

Course Syllabus

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Updated 8 February 2022



BI311 Biostatistics

Department of Biology, Division of Natural Sciences & Mathematics

Meeting times & location:

Section 1: Tuesday & Thursday, 10:00 - 11:20am

Location: Room 202, Eiben Hall

Instructor: Michael Dohm PhD

Office: WSC 108

Office phone: 739-8543

Office Hours: Tuesday & Thursday, 10:30am - 12PM or by appointment (via CANVAS Messaging best option)

E-mail: [mdohm \[at\] chaminade.edu](mailto:mdohm@chaminade.edu) (Students, please use CANVAS messaging)

A pdf version of the syllabus is available from the [Syllabus Archive](https://syllabus.chaminade.edu/) (<https://syllabus.chaminade.edu/>).

Course Description

Biostatistics is a lecture, web-enhanced and hands-on course designed to provide students with the opportunity to develop analytical and statistical reasoning skills appropriate for biology. It is the first of two courses in biostatistics and epidemiology (BI 312) at Chaminade. Statistical reasoning may be defined as the ability to understand and use probability arguments and to recognize the distinction between specific and generalized

conclusions. After an introduction to data sets and the three philosophical positions of statistical hypotheses (frequentist, likelihood, and Bayesian), students will learn to apply statistical reasoning to questions about biological processes. During the semester, students will be given an introduction to (1) statistical tools and approaches used in biological and biomedical research, and (2) experimental design and analysis. Students will learn about error concepts and to identify and estimate via experimental design or simulation impacts of experimental versus biological sources of error on conclusions. Students will move from descriptive statistics and issues of parameter estimation to factorial experimental design (ANOVA, contingency tables), and general linear and logit models, all with examples and problem sets from biology.

Statistical reasoning

Statistical reasoning may be defined as the ability to understand and use numbers to communicate findings and to support opinions. Statistical reasoning is important to your future, for two reasons. The biological sciences are, by their nature, an experimental science: all disciplines in biology involve the presentation and analysis of data. Consider a biomedical example: You work as an AIDS counselor in a major U.S. city. Before you is the result of a male client's HIV test. It is positive, meaning the ELISA and Western Blot tests detected HIV in the blood sample. The client, who insists that he does not fit any known risk behavior group, now sits before you, waiting to hear the results. Your training has given you the following facts: (1) less than 0.01% of men fitting this category (heterosexual, no IV drug use) are infected with HIV in the U.S.; (2) the sensitivity of the tests is very high, 99.9% (sensitivity is defined as the percentage of individuals with a disease who are correctly classified by a test as having the disease); and the specificity of the tests is also high, 99.9% (specificity is defined as the percentage of individuals without a disease who are correctly classified by a test as not having the disease).

How do you communicate the client's test results?

Statistical reasoning is common to our daily lives. The above example illustrates the problem from the perspective of a counselor, but as citizens, we are faced with a barrage of numbers: our risk of developing a particular disease (breast cancer, 1 in 9 women; prostate cancer, 1 in 9 men, etc.); our risk from dying under general anesthesia (on average, about 0.01% or 1 death every 10,000 U.S. cases); our risk of dying in a car crash versus our risk of dying in a plane crash. Data summaries, projections and predictions, and declarations of probability and likelihood are important tools for communicating complex information. The media commonly employ these tools to present information to you: The latest results from

clinical trials of an HIV drug therapy, putative links between diet and health, effects of environmental toxins on health... the list is long.

Often, the portrayal of medical and health news in the media is conflicting, and the lack of consistency can be explained in part by failure to communicate the statistical issues. One result from the media's poor presentation of science results is the impression that just about everything and anything can be shown to adversely affect health... not a very useful conclusion. More importantly, exaggerated claims are made with numbers, and it may be difficult to sort fact from interpretation from fiction when numbers are used.

Required Text(s)

1. [Mike's Biostatistics Book \(https://biostatistics.letgen.org/\)](https://biostatistics.letgen.org/), ebook available at no cost from course web site.
2. [Mike's Biostatistics Workbook \(https://mikeworkbook.letgen.org/\)](https://mikeworkbook.letgen.org/), provided in class and via course web site at no cost

Other textbooks (recommended but not required)

Helpful, short books on Biostatistics

1. Weaver, A., and S. Goldberg. 2011. *Clinical biostatistics and epidemiology made ridiculously simple*. MedMaster.
2. Motulsky, 2015. *Essential biostatistics: A nonmathematical approach*. Oxford University Press

Books on R

1. Knell, R. 2013. *Introductory R: A Beginner's Guide to Data Visualisation and Analysis Using R [Kindle Edition]*. At less than \$6, this is a really good, short book to answer many of your questions about R.
2. Everitt, B. S., and T. Hothorn. 2009. *A Handbook of Statistical Analysis Using R, 2nd edition*. Chapman and Hall/CRC. This book is a reference to using R with focus on use of the command line and scripts.

