HSNC UNIVERSITY, MUMBAI

Board of Faculty of Science & Technology

Board of Studies in the Subjects of Statistics and Data Science & Business Analytics

1) **Name of Chairperson/Co-Chairperson/Coordinator:-**

   a) Dr Asha Jindal, Associate Professor and Head of Department, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai –400 020. Email ID- asha.jindal@kccollege.edu.in Mobile no- 9821235627

2) **Two to five teachers each having minimum five years teaching experience amongst the full time teachers of the Departments, in the relevant subject.**

   a) **Dr. S. B. Muley,** Assistant Professor, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai – 400 020. Email ID sakharam.muley@kccollege.edu.in , Mobile No- 9323817918

   b) **Mrs. Pratiksha Kadam,** Assistant Professor, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai – 400 020. Email ID pratiksha.kadam@kccollege.edu.in , Mobile No- 7507162816

   c) **Ms. Shailaja Rane,** Assistant Professor, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai – 400 020. Email ID shailaja.rane@kccollege.edu.in, Mobile No- 7506986359

3) **One Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body;**

   a) **Dr Anjum Ara Ahmed;** I/C Principal, Rizvi College, Mumbai. Email ID **anjumahmed8@gmail.com, Mobile No-** 8451046220

4) **Four external experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body;**

a. **Prof. Suresh Kumar Sharma,** Professor, Department of Statistics, Panjab University, Chandigarh. Email ID ssharma643@yahoo.co.in, **Mobile No**-9815911381

b. **Mr Mukesh Jain,** Chief Technological Officer, Capgemini. Email ID mdjain@hotmail.com, **Mobile No**-7972637347.

c. **Dr Santosh Gite,** Associate Professor, Dept. of Statistics, University of Mumbai, Mumbai. Email ID santgite@yahoo.com, **Mobile No**- 9167157717.

d. **Mr Prashant Kumar Nair,** Director, Geo Spatial Analytics Global Lead, Intelligent Analytics, Nielsen Connect, Email ID prashantkumar.nair@nielsen.com , **Mobile No**-9833747057.

5. Top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year.

a) **Ms. Mohaddasah Patel** (undergraduate student 18-19) Email Id- mohaddasah.98@gmail.com ; Mobile no- 9833781878

b) **Ms. Divya Srivastava** (undergraduate student18-19) Email ID- divyasrivastav20@gmail.com ; Mobile no- 8879240305

Part –I

Outline of Choice Based Credit System as outlined by University Grants Commission:

R. ** : The Definitions Of The Key Terms Used In The Choice Based Credit System And Grading System Introduced From TheAcademicYear2020-2021AreAs Under:**

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a core course.

2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

   2.1 **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

   2.2 **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of adiscipline specific elective paper.

   2.3 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.
   P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. **Choice Base Credit System :** CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.

4. **Honours Program :** To enhance employability and entrepreneurship abilities among the learners, through aligning Inter Disciplinary / Intra Disciplinary courses with Degree Program. Honours Program will have
40 additional credits to be undertaken by the learner across three years essentially in Inter / Intra Disciplinary course.

   A learner who joins Regular Undergraduate Program will have to opt for Honours Program in the first year of the Program. However, the credits for honours, though divided across three years can be completed within three years to become eligible for award of honours Degree.

5. **Program:** A Program is a set of course that are linked together in an academically meaningful way and generally ends with the award of a Degree Certificate depending on the level of knowledge attained and the total duration of study, B.Sc. Programs.

6. **Course:** A 'course' is essentially a constituent of a 'program' and may be conceived of as a composite of several learning topics taken from a certain knowledge domain, at a certain level. All the learning topics included in a course must necessarily have academic coherence, i.e. there must be a common thread linking the various components of a course. A number of linked courses considered together are in practice, a 'program'.

7. **Bridge Course:** Bridge course is visualized as Pre semester preparation by the learner before commencement of regular lectures. For each semester the topics, whose knowledge is considered as essential for effective and seamless learning of topics of the Semester, will be specified. The Bridge Course can be conducted in online mode. The Online content can be created for the Bridge Course Topics.

8. **Module and Unit:** A course which is generally an independent entity having its own separate identity, is also often referred to as a 'Module' in today's parlance, especially when we refer to a 'modular curricular structure'. A module may be studied in conjunction with other learning modules or studied independently. A topic within a course is treated as a Unit. Each course should have exactly 3 Units.

