

	<b>Independent University, Bangladesh</b>			
	Department of Physical Sciences			
	Semester	Course code	Course Title	Section
Spring 2016	MAT 211	Probability and Statistics	01	

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**Pre-requisite:** MAT 101 or equivalent.  
**Instructional Format p/w:** 2×1½ -hours lectures

### Course objectives

An understanding of statistics is needed in the implementation of uncertainty calculations in different fields. It is understandable clearly by anyone, today information is everywhere and one will be bombarded with the numerical information. What is needed then? Skills are needed today to deal with all of numerical information. First, need to be critical consumers of information presented by others and second, need to be able to reduce large amounts of data into a meaningful form so that one can make effective interpretations, judgments and decisions. The course ‘MAT 211 Probability and Statistics’ is an important foundation course offered by IUB and suited for all undergraduate students who wish to major under the non-SECS, IUB. It covers all the elementary topics in statistics and explains how theories can be applied to solve real world problems. Topics include: Descriptive Statistics Techniques, Probability Theory with Important Probability Distributions, Sampling Theory, Statistical Inference, Linear Correlation and Regression Theories.

By the end of the course, students should able to:

- (1) Follow statistical arguments in reports and presentations
- (2) Understand how to apply the statistical tools to make effective decisions and find that many of the topics and methods students learn can be used in other courses in their future education
- (3) Finally, express statistical findings in non-technical language.

**Textbook:** All students should collect:  
 Anderson D.R., Sweeney, D.J. and Thomas A.W. (2011), Statistics for Business and Economics (11th Edition), South-Western, A Division of Thomson Learning.

### Recommended Reference

Murray R. Spiegel and Larry J. Stephens (2008), Schaum’s Outline of Theory and Problems of Statistics (Fourth edition), Schaum’s Outline Series, McGraw-Hill.

## Evaluation criteria

Homework will be assigned weekly. Students are not required to hand those back for grading but completing the given homework is essential for understanding the material and performing satisfactorily on examinations.

### The weighting scheme is as follows:

Class Attendance:	5%
Two Class tests (CT):	35%(20% + 15%)
Mid-term test (MT):	20%
Final test (FT):	40%

## Rules and regulations

- Students are required to attend classes on time and to take well-organized notes.
- If a student misses or fails to attend a class, it is his/her sole responsibility to obtain missing information (for examples, change of exam dates, omit/add some topics, lecture notes, new home works etc).
- For a test, no extensions or alternative times are possible and also there is no word for make-up.
- For any unavoidable circumstances, the test will be strictly held on the next lecture.
- No extra work will be given to improve the grade.
- Students are required to show matured behaviour in class. For examples, cellular phones will be shut off during class lectures and examinations. Eating, drinking, chewing gum, reading newspapers, socialization and sleeping are not permitted in class.
- **Any kinds of cheating in class are strictly prohibited and may result in a failing grade for the course.**
- Students are advised to obtain a scientific calculator for use in the class. It is noticeable that the two variables calculator is needed for all types of calculations.

## Grading scales

Above 85%:	A
81% - 85%:	A-
76% - 80%:	B+
71% - 75%:	B
66% - 70%:	B-
61% - 65%:	C+
56% - 60%:	C
51% - 55%:	C-
46% - 50%:	D+
40% - 45%:	D
Below 40%:	F

## Incomplete (I-Grade)

I-grade will be given only to a student who has completed the bulk of the course works and is unable to complete the course due to a serious disruption not caused by the student's own slackness.

