Master Course Syllabus

Your College, Your Future

Established 1969

MAT-120
PROBABILITY AND STATISTICS

Course Number	MAT 120
Course Title	Probability and Statistics
Credit Hours	3
Prerequisites	A C or Higher in MAT 102 Intermediate Algebra or MAT 110 College Algebra or placement
Course Description	This course includes introductory probability and statistics, including organization of data, sample space concepts, random variables, counting problems, binomial and normal distributions, central limit theorem, confidence intervals and test hypotheses for large and small samples; types I and II errors; linear regression; and correlation.
Course Objectives	Distinguish between a population and a sample.
	Distinguish between a parameter and a statistic.
	Distinguish between descriptive statistics and inferential statistics.
	Distinguish between qualitative data and quantitative data.
	Classify data with respect to the four levels of measurement: nominal, ordinal, interval, and ratio.
	Determine the method of data collection (observational study, experiment, simulation, or survey.
	Design an experiment.
	Create a sample using different sampling methods (simple random sampling, stratified sampling, cluster sampling, and systematic sampling).
	Identify a biased sample.
	Construct a frequency distribution including limits, midpoints, relative frequencies, cumulative frequencies, and boundaries.

Construct frequency histogram, frequency polygons, relative frequency histograms, and ogives.

Graph quantitative data sets using exploratory data analysis tools of stem-and-leaf plots and dot plots.

Graph and interpret paired data sets using scatter plots and time series charts.

Graph qualitative data sets using pie charts and Pareto charts.
Find the mean, median, and mode of a population and a sample.

Find a weighted mean of a data set and the mean of a frequency distribution.

Describe the shape of a distribution as symmetric, uniform, or skewed and how to compare the mean and median of each.

Find the range of a data set.

Find the variance and standard deviation of a population and a sample.

Use the Empirical Rule and Chebychev's Theorem to interpret standard deviation.

Approximate the sample standard deviation of grouped data.

Find the quartiles and interquartile range of a data set.

Draw a box-and-whisker plot.

Interpret other fractiles such as percentiles.

Find and interpret the standard score.

Identify the sample space of a probability experiment and to identify simple events.

Use the Fundamental Counting Principle to find the number of ways two or more events can occur.

Distinguish among classical probability, empirical probability, and subjective probability.

Find the probability of the complement of an event and how to find other probabilities using tree diagrams and the Fundamental Counting Principle.

Find conditional probabilities.

Distinguish between independent and dependent events.

Use the Multiplication Rule to find the probability of two events occurring in sequence.

Determine whether two events are mutually exclusive.

Use the Addition Rule to find the probability of two events.

Find the number of ways a group of objects can be arranged in order and number of ways to choose several objects from a group without regard to order.

Use counting principles to find probabilities.

Distinguish between discrete random variables and continuous random variables.

Determine whether a distribution is a probability distribution.
Construct a discrete probability distribution and its graph and find the mean, variance, and standard deviation of a discrete probability distribution.

Find the expected value of a discrete probability distribution.
Determine whether a probability experiment is a binomial experiment.

Find binomial probabilities.

Construct a binomial distribution and its graph and find the mean, variance, and standard deviation of a binomial probability distribution.

Interpret graphs of normal probability distributions.

Find and interpret z-scores.

Find areas under the standard normal curve.

Find probabilities for normally distributed variables.

Find a z-score given the area under the normal curve.

Transform a z-score to an x-value.

Find a specific data value of a normal distribution given the probability.

Find sampling distributions and verify their properties.

Interpret the Central Limit Theorem.

Apply the Central Limit Theorem to find the probability of a sample mean.

Decide when the normal distribution can approximate the binomial distribution.

Find the correction for continuity.

Use the normal distribution to approximate binomial probabilities.

State a null hypothesis and an alternative hypothesis.

Identify type I and type II errors.

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	Determine whether to use a one-tailed or a two-tailed statistical test. Interpret a decision based on the results of a statistical test. Find P-values and use then to test a mean. Use the t-test to test a mean. Use technology to find P-values and use them with a t-test to test a mean. Use a z-test to test a population proportion. Construct a scatter plot. Find a correlation coefficient. Perform a hypothesis test for a population correlation coefficient ϱ (rho). Find the equation of a regression equation. Predict y-values using a regression equation. Find and interpret the coefficient of determination. Use a multiple regression equation to predict y-values.
Course Developer	Isaac Docsol
Means of Instruction	Lecture
Required Textbook/Written Materials/Supplies	*See Booklist online for current book.*

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General Education Core Competencies

General Education Core Competencies	Course Methodology, Content and/or Assessment
Communication: Students will be able to communicate effectively through reading, writing, speaking and listening. • Prepare written documents in a professional manner. • Develop oral communication skills to present information in a professional and appropriate manner. • Demonstrate appropriate listening skills in one-on-one and small and large group settings.	Students will create lab reports using a word processor and will display graphs in a professional manner using TI Connectivity Kit software or Microsoft Excel. Students will develop oral and written communication skills and listening skill by working in small groups, cooperative learning activities, and laboratory settings. On tests, quizzes, and the Final Exam, students will be expected to write the final answers of some constructed response questions (short answer, essay, true/false) in complete sentences or face penalties for noncompliance (points will be deducted). Students are expected to show all work and calculations and explain or justify answers.

General Education Core Competencies	Course Methodology, Content and/or Assessment
Mathematical Reasoning: Students will apply those mathematical skills appropriate to their program of study. • Analyze and solve mathematical problems needed in the workplace, daily life and educational environment. • Interpret data using analytical methods.	Students will use mathematical concepts and techniques to analyze and solve real-world applications across several contexts and disciplines (Business and Economics, Life Sciences, Social and Behavioral Sciences, Physical Sciences, & General). Students will apply Intermediate Algebra concepts and analyze and/or interpret data using mathematical techniques in in-class and out of class laboratory assignments/projects.
Critical Thinking: Students will employ effective processes for resolving problems and making decisions. • Identify problems and potential causes. • Solve problems using basic research, analysis and interpretation. • Evaluate results of solutions and revise strategies as indicated by findings.	Students will develop critical thinking skills by successfully completing laboratory activities, quizzes tests, final exam, and the final capstone activity. When tests, quizzes, and other assessments are returned to the student, the student is expected to engage in error analysis to minimize the probability of future errors in his or her work.

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Technology Utilization: Students will apply knowledge of computers on a level compatible with job and/or educational demands. • Demonstrate a basic knowledge of computer applications including word processing, spreadsheets, databases, and presentation software. • Use basic operating system functions competently (e.g. store and retrieve data, load software). • Demonstrate communication and research skills through use of the internet.	Student will use graphing calculators in class when learning mathematical concepts in this course. Students will use TI Connectivity Kit software, Microsoft Word, Excel, PowerPoint, and the Internet in completing course assignments. Students will create lab reports using a word processor and will display graphs in a professional manner using TI Connectivity Kit software or Microsoft Excel.

General Education Core Competencies	Course Methodology, Content and/or Assessment
Interpersonal Skills: Students will deal effectively and appropriately with others. • Interact well with individuals and groups from diverse backgrounds and cultures. • Work with others in situational analysis, problem solving, and task accomplishment. • Demonstrate respect for the rights, work, and views of others.	Students will develop interpersonal skills by working in small group and cooperative learning group situations. When students are working in these situations, the student is expected to work with a positive attitude and mutual respect with other support group members and assist the team in accomplishing stated objectives and/or goals.
Professionalism: Students will exhibit professionalism through observances of a code of ethics, a sense of responsibility, good habits, and a positive attitude. • Demonstrate personal and business integrity and ethics. • Recognize, manage, and cope with the transitions of change. • Utilize informational resources for lifelong learning.	The student will have to show the ability and proper attire, to project professionalism in the industrial/ mechatronics field. Be eager for a lifelong learning career.

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College Policies

Policy Type	Policy Description
Attendance Policy	Williamsburg Technical College does not require specific attendance in a course. Acknowledging that participation supports student success in coursework, however, individual instructors may set attendance guidelines for the course. Those specific guidelines must be included in the course syllabus. (*See Syllabus Addendum provided by the instructor.*) In addition, students must attend during the first two weeks of class or inform the instructor of their intent to attend to remain on the class roster. If no prior arrangements have been made and the student does not attend during the first two weeks following the semester start date, the student will be dropped as a "no show" from that course following the second week of class. Class rosters will be final as of the end of the second week of classes. Students may withdraw from a class at any time by completing a withdrawal form in the Student Services Office. A student can only receive a "WP" grade if withdrawal is completed in the Student Services Office prior to the last date to receive a "WP" grade published in the academic calendar. Students who fail to withdraw by the specified time will receive a letter grade for the course. For specific procedures related to this policy, refer to WTC Procedure D-23.1.

Policy Type	Policy Description
Policy for Students with Disabilities	The Student Affairs Division provides counseling and support services which help students with disabilities to pursue academic programs of their choice and participate fully in campus life. The AVP for Student Affairs can arrange counseling, special parking, priority registration, and other reasonable services needed by students with disabilities. Students with disabilities are encouraged to contact the AVP for Student Affairs to discuss needs and concerns as they arise.
Policy for Academic Misconduct	All forms of academic dishonesty including, but not limited to, cheating on tests, plagiarism, collusion, and falsification of information will call for discipline. See the Student Code & Grievance Procedure in the Williamsburg Technical College Catalog for details.

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Grading Policy	The College operates on the semester hour system, and the following symbols are used in grading: A-- Excellent B -- Above Average C -- Average D -- Passing F -- Failure I -- Incomplete WF -- Withdrawal while failing WP -- Withdrawal while passing
Policy for Class Safety and Emergencies	Injuries must be reported to the AVP for Student Affairs immediately. Insurance claim forms are available in the Student Affairs division. Please refer to the college catalogue for more information on how Williamsburg Technical College addresses safety and emergency issues. For additional information, contact Student Affairs at 843.355.4162. Students taking coursework at off-site locations are responsible for reading and adhering to all safety instructions and guidance at the off-site location. Health Services and First Aid Williamsburg Technical College is a commuter institution; therefore, infirmary facilities are not provided. Basic first aid for minor injuries is available, and first aid kits are located in various departments of the College. Major illness or injury will be treated by health professionals. The campus is located adjacent to Williamsburg Regional Hospital. Each student is covered by accident insurance at no additional cost. This group insurance covers the student while on campus and during college-sponsored group travel.