Calculus for Life Sciences Students), and **3C** (Ordinary Differential Equations with Linear Algebra for Life Sciences Students), or **31A** (Differential & Integral Calculus) **31B** (Integration & Infinite Series), **32A** (Calculus of Several Variables) **32B** (Calculus of Several Variables), **33A** (Linear Algebra & Applications), and **33B** (Differential Equations); • **Physics 1A** (Physics for Scientists & Engineers), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity), **4AL** (Physics Laboratory for Scientists & Engineers: Mechanics, and **4BL** (Physics Laboratory for Scientists & Engineers: Electricity & Magnetism), or **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light and Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism, & Modern Physics).	**Required:** • **Atmospheric & Oceanic Sciences 51** (Fundamentals of Climate Science), **90** (Introduction to Undergraduate Research in Atmospheric & Oceanic Sciences), • **Chemistry 14A** (Atomic & Molecular Structure, Equilibria, Acids & Bases), **14B** (Thermodynamics, Electrochemistry, Kinetics, & Organic Chemistry), or 20A (Chemical Structure) and **20B** (Chemical Energetics & Change); • **Earth & Planetary Sciences 71** (Intro to Computing for Geoscientists -*preferred*) or **Program in Computing 10A** (Intro to Prog.); • **Mathematics 3A** (Calculus for Life Sciences Students), **3B** (Calculus for Life Sciences Students), and **3C** (Ordinary Differential Equations with Linear Algebra for Life Sciences Students), or **31A** (Differential & Integral Calculus) **31B** (Integration & Infinite Series), **32A** (Calculus of Several Variables), 32B (Calculus of Several Variables), **33A** (Linear Algebra & Applications), and **33B** (Differential Equations); • **Physics 1A** (Physics for Scientists & Engineers), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics, and Special Relativity), or **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism & Modern Physics). **Summary of major changes:** • **C & EE M20** is no longer required. • **Physics 4AL & 4BL** are no longer required preparation courses for this major. • **Effective Fall 2021, AOS 90** is <u>required</u>. • **EPS 71 i**s a new added course <u>optional</u>.

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
ATMOSPHERIC AND OCEANIC SCIENCES/ MATHEMATICS	**Required:** • **Mathematics 31A** (Differential and Integral Calculus), **31B** (Integration and Infinite Series), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** (Linear Algebra and Applications), **33B** (Differential Equations), • **Physics 1A**, (Physics for Scientists and Engineers: Mechanics), **1B** (Physics for Scientists and Engineers: Oscillations, Waves, Electric and Magnetic Fields) • **Computing 10A**, (Introduction to Programming) and two courses selected from **Atmospheric & Oceanic Sciences 1** (Climate Change) , **2** (Air Pollution), **3** (Introduction to Atmospheric Environment), and **5** (Climates of Other Worlds).	**Required:** • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Series), **32A** (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** (Linear Algebra & Applications), **33B** (Differential Equations), • **Physics 1A**, (Physics for Scientists Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), **Computing 10A**, (Intro to Programming) or • **Earth & Planetary Sciences 71**, • **Atmospheric & Oceanic Sciences 90** and one course selected from **AOS 1** (Climate Change), **AOS 2** (Air Pollution), **AOS 3** (Intro to Atmospheric Environment), and **AOS 5** (Climates of Other Worlds), **AOS 7** (Perils of Space: Intro to Space Weather) or **AOS 51** (Fundamentals of Climate Science). **Summary of Changes** **EPS 71** and **AOS 7** are newly added course options to meet preparation for this major. **Effective Fall 2021, AOS 90** is a new _required_ preparation course for this major.
