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

HONOURS PROGRAM

Concept

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 the 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.

The curriculum design for subsidiary subjects under honours program should be blend of theory and experiential learning with hands on training.

Objectives

➢ Instilling conceptual understanding in cross discipline to equip students to deal with business realities of today
➢ Prepares them to drive and face the challenge of tomorrow
➢ Develop the ability and competence to have a problem-solving approach towards the issues
➢ Enhancing employability options
➢ Informed and Ethical Decisions

Graduate Attributes

Disciplinary Knowledge ,Critical Thinking / Reflective Thinking, Communication Skills, Cooperation/Team Work , Research Related Skills, Moral and Ethical Awareness , Information/Digital literacy , Scientific reasoning

Programs

➢ Honours in B.Com, BAF, BMS, BFM, BBI under faculty of Commerce
➢ Honours in BMM under faculty of Arts
   with Statistics and Law as minor subjects.

   B.Sc (Statistics) under the faculty of Science
   with Accountancy and Law as minor subjects.

   B.Sc Honours in Biotechnology, Life Science, Microbiology,
   with Healthcare and Diagnostics as minor subjects.

Academic scheme

Credits

Semester	Minor Subject 1	Minor Subject 2
I	3	3
II	3	3
III	3	3
IV	3	3
V	3	3
VI	3	3
TOTAL	18	18
Internship	4	

The students will have to complete one moth of internship at the end of semester III/IV/V

(1) THE SCHEME OF TEACHING AND EXAMINATION:

The minimum duration of the Under Graduate Programme will be of 3 years in the Semester pattern i.e. from Sem. I to Sem.VI. The degree will be awarded to a learner who completes 40 credits of the programme in a period of 3 years from the year of enrolment.

The Scheme of Teaching and Examination shall be divided into **TWO** components, **internal assessment and External assessment** (semester-end examination) for each course of the program.

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 based on 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.

(2)   INTERNAL ASSESSMENT – 40%   40 MARKS

Sr. No.	Particulars	Marks
1	Assessment of Practical exercise / case study / presentation, assignment presentation / MCQ designed with experiential learning and hands on learning experience	30 Marks
2	Active participation in routine class instructional deliveries	10 Marks

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

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

         1)   Hands on practical evaluation -30 Marks   Duration 1 Hour
         2)   Theory paper   -30 Marks   Duration 1 Hour

The marks of the internal assessment should not be disclosed to the students till the results of the corresponding semester are declared by the university.

B.Com. Honours Programme in Statistics

There is always scope for improvement. Perfection is a moving goal. Improvement is measured through business results. There is an unknown improvement sequence that will bring best results in your unique business situation. Statistical Data driven approaches help in finding root causes of problems and fixing them permanently.

This Course is based on motto of learning while doing and is of 20 Credits. There will be Sic Semesters. Each Semester course work is of 3 Credits. Two Credits are assigned for Internship in Companies like Reliance, Accenture, CapGemini etc in R & D Departments. A 15days internship of one credit should be undertaken in any two semesters out of Sem III, Sem IV and Sem V only and two internship cannot be completed in single semester.

Learning Outcomes:

i. Students will learn Statistics from basics concepts to creating basic models for predictions

ii. Students will learn how Statistics is actually used large corporations like Microsoft, Jio, Amazon and other top companies globally

iii. In the hands-on session, Students will gain skills on identifying opportunities for Analytics.

iv. Students will acquire analytics skill needed for R & D for smooth run of any business.

v. Students will learn to solve business problems using a structured approach to improve an Organisation's performance.

Semester I: **<u>Data Collection and Visualisation with MS-Excel</u>**

Learning Objective:

This course aims to prepare participants to learn to make scientific enquiry and scientific instrument widely known as questionnaire. Learner will learn how to classify data, data types then techniques of basic visualization to advance visualisation, to create dashboards, info graphics and narrate stories hiding in data.

Course Code	Title	Credits
	<u>Data Collection and Visualisation with MS-Excel</u>	**3 Credits (45 Hours)**

Unit I: Types of Data and Data Condensation(15 Hours)
 	
I.   Installation---
Installation of add-in **MegaStat** in Excel Library from https://megastat.software.informer.com and activation of **Data Analysis ToolPak**.
 	