Other (bio)statistics textbooks (We used these books in previous Biostatistics courses)

1. Glover, T., and K. Mitchell. 2008. *An Introduction to Biostatistics*, 2nd edition. Waveland Press.
2. Norman, G. R, and D. L. Streiner. *Biostatistics: The Bare Essentials*. People's Medical Publishing House.

3. Whitlock, M. C., and D. Schluter. 2008. *The Analysis of Biological Data*. Roberts and Company.

Course Management System (CMS)

BI311 is a web-enhanced course: We meet at the scheduled times like any traditional course, but components of the course are available to you at all times throughout the semester. Chaminade University relies on CANVAS to help manage courses. Access to the site is via <https://chaminade.instructure.com> (<https://chaminade.instructure.com>).

Logon instructions will be provided on the first day of class. Slides presented during class time are posted on the course website for your use. Homework, quizzes and related materials are also made available on the site.

Course Assessment

Homework: Ten (10) homework problem sets that will help you understand concepts that we cover in class. Each set is worth **5 points**. Homework will include, but are not limited to the following kinds of tasks: calculations and formula derivations, presenting experimental designs, methods and statistical results using tables and graphs. Homework is presented in Mike's Workbook for Biostatistics; completed homework are submitted to CANVAS.

Although some work may be done during class time, students should expect work will need to be completed outside of class time. You may work together on homework, but each student must turn in their own homework. Additional work, ungraded, may be assigned in order to enhance skills or emphasize concepts.

Homework are due prior to exams that they support.

Work on your own: Your textbook also has many problems to work on: I will recommend many, but will not grade work from the text book. While these are not required, the more you do, the more you will benefit. You can expect a learning curve with biostatistics -- it is imperative that you make the effort on your own, outside of class, to do as much applied work as you can. We will discuss some of these problems in class as part of lecture.

Quizzes: Ten (10) weekly quizzes will be assigned, each up to **5 points**; these TRUE/FALSE and multiple choice questions are designed to test your knowledge and provide instant feed-back.

Quizzes are due prior to exams that they support.

Four exams, each up to 100 points:

- Exam 1 will cover material from Chapter 1 - 5
- Exam 2 will include selected topics from Exam 1 and will cover material from Chapter 6 - 8
- Exam 3 will include selected topics from Exam 1 & 2 and cover material from Chapter 9 - 15
- Exam 4 will include selected topics from Exam 1, 2 & 3 and cover material from Chapter 16 - 18

All readings are from [Mike's Biostatistics Book \(https://biostatistics.letgen.org/\)](https://biostatistics.letgen.org/)

The exams focus on your understanding of important concepts, your ability to evaluate experimental designs, and your ability to recognize and apply appropriate statistics to be employed given sets of data or particular experimental designs. Exam questions will be drawn from homework and/or from suggested problems in the textbook.

Because of the nature of biostatistics, all exams after Exam 1 should be viewed as cumulative. *Progression through the biostatistics course is a cumulative knowledge process.* Following Exam 1 and continuing through the fourth exam, you will be expected to draw on concepts and facts introduced in the first weeks of the course. Thus, all exams after Exam 1 are cumulative and you can expect to be asked on concepts drawn from any point prior to the exam date.

Independent Project. The best way to learn statistics is to work with your own data. Students will design, implement, collect and analyze data relevant to student's interest. Group projects are possible provided there are significant questions that can support individual reports. Students must propose and receive approval for the project no later than the end of the third week of the semester. Students will submit a written report (draft, final) and produce a short video presentation. The project is optional. Because I feel so strongly about the learning opportunity, you may submit a project in place of the fourth exam.

Class Participation: You are expected to come to class prepared, to participate fully in class by asking questions, bringing attention to media announcements of relevance to biostatistics, by helping in data collection needed for homework projects. I also encourage all of you to assist fellow students with computer and statistical software-related questions.

Points available and weights for each graded element are listed in the table.