**Mid-term and Final Test:** All sections will have a common examination. Materials and dates will be announced later.

## Course Plan

Lecture #	Topics	Text/Reference
Lecture 1	Introduction: Definition: variable, scales of measurement, raw data, qualitative data, quantitative data, cross-sectional data, time series data, census survey, sample survey, target population, random sample, computer and statistical packages	Course Guide, pp.7-8  HW: Text Ex: 2,4,6,9-13, pp.21-23
Lecture 2	Summarizing qualitative data- Frequency distribution, relative frequency distribution, bar chart, pie chart Applications from real data  Summarizing quantitative data- Frequency distribution, relative frequency distribution, cumulative frequency distribution, Applications from real data	Course Guide, pp.9-11 HW: Text Ex:4-10, pp.36-39  HW: Text Ex:15-21, pp.46-48 Ex: 39, 41 and 42, pp.65-67
Lecture 3	Histogram, ogive, line chart, stem and leaf display Applications from real data  Summarizing bi-variate data: Cross-tabulation, scatter diagram, Applications from real data	Course Guide, pp.12-14  HW: Text Ex:15-21, pp.46-48 Ex:25-28, pp.52-53  HW: Text Ex:31, 33-36, pp.60-61
Lecture 4	Measures of average: simple mean, percentiles (median, quartiles), mode Applications from real data	Course Guide, pp.15-16  HW: Text Ex: 5-10, pp.92-94
Lecture 5	Measures of variability: variance, standard deviation, coefficient of variation, detecting outliers (five number summary), Applications from real data	Course Guide, pp.17-18  HW: Text Ex: 16-24, pp.100-102 Ex: 40-41, pp.112-113
Lecture 6	Review	Lecture 1 - Lecture 5
Lecture 7	Class Test 1(20%)	Topic Lecture 1-Lecture 5
Lecture 8	Working with grouped data, weighted mean, skewness, kurtosis, case study	Course Guide, pp.20-28

		HW: Text Ex: 54-57, pp.128-129  Text: Case problems 1, 2, 3, 4, pp.137-141
Lecture 9	Probability Theory:  Random experiment, random variable, sample space, events, counting rules, tree diagram, probability defined on events	Course Guide, pp.29-33  HW: Text Ex: 1-9, pp.158-159 Ex: 14-21, pp.162-164
Lecture 10	Basic relationships of probability: addition law, complement law, conditional law, multiplication law	Course Guide, pp.34-36 HW: Text Ex: 22-27, pp.169-170 Ex: 32-35, pp.176-177
Lecture 11	Review	Lecture 8 - Lecture 10
<b>Lecture 12</b>	<b>Mid-term test (20%)</b>	<b>Topic: Lecture 8-Lecture 10</b>
Lecture 13	Normal Distribution	Course Guide, pp.38-40 Text, Ex: 10-25, pp.248-250
Lecture 14	Lecture 13 continued	HW: Text Ex: 10-25, pp.248-250
<b>Lecture 15</b>	<b>Class test 2(15%)</b>	<b>Topic: Lecture 13 - Lecture 14</b>
Lecture 16	Target population, random sample, table of random numbers, simple random sampling, point estimates (sample mean and sample SD)	Course Guide, pp.42-44 HW: Text Ex: 3-8, pp.272-273
Lecture 17	Interval estimation: Parameter, statistic, margin of error (ME), statistical tables (z-table, t-table, chi-square table, F-table), confidence interval of population mean, confidence interval of population SD, Applications from real data	Course Guide, pp.45-53 HW: Text Ex:5-10, pp.315-316 Ex: 4-8, pp.457-459
Lecture 18	Interval estimations about two population means, two standard deviations  Applications from real data	Text, Chapter 10, pp.408-410, p.416 HW: Text Ex: 4-8, pp.413-415 Ex: 13, p.421
Lecture 19	Test of hypothesis  Concept of hypothesis, null hypothesis, alternative hypothesis, one-tail tests, two-tail test, tests of population mean (large samples test, small	Course Guide, pp.55-67  HW: Text Ex:15-22, pp.369-370 Ex: 9-12, p.459

	<p>samples test), test of population SD</p> <p>Applications from real data</p>	
Lecture 20	Lecture 19 continued	Course Guide, pp.55-67
Lecture 21	<p>Test of hypothesis</p> <p>Tests of two populations means, two standard deviations</p> <p>Applications from real data</p>	<p>Course Guide, pp.68-69</p> <p>Text, Chapter 11</p> <p>HW: Text</p> <p>Ex:12-18, pp.420-423</p> <p>Ex:16-22, pp.465-466</p>
Lecture 22	<p>Correlation analysis</p> <p>Concepts of covariance and correlation (Numerical measures of bi-variate data),</p> <p>Regression analysis</p> <p>Linear and multiple regression model, prediction, coefficient of determination</p> <p>Applications from real data</p>	<p>Course Guide, pp.70-79</p> <p>Text, Ex: 47-51, pp.122-124</p>
Lecture 23	Lecture 22 continued	<p>HW: Text</p> <p>Ex: 4-14, Ex: 18-21, pp.570-582</p>
Lecture 24	Review of Final Test (40%)	<b>Topics and date will be announced later</b>