



Savitribai Phule Pune University

(Formerly University of Pune)

S. Y. B. Sc. / S. Y. B. A. Statistics Syllabi in NEP

(Level 5.0)

National Education Policy Syllabus

To be implemented from Academic Year 2025-2026

Title of the program: S. Y. B. Sc. / S. Y. B. A. Statistics

Students who have Statistics as one of the major subject at first year of the three year course can offer Statistics as the major subject or minor subject in the second year of under graduation.

At **second year of under-graduation**, students are expected to study various probability distributions and its applications to real life situations. It is a foundation for further theory. An important branch of Statistics, viz. testing of hypotheses related to mean, variance, proportion, correlation etc. will be introduced. Some topics related to applications of Statistics will also be introduced. Further the students are expected to start using statistical software *R* and verify the computations during practical. It is a skill-oriented part of the course.

Note

1. Students must complete all the practicals to the satisfaction of the teacher concerned.
2. At the time of practical examination, a student must produce the laboratory journal along with the completion certificate signed by the Head of the Department.
3. Structure of evaluation of practical paper at

a) Continuous Internal Assessment (CIA) – 15 Marks

Section		Marks
i)	Journal	05
ii)	Viva-voce	10

b) End Semester Examination – 35 Marks

- i) Set four questions each of fourteen marks.
- ii) Student has to solve any two of these four questions.
- iii) Viva-voce of seven marks.

Instruction for Examination

1. The theory question paper for each paper shall cover all the topics in the pertaining syllabus with proportional weightage to the number of hours of instruction prescribed.
2. The practicals are to be conducted in batches as per the University norms for the faculty of Science.
3. Medium of Instruction: English
4. Examination:

- A) Pattern of examination: Semester wise
- B) Standard of passing: As per norms of University.
- C) Each course exam must be of 50 marks – Internal – 15 marks & External – 35 marks.

Statistics as Minor Subject and any other subject as Major (each theory / practical paper has 2 credits)

Year /Level	Sem	Code Number	Title of the paper (Theory /Practical)	Credits allotted	Lecture/Practical hours per week
II 5.0/200	III	STS-241-MN	Probability Distributions and Demography	02	02
		STS-242-MNP	Statistics Practical on Probability Distributions and Demography	02	04
	IV	STS-291-MN	Sampling Distributions & Statistical Inference	02	02
		STS-292-MNP	Practical on Sampling Distributions and Statistical Inference	02	04

List of Generic / Open Electives (OE):

Year / Level	Sem	Code Number	Title of the paper (Theory / Practical)	Credits allotted	Lecture/Practical hours per week
II 5.0/200	III	OE-201-STs	Business Statistics - IOR	02	02
		OE-202-STs	Applied Statistics - I	02	02
	IV	OE-251-STs	Business Statistics - II	02	02
		OE-252-STs	OR Applied Statistics - II	02	02

List of Skill Enhancement Courses (SEC):

Year / Level	Sem	Code Number	Title of the paper (Theory / Practical)	Credits allotted	Lecture/Practical hours per week
II 5.0/200	IV	SECP-251-STs	Descriptive Statistics using R-software (Practical Course)	02	04

Indian Knowledge System (IKS):

Year / Level	Sem	Code Number	Title of the paper (Theory / Practical)	Credits allotted	Lecture/Practical hours per week
II 5.0/200	III	STS-201-IKS	Evolution / Development of Statistics in India	02	02

Statistics as Minor Subject and any other subject as Major

(Each theory / practical paper has 2 credits)

Paper Code and Title: STS-241-MN: Probability Distributions and Demography

Course type- Theory

No. of credits – 2

No. of contact hours - 30

Course outcomes:

At the end of this course, students are able to:

1. Understand about continuous univariate and bivariate random variables, their expectation, variance, higher order moments and their properties.
2. Get the knowledge of different standard discrete and continuous distributions.
3. Identify various applications of these distributions in real life.
4. Simulate random samples from standard continuous distributions.