Item	How many?	Each	Points	Weight
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Item	How many?	Each	Points	Weight
Quizzes	10	5	50	12.5%
Homework	10	5	50	12.5%
Exams*	4	75	300	75%
Total			400	100%

*Optional project

A student project can be used to replace Exam04

Project	1	75
	Draft	30
	Final	20
	Presentation	25

Official grade records

Canvas provides a way for you to monitor your graded assignments. This is convenient, but students should be aware that the final word about grades depends on the Official Grade Book for the course. Thus, although the Canvas record will show your points for an assignment, be advised that your assigned grade is finalized by the official grade book, which is maintained by Dr Dohm. You may always inquire about your current standing in the course by sending a [message to Dr Dohm, within Canvas](#).

Grading Scale

Letter grades are given in all courses except those conducted on a credit/no credit basis. They are interpreted as follows:

- A 90 - 100% Outstanding scholarship and an unusual degree of intellectual initiative
- B 80 - 89% Superior work done in a consistent and intellectual manner

C 70 - Average grade indicating a competent grasp of subject matter
79%

D 50 - Inferior work of the lowest passing grade, not satisfactory for fulfillment of
69% prerequisite course work.

F < 49% Failed to grasp the minimum subject matter; no credit given

Course Schedule

Major assignments schedule

Week	Item
5	Exam01
8	Exam02
13	Exam03
13	Project draft
15	Project final
16	Project presentation
Finals	Exam04

Click [here for the BI311 schedule of lectures and all assignments.](#)

Student (Course) Learning Outcomes

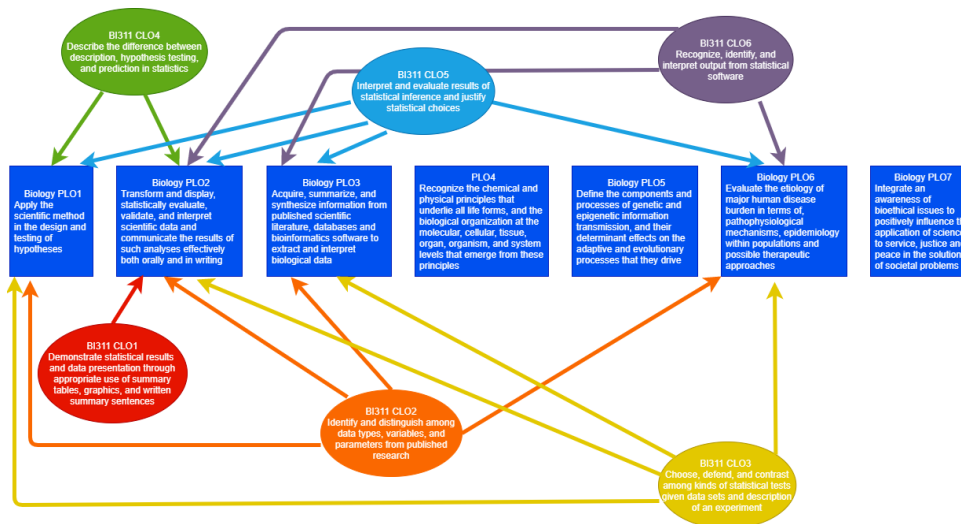
Students will

1. Demonstrate statistical results and data presentation through appropriate use of summary tables, graphics, and written summary sentences (PLO #1, 2, 3, 7).
2. Identify and distinguish among data types, variables, and parameters from published research (PLO #1, 2, 3, 7).
3. Choose, defend, and contrast among kinds of statistical tests given data sets and description of an experiment (PLO #1, 2, 3, 7).
4. Describe the difference between description, hypothesis testing, and prediction in statistics (PLO #1, 2, 3, 7).
5. Interpret and evaluate results of statistical inference and justify statistical choices

(PLO #1, 2, 3, 7).

6. Recognize, identify, and interpret output from statistical software (PLO #2, 3, 7).

CLO	PLO
1	1, 2, 3, 7
2	1, 2, 3, 7
3	1, 2, 3, 7
4	1, 2, 3, 7
5	1, 2, 3, 7
6	2, 3, 7



Biology Program Learning Outcomes

1. Apply the scientific method in the design and testing of hypotheses
2. Transform and display, statistically evaluate, validate, and interpret scientific data and communicate the results of such analyses effectively both orally and in writing
3. Acquire, summarize, and synthesize information from published scientific literature, databases and bioinformatics software to extract and interpret biological data
4. Recognize the chemical and physical principles that underlie all life forms, and the biological organization at the molecular, cellular, tissue, organ, organism, and system levels that emerge from these principles
5. Define the components and processes of genetic and epigenetic information transmission, and their determinant effects on the adaptive and evolutionary processes that they drive

6. Evaluate the etiology of major human disease burden in terms of, pathophysiological mechanisms, epidemiology within populations and possible therapeutic approaches
7. Integrate an awareness of bioethical issues to positively influence the application of science to service, justice and peace in the solution of societal problems

University outcomes

Marianist Values

This class represents one component of your education at Chaminade University of Honolulu. An education in the Marianist Tradition is marked by five principles and you should take every opportunity possible to reflect upon the role of these characteristics in your education and development:

1. Education for formation in faith
2. Provide an integral, quality education
3. Educate in family spirit
4. Educate for service, justice and peace
5. Educate for adaptation and change

Native Hawaiian Values

Education is an integral value in both Marianist and Native Hawaiian culture. Both recognize the transformative effect of a well-rounded, value-centered education on society, particularly in seeking justice for the marginalized, the forgotten, and the oppressed, always with an eye toward God (Ke Akua). This is reflected in the 'Ōlelo No'eau (Hawaiian proverbs) and Marianist core beliefs:

1. Educate for Formation in Faith (Mana) E ola au i ke akua ('Ōlelo No'eau 364) May I live by God
2. Provide an Integral, Quality Education (Na'auao) Lawe i ka ma'alea a kū'ono'ono ('Ōlelo No'eau 1957) Acquire skill and make it deep
3. Educate in Family Spirit ('Ohana) 'Ike aku, 'ike mai, kōkua aku kōkua mai; pela iho la ka nohana 'ohana ('Ōlelo No'eau 1200) Recognize others, be recognized, help others, be helped; such is a family relationship
4. Educate for Service, Justice and Peace (Aloha) Ka lama kū o ka no'eau ('Ōlelo No'eau 1430) Education is the standing torch of wisdom
5. Educate for Adaptation and Change (Aina) 'A'ohe pau ka 'ike i ka hālau ho'okahi ('Ōlelo No'eau 203) All knowledge is not taught in the same school

Alignment of Natural Sciences Courses with Marianist and Hawaiian values of the University.

The Natural Sciences Division provides an integral, quality education: sophisticated integrative course content taught by experienced, dedicated, and well-educated instructors.

- We educate in the family spirit – every classroom is an Ohana and you can expect to be respected yet challenged in an environment that is supportive, inclusively by instructors who take the time to personally get to know and care for you.
- We educate for service, justice and peace, since many of the most pressing global issues (climate change, health inequity, poverty, justice) are those which science and technology investigate, establish ethical parameters for, and offer solutions to.
- We educate for adaptation and change. In science and technology, the only constant is change. Data, techniques, technologies, questions, interpretations and ethical landscapes are constantly evolving, and we teach students to thrive on this dynamic uncertainty.

The study of science and technology can be formative, exploring human creativity and potential in the development of technologies and scientific solutions, the opportunity to engage in the stewardship of the natural world, and the opportunity to promote social justice. We provide opportunities to engage with the problems that face Hawai'i and the Pacific region through the Natural Sciences curriculum, in particular, those centered around severe challenges in health, poverty, environmental resilience, and erosion of traditional culture. The Marianist Educational Values relate to Native Hawaiian ideas of mana, na'auao, ohana, aloha and aina. We intend for our Natural Sciences programs to be culturally-sustaining, rooted in our Hawaiian place, and centered on core values of Maiau, be neat, prepared, careful in all we do; Makawalu, demonstrate foresight and planning; `Ai, sustain mind and body; Pa`a Na`au, learn deeply.

Course policies

Canvas "grading"

Canvas "grades" are tentative and not official. Canvas scores available to students are not official until the instructor announces such to the class. Official grading is done by the instructor and records are kept on the instructor's computer.

Instructor and Student Communication

Questions for this course can be posted to the instructor via CANVAS. Online, in-person and phone conferences can be arranged. Most messages to Canvas will be replied within 24 hours, often much sooner. Email to instructor's chaminade.edu e-mail may take up to 3 days for response.

Graded materials will generally be returned within 7 - 10 days.

Accessibility and Accommodations

If you need individual accommodations to meet course outcomes because of a documented disability, please speak with me to discuss your needs as soon as possible so that we can ensure your full participation in class and fair assessment of your work. Students with special needs who meet criteria for the Americans with Disabilities Act (ADA) provisions must provide written documentation of the need for accommodations from the Counseling Center by the end of week three of the class, in order for instructors to plan accordingly. If a student would like to determine if they meet the criteria for accommodations, they should contact the Counseling Center at (808) 735-4845 for further information (counselingcenter@chaminade.edu).

