

STAT 305, 2020 Summer Term 2 | Course Description

Instructor: [Ben Bloem-Reddy](#)

An introduction to likelihood and Bayesian principles for statistical models and inference.

Topics covered: Probability theory (quick review), sampling distribution theory, large sample theory and methods of estimation and hypothesis testing, including maximum likelihood estimation, likelihood ratio testing and confidence interval construction.

Pre-requisites: Either (a) one of STAT 200, STAT 203, BIOL 300, STAT 241, STAT 251, COMM 291, ECON 325, FRST 231, PSYC 218, PSYC 366, and one of MATH 302, STAT 302; or (b) a score of 65% or higher in one of MATH 302, STAT 302.

Given the compressed nature of the Summer Term, it will be very difficult to make up for gaps in pre-requisites. You will be expected to independently review any necessary pre-requisite material.

Learning objectives: At the end of STAT 305, you will be able to:

- identify applicable statistical approximations for large samples;
- derive and compute maximum likelihood estimators;
- apply Bayes' theorem to get posterior distributions of parameters and conduct Bayesian hypothesis testing;
- differentiate frequentist and Bayesian approaches to estimation and inference;
- formulate hypotheses appropriate for statistical inference;
- apply the Neyman-Pearson lemma to obtain sensible test statistics;
- interpret results of statistical inference.

Textbook and other materials

Course pack (required): "STAT 305, Introduction to Statistical Inference", by William J. Welch. Available only in hard copy from the UBC bookstore (<https://shop.bookstore.ubc.ca/p-124724-stat-305-ccm-bloem-reddy-001.aspx>). Please order your copy as soon as possible; an electronic version is not available.

Overleaf Student Premium Subscription Plan (required^{*}). Available at overleaf.com. Basic Overleaf accounts are free; we will need features that require a Premium subscription. [Student Premium subscriptions](#) are \$9/month (so \$18 for the duration of this course) or \$90/year ([currently discounted to \\$64/year](#)).

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Format

Method of instruction: We will adapt the “flipped classroom” approach of the in-person version of STAT 305: students are expected to engage with the course notes prior to class, and lectures are organized around problem worksheets.

The current education literature suggests that the flipped classroom model can increase student performance in tests, quizzes, and homework, as well as improve students’ understanding and retention of new material. More information about the flipped classroom model is available on [UBC’s flexible learning webpage](#).

Adaptation to online instruction: In order to accommodate variations in student schedules due to, for example, differences in time zones or in reliability of internet connectivity, all lectures will be pre-recorded. **Three worksheet video lectures will be posted to Canvas (under Assignments) each Tuesday and Thursday throughout the term, with the exception of weeks with a quiz scheduled.** In place of iClicker questions, worksheet videos will have embedded “clicker” questions. (Note: The “clicker” questions are handled entirely by Canvas, so you do NOT need an iClicker for this course.)

Learning activities

- pre-recorded video lectures and “clicker” questions (on Canvas);
- assigned readings from the course text;
- recorded live Q&A sessions with the instructor;
- group lab assignments (group interactions via Canvas + Collaborate Ultra);
- weekly WeBWork assignments;
- weekly suggested written assignments.