Term Information

Effective Term   Autumn 2023

General Information

Course Bulletin Listing/Subject Area   Statistics
Fiscal Unit/Academic Org   Statistics - D0694
College/Academic Group   Arts and Sciences
Level/Career   Graduate
Course Number/Catalog   6111
Course Title   Foundations of Statistical Theory I
Transcript Abbreviation   Fd Stat Theory I
Course Description   This is the first part of a course that reviews and introduces the mathematical foundations that are
                                                      necessary for the coursework in the PhD programs in statistics and biostatistics and the statistics MS
                                                      program, focusing on using mathematical tools for statistical analysis.
Semester Credit Hours/Units   Fixed: 3

Offering Information

Length Of Course   14 Week, 12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Flexibly Scheduled Course   Never
Does any section of this course have a distance   No
education component?
Grading Basis   Letter Grade
Repeatable   No
Course Components   Lecture
Grade Roster Component   Lecture
Credit Available by Exam   No
Admission Condition Course   No
Off Campus   Never
Campus of Offering   Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites   Prerequisites: Entry to this course is restricted to graduate standing in the Statistics MS program,
                                                      Statistics PhD program, or Interdisciplinary Biostatistics PhD program; Or permission of instructor.
Exclusions
Electronically Enforced   No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code   27.0501
Subsidy Level   Doctoral Course
Intended Rank   Masters, Doctoral

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors
The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Demonstrate a thorough understanding of how to use both univariate and multivariate calculus tools to obtain results in Statistics and Biostatistics.
- Demonstrate understanding of Euclidean spaces and concepts relating to a vector basis for use in statistical regression models.
- Apply multiple strategies of proof to obtain results in statistical theory.
- Demonstrate understanding of convergence of sequences to obtain results in probability and statistical theory.

Content Topic List

- Univariate Calculus Review
- Multivariate Differentiation
- Multivariate Integration
- Vectors, Vector Spaces, and Geometry
- Introduction to Proofs
- Sequences
- Continuity

Sought Concurrence
Yes

Attachments

- STAT6111_syllabus.pdf: Syllabus

  (Syllabus. Owner: Craigmile,Peter F)

- Math Concurrence.pdf: Concurrence from Math

  (Concurrence. Owner: Craigmile,Peter F)

Comments

- Please see feedback email sent to department 2-8-2023 RLS *(by Steele,Rachel Lea on 02/08/2023 09:18 AM)*

- This course is designed to support the required first year PhD courses by offering a mix of just-in-time math support for the first year courses, and preparation for the second year courses, with a focus on applications and examples in Statistics and Biostatistics.

  Our students enter with (increasingly) diverse backgrounds, and we believe that a course that complements the first year courses and can adapt to the student population entering our program each year will be able to improve our students' first year experience as well as their training. The course will focus strongly on mathematical techniques used frequently in Statistics and Biostat. and include examples from statistical theory.

  This course and Stat 6112 is proposed as part of a comprehensive redesign of the Ph.D. program in Statistics. Currently some PhD students take Math 4545 and Stat 6860; they will no longer take these courses. Stat 6111 will also be recommended to students in the Ph.D. program in Biostatistics. *(by Craigmile,Peter F on 12/13/2022 08:37 AM)*

- 5000-level courses are meant for both undergraduates and graduate students. There is no real indication on the form or the syllabus that this is also meant for undergraduate students. (Will this count in your undergraduate major even as an elective? If so uploaded updated curriculum map.) *(by Vankeerbergen,Bernadette Chantal on 12/10/2022 04:31 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Craigmile,Peter F	12/07/2022 10:03 AM	Submitted for Approval
Approved	Craigmile,Peter F	12/07/2022 10:04 AM	Unit Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	12/10/2022 04:31 PM	College Approval
Submitted	Craigmile,Peter F	12/19/2022 05:48 PM	Submitted for Approval
Approved	Craigmile,Peter F	12/19/2022 05:49 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	01/17/2023 02:56 PM	College Approval
Revision Requested	Steele,Rachel Lea	02/08/2023 09:18 AM	ASCCAO Approval
Submitted	Craigmile,Peter F	02/08/2023 09:27 AM	Submitted for Approval
Approved	Craigmile,Peter F	02/08/2023 09:27 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	02/08/2023 09:50 AM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	02/08/2023 09:50 AM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

SYLLABUS: STAT 6111

Foundations of Statistical Theory I
Autumn 2023 (full semester)
3 credit hours

COURSE OVERVIEW

Instructor

<NAME TO BE ANNOUNCED>

Email address: <TO BE ANNOUNCED>

Lectures: This class will meet 3 days a week for 55 minutes. <LOCATION TO BE ANNOUNCED>

Office hours: <TO BE ANNOUNCED>

Graduate teaching assistant

<NAME>

Email address: <TO BE ANNOUNCED>

Office hours: <TO BE ANNOUNCED>

Prerequisites

Entry to this course is restricted to graduate standing in the Statistics MS program, Statistics PhD program, or Interdisciplinary Biostatistics PhD program; Or permission of instructor.

Course description

This is the first part of a course that reviews and introduces the mathematical foundations that are necessary for the coursework in the PhD programs in Statistics and Biostatistics, focusing on applying univariate and multivariate calculus, linear algebra, strategies of proof, and real analysis to statistical theory and methods.

