NASSAU COMMUNITY COLLEGE

DEPARTMENT OF MATHEMATICS/COMPUTER SCIENCE/INFORMATION TECHNOLOGY

Course Syllabus for

MAT 102
Introduction to Statistics

Course Information

- Title — Introduction to Statistics
- Credit Hours — 3 Credits
- Number — MAT 102
- Section — JE
- CRN — 20648
- Semester/Term — Fall 2019
- Meeting time — Monday/Wednesday 12:30 – 1:45
- Location — Wednesday B129

Instructor/Contact Information

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Course Description

- MAT 102: Introduction to Statistics
- *Prerequisites:* Students must have satisfied all MAT, ENG 001and RDG 001 remediation requirements prior to starting the course.
- *Description:* Appropriate and inappropriate uses of statistics, measures of central tendency and variability, basic concepts of probability, the binomial, normal and 't' distributions, testing hypotheses, estimation, chi-square, linear regression, and correlation.
  In addition to the required text book, instructors may optionally recommend supplementary manuals or other aids to assist students in using the built-in statistical functions of the TI-83/84 calculator. As the supplementary manuals and other aids are optional, course work may not be assigned directly from them.
- *Calculator Requirement:* The TI-83 or TI-84 graphing calculator is required and will be used extensively throughout the course. (The TI-83 Plus and the TI-84 Silver Edition are also acceptable.) However, if the student does not already own one of the listed calculators (s) s/he is encouraged to buy the TI-84 Plus Silver Edition.
- MAT 102 satisfies SUNY GEN ED-GMAT; NCC GEN EDMATH. MAT 102 serves as a prerequisite for MAT 103 (Applied Statistics) and MAT 119 (Data Analytics).

DETAILED TOPICS OUTLINE

1. Introduction to Statistics

- Sampling definition with examples
- Basic misuses of statistics covered: misleading graphs, non-representative samples, inappropriate comparisons, etc.

2. Organizing and Presenting Data

- Data Types: discrete-continuous, numerical-categorical.
- Recognize and interpret data presented in graphical form such as line graphs, bar graphs, histograms and pie charts.
- Construction of a stem-and-leaf display, frequency distribution tables for categorical and numerical data that includes class ranges, class boundaries, class marks, frequencies and relative percentages.
- Histograms from numerical data with appropriate labels including class boundaries and frequencies.
- Characteristics of distributions covered: shape (bell, skewed), center, spread, outliers.
- Empirical rule for normal distributions.

3. Numerical Techniques for Describing Data

- Calculation of the mode, range, sample and population means, medians and standard deviations from numerical data.
- Understanding the meaning and relevance of the population standard deviation, σ, and sample standard deviation, s (as an estimate of σ).
- Understanding how means, medians and modes are affected by changes in the data (for example; addition of constants, multiplication by constants, and exclusion of outliers).
- Understanding the operations dictated by basic mathematical formulas such as: $Z = \frac{X - \mu}{\sigma}$
- Characterize distributions as bell shaped (normal), skewed or other.
- Computation of z-scores from raw scores and vice versa.
- Computation of percentile rank, percentiles and quartiles.
- Construction and interpretation of Box-and-Whisker plots using 1-variable stats on the TI-83/84 calculator.
- Construction and interpretation of the 5-number summary for the Box-and-Whisker plot. Discuss outliers.

4. Linear Correlation and Regression Analysis

- Construction of a scatter diagram from sets of raw data.
- Examine scatter diagrams that show obvious linear correlation from those which do not.
- Calculation of the linear regression equation and use it to make predictions (estimates).
- Interpretation of the meaning of the Correlation Coefficient, r, and the Coefficient of Determination, r^2.

5. Probability (*Faculty are strongly advised not to spend more than one lecture on probability unless there is time to cover all outline topics.)*

- Basic concept of the meaning of probability, basic combinations and sample spaces.
- The law of large numbers and methods of assigning probabilities
- Determine probabilities of combinations of mutually exclusive events (addition rule) and independent events (multiplication rule).