BIOCHEMISTRY	**Required:** • **Chem 20A** (Chemical Structure), **20B** (Chemical Energetics and Change), & **20L** (General Chemistry Laboratory) & **30A** (Organic Chemistry), **30AL** (Organic Chemistry Laboratory), **30B** (Organic Chemistry), **30BL** (Organic Chemistry Laboratory), **30C** (Organic Chemistry), **30CL** (Organic Chemistry Laboratory) • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **Math 33A** is strongly recommended • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), and **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity), OR **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism & Modern Physics)	**Required:** • **Chem 14A** (Atomic and Molecular Structure, Equilibria, Acids & Bases), **14B** (Thermodynamics, Electrochemistry, Kinetics & Organic Chemistry) or **14AE**, **14BE** or **20A** (Chemical Structure), **20B** (Chemical Energetics & Change), & **20L** (General Chemistry Laboratory) & **30A** (Organic Chemistry), **30AL** (Organic Chemistry Laboratory), **30B** (Organic Chemistry), **30BL** (Organic Chemistry Laboratory), **30C** (Organic Chemistry), **30CL** (Organic Chemistry Laboratory) • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Studies), 32A, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **Math 33A** is strongly recommended • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), and **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity), OR **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light, and Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism & Modern Physics) **Summary of Changes** **Chem 14AB** or **14AE** & **14BE** are new course _options_.

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
BIOPHYSICS	**Required:** • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric &Magnetic Fields), and **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity), **4AL** (Physics Laboratory), **4BL** (Physics Laboratory), **17** (Chemical Principles • **CHEM 20A** (Chemical Structure), **20B** (Chemical Energetics & Change), **30A** (Organic Chemistry), **30B** (Organic Chemistry) • **Life Sciences 7A** (Cell & Molecular Biology), **7B** (Genetics, Evolution, and Ecology), **7C** (Physiology & Human Biology) • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** (Linear Algebra with Applications), **33B** (Differential Equations)	**Required:** • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), and **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics &Special Relativity), **4AL** (Physics Laboratory), **4BL** (Physics Laboratory), **17** (Chemical Principles) • **CHEM 20A** (Chemical Structure), **20B** (Chemical Energetics and Change) • **Life Sciences 7A** (Cell and Molecular Biology) • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** (Linear Algebra with Applications), **33B** (Differential Equations) **Summary of Changes** **Chem 30A** and **30B** have been removed as required preparation courses for this major . **Life Sciences 7B** and **7C** have been removed as required preparation courses for this major.
CHEMISTRY	**Required:** • **Chem 20A** (Chemical Structure), **20B** (Chemical Energetics and Change), & **20L** (General Chemistry Laboratory) & **30A** (Organic Chemistry), **30AL** (Organic Chemistry Laboratory), **30B** (Organic Chemistry), **30BL** (Organic Chemistry Laboratory), **30C** (Organic Chemistry), **30CL** (Organic Chemistry Laboratory) • **Mathematics 31A** (Differential and Integral Calculus), **31B** (Integration and Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables) • **Physics 1A** (Physics for Scientists and Engineers: Mechanics), **1B** (Physics for Scientists and Engineers: Oscillations, Waves, Electric and Magnetic Fields), and **1C** (Physics for Scientists and Engineers: Electrodynamics, Optics, and Special Relativity), **4BL** (Physics Laboratory), • OR **5A** (Physics for Life Sciences Majors: Mechanics and Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light, and Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism, and Modern Physics)	**Required:** • **Chem 20A** (Chemical Structure), **20B** (Chemical Energetics & Change), and **20L** (General Chemistry Lab) & **30A** (Organic Chemistry), **30AL** (Organic Chemistry Lab), **30B** (Organic Chemistry), **30BL** (Organic Chemistry Lab) **30C** (Organic Chem.), **30CL** (Organic Chemistry Lab) • **Mathematics 31A** (Differential &Integral Calculus), **31B** (Integration & Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** (Linear Algebra with Applications) • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), and **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity), **4BL** (Physics Laboratory) OR **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism & Modern Physics) **Summary of Changes** **Math 33B** is no longer required for this major. Effective Fall 2021, **Math 33A** is now <u>required</u> as preparation for this major

