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Arts, Science and Commerece College, Ozar (MIG)

Program Outcomes and Objectives
Bachelor of Science - Statistics at undergraduate Level

Statistics is a mathematical science involving the collection, presentation, analysis and interpretation of data. This is an interdisciplinary subject & can be applied to various disciplines. A number of specialties have evolved to apply statistical and methods to various disciplines. Certain topics have "statistical" in their name but relate to manipulations of probability distributions rather than to statistical analysis.

Application of statistics in various fields as given below.

- **Actuarial science** is the discipline that applies mathematical and statistical methods to assess risk in the insurance and finance industries.
- **Astrostatistics** is the discipline that applies statistical analysis to the understanding of astronomical data.
- **Biostatistics** is a branch of biology that studies biological phenomena and observations by means of statistical analysis, and includes medical statistics.
- **Business analytics** is a rapidly developing business process that applies statistical methods to data sets (often very large) to develop new insights and understanding of business performance & opportunities
- **Chemometrics** is the science of relating measurements made on a chemical system or process to the state of the system via application of mathematical or statistical methods.
- **Demography** is the statistical study of all populations. It can be a very general science that can be applied to any kind of dynamic population, that is, one that changes over time or space.
- **Econometrics** is a branch of economics that applies statistical methods to the empirical study of economic theories and relationships.
- **Environmental statistics** is the application of statistical methods to environmental science. Weather, climate, air and water quality are included, as are studies of plant and animal populations.
- **Epidemiology** is the study of factors affecting the health and illness of populations, and serves as the foundation and logic of interventions made in the interest of public health and preventive medicine.
- **Geostatistics** is a branch of geography that deals with the analysis of data from disciplines such as petroleum geology, hydrogeology, hydrology, meteorology, oceanography, geochemistry, geography.
- **Machine learning** is the subfield of computer science that formulates algorithms in order to make predictions from data.

- **Operations research** (or operational research) is an interdisciplinary branch of applied mathematics and formal science that uses methods such as mathematical modeling, statistics, and algorithms to arrive at optimal or near optimal solutions to complex problems.
- **Population ecology** is a sub-field of ecology that deals with the dynamics of species populations and how these populations interact with the environment.
- **Psychometrics** is the theory and technique of educational and psychological measurement of knowledge, abilities, attitudes, and personality traits.
- **Quality control** reviews the factors involved in manufacturing and production; it can make use of statistical sampling of product items to aid decisions in process control or in accepting deliveries.
- **Quantitative psychology** is the science of statistically explaining and changing mental processes and behaviors in humans.
- **Reliability engineering** is the study of the ability of a system or component to perform its required functions under stated conditions for a specified period of time
- **Statistical finance**, an area of economics physics, is an empirical attempt to shift finance from its normative roots to a positivist framework using exemplars from statistical physics with an emphasis on emergent or collective properties of financial markets.
- **Statistical mechanics** is the application of probability theory, which includes mathematical tools for dealing with large populations, to the field of mechanics, which is concerned with the motion of particles or objects when subjected to a force.
- **Statistical physics** is one of the fundamental theories of physics, and uses methods of probability theory in solving physical problems.
- **Statistical signal processing** utilizes the statistical properties of signals to perform signal processing tasks.
- **Statistical thermodynamics** is the study of the microscopic behaviors of thermodynamic systems using probability theory and provides a molecular level interpretation of thermodynamic quantities such as work, heat, free energy, and entropy.

Student who have completed a degree in Statistics should be equipped to:

1. Find employment utilizing their Statistical knowledge;
2. Use their Statistical knowledge to solve problems; and undertake further studies related to Statistics.

Based on these objectives, a set of program outcomes has been adopted which describe the skills, knowledge, attitudes, values and behaviors that students should be able to demonstrate by the time they complete the program. Specifically, students completing a Statistics as a principal subject should:

1. gain knowledge in foundational areas of Statistics ;
2. communicate Statistical accurately, precisely and effectively;
3. develop Statistical thinking;

4. apply Statistical knowledge; and
5. be able to solve Statistical problems using technologies in ICT and software like MS EXCEL and open software R.