6. Random Variables and Discrete Probability Distributions

- Discuss the difference between discrete and continuous random variables.
- Interpretation of the probability Distribution of a Discrete Random Variable.
- Calculation of binomial probabilities using the Binomial Probability Formula and evaluate nCs using the TI-83/84 calculator.

7. Continuous Probability Distributions and the Normal Distribution

- Use of the tables to introduce and enhance instruction is encouraged but the use of the calculator is required.
- Interpret areas of continuous probability distributions. (Apply the continuity correction.)
- Determine areas, z-scores and raw scores using the normal curve with the TI-83/84 calculator.
- Interpret areas under the normal curve as proportions of populations, probabilities of events, percentiles and approximations to binomial experiments.

8. Sampling and Sampling Distributions

- Calculation of the Mean and Standard Deviation of the Sampling Distribution of the Mean.
- Interpretation of the Standard Error of the Mean.
- Applying the Central Limit Theorem ($n > 30$).
- Calculation of probabilities using the sampling distribution of the mean.
- If time permits: Calculations and interpretation of the standard error of the proportion ($np > 10$, $n(1-p) > 10$). Calculate probabilities using the sampling distribution of the proportion.

9. Estimation

- Construction of point estimates, confidence intervals and margin of error of the mean using the t-distribution.
- If time permits: extend these topics to population proportion and determination of sample size.

10-13. Hypothesis Testing

- Cover the basic concepts of hypothesis testing in Chapter 10 and may, at their discretion, use one or more of the hypothesis testing chapters to deal with particular applications.
  - 11. Hypothesis Test Involving a Population Proportion.
  - 11. Hypothesis Test Involving a Population Mean.
  - 12. Hypothesis Test Involving Two Population Proportions Using Independent Samples.
  - 13. Hypothesis Test Involving Two Population Means Using Independent Samples.

Cover the key hypothesis testing topics: use of z-scores, t-scores, alphas and p-values.

For all hypothesis tests, (Chapters 11-13)

utilize the TI-83/84 calculator.
formulate null and alternative hypotheses from verbal problem descriptions.
identify 1TT or 2TT.
identify alpha for the test.
identify and determine the test statistic.
state the decision rule.
reach a conclusion by either (or both)
- obtaining and relating the p-value to α

and/or

- using α to determine the decision rule and relating the test statistic to the critical value(s).

14. Chi-Square

- Construction of a table for calculation of chi-square statistic.
- Formulate and perform hypothesis test for chi-square test of independence using the TI-83/84 calculator.
- Interpretation of the p-value.

15. Inference for Correlation and Regression

- Testing the significance of the correlation coefficient.
- Assumptions for linear regression analysis.

- **Emphasis of Topics:**

Suggested topics for reduced emphasis	Suggested topics for increased emphasis
1. Routine use of formulas to make statistical calculations should be de-emphasized in favor of the calculator. However, the student should at least demonstrate the ability to understand and apply the formulas without use of a calculator.	1. Use of data sets
2. Probability beyond the basic concepts needed for understanding of probability in the Normal distribution and hypothesis tests.	2. Discussion of conclusions that can or cannot be made from statistical analysis.
	3. Writing explanations for conclusions.
	4. Sampling techniques for selecting a representative sample.
	5. Discussion of statistics within newspapers and magazines that can be used to make inferences about contemporary issues.
	6. The importance of objective and clear wording on survey questions.

Learning Outcomes and Objectives

- OBJECTIVES: General

  To enable the student to learn to critically analyze statistical information presented by the media, describe statistical data and develop an understanding of statistical methods frequently encountered in the fields of science, business, politics, health, and the behavioral sciences.
- OBJECTIVES: Specific

  To enable the student to:
  - compute basic descriptive measures.
  - draw appropriate graphs for a data set.
  - understand the concept of sampling distributions.
  - apply statistical theory for the purpose of estimating population parameters.
  - conduct hypotheses tests using the normal, t, and chi square sampling distributions.
  - extrapolate using correlation and regression.

- SUNY General Education Goals & Outcomes

1. Draw Inferences from Mathematical Models
Students will demonstrate the ability to and draw inferences from mathematical models such as formulas, graphs, tables, and schematics.