II.   Introduction, Data Types--
  ➢ Definition of Statistics, Application and scope of Statistics
  ➢ Concept of Population and Sample. Finite, Infinite Population, Parameter and Statistic.
  ➢ Types of data: Qualitative and quantitative data; Time series data and cross section data, discrete and continuous data.
  ➢ Different types of scales: nominal, ordinal, interval and ratio.
  ➢ Concept of population and sample. Finite and Infinite population
 	
III.   Primary data and Secondary Data--
concept of a questionnaire and a schedule, Secondary data and Collection
 	
IV.   Experiential Learning--
1) Designing of a questionnaire and/or a schedule
2) Collection of Data and Preparation of Excel Response sheet
		2 Hours
		
		3 Hours
		
		4 Hours
		
		6 Hours

Unit II: Data Visualization (15 Hours)	
I. **Introduction** ---	2 Hours
The philosophy of Data Visualization, Deconstructing and understanding the expression data visualization, Understanding how data analysis and visualization complement each other, A drill-down into what constitutes data with examples	
II. Experiential Learning with Pivot Table---------------------------------	4 Hours
An analysis of a "data table", The "Row View", The "Column View", What might interest a data analyst about rows i.e. instances or samples, What might interest a data analyst about columns i.e. attributes or variables with suitable examples	
III. Visualisation--	2 Hours
Where does Data Visualization enter the frame of Data Analysis? , The motive force behind visualization – A PICTURE SPEAKS LOUDER THAN A THOUSAND WORDS, The interplay of variables that leads to visualization, Univariate analysis, Bivariate analysis , Multivariate analysis and their visualization	2 Hours
IV. The WHY, WHAT and HOW of Visualization-------------------------	
Why visualize (what questions do we want visualization to answer),What is being visualized (the data)?, How should we visualize (the various types of plots and graphs)	5 Hours
V. Experiential Learning with Univariate Visualization------------------	
1) Constructing and interpreting: Histogram, Pie chart, Bar chart. Box and Whisker plot , stem leaf diagram	
2) Going beyond Univariate Visualization: Pareto Chart, Fishbone Chart	
Unit III: Data Visualization(15 Hours)	
I. Pair Plots, Bivariate Visualization --	1 Hours
visualizing the relationship of two variables, The cause-effect relationship, Concept of X and Y variables, Concept of independent and dependent variables, Choice of pair of variables, which is X and which is Y, what questions will the combination answer	
II. The matrix of 4 combinations--	1 Hours
➢ Categorical (X) vs Categorical (Y) ➢ Numeric (X) vs Numeric (Y) ➢ Categorical (X) vs Numeric (Y) ➢ Numeric (X) vs Categorical (Y)	
III. Experiential Learning with Bivariate Visualization -------------------	9 Hours
1) The Grouped Bar chart, The Stacked Bar chart, Ogives, Frequency Curve and Frequency Polygon	
2) Going beyond Bivariate Visualization: Thermometer Chart, Funnel Chart, Waterfall chart, Pyramids, Power Maps	

	3) The Scatter plot: Using the scatter plot for bivariate visualization (two numeric variables), 4) More visualizations: Power Curve, Exponential Curve, Logarithmic Curve, Pareto Curve and relationship with Coefficient of Determination R^2. 5) Time series visualizations using the line chart	
IV.	Infographics-- Concept, Types, Experiential Learning for storytelling using Excel deshboard and infographics.	4 Hours

Reference Books:

1. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd.
2. Spiegel M.R.: Theory and Problems of Statistics, Schaum's Publications series. Tata McGraw-Hill.
3. Kothari C.R. : Research Methodology, Wiley Eastern Limited.

Reference Websites:

i). www.statsci.org/datasets.html

ii). www.statweb.calpoly.edu/bchance/stat-stuff.html

iii). www.amstat.org/publications/jse/jse-data-archive.html

iv). www.amstat.org/publications/chance

v). www.math.uah.edu/stat

vi). www.amstat.org/publications/stats

vii). www.stat.ucla.edu/cases

viii). https://data.gov.in/

ix). https://www.connectmath.com/training/MegaStat_User_Guide.pdf

x). https://youtu.be/bxr0iL6NI1g

xi). https://www.moresteam.com/toolbox/pareto-chart-manufacturing.cfm

xii). https://youtu.be/ySbhsX-y8zE

Semester II: **Data Analytics-I(Introduction to Six Sigma with MS-Excel)**

Learning Objectives:

Learning Objectives:

This course will prepare participants to use the Quality Management tools conveniently and effectively including statistical techniques. Also, the participants will be able to handle practical situations in the organization more efficiently and disciplined culture in executing the responsibilities.