Course learning outcomes

By the end of this course, students should successfully be able to:

- Demonstrate a thorough understanding of how to use both univariate and multivariate calculus tools to obtain results in Statistics and Biostatistics.
- Demonstrate understanding of Euclidean spaces and concepts relating to a vector basis for use in statistical regression models.
- Apply multiple strategies of proof to obtain results in statistical theory.
- Demonstrate understanding of convergence of sequences to obtain results in probability and statistical theory.

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

Required

- P.D. Lax and M.S. Terrell. *Multivariable Calculus with Applications*. Springer, 2017. Available online through OSU library: https://link-springer-com.proxy.lib.ohio-state.edu/book/10.1007/978-3-319-74073-7 **[LT in schedule]**

- J.E. Gentle. *Matrix Algebra: Theory, Computations, and Applications in Statistics*. Springer, 2007. Available online through OSU library: https://ebooks.ohiolink.edu/content/f18d4bcc-c05c-11ea-b48a-0a28bb48d135 **[G in schedule]**

- D.W. Cunningham. *Real Analysis with Proof Strategies*. CRC Press, 2021. Available online through OSU library: https://www-taylorfrancis-com.proxy.lib.ohio-state.edu/books/mono/10.1201/9781003091363/real-analysis-daniel-cunningham **[C in schedule]**

Recommended/optional

- None.

Necessary Software

- This class will require you to use the statistical software packages called R (The R Project for Statistical Computing; http://www.r-project.org/) and RStudio (https://posit.co). These software packages are available as Free Software.

GRADING AND FACULTY RESPONSE

ASSIGNMENT CATEGORY	PERCENTAGE
Homework	45
Quizzes	40
Participation	15
Total	100

Class time will be a mix of lecture and group work on practice problems and homework problems. Instead of having traditional exams, there will be approximately 8 short quizzes throughout the semester consisting of questions very similar to those on the homework.

Late assignments

<Policy will be added when the course is offered>

Instructor feedback and response time

<Policy will be added when the course is offered>

COURSE SCHEDULE

Refer to the Carmen course for up-to-date assignment due dates.

Week	Dates	Topics	Reading	Assignments
1	Aug 23, 25	Univariate Differentiation	Course Notes	
2	Aug 28, 30, Sep 1	Taylor Series, Univariate Integration	Course Notes	HW 1 due, Quiz 1
3	Sep 6, 8	Finish Univariate Calculus Review	Course Notes; LT 1.1, 1.4	
4	Sep 11, 13, 15	Introduction to Multivariate Calculus	LT 2.1, 3.1-3.3	HW 2 due, Quiz 2
5	Sep 18, 20, 22	Multivariate Integration	LT 4.1-4.3, 6.1-6.3	HW 3 due
6	Sep 25, 27, 29	Multivariate Integration Continued	LT 6.4-6.5	HW 4 due, Quiz 3
7	Oct 2, 4, 6	Introduction to Vectors and Vector Spaces	G 1, 2.1.1-2.1.3	HW 5 due, Quiz 4
8	Oct 9, 11	Inner Products, Norms	G 2.1.4-2.1.9	
9	Oct 16, 18, 20	Vector Geometry	G 2.1.8, 2.2.1-2.2.5	HW 6 due, Quiz 5
10	Oct 23, 25, 27	Strategies of Proof	C 1.1-1.4	HW 7 due
11	Oct 30, Nov 1, 3	The Real Numbers	C 2.2-2.3, 3.1	HW 8 due, Quiz 6
12	Nov 6, 8	Sequences	C 3.2, 3.3	
13	Nov 13, 15, 17	Sequences Continued	C 3.4-3.6	HW 9 due, Quiz 7
14	Nov 20	Sequences Continued	C 3.7	
15	Nov 27, 29, Dec 1	Continuity	C 4.1-4.3	HW 10 due
16	Dec 4, 6	Continuity Continued	C 4.4	Quiz 8

OTHER COURSE POLICIES

Academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct **http://studentlife.osu.edu/csc/**.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.
If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.
Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Land Acknowledgement

We would like to acknowledge the land that The Ohio State University occupies is the ancestral and contemporary territory of the Shawnee, Potawatomi, Delaware, Miami, Peoria, Seneca, Wyandotte, Ojibwe and Cherokee peoples. Specifically, the university resides on land ceded in the 1795 Treaty of Greeneville and the forced removal of tribes through the Indian Removal Act of 1830. I/We want to honor the resiliency of these tribal nations and recognize the historical contexts that has and continues to affect the Indigenous peoples of this land.

More information on OSU's land acknowledgement can be found at https://mcc.osu.edu/about-us/land-acknowledgement

Your mental health

As a student you may experience a range of issues that can cause barriers to learn, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This course requires use of CarmenCanvas (Ohio State's learning management system) and other communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Canvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)
- Collaborative course tools

Subject: Fw: Concurrence for STATS 6111-6112

Date: Monday, December 19, 2022 at 7:43:10 PM Greenwich Mean Time

From: MacEachern, Steven

To: Craigmile, Peter

Hi Peter.

The concurrence from Mathematics.

My best,

Steve

From: Lafont, Jean-Francois <jlafont@math.ohio-state.edu>
Sent: Monday, December 19, 2022 1:31 PM
To: MacEachern, Steven <snm@stat.osu.edu>
Subject: Concurrence for STATS 6111-6112

Dear Prof. MacEachern,

Thank you for sharing your proposal for the STAT 6111-6112 course sequence. I have discussed the proposal with the Mathematics Department leadership team, and we have reviewed the proposed syllabus. We are happy to provide concurrence for this course.

With best regards,

Jean-Francois Lafont
Professor and Chair
Department of Mathematics
Ohio State University