

**Statistics 723 H(3-0)**
**Theory of Hypothesis Testing**

**Calendar Description:** Likelihood ratio (LR), union-intersection, most powerful, unbiased and invariant tests, Neyman-Pearson Lemma, Karlin-Rubin Theorem, confidence interval (CI), pivotal quantities, shortest length and expected length CI, uniformly most accurate CI, confidence region, simultaneous CI, large-sample tests (Wald's, score, LR tests), Bayesian hypothesis testing, analysis of variance and linear models.

**Prerequisite:** [Statistics 721](#)

(see Course Descriptions under the year applicable: <http://www.ucalgary.ca/pubs/calendar/> )

*Syllabus*

<u>Topics</u>	<u>Number of hours</u>
<b>Hypothesis testing preliminaries</b> - Null and alternative hypotheses, simple and composite hypotheses, power, size, Type I and Type II errors, significance level, p-value	2
<b>Methods of test construction</b> - Likelihood ratio test (LRT), union-intersection test, intersection-union test, tests in multiparameter case	6
<b>Optimality of tests</b> - Uniformly most powerful test, unbiased test, invariant test, monotone likelihood ratio, Neyman-Pearson Lemma, Karlin-Rubin Theorem	6
<b>Large-sample tests</b> - Asymptotic distribution of LRT statistic, Wald's test, Rao's score test	4
<b>Interval estimation</b> - Confidence intervals (CIs), methods of CI construction, pivotal quantities, shortest length and shortest expected length CIs, uniformly most accurate CIs, large-sample CIs, confidence regions, simultaneous CIs	10
<b>Bayesian hypothesis testing</b> - Decision theoretic approach, loss and risk functions, Bayes factors	2
<b>Bayesian hypothesis testing</b> - Decision theoretic approach, loss and risk functions, Bayes factors	6
<b>Analysis of variance (ANOVA) and linear models</b> – One-way ANOVA, F-test, inference on contrasts, linear regression model, least squares estimation, normal theory inferences	6
<b>TOTAL HOURS</b>	<b>36</b>

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