Outcome

1.1 Mathematical Interpretation
Students will interpret variables, parameters, and other specific information within a mathematical model.

1.2 Draw Inferences
Students will draw inferences about the situation being modeled mathematically.

1.3 Verbal Interpretation
Students will verbally interpret the results of their analysis of the mathematical model.

2. Represent Mathematical Information
Students will demonstrate the ability to represent mathematical information symbolically, visually, numerically and verbally.

Outcome

2.1 Mathematical Information
Students will employ the appropriate representation to display the mathematical information.

2.2 Mathematical Terminology
Students will clearly define variables; draw, scale and label graphs; use correct mathematical terminology and/or language.

3. Employ Quantitative Methods
Students will demonstrate the ability to employ quantitative methods such as arithmetic, geometry, or statistics to solve problems.

Outcome

3.1 Identify Quantitative Methods
Students will be able to identify a specific numeric, algebraic, or statistical method(s) needed to solve a problem .

3.2 Applying Quantitative Methods
Students will apply the method identified, and correctly solve the problem.

4. Check Mathematical Results for Reasonableness
Students will demonstrate the ability to estimate and check mathematical results for reasonableness.

Outcome

4.1 Estimation
Students will estimate and justify a mathematical result to a problem.

4.2 Reasonableness
Students will articulate a justification for the estimate using a clearly defined logical plan.

5. Recognize Limits
Students will demonstrate the ability to recognize the limits of mathematical and statistical methods.

Outcome

5.1 Real Life Comparison
Students will describe how the results of the mathematical model may differ from the real-life situation it is modeling.

5.2 Mathematical Assumptions
Students will articulate the assumptions made in developing a mathematical/statistical model.

Instructional Methods

This course is taught using a variety of instructional methods including lecture, class discussion, and small group work when applicable.

Textbook and Materials

- Required textbook: Introduction to Statistics 10th Ed. by DeSanto, Totoro, Moscatelli & Rojas. Published by Pearson
- Electronic references: http://www.pearsonmylabandmastering.com

Student Responsibilities / Course Policies

- Participation — It is expected that you attend class regularly, arrive on time and stay for the entire period. You should be prepared for class with your text (hard copy or etext), calculator, relevant handouts, notebook, and writing implements. During class, you should be taking notes and participating in our discussions. *All students are expected to show respect for all others at all times – phones are to be turned off. In addition, classroom interruptions will not be tolerated. This includes, but is not limited to, texting, late arrivals, walking out in the middle of class, "private" conversations, etc.* Students are responsible (even if absent) for all material covered in class, all assignments, and announcements made in class.
- Homework — Homework is a necessary component to this class. All homework will be assigned on MyStatLab. Assignments will have an open and a close date. ***You are encouraged to do the HW as soon as it is assigned to avoid any technical problems.*** Assignments will not be reopened due to lack of planning on your part. MyStatLab has other features that you are encouraged to use and take advantage of. *This is your review for exams! Do not wait until an exam is announced to review*.
- Attendance/lateness policy — All students are expected to arrive on time and not leave prior to the end of class. Excessive latenesses/absences will prevent you from taking advantage of replacing a low exam with your final exam grade if it helps your grade. A student that comes excessively late may be marked as absent.
- Missed exams/quizzes policy — There will be ***no make-up exams.***
- Withdrawal — The only way to get a W in this class is to file the proper paperwork and have it preprinted in Banner. Withdrawal requests must be made prior to the day of the final. *If you disappear for any reason and do not get my signature to file the paperwork before the above date, you will receive a UW.*

  An Incomplete will not be offered unless there is a good, documented reason why one is necessary. *You must be passing at the time you request an INC grade.* Any situation that needs consideration should be addressed promptly.

Academic Dishonesty & Plagiarism

Academic dishonesty, which includes plagiarism and cheating, will result in some form of disciplinary action that may lead to suspension or expulsion under the rules of the Student Code of Conduct. Cheating can take many forms including but not limited to copying from another student on an examination, using improper forms of assistance, or receiving unauthorized aid when preparing an independent item of work to be submitted for a grade, be it in written, verbal or electronic form. Anyone who assists or conspires to assist another in an act of plagiarism or any other form of academic dishonesty may also be subject to disciplinary action.