Title IX Compliance

Chaminade University of Honolulu recognizes the inherent dignity of all individuals and promotes respect for all people. Sexual misconduct, physical and/or psychological abuse will NOT be tolerated at CUH. If you have been the victim of sexual misconduct, physical and/or psychological abuse, we encourage you to report this matter promptly. As a faculty member, I am interested in promoting a safe and healthy environment, and should I learn of any sexual misconduct, physical and/or psychological abuse, I must report the matter to the Title IX Coordinator. If you or someone you know has been harassed or assaulted, you can find the appropriate resources by visiting Campus Ministry, the Dean of Students Office, the Counseling Center, or the Office for Compliance and Personnel Services.

Attendance Policy

The following attendance policy is from the [Chaminade University Undergraduate Catalog](#)

(<https://catalog.chaminade.edu/generalinformation/academicaffairs/policies/attendance>):

Students are expected to attend regularly all courses for which they are registered. Student should notify their instructors when illness or other extenuating circumstances prevents them from attending class and make arrangements to complete missed assignments.

Notification may be done by emailing the instructor's Chaminade email address, calling the

instructor's campus extension, or by leaving a message with the instructor's division office. It is the instructor's prerogative to modify deadlines of course requirements accordingly. Any student who stops attending a course without officially withdrawing may receive a failing grade. Unexcused absences equivalent to more than a week of classes may lead to a grade reduction for the course. Any unexcused absence of two consecutive weeks or more may result in being withdrawn from the course by the instructor, although the instructor is not required to withdraw students in that scenario. Repeated absences put students at risk of failing grades. Students with disabilities who have obtained accommodations from the Chaminade University of Honolulu ADA Coordinator may be considered for an exception when the accommodation does not materially alter the attainment of the learning outcomes. Federal regulations require continued attendance for continuing payment of financial aid. When illness or personal reasons necessitate continued absence, the student should communicate first with the instructor to review the options. Anyone who stops attending a course without official withdrawal may receive a failing grade or be withdrawn by the instructor at the instructor's discretion.

Online Attendance

During the first three weeks (subject to change), this course is primarily online. Attendance for this course during the online phase is based on the (1) timely submission of assignments and/or (2) logging onto the course at least once per week. Students will receive credit for 'attending' the class each time a weekly assignment is submitted and/or each time student signs on to the course and navigate to at least one page or module removed from the home page within the Canvas system for the course. Some weekly lessons require the submission of one assignment, some require two. Each lesson will indicate when it is complete. The student is responsible for pressing the 'submit' button each time he or she has completed an assignment. If the page indicating that the assignment has been submitted does not appear, then the assignment has not been submitted.

Late Work Policy

There are no make-ups for quizzes, unless a physician's note documents your absence during quizzes. Journal article presentations CANNOT be made-up. Quizzes and assignments are due by 8:59am HST on the assigned date. Up to 10% grade reduction will be assessed for each 12 hour late assignment. All quizzes and assignments close by 3 days post the due date.

Grades of "Incomplete"

Students and instructors may negotiate an incomplete grade when there are specific justifying circumstances. An Incomplete Contract (available from the Divisional Secretary and the Portal) must be completed. When submitting a grade, the “I” will be accompanied by the alternative grade that will automatically be assigned after 90 days. These include IB, IC, ID, and IF. If only an “I” is submitted the default grade is F. The completion of the work, evaluation, and reporting of the final grade is due within 90 days after the end of the semester or term. This limit may not be extended.

Writing Policy

Instructions for the writing assignments are detailed for each individual assignment on the canvas course page.

Potential resources for writing assignments:

- Google Scholar
- Pubmed
- Sullivan Library

Cell phones, tablets, and laptops

Instructor policy: Students are encouraged to use personal digital devices during class provided such use does not distract others or interfere with class activities.

University policy. Music Devices and Cellular Phones: *Unless specifically permitted by your instructor* [emphasis by instructor], use of music devices and cell phones is prohibited during all Natural Science and Mathematics classes, as it is discourteous and may lead to suspicion of academic misconduct. Students unable to comply will be asked to leave class. Out of consideration for your classmates, please set your cell phone to silent mode during class. Students are encouraged to bring laptops or tablets to class as the instructor will assign online activities and readings that will require the use of a laptop or tablet. Laptops and tablets should not be misused, such as checking distracting websites. Use your best judgment and respect your classmates and instructor.