9. **Self-Learning: 20% of the topics will be marked for Self-Learning.** Topics for Self-Learning are to be learned independently by the student, in a time-bound manner, using online and offline resources including online lectures, videos, library, discussion forums, fieldwork, internships etc.

   Evaluative sessions (physical/online), equivalent to the credit allocation of the Self Learning topics, shall be conducted, preferably, every week for each course. Learners are to be evaluated real time during evaluative sessions. The purpose of evaluative sessions is to assess the level of the students' learning achieved

in the topics earmarked for Self-Learning.

The teacher's role in these evaluative sessions will be that of a Moderator and Mentor, who will guide and navigate the discussions in the sessions, and offer concluding remarks, with proper reasoning on the aspects which may have been missed by the students, in the course of the Self-Learning process.

The modes to evaluate self-learning can be a combination of the various methods such as written reports, handouts with gaps and MCQs, objective tests, case studies and Peer learning. Groups can be formed to present self-learning topics to peer groups, followed by Question and Answer sessions and open discussion. The marking scheme for Self Learning will be defined under Examination and Teaching.

The topics stipulated for self-learning can be increased or reduced as per the recommendations of the Board of Studies and Academic Council from time to time. All decisions regarding evaluation need to be taken and communicated to the stakeholders preferably before the commencement of a semester. Some exceptions may be made inexigencies, like the current situation arising from the lockdown, but such ad hoc decisions are tobe kept to the minimum possible.

10. **Credit Point:** Credit Point refers to the 'Workload' of a learner and is an index of the number of learning hours deemed for a certain segment of learning. These learning hours may include a variety of learning activities like reading, reflecting, discussing, attending lectures / counseling sessions, watching especially prepared videos, writing assignments, preparing for examinations, etc. Credits assigned for a single course always pay attention to how many hours it would take for a learner to complete a single course successfully. A single course should have, by and large a course may be assigned anywhere between 2 to 8 credit points wherein 1 credit is construed as corresponding to approximately 30 to 40 learning hours.

11. **Credit Completion and Credit Accumulation:** Credit completion or Credit acquisition shall be considered to take place after the learner has successfully cleared all the evaluation criteria with respect to a single course. Thus, a learner who successfully completes a 4 CP (Credit Point) course may be considered to have collected or acquired 4 credits. learner level of performance above the minimum prescribed level (viz. grades / marks obtained) has no bearing on the number of credits collected or acquired. A learner keeps on adding more and more credits as he completes successfully more and more courses. Thus the learner 'accumulates' course wise credits.

12. **Credit Bank:** A Credit Bank in simple terms refers to stored and dynamically

updated information regarding the number of Credits obtained by any given learner along with details regarding the course/s for which Credit has been given, the course-level, nature, etc. In addition, all the information regarding the number of Credits transferred to different programs or credit exemptions given may also be stored with the individual's history.

13. **Credit Transfer:** (performance transfer) When a learner successfully completes a program, he/she is allowed to transfer his/her past performance to another academic program having some common courses and Performance transfer is said to have taken place.

14. **Course Exemption:** Occasionally, when two academic programs offered by a single university or by more than one university, may have some common or equivalent course-content, the learner who has already completed one of these academic programs is allowed to skip these 'equivalent' courses while registering for the new program. The Learner is 'exempted' from 'relearning' the common or equivalent content area and from re-appearing for the concerned examinations. It is thus taken for granted that the learner has already collected in the past the credits corresponding to the exempted courses.

Part-II

O*** The fees for transfer of credits or performance will be based on number of credits that a learner has to complete for award of the degree.**

The Scheme of Teaching and Examination:

The performance of the learners shall be evaluated in two components: Internal Assessment with 40% marks by way of continuous evaluation and by Semester End Examination with 60% marks by conducting the theory examination.

INTERNAL ASSESSMENT:- It is defined as the assessment of the learners on the basis of continuous evaluation as envisaged in the credit based system by way of participation of learners in various academic and correlated activities in the given semester of the programme.

