BIOSTATISTICS (BIOSTAT)

BIOSTAT 200 Biostatistical Methods in Clinical Research I (3 Units) Fall
Instructor(s): Isabel Elaine Allen
Prerequisite(s): None

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion

Course is an introduction to the study of biostatistics. Course addresses types of data, their summarization, exploration and explanation, as well as concepts of probability and their role in explaining uncertainty. Course concludes with coverage of inference applied to means, proportions, regression coefficients and contingency tables. Throughout the course, the software program STATA will be used.

School: Graduate Division
Department: Clinical Research Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? Yes
Is this an Interprofessional Education (IPE) course? Yes
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes

BIOSTAT 202 Opportunities and challenges of complex biomedical data (3 Units) Summer
Instructor(s): Aaron W Scheffler
Prerequisite(s): None

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion

This is an introduction to the opportunities and challenges of using large datasets for biomedical research. Topics to be covered include: What is data science/big data? What makes it different from non-big data? What big data can and cannot do. Phases of data science: getting data, merging and cleaning data, storing and accessing data, visualizing or telling stories with data, drawing conclusions from data.

School: Graduate Division
Department: Clinical Research Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes

BIOSTAT 208 Biostatistical Methods II (3 Units) Winter
Instructor(s): Steve Shiboski
Prerequisite(s): Possession of MD, PhD, DDS or PharmD degree or permission of course director and Epidemiology 180.04 and Biostat 183 or equivalent.

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects

Instruction in multiple predictor analyses as a tool for control of confounding and for constructing predictive models. Topics will include exploratory data analyses, linear regression, and logistic regression. The STATA statistical package will be used.

School: Graduate Division
Department: Clinical Research Program
May the student choose the instructor for this course? Yes
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? Yes
Is this an Interprofessional Education (IPE) course? Yes
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
**BIOSTAT 209 Biostatistical Methods III (3 Units)** Spring  
*Instructor(s):* Chiung-Yu Huang  
Prerequisite(s): Possession of MD, PhD, DDS or PharmD degree or permission of course director and Epidemiology 202 and BIOSTAT 208.  
Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.  
Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion  
Advanced instruction in multiple predictor analyses. Topics will include survival analysis and regression for repeated measures. In the final weeks of the course, participants will receive individualized instruction for the analysis of their own data.

**School:** Graduate Division  
**Department:** Clinical Research Program  
May the student choose the instructor for this course? No  
Does enrollment in this course require instructor approval? No  
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)  
Graduate Division course: Yes  
Is this a web-based online course? Yes  
Is this an Interprofessional Education (IPE) course? No  
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes

**BIOSTAT 210 Biostatistical Methods IV (2 Units)** Fall  
*Instructor(s):* Dave Glidden  
Prerequisite(s): Possession of MD, PhD, DDS or PharmD degree or permission of course director and Epidemiology 202 and Biostatistics 208 and 209.  
Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.  
Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects  
This is a continuation of the Biostatistical Methods in Clinical Research series, covering additional methods in multi-predictor analyses and allowing more in-depth exploration of the topics covered in Biostat I, II, and III. Topics in survival analysis and longitudinal analysis will be emphasized and students are also encouraged to utilize their own projects to motivate discussion and to suggest topics of interest.

**School:** Graduate Division  
**Department:** Clinical Research Program  
May the student choose the instructor for this course? Yes  
Does enrollment in this course require instructor approval? Yes  
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)  
Graduate Division course: Yes  
Is this a web-based online course? Yes  
Is this an Interprofessional Education (IPE) course? No  
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes

**BIOSTAT 211 Mathematical Foundations of Biostatistics (2 Units)** Winter  
*Instructor(s):* Fei Jiang  
Prerequisite(s): Calculus is a prerequisite for this class. For example, students must understand integration and derivatives. A previous or concurrent course in introductory biostatistics is preferred, BIOSTAT 200  
Restrictions: This course is part of the Epidemiology and Translational Science PhD program and may have space limitations. Auditing is not permitted.  
Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion  
The goal of this course is to equip students with core statistical concepts and methods. In this course students will learn mathematical, computational, statistical and probabilistic background; the basics of probability distributions including the definitions of density functions, cumulative distributions, moments of the distributions; theory and methods for point estimation; and methodology for the construction of hypothesis testing and confidence intervals. R statistical software will be used.

**School:** Graduate Division  
**Department:** Epidemiology And Translational Sciences Program  
May the student choose the instructor for this course? Yes  
Does enrollment in this course require instructor approval? Yes  
Course Grading Convention: P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)  
Graduate Division course: Yes  
Is this a web-based online course? No  
Is this an Interprofessional Education (IPE) course? No  
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
BIOSTAT 212 Introduction to Statistical Computing in Clinical Research (1 Units) Summer

Instructor(s): Jeffrey N. Martin
Prerequisite(s): EPI 180.04 and possession of a MD, PhD, DDS or PharmD or equivalent doctoral degree. Exceptions to these prerequisites may be made with the consent of the Course Director, space permitting.

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted. Preference is given to UCSF-affiliated personnel.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects

This course will introduce clinical researchers to the use of computer software for managing and analyzing clinical research data. Currently available statistical packages will be described and the roles of spreadsheet and relational database programs discussed. Use of STATA for managing, cleaning, describing, and analyzing data will be taught in lecture and laboratory sessions.

School: Graduate Division
Department: Clinical Research Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? Yes
Is this an Interprofessional Education (IPE) course? Yes
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? No

BIOSTAT 213 Introduction to Programming for Health Data Science in R (1.5 Units) Summer

Instructor(s): Efstathios D Gennatas
Prerequisite(s): Basic computer skills.

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion

Vast amounts of health-related data are generated daily and at an increasing rate. Our ability to extract insights from these invaluable resources depends in large part on the effective and efficient use of computational tools to preprocess, analyze and present data. This is an introductory programming course which aims to provide a solid understanding of and hands-on experience in the R language and enable further work in biostatistics, epidemiology, and machine learning/health data science.

School: Graduate Division
Department: Clinical Research Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
**BIOSTAT 214 Programming for Health Data Science in R II (1.5 Units) Fall**

*Instructor(s):* Efstatios D Gennatas, John Kornak  
*Prerequisite(s):* BIOSTAT 213 or equivalent.

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion

R programming course to enable work in any field including biostatistics, epidemiology, data science/machine learning. This course builds on students’ prerequisite core R language knowledge to cover skills in advanced data transformations, visualization, working with big (in-memory) data, report-writing, and core statistic testing.

**School:** Graduate Division  
**Department:** Clinical Research Program

*May the student choose the instructor for this course?* No  
*Does enrollment in this course require instructor approval?* No  
*Course Grading Convention:*

*Graduate Division course:*

*Is this a web-based online course?* No  
*Is this an Interprofessional Education (IPE) course?* No  
*May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?* Yes

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**BIOSTAT 215 Strengthening causal inferences based on observational data (3-4 Units) Spring**

*Instructor(s):* Thomas B. Newman  
*Prerequisite(s):* EPIDEMIOL 203 BIOSTAT 208 BIOSTAT 209

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects, Lab skills, Lab science, Conference, Discussion

The course will define average causal effects in terms of potential outcomes, show when standard regression methods support causal inferences, and show how to estimate and interpret marginal causal effects. It will also cover propensity scores, for rare outcomes but common binary exposures; marginal structural models, for time-dependent treatments with time-dependent confounder/mediators; new-user designs; instrumental variables, for data with important unmeasured confounders.

**School:** Graduate Division  
**Department:** Clinical Research Program

*May the student choose the instructor for this course?* No  
*Does enrollment in this course require instructor approval?* No  
*Course Grading Convention:*

*Graduate Division course:*

*Is this a web-based online course?* Yes  
*Is this an Interprofessional Education (IPE) course?* Yes  
*May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?* Yes
BIOSTAT 216  Machine Learning in R for the Biomedical Sciences  (3 Units)  Winter
Instructor(s): Jean J Feng, Mark R. Segal, John Kornak  
Prerequisite(s): BOSTAT 202, BOSTAT 208, prior completion or concurrent enrollment in BOSTAT 209, and BOSTAT 213. EPI 204 is highly recommended.

Restrictions: This course is part of the Training in Clinical Research (TICR) Program and may have space limitations. Auditing is not permitted.

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects

This is a course that covers machine learning methods as they apply to areas of biomedical research and will teach how to implement the methods in R. Topics to be covered include: What is Machine learning? Prediction techniques (including classification) and methods for assessing them, Cross-validation, penalized regression methods such as lasso, boosting, bagging and ensemble methods, pattern recognition, deep learning, and data reduction methods, and machine learning meta packages in R.

School: Graduate Division
Department: Clinical Research Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes

BIOSTAT 273  Introduction to Biostatistics  (1 Units)  Fall
Instructor(s): David A Quigley  
Prerequisite(s): None

Restrictions: None

Activities: Lecture, Seminar, Clinical, Fieldwork, Independent Study, Project, Web work, Workshop, Practical Experience, Special Projects

This course provides an introduction to biostatistical methods. The course emphasizes practical considerations required to design studies, perform elementary analysis, and become an informed consumer of statistical data. Topics include study design, exploratory data analysis, the P value and hypothesis testing, power analysis, and reproducible analysis methods using the R statistical environment.

School: Graduate Division
Department: Pharmaceutical Science And Pharmacogenomics Prog
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? Yes
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes