Syllabus
Department of Statistics

Four Year B.Sc Honours Course
Effective from the
Session : 2009–2010
National University
Subject: Statistics
Syllabus for Four Year B.Sc Honours Course
Effective from the Session: 2009-2010

Year wise courses and marks distribution

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Detailed Syllabus

First Year

Course Code: 3653, Course Title: Introductory Statistics    Marks 100, 4 Credits, 60 Lectures

Statistics- Definition, scope:
History of statistics, its definition, nature and characteristics, Method of statistics, Scope and application of statistics, Abuse of statistics, Sources of statistical data, Primary and secondary sources of data.

Processing of Data: Measurement of scales; Variables, Attributes, Classification, Characteristic and basis of classification, Array formation. Tabulation, Different types of tables, Frequency distribution.

Presentation Data: Graphical presentation of data, Details of different types of graphs and charts with their relative merits and demerits.

Characteristics of statistical Data: Measures of Location, Dispersion, Skewness, Kurtosis and their properties, Moments, Related theorems with their proofs.

Exploratory Data Analysis: Stem-and-leaf plot using the right number of stems, Box-and-Whisper plots.

Relationship between Variables: Bivariate data, Scattered diagram, Simple correlation, Rank correlation, Correlation ratio, Simple regression analysis. Standard error of estimators of regression coefficients & their properties, Fitting of regression lines.
Books Recommended:
iii) Mostafa, M.G. : Method of Statistics
vi) Anderson, R.L. and Bancraft, T.A.: Statistical Theory in Research

Course Code: 3654, Course Title: Introductory Probability         Marks 100, 4 Credits, 60
Lectures

Elements of set theory, Experiment, Random Experiment, Sample Space, Event Space, Union and Intersection of Events, Different types of events.

Basic concepts of probability: Meaning of probability, Scope of probability, Different approaches of defining probability. Multiplication rule, permutation & combination. Conditional probability, Theorems on conditional probability. Theorem of total probabilities, Bayes theorem and its uses and importance in statistics.

Random Variables: Discrete and continuous random variables, probability mass function, probability density function. Function of random variables and its distribution, joint distribution, marginal and conditional distribution, independence of random variables, mathematical expectation, expectations of sum and products of random variables, conditional expectation and conditional variance. Moments and moment generating functions, Characteristics function, Cumulants and cumulant generating functions, Relation between moments and cumulants.

Detail study of Bernoulli, Bionomial and Poisson distribution.

Books Recommended:
Course Code: 3655, Course Title: Linear Algebra Marks 100, 4 Credits, 60 Lectures

Vector set: **Length angle between two vectors of normalized vectors**, Unit vector sets, linearly dependent and independent vectors Orthogonal vectors, Gram-Schmidt orthogonalization process, Normalization & sweep-out process, vector space & Sub-space and their rank & basis, sub-set & Superset of vectors and related theorems.

**Determinant and matrix**: Distinction between square matrix and determinant. Evaluation of $n \times n$ determinants & their properties and their uses in statistics. Different types of matrices; definitions with examples, matrix operations, rank and elementary transformation of matrices, related theorems of ranks, trace of a matrix, its properties with proofs.


**Books Recommended:**

(i) Santinirayan : A Textbook of Matrices.
(iii) Scrale, S.R : Linear Models.
(v) Ali, M. I : Matrix Algebra
(vi) Abdur Rahman : College Linear Algebra.

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Course Code: 3651, Course Title: Lab-1 (Descriptive Statistics and Probability distributions) Marks 50, 2 Credits, 30 Lectures


Course Code: 3652, Course Title: Lab-2 (Linear Algebra) Marks 50, 2 Credits, 30 Lectures

**Vector**: Rank basis, dimension & orthogonal vectors by the Gram-Schmidt orthogonalization process, orthonormal vectors, linear dependence and independence of vectors etc.

**Linear Algebra**: Rank of a matrix, transpose, Determinant inversion, Trace Solutions of simultaneous
Course Code: 6373, Course Title: Fundamentals of Mathematics    Marks 100, 4 Credits, 60 Lectures

**Real Number System:** Field and order properties, Natural numbers, Integers and rational numbers, Absolute value and their properties, Basic inequalities.

**Complex Number System:** Field of Complex numbers, De Moivre's theorem and its applications.

**Theory of equations:** Relations between roots and coefficients, Symmetric functions of roots, Sum of the powers of roots, Synthetic division, Des Cartes’ rule of signs, Multiplicity of roots, Transformation of equations.


**System of Linear Equations:** System of linear equations (homogeneous and non-homogeneous) and their solutions. Gaussian elimination, Application of matrices and determinants for solving system of linear equations. Applications of system of equations in real life problems.