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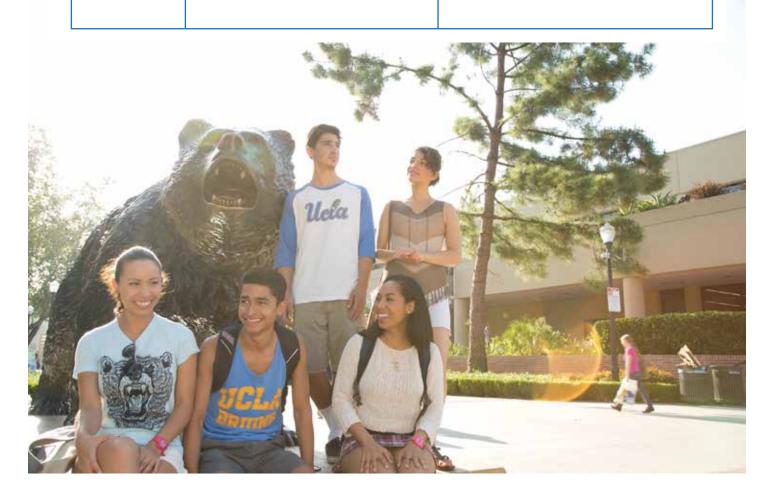| Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
CHEMISTRY/ MATERIAL SCIENCE	**Required:** • **CHEM 20A** (Chemical Structure), **20B** (Chemical Energetics &Change), & **20L** (General Chemistry Lab) & **30A** (Organic Chemistry), **30AL** (Organic Chemistry Lab), **30B** (Organic Chemistry), **30BL** (Organic Chemistry Lab), **30C** (Organic Chemistry), **30CL** (Organic Chemistry Lab) • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), and **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity), **4BL** (Physics Lab) OR **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism, & Modern Physics)	**Required:** • **Chem 20A** (Chemical Structure), **20B** (Chemical Energetics & Change), & **20L** (General Chemistry Lab) & **30A** (Organic Chemistry), **30AL** (Organic Chemistry Lab), **30B** (Organic Chemistry), **30BL** (Organic Chemistry Lab), **30C** (Organic Chemistry), **30CL** (Organic Chemistry Lab) • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration Infinite Studies), **32A**, (Calculus of Several Variables), **32B** (Calculus of Several Variables), **33A** (Linear Algebra) • **Physics 1A** (Physics for Scientists Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields), and **1C** (Physics for Scientists Engineers: Electrodynamics, Optics, Special Relativity), **4BL** (Physics Lab), • OR **5A** (Physics for Life Sciences Majors: Mechanics & Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics), **5C** (Physics for Life Sciences Majors: Electricity, Magnetism, Modern Physics) **Summary of Changes** **Math 33B** is no longer a required preparation course for this major. **Effective Fall 2021, Math 33A** is now <u>required</u> as preparation for this major

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
CLIMATE SCIENCE	**Required:** • **Chem 14A** (Atomic and Molecular Structure, Equilibria, Acids, and Bases), **14B** (Thermodynamics, Electrochemistry, Kinetics, and Organic Chemistry) OR **20A** (Chemical Structure), **20B** (Chemical Energetics and Change) • **Math 3A** (Calculus for Life Sciences Students), **3B** (Calculus of Life Sciences Students), **3C** (Ordinary Differential Equations with Linear Algebra for Life Sciences Students) OR **31A** (Differential and Integral Calculus), **31B** (Integration and Infinite Studies), **32A**, (Calculus of Several Variables), • **Physics 1A** (Physics for Scientists and Engineers: Mechanics), **1B** (Physics for Scientists and Engineers: Oscillations, Waves, Electric and Magnetic Fields), and **1C** (Physics for Scientists and Engineers: Electrodynamics, Optics, and Special Relativity), **4BL** (Physics Laboratory), • OR **5A** (Physics for Life Sciences Majors: Mechanics and Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light, and Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism, and Modern Physics); • **AOS 51** (Fundamentals of Climate Science); • **C & EE M20** (Introduction to Computer Programming with Matlab) or **Comptng 10A** (Introduction to Programming C++) or equivalent course; • **Stats 12** (Introduction to Statistical Methods for Geography and Environmental Studies) or **Stats 13** (Introduction to Statistical Methods for Life and Health Sciences	**Required:** • **Chem 14A** (Atomic and Molecular Structure, Equilibria, Acids, and Bases), **14B** (Thermodynamics, Electrochemistry, Kinetics, and Organic Chemistry) OR **20A** (Chemical Structure), **20B** (Chemical Energetics and Change) • **Math 3A** (Calculus for Life Sciences Students), **3B** (Calculus of Life Sciences Students), **3C** (Ordinary Differential Equations with Linear Algebra for Life Sciences Students) OR **31A** (Differential and Integral Calculus), **31B** (Integration and Infinite Studies), **32A**, (Calculus of Several Variables), **33B** (Differential Equations) • **Physics 1A** (Physics for Scientists and Engineers: Mechanics), **1B** (Physics for Scientists and Engineers: Oscillations, Waves, Electric and Magnetic Fields), and **1C** (Physics for Scientists and Engineers: Electrodynamics, Optics, and Special Relativity), **4BL** (Physics Laboratory), • OR **5A** (Physics for Life Sciences Majors: Mechanics and Energy), **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light, and Optics), and **5C** (Physics for Life Sciences Majors: Electricity, Magnetism, and Modern Physics); • **AOS 51** (Fundamentals of Climate Science); • **C & EE M20** (Introduction to Computer Programming with Matlab) or **Comptng 10A** (Introduction to Programming C++) or equivalent course; • **Stats 12** (Introduction to Statistical Methods for Geography and Environmental Studies) or **Stats 13** (Introduction to Statistical Methods for Life and Health Sciences **Summary of Changes** Effective Fall 2021, **Math 33B** is now <u>required</u> as preparation for this major

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
COGNITIVE SCIENCE	**Required: One course from each area** • **Psych 10** (Introductory Psychology) • **Life Science 1** (Evolution, Ecology, and Biodiversity) OR **Life Science 15** (Life: Concepts and Issues) OR **PhySci 3** (Introduction to Human Physiology); **Chemistry 2** (Introductory Chemistry) OR **Chem 17** (Chemical Principle) OR **Chem 20A** (Chemical Structure) OR **Physics 10** (Physics) OR **Physics 11** (Revolutions in Physics) OR **Physics 1A** (Physics for Scientists and Engineers: Mechanics) OR **Physics 6A** (Physics for Life Science Majors: Mechanics) OR **Ling 1** (Introduction to Study of Language) OR **Ling 20** (Introduction to Linguistic Analysis) • **Mathematics 3A** (Calculus for Life Sciences Students) & **3B** (Calculus for Life Sciences Students) & **3C** OR **31A** (Differential & Integral Calculus) & **31B** (Integration and Infinite Studies) • **Philosophy 7** (Introduction to Philosophy of Mind) OR **8** (Introduction to Philosophy of Science) OR **9** (Principles of Critical Reasoning) OR **23** (Meaning and Communication) OR **31** (Logic, First Course) • **Computing 10A** (Introduction to Programming) and two courses from: **10B** (Intermediate Programming), **10C** (Advanced Programming), **15** (Introduction to Lisp and Symbolic Computation), **16** (Python with Applications), **20A** (Principles of Java Language with Applications), **30** (Machine Organization and Assembly Language Programming), **40A** (Introduction to Programming for Internet), **60** (Data Structures and Algorithms) & **Psych 20A** (MATLAB Programming for Behavioral Sciences; **Psych 20B**: Advanced Topics in MATLAB Programming for Behavioral Sciences)	**Required: One course from each area** • **Psych 10** (Introductory Psychology) • **Life Science 1** (Evolution, Ecology, and Biodiversity) or **Life Science 7A** (Cell and Molecular Biology) OR **Life Science 15** (Life: Concepts and Issues) OR **PhySci 3** (Introduction to Human Physiology); **Chemistry 2** (Introductory Chemistry) or **Chem 17** (Chemical Principles) OR **Chem 20A** (Chemical Structure) OR **Physics 10** (Physics) OR **Physics 11** (Revolutions in Physics) OR **Physics 1A** (Physics for Scientists and Engineers: Mechanics) OR **Physics 5A** (Physics for Life Science Majors: Mechanics and Energy) OR **Ling 1** (Introduction to Study of Language) OR **Ling 20** (Introduction to Linguistic Analysis) • **Math 3A** (Calculus for Life Sciences Students) & **3B** (Calculus for Life Sciences Students) & **3C** OR **31A** (Differential and Integral Calculus) & **31B** (Integration and Infinite Studies) • **Philosophy 7** (Introduction to Philosophy of Mind) OR **8** (Introduction to Philosophy of Science) OR **9** (Principles of Critical Reasoning) OR **23** (Meaning and Communication) OR **31** (Logic, First Course) • **Computing 10A** (Introduction to Programming) and two courses from: **10B** (Intermediate Programming), **10C** (Advanced Programming), **15** (Introduction to Lisp and Symbolic Computation), **16** (Python with Applications), **20A** (Principles of Java Language with Applications), **30** (Machine Organization and Assembly Language Programming), **40A** (Introduction to Programming for Internet), **60** (Data Structures and Algorithms) & (**Psych 20A**: MATLAB Programming for Behavioral Sciences; **Psych 20B**: Advanced Topics in MATLAB Programming for Behavioral Sciences) **Summary of major changes:** **Physics 6A** has been replaced with **Physics 5A** to meet the course preparation for this major.