Course Code	Title	Credits
	<u>Data Analytics- I</u> **Introduction to Six Sigma with MS-Excel**	**3 Credits (45 Hours)**

<u>Unit I</u> : SIX SIGMA(10 Hours)		
I.	Introduction-- History and concept, Basic Principles, Goals, six sigma v/s TQM, ISO 9000, Traditional Management, Quality defined, VOC and CTQ, Quality measurement to six sigma.	4 Hours
II.	Experiential Learning--- Seven tools of quality and its application: 1)Histogram or Stem and Leaf display. 2) Check sheet. 3) Pareto Chart. 4) Cause and Effect diagram (Fish bone Diagram) 5) Defect concentration diagram. 6) Scatter diagram. 7) Control charts (**Only concept of control chart**).	3 Hours
III.	DMAIC with case study--	2Hours
IV.	Introduction to Lean Six Sigma -----------------------------------	1 Hour
<u>Unit II</u> : INTRODUCTION TO BASIC STATISTICS(15 Hours)		
I.	Descriptive Statistics --- Averages, Measures of Variation, Skewness, Kurtosis, Box and Whisker plots	2 Hours
II.	Data Distribution--- Normal Distribution, CLT theorem, Sampling distribution of mean)	2 Hours
III.	Hypothesis Testing --	1 Hour
IV.	Experiential Learning --- • Parametric Test: Applications of Large Sample Test, Applications of Small Sample Test, Application of Chi-Square Test and F test, • *Non Parametric Test: Mann-Whitney U test, Kruskal-Wallis test, Moods median test,* • Design of experiments*: One way and Two way ANOVA.* • Regression analysis using Scatter Diagram.	10 Hours

Unit III : CONTROL CHARTS (20 Hours)	
I. Introduction, Chance and assignable causes, Statistical basis of the control chart: Basic principles of control chart (Shewhart Control Charts), Choice of control limits	2 Hours
II. Control chart for Attributes-- Theory of P, np, c and u charts, p-chart with variable sample size, Experiential Learning: Plotting above charts and Interpretation, *Problems involving setting up standards for future use*	8 Hours
III. Control chart for Variables-- X-Bar, R, S[*sample standard deviation*] Experiential Learning: Plotting above charts and Interpretation, *Problems involving setting up standards for future use*	6 Hours
IV. Introduction to process capability --------------------------------------- concept, Specification limits natural tolerance limits and their comparisions, estimate of percent defectives, Capability ratio and Capability indices (Cp), Capability performance indices Cpk with respect to machine and process interpretation, relationship between i. Cp and Cpk ii. Defective parts per million and Cp	4 Hours

References:

1) Fundamental of Mathematical Statistics, Gupta and Kapoor.

2) Probability and Random process by T. Veerarajan.

3) Six Sigma For Business Excellence, (2005), Penelope Przekop, McGraw-HillSix Sigma Handbook, by Pyzdek, McGraw Hill Education;4 edition (1 July 2017).

4) The Certified Six Sigma Green Belt Handbook, Roderick A. Munro and Govindarajan Ramu , American Society for Quality (ASQ),

5) What Is Design For Six Sigma,(2005), Roland Cavanagh, Robert Neuman, Peter Pande, Tata McGraw-Hill.

6) The Six Sigma Way: How GE, Motorola, And Other Top Companies Are Honing Their Performance, (2000), Peter S. Pande, Robert P. Neuman, Roland R. Cavanagh, McGraw-Hill

7) What Is Lean Six Sigma,(2004), Mike George, Dave Rowlands, Bill Kastle, McGraw-Hill8.

8) Six Sigma Deployment,(2003), Cary W. Adams, Charles E Wilson Jrs, Praveen Gupta, Elsevier Science.

9) Six Sigma For Beginners: Pocket Book(2018), Rajiv Tiwari Kindle Edition

10) Introduction to Statistical Quality Control(2009), Montgomery, Douglas, C ,Sixth Edition, John Wiley & Sons.Inc.

11) Statistical Quality Control: E.L.Grant. 2nd edition, McGraw Hill, 1988.

