



## MATH III (STATISTICS) MATH 210

### Course Description

This course is an introduction to statistical concepts and analytical methods as applied to data in biomedical sciences. It emphasizes the basic concepts of quantitative analysis of data, and statistical inferences. Topics include probability, frequency distributions, central tendency and dispersion; hypothesis testing, confidence intervals for means, variances and proportions; the chi-square statistics; data analysis and linear correlation. The course provides students a foundation to evaluate information critically.

**Credit: 3 credits**

**Repeatable: No**

### Course Structure

The course will be presented in different formats: Lectures, self-directed learning, discussions and student assignments etc.

### Competencies

This course emphasizes competencies to enhance skills essential for a future health care professional.

- Knowledge
  - **Demonstrate content knowledge and skills in foundational courses required by biomedical professionals**
  - Demonstrate information literacy
  - **Demonstrate quantitative reasoning**
  - **Demonstrate longitudinal learning through coursework**
- Critical Thinking
  - **Develop the skills of self-reflection and peer assessment to improve personal performance.**
  - Demonstrate the ability to analyze literature and written material
  - Demonstrate the ability to distinguish between well-reasoned and poorly reasoned arguments
- Communication Skills
  - Demonstrate effective presentation skills to faculty and peers
  - **Demonstrate effective listening skills**
  - Demonstrate effective written communication

**Objectives:**

Upon completion of MATH 210 course, the student should be able to demonstrate:

- Appropriate methods of collecting, analyzing and presenting data.
- Proficiency at computing probabilities of events using the rules and axioms of probability.
- An awareness of different types of probability distributions including their characteristics.
- Competence at determining the probability distributions of discrete and continuous random variables.
- Awareness of the concepts of point and interval estimation for population means, variances and proportions.
- Proficiency in testing hypotheses involving population means and population proportions based on sample statistics
- Competence at conducting tests of significance for association between two nominal variables.
- Competence at conducting tests of significance for the difference between two means.
- Competence at conducting tests of significance for difference between three or more means.
- Competence at conducting tests of significance for linear regression models.

**Schedule:** Dates and times to be posted at the beginning of the term on the online calendar.

### Course Topics / Outline

| Activity | Lecture Topics  |
|----------|---|
| Week 1   | Define and classify variables; Organize and present data, Construct frequency distribution tables; Draw frequency polygons, ogives, stem and leaf plots, box and whiskers plots   |
| Week 2   | Calculate and interpret arithmetic mean, mode, median, trimmed mean, percentiles of discrete ungrouped data, Calculate and interpret range, variance, standard deviation, coefficient of variation  |
| Week 3   | Define correlation and regression; draw scatter diagrams, estimates for parameters of simple regression line; equation of least squares line for a set of data points   |
| Week 4   | Interpret slope and y-intercept of least squares regression line; use equation of least squares line to predict y from x , Calculate and interpret the value of the coefficient of correlation and the coefficient of determination, Define an experiment, outcome, event, sample space, randomness, probability, Define mutual exclusivity and independence of events; calculate simple probabilities, Calculate marginal, joint and conditional probabilities |
| Week 5   | Discrete random variable and associated probability distribution; calculate expected value and variance of discrete random variable, properties of Binomial and Poisson distributions; Binomial and Poisson probability, expected value and variance  |
| Week 6   | Define continuous random variable and associated probability distribution; define Normal probability model; standardize random variable, Determine probability by reading values from the Normal tables, Use the Normal distribution as an approximation to the Binomial  |
| Week 7   | <b>Mid-Term Examination</b>   |

|         |  |
|---------|--|
| Week 8  | Sum, Difference and Combinations of Random Variables, Define the mean and variance of the sampling distribution of the sample mean; use the Central Limit Theorem, Define and use the T-distribution to solve problems, Determine the sample size for a given confidence level and interval width; explain relationship among sample size, interval width and confidence coefficient |
| Week 9  | Explain the reasoning of significance tests; state hypotheses; Define p-value; choose suitable test statistics, explain the use of p-value in decision making, Define Type I and Type II errors; calculate the probability of a Type I and of a Type II error, Test hypotheses for population mean, Test hypotheses for population proportion  |
| Week 10 | Test hypotheses for difference between means, Test hypotheses for the difference between proportions, Define and use Chi-square distribution to test hypotheses, Explain the limitations of the Chi-square test  |
| Week 11 | ANOVA (T-TEST), ANOVA (F_TEST), ANOVA ( $R^2$ )  |
| Week 12 | Multiple Regression Analysis, F-Test   |
| Week 13 | Pre Examination Review   |
| Week 14 | <b>End of Term Examination</b>   |

**Assignments:**

Students present written solutions to questions on each topic assigned.

**Textbooks and Reference Materials:**

David S. Moore, George P. Mc Cabe, Bruce A. Craig. Introduction to the Practice of Statistics. 9<sup>th</sup> edition. Publisher: W. H. Freeman.

**Evaluation:** Students are evaluated by a midterm exam, a final exam, assignments and their attendance.

**Points:**

|              | Points* |
|--------------|---------|
| Assignments  | 20%     |
| Mid Term     | 30%     |
| Final exam   | 40%     |
| Attendance   | 10%     |
| Total points | 100%    |

\*Points are approximate and may be adjusted during the term. Students will be notified of changes.

**Grade:**

| Percent of Points | Letter Grade |
|-------------------|--------------|
| 95-100%           | A(h)         |
| 90-94%            | A            |
| 85-89%            | B+           |
| 80-84%            | B            |
| 75-79%            | C+           |
| 70-74%            | C            |
| <70%              | F            |

**Attendance:**

Students are expected to attend at least 80% of all scheduled learning activities. Attendance in the class will be recorded. Students attended 80% or more will be awarded with 10% on total scoring system. Please note that absences due to illness or misadventure will be factored into the 20% of allowable absences if informed respective faculty or the Dean of Students.

**Policies:**Professional Demeanor

The student should be thoughtful and professional when interacting with faculty and other students. Inappropriate behavior includes the use of offensive language, gestures, or remarks with sexual overtones. Students should maintain a neat and clean appearance, and dress in attire that is generally accepted as professional.

Honesty

Students are expected to demonstrate honesty and integrity in all aspects of their education and in their interactions with faculty, administration, physicians, patients, and fellow students. They will not cheat, plagiarize, or assist others in the commission of these acts.

**Faculty and Office Hours:**

Mr. Marcus Caine, Instructor

Student may schedule an appointment by email.