A). Internal Assessment – 40% **40 marks**

Practical's (internal Components of the Practical Course)

1. For Theory Courses

Sr. No.	Particulars	Marks
1	**ONE** class test / online examination to be conducted in the given semester	15 Marks
2	One assignment based on curriculum (to be assessed by the teacher Concerned	10 Marks
3	Self-Learning Evaluation	10 Marks
4	Active participation in routine class instructional deliveries	05 Marks

2. For Courses with Practicals

Each practical course can be conducted out of 50 marks with 20 marks for internal and 30 marks for external

Practical's (Internal component of the Practical Course)

Sr. No	Evaluation type	Marks
1	Two Best Practicals /Assignments/Presentation /Preparation of models/ Exhibits **Or** One Assignment/ project/presentation to be assessed by teacher concerned	10
2	Journal	05
3	Viva	05

The semester end examination (external component) of 60 % for each course will be as follows:

i) **Duration** – **2 Hours** ii) **Theory Question**

Paper Pattern:-

1. There shall be four questions each of 15 marks. On each unit there will be one question and the fourth one will be based on entire syllabus.
2. All questions shall be compulsory with internal choice within the questions. (Each question will be of 20 to 23 marks with options.)
3. Question may be subdivided into sub-questions a, b, c… and the allocation of marks depend on the weightage of the topic.

The marks will be given for all examinations and they will be converted into grade (quality) points. The semester-end, final grade sheets and transcripts will have only credits, grades, grade points, SGPA and CGPA.

3. Project and Assignment:

- Project or Assignment, which can in the following forms
  - Case Studies
  - Videos
  - Blogs
  - Research paper (Presented in Seminar/Conference)
  - Field Visit Report
  - Presentations related to the subject (Moot Court, Youth Parliament, etc.)
  - Internships (Exposition of theory into practice)
  - Open Book Test
  - any other innovative methods adopted with the prior approval of Director Board of Examination and Evaluation.

4.Self-Learning Evaluation

- **20% OF THE TOPICS OF CURRICULUM ARE LEARNED BY THE STUDENT THROUGH SELF LEARNING USING ONLINE / OFFLINE ACADEMIC RESOURSE SPECIFIED IN THE CURRICULUM.**

- **HENCE 20% OF THE LECTURES SHALL BE ALLOCATED FOR EVALUATION OF STUDENTS ON SELF LEARNING TOPICS**

- The identified topics in the syllabus shall be learnt independently by the students in a time bound manner preferably from online resources. Evaluative sessions shall be conducted by the teachers and will carry 10 Marks.

  CLUB The self-learning topics into 3-4 GROUPS OF TOPICS ONLY FOR EVALUATION.

- **PRESCRIBE TIME DURATION (IN DAYS) FOR COMPLETION OF EACH GROUP OF TOPIC AND EARMARK SELF LEARNING EVALUATION LECTURES IN THE TIMETABLE. HENCE EACH GROUP OF TOPIC CAN BE ASSIGNED 3 REGULAR LECTURES FOR THIS EVALUATION FOR ENTIRE CLASS**

3 Sub Topics
Each evaluative session shall carry 3 Marks (3 x 3 Units = 9 Marks). Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

4 Sub Topics
Each evaluative session shall carry 2.5 Marks (2.5 x 4 Units = 10 Marks)

- **EVALUATION OF SELF LEARNING TOPICS CAN COMMENCE IN REGULAR LECTURES ASSIGNED FOR SELF LEARNING EVALUATION IN THE TIMETABLE**

3 Evaluative sessions

Each evaluative session shall carry 3 Marks (3 x 3 = 9 Marks).
Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

4 Evaluative sessions

Each evaluative session shall carry 2.5 Marks (2.5 x 4 = 10

Marks). <u>Methods for Evaluation of Self-learning topics:</u>

- Seminars/presentation (PPT or poster), followed by Q&A – Objective questions /Quiz / Framing of MCQ questions.
- Debates
- Group discussion
- You-Tube videos (Marks shall be based on the quality and viewership)
- Improvisation of videos
- Role Play followed by question-answers

TEACHERS CAN FRAME OTHER METHODS OF EVALUATION ALSO PROVIDED THAT THE METHOD, DULY APPROVED BY THE COLLEGE EXAMINATION COMMITTEE, IS NOTIFIED TO THE STUDENTS AT LEAST 7 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION AND IS FORWARDED FOR INFORMATION AND NECESSARY ACTION AT LEAT 3 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION

- Viva Voce
- Any other innovative method

SEMESTER END EXAMINATION: - It is defined as the examination of the learners on the basis of performance in the semester end theory / writtenexaminations.

B. Semester End Examination- 60 % ***60 Marks***

1) Duration – These examinations shall be of 2 Hours duration.
2) Question Paper Pattern: -
   i. There shall be four questions each of 15 marks.
   ii. All questions shall be compulsory with internal choice within the questions.
   iii. Question may be sub-divided into sub-questions a, b, c, d & e only and the allocation of marks depends on the weightage of the topic.

THE MARKS OF THE INTERNAL ASSESSMENT SHOULD NOT BE DISCLOSED TO THE STUDENTS TILL THE RESULTS OF THE CORRESPONDING SEMESTER IS DECLARED.

HSNC University Mumbai

(2020-2021)

Ordinances and Regulations

With Respect to

Choice Based Credit System

(CBCS)

For the Programmes Under

The Faculty of Science and Technology

For the Course

Statistics

Curriculum – First Year Undergraduate Programmes

Semester-I and Semester -II

2020-2021

Statistics
Part 1- Preamble

B. Sc. Statistics program is of minimum 120 credits cover six semesters. Statistics is the language of the uncertainties riddled modern information age. Statistics facilitates the choice making process by quantifying the element of chance or uncertainties. It's descriptive and inferential roles not only formulate the basis of the expansion of almost all the disciplines of the modern world, but also provide an array of non-traditional employment avenues starting from that of sport analysts to business analysts to actuaries. The thrust of the course is to prepare students to enter into a promising career even after graduation, as also provide to them a platform for pursuing higher studies resulting in post-graduate or doctorate degrees. The program has some unique features like number of elective courses and extensive computer training of statistical computations including standard software packages like SPSS, SAS, MINITAB, R and PYTHON.

1. **Course objective:** The main objectives of the course are-

- Make students realize about understanding and importance of the data
- Acquaint students in understanding behaviour of the data
- Make students realize measuring certainty involved into uncertainty in happening of events with accuracy and precision
- Acquaint students in understanding behaviour of the data using discrete probability distributions and continuous probability distributions.
- Make students realize about understanding and importance of the Null hypothesis , Alternative Hypothesis and Large sample Tests
- Develop an understanding and application of statistical concepts and skills in the sciences and social sciences

Sem I

Course Code: US-FST-101

Objective: The objective of the course is to make the students conversant with various techniques used in summarization and analysis of data. The focus will be both on theoretical as well as practical approach using Statistical Software.

Course Code: US-FST-102

Objective: This course will lay the foundation to probability theory and Statistical modelling of outcomes of real life random experiments through various Statistical distributions.

Sem II

Course Code: US-FST-201

Objective: The course deals with the statistical estimation and testing problems when the underlying structure is not univariate but bivariate in nature. Correlation and regression as well as Time series techniques are required to handle two correlated response variables, will be discussed. Interpret and use of range of index number used in business world will also be discussed.

Course Code: US-FST-202

Objective: The objective of the course is to provide a systematic account of continuous distributions, closely related theory of point estimation, theory of testing and confidence sets, together with their applications.

2. Process adopted for curriculum designing.

The members of Department of Statistics initially drafted the syllabus. The draft syllabus was shown to Industry Partners, Academic Partners and Research Institute Partners through mail and in person invited to college.They suggested some changes. These changes were incorporated.

3. Salient features, how it has been made more relevant.

Statistics deals with collection, organization, analysis and interpretation of data. Statistical knowledge is very important as it helps to use appropriate methodologies for collecting data, tools for employing analysis and interpretation of results. It also provides us with techniques which are important in designing and planning of experiments.

A lot of data is generated at each and every moment. Data literacy has become crucial and indispensable to the society. Statistics has the quality of quantifying and measuring uncertainty which helps in assessing risk. It helps in extracting the meaningful information from the data, making predictions and taking decisions. Study of data has become an integral part of education, business, and overall human progress. This has put Statistics on the center stage of teaching, research, policy making and development all over the globe.

The F.Y.B.Sc Statistics syllabus (FSTATS) is a Choice based credit system comprising of two papers having three units each in both the semesters.

The current course is designed to enhance the knowledge of the subject. While designing of the syllabus care has been taken to balance the fundamental techniques of Statistics with soft skills like analysis using MS-Excel (and remaining will be introduced phase wise at S.Y.B.Sc. and T.Y.B.Sc. level).

The course would give the students option to develop skills in areas which have direct relevance to employability in insurance and finance industries, banks, econometrics, quality control, pharmaceutical, medical statistics, agricultural statistics, weather forecasting, civil services, stock market, machine learning and artificial intelligence related job opportunities in Statistics.

4. Learning Outcomes

Our curriculum is designed to educate the learner about various applications of Statistics in various fields like Genetics, Medical Sciences, Pharmaceutical Industry, Environmental, Biotechnology, etc. The course would help students to apply their statistical concepts to summarize, analyze, and inculcate problem solving approach in the newer developments and innovations in the future. The curriculum design and the teaching and the evaluation patterns would help students to develop skills and competencies to build a progressive and successful career in the field of Statistics and Data Science.