Recording of lecture material

Students may not record audio or video of lectures conducted by the instructor nor of any media presented during the lecture without prior permission from the instructor. All materials presented in class by the instructor will be made available to students.

Academic Conduct Policy

The success of the Honor Code is made possible only with the acceptance and cooperation of every student. Each student is expected to maintain the principles of the Code. Example of Honor Code violations include, but are not limited to:

- Giving or receiving information from another student during an examination;
- Using unauthorized sources for answers during an examination;
- Illegally obtained test questions before the test;
- Any and all forms of plagiarism – submit all or part of someone else’s work or ideas as your own;
- The destruction and/or confiscation of school and/or personal property.

Violations of Academic Integrity: Violations of the principle include, but are not limited to:

- Cheating: Intentionally using or attempting to use unauthorized materials, information, notes, study aids, or other devices in an academic exercise.
- Fabrication and Falsification: Intentional and unauthorized alteration or invention of any information or citation in an academic exercise. Falsification is a matter of inventing or counterfeiting information for use in any academic exercise.
- Multiple Submissions: The submission of substantial portions of the same academic work for credit (including oral reports) more than once without authorization.
- Plagiarism: Intentionally or knowingly presenting the work of another as one’s own (i.e., without proper acknowledgment of the source).
- Abuse of Academic Materials: Intentionally or knowingly destroying, stealing, or making inaccessible library or other academic resource materials.
- Complicity in Academic Dishonesty: Intentionally or knowingly helping or attempting to help another to commit an act of academic dishonesty.

Plagiarism includes, but is not limited to:

- Complete or partial copying directly from a published or unpublished source without proper acknowledgement to the author. Minor changes in wording or syntax are not sufficient to avoid charges of plagiarism. Proper acknowledgement of the source of a text is always mandatory.
- Paraphrasing the work of another without proper author acknowledgement.
- Submitting as one’s own original work, however freely given or purchased, the original exam, research paper, manuscript, report, computer file, or other assignment that has been prepared by another individual.

Consequences of academic honesty violations:

From the [Chaminade University catalog](#)

(<https://catalog.chaminade.edu/generalinformation/academicaffairs/policies/academichonesty>)

: Academic honesty is an essential aspect of all learning, scholarship, and research. It is one of the values regarded most highly by academic communities throughout the world. Violations of the principle of academic honesty are extremely serious and will not be tolerated. Students are responsible for promoting academic honesty at Chaminade by not participating in any act of dishonesty and by reporting any incidence of academic dishonesty to an instructor or to a University official. Academic dishonesty may include theft of records or examinations, alteration of grades, and plagiarism, in addition to more obvious dishonesty. Questions of academic dishonesty in a particular class are first reviewed by the instructor, who must make a report with recommendations to the Dean of the Academic Division. Punishment for academic dishonesty will be determined by the instructor and the Dean of Academic Division and may include an “F” grade for the work in question, an “F” grade for the course, suspension, or dismissal from the University.

Additional information on student conduct can be found in the student handbook.

Tutoring and Writing Services

Chaminade is proud to offer free, one-on-one tutoring and writing assistance to all students. Tutoring and writing help is available on campus at Kōkua ‘Ike: Center for Student Learning in a variety of subjects (including, but are not limited to: biology, chemistry, math, nursing, English, etc.) from trained Peer and Professional Tutors. Please check Kōkua ‘Ike’s website (<https://chaminade.edu/advising/kokua-ike/>) for the latest times, list of drop-in hours, and information on scheduling an appointment. Free online tutoring is also available via Smarthinking. Smarthinking can be accessed 24/7 from your Canvas account. Simply click Account – Notifications – Smarthinking. For more information, please contact Kōkua ‘Ike at tutoring@chaminade.edu or 808-739-8305.

Online Tutoring through Smarthinking

- All CUH students are eligible to use Smarthinking, an online tutoring system. Students can access Smarthinking via their Canvas account.
- Through Smarthinking, students can connect in real-time with an expert educator in a variety of subjects using a virtual whiteboard technology. Students also have an option to schedule a 30-minute appointment with a tutor of their choice. The Online Writing Lab provides students with the ability to receive a detailed, personalized critique of any written assignment through a formal critique process.
- All sessions are archived and available for students to review at any time for studying or test preparation.