Unit No.	Content	No. of Hours
1	Standard Discrete Probability Distributions 1.1 Poisson distribution-p.m.f., mean, variance, mode, real life situations where it is applicable, statement of additive property, statement of limiting case of $B(n, p)$. 1.2 Geometric distribution-p.m.f., mean, variance, mode, real life situations where it is applicable. Statement of lack of memory property. 1.3 Negative binomial distribution-p.m.f., mean, variance, real life situations where it is applicable. Relation with geometric distribution, concept of waiting time distribution. 1.4 Numerical Examples	10
2	Continuous Univariate Distributions 2.1 Continuous sample space: Definition, illustrations. Continuous random variable: Definition, probability density function (p.d.f.), cumulative distribution function (c.d.f.), properties of c.d.f. (without proof) 2.2 Mathematical expectation, variance, quartiles and quartile deviation. 2.3 Moment generating function (MGF), Cumulant generating function (CGF): Definition, properties (without proof).	05

	2.4 Numerical Examples	
3	Standard Continuous Probability Distributions	10
	3.1 Uniform distribution- statement of p.d.f., c.d.f., mean, variance, nature of p.d.f. curve	
	3.2 Normal distribution- statement of p.d.f., c.d.f., mean, variance, median, mode, nature of p.d.f. curve, statement of additive property, skewness. Standard normal distribution	
	3.3 Exponential distribution- statement of p.d.f., c.d.f., mean, variance, nature of p.d.f.	
	3.4 Numerical Examples	
4	Demography	05
	4.1 Vital events, vital statistics, methods of obtaining vital statistics, rates of vital events, sex ratios, dependency ratio.	
	4.2 Death/Mortality rates: Crude death rate, specific (age, sex etc.) death rate, standardized death rate (direct and indirect), infant mortality rate.	
	4.3 Fertility/Birth rate: Crude birth rate, general fertility rate, specific (age, sex etc.) fertility rates, total fertility rate.	
	4.4 Growth/Reproduction rates: Gross reproduction rate, net reproduction rate. (Simple Numerical examples only).	
	4.5 Interpretations of different rates, uses and applications.	
	4.6 Numerical Examples	

Books Recommended:

1. Goon A. M., Gupta, M. K. and Dasgupta, B. (1986), Fundamentals of Statistics, Vol. 2, World Press, Kolkata.
2. 4. Gupta, S. C. and Kapoor, V. K. (2002), Fundamentals of Mathematical Statistics, (Eleventh Edition), Sultan Chand and Sons, 23, Daryaganj, New Delhi , 110002 .
3. Hogg, R. V. and Craig, A. T. , Mckean J. W. (2012), Introduction to Mathematical Statistics (Tenth Impression), Pearson Prentice Hall.
4. Kulkarni, M. B., Ghatpande, S. B. and Gore, S. D. (1999), Common Statistical Tests, Satyajeet Prakashan, Pune 411029
5. Medhi, J., Statistical Methods, Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi – 110002.
6. Meyer, P. L., Introductory Probability and Statistical Applications, Oxford and IBH Publishing Co. New Delhi.

Paper Code and Title: STS-242-MNP: Practical on Probability Distributions and Demography

Course type- Practical

No. of credits – 2

No. of contact hours: 60(48+12)

Course Outcomes:

At the end of this course, students will be able to:

- 1) Fit a suitable continuous probability distributions to the data.
- 2) Identify the suitable probability model for the population.
- 3) Generate random samples from the continuous probability distributions.