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
COMPUTATIONAL & SYSTEMS BIOLOGY	**Required:** • **Chem 20A** (Chemical Structure), • **20B** (Chemical Energetics & Change), **20L** (General Chemistry Lab), or **14A** (Atomic & Molecular Structure, Equilibria, Acids & Bases), **14B** (Thermodynamics Electro-chemistry, Kinetics & Organic Chemistry), • **Computer Science 31** (Intro to Computer Science 1) or **Program in Computing 10A** (Intro to Programming); • **Mathematics 31A** (Differential & Integral Calculus), **31B** (Integration & Infinite Series), **33A** (Linear Algebra & Applications), **33B** (Differential Equations); • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields) , **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity) or **5A** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics) **5B** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics) and **5C** (Physics for Life Sciences Majors: Magnetism & Modern Physics). **Students must also complete Life Science 7A, 7B, and 7C.**	**Required:** • **Chem 20A** (Chemical Structure), • **Chem 20B** (Chemical Energetics & Change), **20L** (General Chemistry Lab), or **14A** (Atomic & Molecular Structure, Equilibria, Acids & Bases), **14B** (Thermodynamics, Electrochemistry, Kinetics & Organic Chemistry), • **Computer Science 31** (Intro to Computer Science 1) or **Program in Computing 10A** (Intro to Programming); • **Life Science 30A** (Mathematics for Life Scientists), **30B** (Mathematics for Life Scientists), **40** (Statistics of Biological Systems) and **C&S BIO M32** (Essential Calculus for Mathematical Biologists), or • **Math 32T** (Essential Calculus for Mathematical Biologists) or **31A** or **31AL** (Differential & Integral Calculus Laboratory) , **31B** (Integration & Infinite Series), **33A** (Linear Algebra and Applications), **33B** (Differential Equations); • **Physics 1A** (Physics for Scientists & Engineers: Mechanics), **1B** (Physics for Scientists & Engineers: Oscillations, Waves, Electric & Magnetic Fields) , **1C** (Physics for Scientists & Engineers: Electrodynamics, Optics & Special Relativity) or **Physics 5A** (Physics for Life Sciences Majors: Thermodynamics, Fluids, Waves, Light & Optics) **5B** (Physics for Life Sciences Majors: Thermo-dynamics, Fluids, Waves, Light & Optics) and **5C** (Physics for Life Sciences Majors: Magnetism & Modern Physics). **Students must also complete Life Sciences 7A, 7B, and 7C.** **Summary of Changes** Effective Fall 2021, **LS 30A, 30B, 40** and **C&S M32** or **Math 32T** or **31AL** are <u>required</u> for this major.