Bachelor of Science Statistics can study further in Actuarial Science. In the simplest of terms, it is the study of risks. There is need to predict, assess, and control risks in economy, Businesses, Health industry & risk management for the process of decision-making and safeguarding their future against uncertainties. Statistical techniques help in these areas to large extent.

Individuals who have completed a degree in Statistics with the actuarial track should be equipped to:

1. find employment in an actuarial or financial field utilizing their Statistical knowledge;
2. use their Statistical knowledge to solve problems;
3. complete examinations and other requirements for SOA/CAS designated associate-ship and fellowship; and
4. Undertake further studies related to Statistics.

Students completing a Statistics – actuarial track major should meet the following objectives:

1. gain knowledge in foundational areas of Statistics well as finance and economics essential to the actuarial field;
2. Communicate Statistics accurately, precisely and effectively;
3. develop Statistics thinking;

Structure of the Course Structure of the course for three years are as given below.

Structure of F. Y. B. Sc. Statistics

Paper	Course Title	Marks / Lectures per Week	Lectures
Paper - I	Descriptive Statistics	100/Three lectures / week per paper	Total 36 lectures / paper per term
Paper II	Discrete Probability and Probability Distributions	100/Three lectures / week per paper	Total 72 Lectures per Paper
Paper–III	Practical	Four lectures / week	Total 96 – Term I & II

Course Outcomes

Name of the department: Statistics

Class	Name of the Course: Paper - I Annual Pattern Code:	Name of the Teacher	Outcomes
F.Y.B. Sc. Statistics	Paper - I Descriptive Statistics	Dr Mrs S T Wagh	1. To acquaint students with some basic concepts in Statistics. 2. Introduced to some elementary statistical methods of analysis of data 3. Students are expected to be able, i. to compute various measures of central tendency, dispersion, skewness and kurtosis. ii. To analyze data pertaining to attributes and to interpret the results. iii. To compute the correlation coefficient for bivariate data and interpret it. (iv) to fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables. (v) to fit linear regression model to the bivariate data (vi) to compute and interpret various index numbers.
F.Y.B. Sc. Statistics	Paper II Discrete Probability and Probability Distributions	Dr Mrs S T Wagh	1. The main objective of this course is to introduce to the students the basic concepts of probability, axiomatic theory of probability, concept of random variable, probability distribution (univariate and bivariate) discrete random variables, expectation and moments of probability distribution. By the end of the course students are expected to be able 2. The student should be able to i. distinguish between random and non-random experiments. ii. To find the probabilities of events. Iii. To obtain a probability distribution of random variable (one or two dimensional) in the given situation, and iv. To apply standard discrete probability distribution to different situations.
F.Y.B. Sc. Statisti	Paper–III Practical	Dr Mrs S T Wagh	At the end of this course students are expected to be able 1. to use various graphical and diagrammatic techniques and interpret. 2. to compute various measures of central tendency,

CS			dispersion, skewness and kurtosis,
			3. to compute correlation coefficient, regression coefficients,
			4. to fit binomial and Poisson distributions,
			5. to analyse data pertaining to discrete and continuous variables and to interpret the results,
			6. to compute probabilities of bivariate distributions,
			7. to interpret summary statistics of computer output.& to summarize and analyze the data using computer.
			8. to draw random samples from Poisson and binomial distributions.

Course Outcomes

Name of the department: Statistics

Structure of the Course Structure of the course for three years are as given below.