Plagiarism is a particular type of academic dishonesty that involves taking the words, phrases or ideas of another person and presenting them as one's own. This can include using whole papers and paragraphs or even sentences or phrases. Plagiarized work may also involve statistics, lab assignments, art work, graphics, photographs, computer programs and other materials. The sources of plagiarized materials include but are not limited to books, magazines, encyclopedias or journals; electronic retrieval sources such as materials on the Internet; other individuals; or paper writing services.

A student may be judged guilty of plagiarism if the student:

(a) Submits as one's own an assignment produced by another, in whole or in part.

(b) Submits the exact words of another, paraphrases the words of another or presents statistics, lab assignments, art work, graphics, photographs, computer programs and other materials without attributing the work to the source, suggesting that this work is the student's own.

Allegations of student plagiarism and academic dishonesty will be dealt with by the appropriate academic department personnel. It is the policy of Nassau Community College that, at the discretion of the faculty member, serious acts will be reported in writing to the Office of the Dean of Students, where such records will be kept for a period of five years beyond the student's last semester of attendance at the College. These records will remain internal to the College and will not be used in any evaluation made for an outside individual or agency unless there is a disciplinary action determined by a formal ruling under the Student Code of Conduct, in which case only those records pertaining to the disciplinary action may apply. A student whose alleged action is reported to the Office of the Dean of Students will be notified by that office and will have the right to submit a letter of denial or explanation. The Dean will use his/her discretion in determining whether the alleged violation(s) could warrant disciplinary action under the Student Code of Conduct. In that case the procedures governing the Code of Conduct will be initiated.

Copyright statement:

The Higher Education Opportunity Act of 2008 (HEOA) requires the College to address unauthorized distribution of copyrighted materials, including unauthorized peer-to-peer file sharing.

Thus, the College strictly prohibits the users of its networks from engaging in unauthorized distribution of copyrighted materials, including unauthorized peer-to-peer file sharing. Anyone who engages in such illegal file sharing is violating the United States Copyright law, and may be subject to criminal and civil penalties. Under federal law, a person found to have infringed upon a copyrighted work may be liable for actual damages and lost profits attributable to the infringement, and statutory damages of up to $150,000. The copyright owner also has the right to permanently enjoin an infringer from further infringing activities, and the infringing copies and equipment used in the infringement can be impounded and destroyed. If a copyright owner elected to bring a civil lawsuit against the copyright infringer and ultimately prevailed in the claim, the infringer may also become liable to the copyright owner for their attorney's fees and court costs. Finally, criminal penalties may be assessed against the infringer and could include jail time,

depending upon the severity of the violation. Students should be aware that unauthorized or illegal use of College computers (such as engaging in illegal file sharing and distribution of copyrighted materials), is an infraction of the Student Code of Conduct and may subject them to disciplinary measures. To explore legal alternatives to unauthorized downloading, please consult the following website: http://www.educause.edu/legalcontent.

Course Resources

- Web sites: www.mymathlab.com, khanacademy.com, purplemath.com
- Library services: Textbook is available at the reference desk at the NCC library
- Labs and learning centers: If needed, students are encouraged to avail themselves of further study and/or educational assistance available in the Mathematics Center located in B-l30. These activities and use of the resources provided are designed to help the student master necessary knowledge and skills.
- Extra help options Office hours, if available and the Mathematics Success Center (B116) and the Mathematics Center (B130).

Assessments and Grading Methods

- **Exams: 20% each** – There will be **THREE** interim tests. ***There are no make-up exams.*** Any missed test will be given a grade of zero. *Students are advised that absences in excess of 10% of the total class meetings many be dropped from the course (From the online catalog, page 30).* With this in mind, any student who has **no more than three absences** may use their final exam grade to also replace a missed exam or low grade if it helps their test average. Any student with more than three absences will have their grade based upon the work completed including zeroes for missed work.
- **Homework: 20%** – there will be homework assigned nightly through MyStatLab. These are due by the end of day of the next class meeting.
- **Final Exam: 20%** – there will be a cumulative final.