- The learner will understand the importance of the data
- The learner will get acquainted with understanding behaviour of the data and pattern recognition.
- The learner will learn measuring certainty involved into uncertainty in happening of events with accuracy and precision
- The learner will understand behaviour of the data using discrete and continuous probability distributions.
- The learner will learn the handling of various softwares which will help them to acquaint with requisite skill which in turn will prepare them to secure high paid job in the industries.
- The learner will learn application of statistical concepts and skills in the sciences, management, commerce, social sciences and research.

Part 2- The Scheme of Teaching and Examination is as under:
Semester – I
Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (**Statistics**)			US-FST-101, US-FST- 102, US-FST- 1P1	
2	Elective Course	Discipline Specific Elective (DSE) Course			
		2.1	Interdisciplinary Specific Elective (IDSE) Course		
		2.2	Dissertation/Project		
		2.3	Generic Elective (GE) Course		
3	Ability Enhancement Courses (AEC)				
	Skill Enhancement Courses (SEC)				

First Year Semester I Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Total Marks
			Units	S. L.	L	T	P	Credit	S. L. E	CT	TA	SEE	
1	US-FST-101	DESCRIPTIVE STATISTICS-I	3	20% *	3	0	0	2	10	20	10	60	100
2	US-FST-102	STATISTICAL METHODS-I	3	20% *	3	0	0	2	10	20	10	60	100
3	US-FST-1P1	Practicals Based US-FST--101 + Practicals Based US-FST--102			0	0	6	2				100 (80+20)	100
	Total Hours / Credit							06	Total Marks				300

***One to two lectures to be taken for CONTINUOUS self -learning Evaluation.**

First Year Semester I - Units – Topics – Teaching Hours

S.N	Subject Code	Subject Unit Title		Hours /Lectures	Total No. of hours/lectures	Credit	Total Marks
1	US-FST-101	I	Types of Data and Data Condensation	15	45 L	2	100 (60+40)
		II	Theory of Attributes and Measures of Central Tendency	15			
		III	Measures of Dispersion, Skewness & Kurtosis	15			
2	US-FST-102	I	Elementary Probability Theory	15	45L	2	100 (60+40)
		II	Concept of Discrete random variable and properties of its probability distribution	15			
		III	Some Standard Discrete Distributions	15			
3	US-FST-P-1	I	Practicals based on US-FST-101	3	45x2= 90L lectures per batch	2	100 (80+10+10)
		II	Practicals based on US-FST-102	3			
			TOTAL			6	300

- **Lecture Duration – 48 Minutes**
- **One Credit =15 class room teaching hours.**

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE- Self learning evaluation CT-Commutative Test, SEE- Semester End Examination , PA-Project Assessment, AT- Attendance

Part -3 Detailed Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

Course Code: US-FST-101

Unit	Content	No. of Lectures
1	**1. Types of Data and Data Condensation** 1.1 Introduction to definition of Statistics, Application and scope of Statistics 1.2 Concept of Population and Sample. Finite, Infinite Population, Parameter and Statistic. 1.3 Types of data: Qualitative and Quantitative data; Time series data and cross section data, discrete and continuous data. 1.4 Different types of scales: nominal, ordinal, interval and ratio. 1.5 Univariate and bivariate frequency distribution of discrete and continuous variables. 1.6 Cumulative frequency distribution. 1.7 Tabulation. 1.8 Graphical representation of frequency distribution by Simple Bar Diagram, Multiple Bar Diagram, Subdivided and Proportionate Bar Diagram, Pie Diagram, Histogram, frequency Curve, frequency polygon, Cumulative frequency curves, Stem and leaf diagram, Pareto Diagram	15
2	**2. Theory of Attributes and Measures of Central Tendency** **2.1 Theory of Attributes** 2.1.1. Dichotomous classification- for two and three attributes, Verification for consistency. 2.1.2. Association of attributes: Yule's coefficient of association Q. Yule's coefficient of Colligation **2.2 Measures of Central Tendency** 2.2.1. Concept of central tendency of data. Requirements of good measure. 2.2.2. For Raw Data, Ungrouped Frequency Data, Grouped Frequency Data: 2.2.3. Mathematical averages Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean, 2.2.4. Locational averages: Median, Mode and 2.2.5. Partition Values: Quartiles, Deciles and Percentiles. Empirical relation between mean, median and mode Merits and demerits of different measures & their applicability	**15**
3	**3. Measures of Dispersion, Skewness & Kurtosis** 3.1. Concept of dispersion. Requirements of good measure. 3.2. Absolute and Relative measures of dispersion: Range,	**15**

	Quartile Deviation, Mean absolute deviation, Standard deviation. 3.3. Variance and Combined variance, raw moments and central moments and relations between them. Their properties 3.4. Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments, Measure of Kurtosis. 3.5. Box Plot, Stem and Leaf Diagram	

Self-Learning topics (Unit wise)

Unit	Topics
1	1.1 Introduction to definition of Statistics
1	1.3 Types of data: Qualitative and quantitative data
1	1.4 Different types of scales: nominal, ordinal, interval and ratio.
2	2.2.3 Mathematical averages Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean
2	2.2.4 Locational averages: Median, Mode.
2	2.2.5 Partition Values: Quartiles, Deciles and Percentiles.

Online Resources

'Business Statistics' by Dr Mukesh Kumar Barua from IIT Roorkee available on the Swayam portal, https://nptel.ac.in/courses/110/107/110107114/ for US-FST-101 for unit I and unit II

Course Code: US-FST-102

Unit	Content	No. of Lectures
I	**1. Elementary Probability Theory** 1.1.Permutation and Combination 1.2.Trial, random experiment, sample point and sample space. 1.3.Definition of an event. Operation of events, mutually exclusive and exhaustive events. 1.4.Classical (Mathematical), Empirical and Axiomatic definitions of Probability and their properties. 1.5.Theorems on Addition and Multiplication of probabilities. 1.6.Independence of events, pair wise independence upto three events, Conditional probability, Bayes theorem and its applications.	**15**
II	**2. Concept of Discrete random variable and properties of its probability distribution** 2.1 Random variables and Types of random variables. Definition and properties of probability mass function and cumulative distribution function of discrete random variable. 2.2 Central and Non- Central moments (definition only) and their relationship (up to order four). Calculation of moments, Skewness and Kurtosis using probability concept. 2.3 Expectation of a random variable. Theorems on Expectation & Variance. 2.4 Joint probability mass function of two discrete random variables. 2.5 Marginal and conditional distributions. Theorems on Expectation	**15**

	& Variance. 2.6 Covariance and Coefficient of Correlation. Independence of two random variables.	
III	**3. Some Standard Discrete Distributions** 3.1 Discrete Uniform, Binomial, Poisson distributions and Hypergeometric distribution: derivation of their mean and variance. 3.2 Recurrence relation for probabilities of Binomial and Poisson distributions. Poisson approximation to Binomial distribution, Binomial approximation to hypergeometric distribution.	**15**

Self-Learning topics (Unit wise)

Unit	Topics
1	1.1.Permutation and Combination
1	1.2. Trial, random experiment, sample point and sample space.
1	1.3. Definition of an event. Operation of events, mutually exclusive and exhaustive events.
1	1.4.Classical (Mathematical), Empirical and Axiomatic definitions of Probability and their properties.
1	1.6.Independence of events

Online Resources

'Introduction to Probability and Statistics' by Prof. G. Srinivasan from IIT Madras available on the Swayam portal, https://nptel.ac.in/courses/111/106/111106112/ for US-FST- 102 for unit I.

Part -4 Detailed Scheme Practicals

Code: US-FST- 1P1

Paper-I-Practical Total Credit: 01

Title of Paper: Descriptive Statistics using MS-Excel-I

Unit	Content	No. of Lectures
I	1. Creating and Navigating worksheets and adding information to worksheets. 2. Multiple Spreadsheets 3. Data Analysis: Sort, Filter, Frequency Tables, Subtotal and Pivot Tables. 4. Graphs and Diagrams	03 Lectures per Practical per Batch
II	5. Theory of attributes 6. Functions: Mathematical and Statistical Functions 7. Measures of Central Tendencies	
III	8. Measures of dispersion 9. Skewness and Kurtosis	

Paper-II-Practical Total Credit: 01

Title of Paper: Statistical Methods using MS-Excel-I

Unit	Content	No. of Lectures
I	1. Elementary Probability 2. Advance Probability	03 Lectures per Practical per Batch
II	3. Discrete Random Variables 4. Bivariate Probability Distributions	
III	5. Binomial distribution 6. Poisson distribution 7. Hyper geometric distribution 8. Practical using MS-Excel: Computation of probabilities, plotting of p.m.f. and c.d.f., fitting of discrete distributions.	