Structure of S. Y. B. Sc. Statistics(SEMESTER SYSTEM)

Paper	Course Title	Marks / Lectures per Week	Lectures
S. Y. B. Sc Paper - I	ST: 211 DISCRETE PROBABILITY DISTRIBUTIONS AND TIME SERIES DISCRETE PROBABILITY DISTRIBUTIONS , TIME SERIES AND R SOFTWARE	45 /Four lectures / week per paper	Total 45 lectures / paper per term
S. Y. B. Sc Paper II	ST: 212 CONTINUOUS PROBABILITY DISTRIBUTIONS-I CONTINUOUS PROBABILITY DISTRIBUTIONS	45 /Four lectures / week per paper	
S. Y. B.	ST: 221 STATISTICAL	45 /Four lectures / week	

Sc Paper - I	METHODS AND NATIONAL INCOME STATISTICAL METHODS AND USE OF R-SOFTWARE	per paper	
S. Y. B. Sc Paper II	ST: 222 CONTINUOUS PROBABILITY DISTRIBUTIONS-II AND DEMOGRAPHY SAMPLING DISTRIBUTIONS AND INFERENCE	45 /Four lectures / week per paper	
S. Y. B. Sc Paper–III	Practical	Four lectures / week	Total 96 – Term I & II

Class	Name of the Course: Paper - I Annual Pattern Code:	Name of the Teacher	Outcomes
S.Y.B. Sc. Statistics	Paper - I Descriptive Statistics	Dr Mrs S T Wagh	1.To fit various discrete and continuous probability distributions and to study various real life situations 2. To identify the appropriate probability model that can be used. 3. To use forecasting and data analysis techniques in case of univariate and multivariate data sets. 4. To use statistical software packages. 5. To test the hypotheses particularly about mean
S.Y.B. Sc. Statistics	SEMESTER – I, PAPER – II ST 212 : CONTINUOUS PROBABILITY DISTRIBUTIONS	Dr Mrs S T Wagh	1. Introduction to R, features of R, starting and ending R session, getting help in R, R commands and case sensitivity. 2. Vectors and vector arithmetic a) creation of vectors using functions c, seq, rep b) Arithmetic operations on vectors using operators +, -, * , / , ^ 3. Numerical functions: log10, log, sort, max, min, unique, range, length, var, prod, sum, summary, fivenum etc. d) accessing vectors 4. Data frames : creation using data.frame, subset and transform commands. 3.4 Resident data sets : Accession and summary 3.5 p, q, d, r functions

S.Y.B. Sc. Statistics	Paper–III Practical	Dr Mrs S T Wagh	1. To study Exact probability distributions like Chi-square Distribution: , t & F distributions . 2. To study Tests based on chi-square distribution: a) Test for independence of two attributes With Yates' correction b) Test for independence of two attributes, McNemar's test c) Test for 'Goodness of Fit'. d) Test for Equality of variance against one-sided and two-sided alternatives when i) mean is known , ii) mean is unknown. 3. Tests based on t-distribution: a) t-tests for population means : i) one sample and two sample tests for one-sided and two-sided alternatives, ii) $100\,1(-\alpha)\%$ two sided confidence interval for population mean (μ) and difference of means ( ) $\mu 1 - \mu 2$ of two independent normal populations. b) Paired t-test for one-sided and two-sided alternatives. 4. Test based on F-distribution: a) Test for Equality of variance against one-sided and two-sided alternatives when i) means are known, ii) means are unknown.
S.Y.B. Sc. Statistics	SEMESTER – II, PAPER - II ST 222: SAMPLING DISTRIBUTIONS AND INFERENCE		1. students are expected to study various probability distributions and its applications to real life situations. 2. An important branch of Statistics, viz testing of hypotheses related to mean, variance, proportion, correlation etc. will be introduced. 3. Some topics related to applications of Statistics will be also introduced.
S.Y.B. Sc. Statistics	PAPER - III ST 223 : Practicals (Annual Examination)		1. To compute multiple and partial correlation coefficients, to fit trivariate multiple regression plane, to find residual s. s. and adjusted residual s. s. (using calculators and MSEXCEL). 2. To fit various discrete and continuous distributions, to test the goodness of fit, to draw model samples (using calculators , MSEXCEL and R software). 3. To test various hypotheses included in theory. 4. To analyze time series data. 5. Project based on analysis of data collected by students in groups maximum 6 students. (Project is equivalent to five practical)

H. O. D.

Department of Statistics