Americans with Disabilities Statement & Non-Discrimination Statement (NCC Required)

- "If you have a physical, psychological, medical, or learning disability that may have an impact on your ability to carry out the assigned coursework, I urge you to contact the staff at the Center for Students with Disabilities (CSD), Building U, (516)572-7241, TTY (516)572-7617. The counselors at CSD will review your concerns and determine to what reasonable accommodations you are entitled as covered by the Americans with Disabilities Act and section 504 of the Rehabilitation Act of 1973. All information and documentation pertaining to personal disabilities will be kept confidential."

Course Schedule and Important Dates

MAT 102 - JE Fall 2019 Tentative Schedule

The following is intended to provide you with a tentative outline of how this course will progress. Dates of exams may be adjusted to account for progress of the class as a whole.

Class #	Day	Date	Topics	Assignments
Day 1	Wed	4-Sep	1.1 - 1.2: Introduction to Statistics 2.1 - 2.2: Classification of Data	
Day 2	Mon	9-Sep	2.3 - 2.4: Organizing and Presenting Data	
Day 3	Wed	11-Sep	2.5: Organizing and Presenting Data (continued)	
Day 4	Mon	16-Sep	2.7: Interpreting Graphs 3.1: Measures of Central Tendency	
Day 5	Wed	18-Sep	3.2 - 3.3: Measures of Variability	
Day 6	Mon	23-Sep	3.4: Measures of Relative Standing	
Day 7	Wed	25-Sep	5.4 - 5.5: Basic Probability	
Day 8	Wed	2-Oct	6.1 - 6.3: Random Variables and Discrete Probability Distributions	
Day 9	Mon	7-Oct	**Exam I on chapters 1, 2, 3, 5**	
Day 10	**Mon**	14-Oct	7.1 - 7.2: Continuous Probability Distributions 7.3 - 7.4: The Normal Distribution	
Day 11	Wed	16-Oct	7.5 - 7.6: The Normal Distribution and its Applications	
Day 12	Mon	21-Oct	7.7 - 7.8: Percentiles and Probability	
Day 13	Wed	23-Oct	8.1 - 8.4: The Sampling Distribution of the Mean	
Day 14	Mon	28-Oct	8.5: Calculating Probbilities using the Sampling Distribution of the Mean 8.6: The Effect of Sample Size on the Standard Error of the Mean	
Day 15	Wed	30-Oct	8.7: The Sampling Distribution of the Proporition 9.1 - 9.3: Point Estimation	
Day 16	Mon	4-Nov	9.4 - 9.6: Confidence Intervals for the Population Mean and Proportion	
Day 17	Wed	6-Nov	**Exam II on chapters 6, 7, 8**	
Day 18	Mon	11-Nov	10: Introduction to Hypothesis Testing	
Day 19	Wed	13-Nov	11.1 - 11.3: Hypothesis Testing Involving One Population	
Day 20	Mon	18-Nov	11.4 - 11.6: Hypothesis Testing Invovling One Populatin (continued)	
Day 21	Wed	20-Nov	12: Hypothesis Testing Involving Two Popuation Proportions	
Day 22	Mon	25-Nov	Chapter 14: The Chi-Square Distribution	
Day 23	Wed	27-Nov	Chapter 14: Test of Independence	
Day 24	**Mon**	2-Dec	**Exam III on chapters 9, 10, 11, 12, 14**	
Day 25	Wed	4-Dec	4.1 - 4.3 : Linear Correlation and Regression Analysis	
Day 26	Mon	9-Dec	4.4 - 4.6 : Linear Correlation and Regression Analysis (continued)	
Day 27	Wed	11-Dec	15.1 - 15.4: Inferences for Linear Correlation and Regression	
Day 28	Mon	16-Dec	15.1 - 15.4: Inferences for Linear Correlation and Regression (continued)	
Day 29	Wed	18-Dec	Review/wrap-up	
Day 30	Mon	23-Dec	**Cumulative Final Exam**	