GEOGRAPHY ENVIRONMENTAL STUDIES	**Required:** • **Geog 1** (Earth's Physical Environment); or **2** (Biodiversity in Changing World), **3** (Cultural Geography) or **4** (Globalization: Regional Development and World Economy), **6** (World Regions: Concepts and Contemporary Issues), **5** (People and the Earths Environment). • **Statistics 12** (Introduction to Statistical Methods for Geography and Environmental Studies).	**Required:** • **Geog 1** (Earth's Physical Environment); or **2** (Biodiversity in Changing World), **3** (Cultural Geography) or **4** (Globalization: Regional Development and World Economy), **6** (World Regions: Concepts and Contemporary Issues), **5** (People and the Earths Environment) & **Geog 7** (Intro to Geographic Information Systems), **Statistics 12** (Intro to Statistical Methods for Geography and Environmental Studies) . **Summary of Changes** Effective Fall 2021, **Geog 7** is a new <u>required</u> preparation course for this major

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Major	2018–2019 Major Requirements	Updated 2019–2020 Major Requirements
HISTORY	**Required:** • Three courses, including two in Western Civilization-**Hist 1A** (Introduction to Western Civilization: Ancient Civilization, Prehistory to circa AD to 843), **1B** (Introduction to Western Civilization: Circa 843 to circa 1715), **1C** (Introduction to Western Civilization: Circa 1715 to present) or two courses in world history- **20** (World History to AD 600), **21** (World History, circa 600 to 1760), **22** (Contemporary World History, 1760 to present), and one course from **96W** or **97A**	**Required:** • Two course from any History GE survey: **History 1A, Hist 1A** (Intro to Western Civilization: Ancient Civilization, Prehistory to circa AD to 843), **1B** (Intro to Western Civilization: Circa 843 to circa 1715), **1C** (Intro to Western Civilization: Circa 1715 to present or two courses in world history) **2B** (Social Knowledge and Social Power), **2C** (Religion, Occult, and Science: Mystics, Heretics, and Witches in Western Tradition, 1000 to 1600), **3A** (Renaissance to 1800), **3B** (Enlightenment to 1900), **3C** (20th Century), **3D** (History of Modern Medicine), **M4** (Intro to History of Religions), **5** (Holocaust: History and Memory), **8A** (Colonial Latin American), **8B** (Modern Latin America), **8C** (Latin American Social History), **9A** (History of India), **9C** (History of Japan), **9D** (History of Middle East), **9E** (Southeast Asian Crossroads) , **M10A** (History of Africa: to 1800), **10B** (History of Africa: 1800 to present) , **11A** (History of China: to 1000), **11B** (History of China: Circa 1000 to 2000), **12A** (Inequality: History of Mass Imprisonment), **12B**, (Inequality: History of Neoliberalism), **12C** (Inequality: Global History of Anti-Colonial Thought Struggle), **13A** (History of the U.S. and its Colonial Origins: Colonial Origins and First Nation Building Acts), **13B** (History of the U.S and its Colonial Origins: 19th century), **13C** (History of the U.S. and its Colonial Origins: 20th century), **14** (Atlantic World, 1492 to 1830), **20** (World History to AD 600), **21** (World History, circa 600 to 1760), **22** (Contemporary World History, 1760 to Present); and one course from **96W** (Intro to Historical Practice) or **97A** (Intro to Historical Practice) through **97O** (Intro to Historical Practice). **Summary of Changes** Effective 2021, students are able to complete any two History GE lectures from the following multiple quarter sequences: **Western Civilization 1ABC** ; **3ABC**; **8ABC**; **9ACDE**; **M10A-10B**; **11A-11B**; **12ABC**; **13ABC** or **20-21-22** and one course from **96W** or **97A-97O**.
STATISTICS	**Required:** • **Mathematics 31A** (Differential & Integration), **31B** (Integration & Infinite Series), **32A** (Calculus of Several Variables), **32B** (Calculus of Several Variables) , **33A** (Linear Algebra with Applications) **Statistics 20** (Intro to Statistical Programming with R), and one course from **Stats 10** through **13**.	**Required:** • **Mathematics 31A** (Differential and Integration), **31B** (Integration and Infinite Series), **32A** (Calculus of Several Variables), **32B** (Calculus of Several Variables) , **Statistics 20** (Introduction to Statistical Programming with R), and one course from **Stats 10** through **13**. **Summary of Changes** Math **33A** is no longer required for this major.