**Two-dimensional Geometry:** Transformation of coordinates, Pair of straight lines (homogeneous second degree equations, general second degree equations representing pair of straight lines, angle between pair of straight lines, bisectors of angle between pair of straight lines), General equations of second degree (reduction to standard forms, identifications, properties and tracing of conics).

**Three-dimensional Geometry:** Three-dimensional coordinates, Distance, Direction cosines and direction ratios. Planes and straight lines. Vectors in plane and space. Algebra of vectors. Scalar and vector product. Vector equations of straight lines and planes.

Evaluation: Final examination (Theory, 4 hours): 100 marks.

Ten questions will be set, of which any six are to be answered.

**Books Recommended:**

2. Howard Anton & Chris Rorres – *Elementary Linear Algebra with Application.*

Course Code: 6374, Course Title: Calculus-I    Marks 50, 2 Credits, 30 Lectures

**Functions & their graphs:** Polynomial and rational functions, logarithmic and exponential functions, trigonometric functions & their inverses, hyperbolic functions & their inverses, combinations of such functions.

**Limit and continuity:** Definitions and basic theorems on limit and continuity. Limit at infinity & infinite limits, Computation of limits.


Evaluation: Final exam (Theory, 3 hours): 50 marks.
Six questions will be set, of which any four are to be answered.

Books Recommended:
1. Howard Anton - Calculus (7th and forward editions).

Course Code: 6223, Course Title: Principles of Economics Marks 100, 4 Credits, 60 Lectures


2. Supply and Demand: Demand and Quantity Demanded, Demand Schedule, Demand Curve, Supply and Quantity Supplied, Supply Schedule, Supply Curve, Equilibrium of Supply and Demand, Movement along the Supply and Demand Curve and Shift of Supply and Demand Curve and Its Effects on Equilibrium Price and Quantity. Elasticity of Supply and Demand; Determinants of Elasticity of Demand.


4. Production and Cost: Production Function and Technology; Production with One Variable Input; Production with Two Variable Inputs; Returns to Scale; Costs in the Short-run; Costs in the Long-run.

5. Market Analysis:
   A. Perfect Competition: Characteristics of Perfect Competition; Average and Marginal Revenue; Individual and Market Supply; Short-run equilibrium of a competitive firm Long run Equilibrium under Perfect Competition.
   B. Monopoly: Average and Marginal Revenue; Supply Curve of the Monopolist; Perfect Competition and Monopoly Compared;

6. Overview of Macro Economics: Objective and Instruments of Macroeconomics, National
Product, Gross National Product, From GDP to Disposable Income, Net Economic Welfare (NEW).


9. **Money**: Definition and Functions of Money-Importance of Money in Modern Economy-Different Concepts of Money (M1, M2, M3)-Value of Money. Concept, Causes and Effects of Inflation and Deflation.

10. **Government Revenue and Expenditure**: Difference between Public Sector and Private Sector finance, Different Sources of Govt. Revenues, Taxation and Different Kinds of Taxes, Definition of Revenue Budget, Development Budget, Revenue Budget Vs. Development Budget, Surplus, Deficit and Balanced Budget.

**Books Recommended:**

**Course Code: 6224, Course Title: Bangladesh Economy**  
**Marks 50, 2 Credits, 30 Lectures**

1. **Economic Development**: Development and underdevelopment- a historical analysis; causes of economic backwardness; determinants of development; features of Bangladesh economy; causes of low per capita income; measures for improving standard of living; social and economic infrastructure of Bangladesh Economy.

2. **Demographic Structure of the economy**: Size and composition of the population, density and regional distribution of population; trend of population growth; population policy; education and manpower training; population control and economic development.

3. **National Income**: The size and composition of the GDP and GNP at constant and current prices, sectoral contribution to the GDP and the pattern of structural changes; The size and composition of the rural sector, off-farm and on-farm income sources in rural areas; pattern of income distribution and magnitude of poverty.

4. **Agriculture**: Importance and role of agriculture in the economy of Bangladesh; role of agriculture as a basic for industrialization; problems of agriculture; components of agriculture- crops, forestry; fishery and livestock; self-sufficiency in food; relative efficiency of large and small scale holding; modernization of agriculture, land reforms and agricultural marketing; agricultural credit.

5. **Industry**: Size and composition of industrial sector; small versus large-scale industries; private versus public sectors; problems prospects of private entrepreneurship; problems, prospects of nationalized industries;
6. **Planning in Bangladesh**: Objectives strategies, sectoral allocation and achievements; Annual Development Plan; Five year plans.

**Books Recommended:**

2. Abu Abdullah : *Land Reform and Agrarian Change in Bangladesh, BIDS*
3. Saha K. : *Economics of Rural Bangladesh, BIDS*
4. Abul Barkhat : *Political Economy of Khasland*
5. Government of Bangladesh : *First, Second, Third and fourth five year plans*
6. Musharraf Hussain : *Agriculture in Bangladesh*