Part 5- The Scheme of Teaching and Examination is as under:

First Year Semester – II

Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (**Statistics**)			US-FST-201, US-FST-202, US-FST-1P2	
2	Elective Course	Discipline Specific Elective (DSE) Course			
		2.1	Interdisciplinary Specific Elective (IDSE) Course		
		2.2	Dissertation/Project		
		2.3	Generic Elective (GE) Course		
3	Ability Enhancement Courses (AEC)				
	Skill Enhancement Courses (SEC)				

First Year Semester -II Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Tot al Marks
			Unit s	S. L.	L	T	P	Credit	S. L. E	CT	T A	SEE	
1	US-FST-201	DESCRIPTIVE STATISTICS-II	3	20% *	3	0	0	2	10	20	10	60	100
2	US-FST-202	STATISTICAL METHODS-II	3	20% *	3	0	0	2	10	20	10	60	100
3	US-FST-1P2	Practicals Based US-FST--201 + Practicals Based US-FST—202			0	0	6	2				100 (80 +20)	100
	Total Hours / Credit							06	Total Marks				300

***One to two lectures to be taken for CONTINUOUS self -learning Evaluation.**

First Year Semester – II Units – Topics – Teaching Hours

S.N	Subject Code	Subject Unit Title		Hours /Lectures	Total No. of hours/lectures	Credit	Tot al Marks
1	US-FST-201	I	Correlation and Regression Analysis	15	45	2	100 (60+40)
		II	Time Series	15			
		III	Index Numbers	15			
2	US-FST-202	I	Continuous Random Variable	15	45	2	100 (60+40)
		II	Some Standard Continuous Distributions	15			
		III	Elementary topics on Estimation and Testing of Hypothesis	15			
3	US-FST-P-2	I	Practicals based on US-FST-201	3	45x2= 90 lectures per batch	2	100 (80+10+10)
		II	Practicals based on US-FST-202	3			
			TOTAL			6	300

- **Lecture Duration – 48 Minutes**
- **One Credit =15 Classroom hours**

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE- Self learning evaluation CT-Commutative Test, SEE- Semester End Examination , PA- Project Assessment, AT- Attendance

Part -6 - Detailed Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

Course Code: US-FST-201

Unit	Content	No. of Lectures
I	**1. Bivariate Correlation and Regression Analysis** 1.1 Scatter Diagram, Product moment correlation coefficient and its properties. Spearman's Rank correlation.(With and without ties) 1.2 Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares. Properties of regression. 1.3 Relation between regression coefficients and correlation coefficient. 1.4 Fitting of curves reducible to linear form by transformation. Concept and use of coefficient of determination. 1.5 Fitting a quadratic curve by method of least squares.	**15**
II	2 **Time Series** 2.1 Definition of time series. Its component. Models of time series. 2.2 Estimation of trend by: i) Freehand curve method ii) method of semi average iii) Method of Moving average iv) Method of least squares(linear trend only). Exponential smoothing. Accuracy measurements: Mean absolute percentage error, Root mean square	**15**

	error. 2.3 Estimation of seasonal component by i) method of simple average ii) Ratio to moving average iii) Ratio to trend method.	
III	3 **Index Numbers** 3.1 Index numbers as comparative tool. Stages in the construction of Price Index Numbers. 3.2 Measures of Simple, Weighted and Composite Index Numbers. Laspeyre's, Paasche's, Marshal -Edgeworth and Fisher's Index Numbers formula. 3.3 Quantity Index Numbers and Value Index Numbers Time reversal test, Factor reversal test, Circular test. 3.4 Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing and deflating. 3.5 Cost of Living Index Number. Concept of Real Income based on Wholesale Price Index Number	**15**

Self-Learning topics (Unit wise)

Unit	Topics
3	3.2 Measures of Simple and Composite Index Numbers. Laspeyre's, Paasche's, Marshal-Edgeworth's and Fisher's Index Numbers formula.
3	3.3 Quantity Index Numbers and Value Index Numbers Time reversal test, Factor reversal test, Circular test.
3	3.4 Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing and deflating.

Online Resources

'Statistics for Business Economics' by Dr. Patel from University School of Sciences available on the Swayam portal, http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/227 for US-FST-201 for unit III

Course Code: US-FST-202

Unit	Content	No. of Lectures
I	1. **Continuous Random Variable** 1.1 Concept of Continuous random variable and properties of its probability distribution. 1.2 Probability density function and cumulative distribution function. Their graphical representation. 1.3 Expectation of a random variable and its properties. Measures of location, dispersion and kurtosis. Raw and central moments (simple illustrations).	**15**
II	2. **Some Standard Continuous Distributions** 2.1 Rectangular and Normal distribution.	**15**

	2.2 Derivations of Cumulative distribution function, mean, median and variance for Uniform distribution 2.3 Properties of Normal distribution (without proof). Additive Property of Normal Distribution (Statement only). Properties of normal curve. Use of standard normal tables. 2.4 Normal approximation to Binomial and Poisson distribution (Statement and Problems only). 2.5 Exponential, memory less property of exponential distribution. 2.6 Derivations of Cumulative distribution function, mean, median and variance for Exponential distribution	
III	**3. Elementary topics on Estimation and Testing of Hypothesis** **3.1. Sample from a distribution :** **3.1.1.** Concept of Parameter, statistic, estimator and estimate. **3.1.2.** Properties of good estimator (Only names), unbiasedness and standard error of an estimator. **3.1.3.** Central Limit theorem (statement only). **3.1.4.** Sampling distribution of sample mean and sample proportion (For large sample only). **3.1.5.** Standard errors of sample mean and sample proportion. **3.1.6.** Interval estimate of single mean, single proportion, Difference between two population mean and Difference between two population proportions from sample of large size. 3.2.**Testing of Hypothesis:** 3.2.1. Concept of hypothesis Simple Hypothesis and composite hypothesis Null and alternate hypothesis, Types of errors, Critical region, Level of significance and Power of test. 3.3.**Large Sample Tests for Mean and Proportions:** (Development of critical region is not expected.) 3.3.1. For testing specified value of population mean 3.3.2. For testing specified value of population proportion 3.3.3. Test for Difference between Two Population Means 3.3.4. Test for Difference between Two Population Proportions.	**15**

Self-Learning topics (Unit wise)

Unit	Topics
3	3.1.2. Central Limit theorem (statement only).
3	3.1.3. Sampling distribution of sample mean and sample proportion (For large sample only).
3	3.1.4. Standard errors of sample mean and sample proportion.
3	3.1.5. Point and Interval estimate of single mean, single proportion

3	3.2.1 Concept of hypothesis
3	3.2.1 Simple Hypothesis and composite hypothesis Null and alternate hypothesis
3	3.2.1 Types of errors, Critical region, Level of significance.
3	3.3.4 Test for Difference between Two Population Proportions.

Online Resources

'Business Statistics' by Dr Mukesh Kumar Barua from IIT Roorkee available on the Swayam portal, https://nptel.ac.in/courses/110/107/110107114/ for US-FST-202 for unit III.

Part – 7- Detailed Scheme Practicals

Course Code: US-FST-2P2

Paper-I-Practical Total Credit: 01

Title of Paper: Descriptive Statistics using MS-Excel-II

Unit	Content	No. of Lectures
I	1. LOOKUP Functions, Logical Operators and Conditional Statements 2. Correlation Analysis 3. Regression Analysis 4. Curve Fitting	03 Lectures per Practical per Batch
II	5. Time Series Analysis 6. Exponential Smoothing	
III	7. Basic Index Numbers 8. Advanced Index Numbers	

Paper-II-Practical Total Credit: 01

Title of Paper: Statistical Methods using MS-Excel-II

Unit	Content	No. of Lectures
I	1. Continuous Random Variables	03 Lectures per Practical per Batch
II	2. Uniform distribution. 3. Normal Distributions and Exponential distribution. 4. Practical Using MS-Excel: Computation of probabilities, quantiles, plotting of p.d.f. and c.d.f., fitting of continuous distributions.	
III	5. Sampling distribution and estimation 6. Testing of Hypothesis 7. Large Sample Tests for Attributes 8. Large Sample Tests for Variables 9. Practical Using MS-Excel on Large Sample Tests for Variables and Attributes	

Reference Books:

1. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd.
2. Agarwal B.L.: Basic Statistics, New Age International Ltd.
3. Spiegel M.R.: Theory and Problems of Statistics, Schaum's Publications series. Tata McGraw-Hill.
4. Kothari C.R. : Research Methodology, Wiley Eastern Limited.
5. David S.: Elementary Probability, Cambridge University Press.
6. Hoel P.G.: Introduction to Mathematical Statistics, Asia Publishing House.
7. Hogg R.V. and Tannis E.P.: Probability and Statistical Inference. McMillan Publishing Co. Inc.
8. Pitan Jim: Probability, Narosa Publishing House.
9. Goon A.M., Gupta M.K., Dasgupta B.: Fundamentals of Statistics, Volume II: The World Press Private Limited, Calcutta.