Course Title: **Statistics II**

Lecturer: Tomohiro Uchiyama

Lecture time: Monday 10:45-12:15 & Wednesday 9:00-10:30  
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**Course Description:**

| An introduction to the ideas, techniques and applications of statistics and probability. This course is a continuation of Statistics I. |

An introduction to the ideas, techniques, and applications of statistics and probability. The emphasis is on applying statistics to problems, selecting sensible techniques, following the methodology and interpreting the results. Understanding the concepts and computer-based solutions are emphasised and applications to commerce, social sciences, humanities, science and engineering are considered. Particular topics include probability, inferences involving two populations, applications of Chi-square, analysis of variances, linear correlations and regression analyses (including confidence intervals, hypothesis testings), and an introduction to multiple regression analyses.

**Learning Outcomes:**

A student who successfully completes this course will:

- understand a range of basic statistical concepts in
  - probability: meaning of probability, sets, events, and distributions;
  - inference involving two populations: hypotheses, tests, test statistics, test interpretations;
  - analysis of variances (ANOVA);
  - linear correlations and regressions;
  - multiple linear regressions.

- perform and interpret a range of basic statistical procedures in
  - probability: calculations and identification/application of distributions;
  - inference involving two populations: hypothesis tests and model buildings.
  - analysis of variances (ANOVA);
  - linear correlations and regressions;
  - multiple linear regressions.
• use Excel and R in performing statistical calculations and producing diagrams;

• identify applications of statistics in other university subjects.

Prerequisites:
Statistics I (or something equivalent). Prior knowledge of Excel and R is essential.

Textbooks:
The text for this course is: Mendenhall, Beaver, Beaver, Introduction to probability and statistics, Cengage Learning.

Assessment:

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<thead>
<tr>
<th>Assessment Type</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Quizzes (weekly)</td>
<td>60%</td>
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<tr>
<td>Final Examination</td>
<td>40%</td>
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<tr>
<td>Presentations</td>
<td>Extra points</td>
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Course Outline:

Week 1. Probability 1:
Events, Probability, Conditional probability, Rules of probability.

Week 2. Probability 2:
Mutually exclusive events, Special addition rule, Independent events, Special multiplication rule.

Week 3. Review of statistical inferences from Statistics I:
Estimations, Hypothesis testings, Confidence intervals.

Week 4. Inferences involving two populations 1:
Dependent and independent samples, Inferences concerning the mean difference.

Week 5. Inferences involving two populations 2:
Inferences concerning the difference between proportions, Inferences concerning the ratio of variances, F-distributions.

Week 6. Applications of Chi-square:
Chi-square statistics, Inferences concerning multinomial experiments, Inferences concerning contingency tables.

Week 7. Analysis of variances 1:
Analysis of variances, Logic behind ANOVA.

Week 8. Analysis of variances 2:
Applications of single factor ANOVA, Hypothesis tests for the equality of several means.
Week 9. Linear correlations and regressions 1:
Linear correlation analysis, Inferences about the linear correlation coefficient.

Week 10. Linear correlations and regressions 2:
Confidence intervals and hypothesis testings, Linear regression analysis.

Week 11. Linear correlations and regressions 3:
Inferences concerning the slope of the regression line.

Week 12. Linear correlations and regressions 4:
Confidence intervals for regression, Prediction intervals, Relationships between correlations and regressions.

Week 13. Introduction to multiple linear regressions:
Multiple linear regressions, Overfitting and Multicolinearity, Coefficient of determination, t-test for the partial regression coefficients, Analysis of variance for multiple regressions, Analysis of variance F-test.

Week 14. Review:
Review and a preparatory test.

Week 15. Final Examination: