Department of Mathematical and Physical Sciences, East West University

**Course Outline for Fall 2023**

**Course Code:** STA102 **Title:** Statistics and Probability **Credits:** 3

**Teacher:** M H M Imrul Kabir
Senior Lecturer
Department of Mathematical and Physical Sciences, EWU

**Office:** Room # FUB – 904, East West University
E-mail: ikabir@ewubd.edu

**Class & Office Schedule**

| Days | Office Hours | Class Hours | Course Code | Room No. |
|---|---|---|---|---|
| **Sunday (S)** | 03:10 – 04:40 | 11:50 – 01:20<br>01:30 – 03:00 | MAT101(**19**)<br>STA102 **(3)** | AB3-902<br>FUB-404 |
| **Monday (M)** | 01:30 – 03:00 | 11:50 – 01:20 | STA102 **(4)** | FUB-404 |
| **Wednesday (W)** | 01:30 – 03:00 | 11:50 – 01:20 | STA102 **(4)** | FUB-404 |
| **Thursday (R)** | 03:10 – 04:40 | 11:50 – 01:20<br>01:30 – 03:00 | MAT101(**19**)<br>STA102 **(3)** | FUB-703<br>FUB-404 |
| **Saturday (A)** | 12:01 – 03:00<br>(MS students) | 09:00 – 12:00 | DSA511 **(1)** | 530 (Lab-2) |

**Books:**

1. Devore JL, Farnum NR, and Doi JA. Applied Statistics for Engineers and Scientists, 3rd *edition*, Cengage Learning.
2. Mendenhall, W III, Beaver RJ, and Beaver BM. Introduction to Probability and Statistics, 15th *edition*, Cengage Learning.

**Score Distribution:**

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|---|---|
| Midterm | 30% |
| Assignment | 15% |
| Quiz | 15% |
| Attendance | 10% |
| Final | 30% |
| **Total** | **100%** |

**Grading System:**

| Marks | Grade | | Marks | Grade |
|---|---|---|---|---|
| 80-100 | A+ (4.00) | | 55- below 60 | B- (2.75) |
| 75-below 80 | A (3.75) | | 50-below 55 | C+ (2.50) |
| 70- below 75 | A- (3.50) | | 45- below 50 | C (2.25) |
| 65- below 70 | B+ (3.25) | | 40- below 45 | D (2.00) |
| 60-below 65 | B (3.00) | | Below 40 | F (0.00) |

**Course Rationale:** For engineering students, the course introduces the different statistical techniques useful for research and practice. The emphasis is on applications rather than proofs, but understanding the concepts and the ability to communicate the meaning of the results is vital.

**Course Learning outcomes**

After completing the course, students would be able to.

1. Choose appropriate standard sampling techniques for data collection, and present the data with graphs, tables, and numerical summaries.
2. Evaluate the relationship between two or more variables by correlation and regression analysis.
3. Apply basic probability concepts such as conditional probabilities, independence, and Bayes Rule to calculate probabilities of events in different engineering problems.
4. Identify and apply discrete and continuous distributions appropriately in engineering problems like quality control and reliability engineering.
5. Demonstrate the concepts of simple stochastic processes in discrete time: Markov chains, Queuing process, and their applications.
6. Calculate and interpret confidence intervals for estimating population parameters.
7. Perform a hypothesis test to decide population parameters.

**Ground rules:**

1. Zero tolerance for any cheating in exams.
2. Minimum attendance should be 80%.
3. No makeup exams.

## Detailed Course Outline & lesson plan (approximate):

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| Lesson 01 | **Basic Statistical terms:** Nature and scope, Nature of statistical data, Attributes, and variables, Discrete and continuous variables; |
| Lesson 02 | **Basic Statistical terms:** Levels of measurement; Methods of data collection; |
| Lesson 03 | **Tabular presentation:** Frequency table of numeric and categoric data, contingency table of two categoric variables; |
| Lesson 04 | **Graphical presentation:** Histogram, Bar diagram, Pie-chart, Frequency polygon, Ogive; |
| Lesson 05 | **The measure of location:** characteristics of an ideal measure, Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode; |
| Lesson 06 | **Quantiles:** Quartiles, Deciles and Percentiles;<br>**Measures of dispersion:** Range, Mean deviation, Standard deviation, Coefficient of variation; |
| Lesson 07 | **Skewness and kurtosis;**<br>**Graphical Presentation:** Stem and leaf plot, Box plot, Outlier and its detection with box plot; |
| Lesson 08 | **Regression and correlation:** Scatter diagram, Relation between variables, Simple correlation, Fitting of regression lines; |
| Lesson 09 | **Regression and correlation:** Fitting of regression lines (cont.), Multiple correlation and regression; |
| Lesson 10 | **Theory of probability:** Experiment, Sample space, Event, and mutually exclusive event. Rules of Addition; |
| Lesson 11 | **Theory of probability:** Rules of multiplication, Conditional probability, and independence, Tree diagram, Theorems of total, compound, and conditional probability, Bayes theorem; |
| Lesson 12 | **Random variables:** Discrete and continuous random variables, Probability function, Expectation of sum and products, and variance of random variables; |
| Lesson 13 | **Probability distributions:** Concepts; Binomial distribution, Poisson distribution; |
| Lesson 14 | **Probability distributions:** Normal distribution (with the application of Quality Control); |
| Lesson 15 | **Probability distributions:** Exponential distribution with application in reliability; Uniform distribution; |
| Lesson 16 | **Stochastic process:** Random process, Autocorrelation function of a random process, Multiple random processes, Markov process; |
| Lesson 17 | **Queuing process.** |
| Lesson 18 | **Sampling techniques:** Probabilistic and Non-probabilistic sampling methods; |
| Lesson 19 | **Concept building of a hypothesis test and confidence interval:** Formulation of hypothesis, Test statistic, Decision rule, and how to get the decision; |
| Lesson 20 | **Test of significance and confidence interval:** Means, Variance; |
| Lesson 21 | **Test of significance and confidence interval:** Proportion, Correlation coefficients, Regression coefficients. |