Expt. No.	Title of the Experiment	No. of Experiments
1	Applications of Poisson distribution.	1
2	Fitting of Poisson distribution.	1
3	Application of geometric distribution.	1
4	Application of negative binomial distribution.	1
5	Fitting of negative binomial distribution.	1
6	Applications of normal distribution.	1
7	Application of exponential distribution.	1
8	Fitting of normal distribution and computation of expected frequencies.	1
9	Model sampling from exponential distribution using distribution function.	1
10	Generating random samples from normal distribution using distribution function	1
11	Computation of CDR, SDR, STDR.	1
12	Computations of GRR and NRR.	1

Paper Code and Title: STS-291-MN: Sampling Distributions and Statistical Inference

Course type- Theory

No. of credits – 2

No. of contact hours - 30

Course Outcomes:

At the end of this course, students are able to

- 1) Understand the concept of sampling distributions and its various applications in real life.
- 2) Understand the concept of testing of hypothesis.
- 3) Test the hypothesis for population means and population proportions for small sample and large sample.
- 4) Test the independence of two attributes using chi-square test.
- 5) Test the population mean and population variance.

Unit No.	Content	No. of Hours
1	Sampling Distributions 1.1 Chi-square Distribution Statement of p.d.f., mean and variance, applications of the chi-square distribution, use of chi-square tables for calculations of probabilities. 1.2 Student's t distribution Statement of p.d.f., mean and variance, applications of the t distribution, use of t tables for calculations of probabilities. 1.3 Snedecor's F distribution Statement of p.d.f., mean and variance, applications of the F distribution, use of F tables for calculations of probabilities.	10 H
2	Testing of Hypothesis 2.1 Statistic and Parameter: Random sample $X_1, X_2, \dots, X_n$ from a distribution, concept of statistic, sampling distribution of a statistic, standard error of a statistic. Notion of parameter and parameter space. Concept of family of distributions. 2.2 Introduction to problem of estimation and testing of hypothesis. Estimator and estimate, difference between estimator and estimate. Point and interval estimation	06 H

2.3 Statistical hypothesis, null and alternative hypotheses, simple and composite hypotheses, one-sided and two-sided alternative hypotheses, critical region, type-I and type-II error, notion of size and power of test, level of significance, p-value. Two-sided confidence interval.

3 Tests based on normal distribution 05 H

3.1 Test for population means:

i) $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$ $H_1 : \mu > \mu_0, H_1 : \mu < \mu_0$, (variance known)

ii) $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$ $H_1 : \mu_1 > \mu_2, H_1 : \mu_1 < \mu_2$ (variances are known)

3.2 Tests for population proportions:

i) $H_0 : P = P_0$ against $H_1 : P \neq P_0$ $H_1 : P > P_0, H_1 : P < P_0$,

ii) $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$ $H_1 : P_1 > P_2, H_1 : P_1 < P_2$.

4 Tests based on sampling distributions 09 H

4.1 Test for independence of two attributes

4.2 Test for goodness of fit.

4.3 Test for population variance.

4.4 Tests for population means: a) one sample and two sample b) two-sided confidence interval for population mean (variance unknown).

4.5 Paired t-test.

4.6 Test for equalities of variance when i) means are known and ii) means are unknown.

4.7 Examples.

Paper Code and Title: STS-292-MNP: Practical on Sampling Distributions and Statistical Inference

Course type- Practical

No. of credits – 2

No. of contact hours – 60(48+12)

Course Outcomes:

At the end of this course, students will be able to:

- 1) Understand the concept of sampling distributions and its various applications in real life.
- 2) Test the hypothesis for population means and population proportions for large sample.
- 3) Test the independence of two attributes using chi-square test.
- 4) Test the population mean and population variance for small sample problem.

Expt. No.	Title of the Experiment	No. of Experiments
1	Test for means (one sample problem) (variance known).	1
2	Test for means (two sample problem) (variance known).	1
3	Test for proportions (one sample problem)	1
4	Test for proportions (two sample problem)	1
5	Test for means (one sample problem) (variance unknown).	1
6	Test for means (two sample problem) (variance unknown).	1
7	Paired t-test.	1
8	Test for independence of attributes for 2 x 2 contingency table.	1
9	Test for independence of attributes for r x s contingency table.	1
10	Test for goodness of fit.	1
11	Test for population variance. (μ - known and unknown).	1
12	Tests for equality of population variances.	1