12) Quality Control and Industrial Statistics: Duncan. 3rd edition, D.Taraporewala sons & company.

13) Quality Control: Theory and Applications: Bertrand L. Hansen, (1973),Prentice Hall of IndiaPvt. Ltd.

14) Introduction to Statistical Quality Control(2009), Montgomery, Douglas, C. , Sixth Edition, John Wiley & Sons, Inc.

15) Quality Control (1976), I.V. Burr, Mardekkar, New York, 16.Fundamentals of Applied Statistics , Gupta and Kapoor.

Web Sites

      i). https://sixsigmastudyguide.com/run-chart/
      ii). https://kissflow.com/project/agile/5-principles-of-lean/
      iii). https://quality-one.com/grr/

Forecasting Techniques in Capital Market

Learning Objectives:

The Course is aimed to give entry level knowledge to students about Capital Markets, Investment Alternatives, Understanding and Measuring Risk associated with investments, Forecasting Techniques. Etc. This shall form the foundation for advanced Forecasting Techniques and Portfolio Management skills

Unit	Topics	No. of Hours
I	**Investment Alternatives in Capital Market** Introduction to Concept of: i. Equity Stock ii. Bonds iii. Debentures \ Preference Shares iv. Gold v. Others Basic Understanding of Stock Market Trade Mechanism and terminologies. **Experiential Learning:** *Vising various* BSE / NSE, Economic Times, Moneyctrol.com, etc. *investment websites and preparing list of all the investment options available in India for Indian along with brief explanation of 5 to 7 lines on each.* ***Concepts of Risky and Risk-free asset classes.*** Introduction to Risk as Uncertainty. Classifying investments into Risk-free and Risky assets. ***Introduction to Measuring Returns and Risk:*** Measuring Rate of Returns, Interest Rates, Discounting, CAGR, etc., Variance & Standard Deviation as measure of Risk., Real life Problem Solving with *use of MS-Excel in calculations* ***Causes / Factors of stock price movement:*** Economy Specific Factors, Company Specific Factors. Experiential Learning: *Measuring Returns and Risk*	15
II	***Concepts of Portfolio and Risk Assessment & Diversification*** • Portfolio as a basket of different Investments • Expected Return of a Portfolio	15

	• Risk of a Portfolio • Concepts of CAPM, SML, etc. • Classification of Risk into Systematic and Unsystematic Risk • Understanding diversification as a Risk controlling tool **Experiential Learning:** 1) https://zoo.cs.yale.edu/classes/cs458/lectures/old/mpt/CAPM.html 2) http://articles-junction.blogspot.com/2013/10/concept-of-risk-and-return-withdiagram.html#:~:text=In%20concept%20of%20risk%20and%20return%2C%20the%20simple%20investment%20management,equity%20shares%2C%20bring%20higher%20returns.	
III	***Basics of Forecasting Techniques in Capital Markets / Stocks Market*** • Regression as a tool • Factor Models • Time-series and Autoregressive models. **Experiential Learning:** https://www.analyticsvidhya.com/blog/2020/10/examining-the-simple-linear-regression-method-for-forecasting-stock-prices-using-excel/ ***Introduction to Forecasting using Historical Charts*** • Concepts of Charts as reflection of sentiments • Various Technical Analysis Tools for forecasting **Experiential Learning:** Visiting various sites like Economic Times, Moneyctrol.com, etc. to extract various Technical Analysis Reports and studying the same. 1) https://www.arihantcapital.com/knowledge-center/technical-analysis-basics#: 2) https://www.youtube.com/watch?v=rlZRtQkfK04	15

Reference:

Technical Analysis by Martin Pring,

Semester IV

Network Models and Scheduling Techniques using MS Excel

Objective: This paper focuses on the various types of scheduling problems and techniques that can be employed to solve concerned problems and to equip students with practical implication of LPP.

Unit	Topics	Hours
I	**Network optimization models**: Introduction, Basic concepts and Its Applications	1
	Formulation and Introduction to Linear Programming Problem.---------------------	1
	Transportation problem:_____	6
	Introduction, Mathematical formulation as a linear programming problem, methods to find initial basic feasible solution (NWCM, LCM, VAM) and optimal solution (MODI), Variants in Transportation Problem: Unbalanced, Maximization type.	
	Experiential Learning:_____	7
	Solve LPP with Solver (Under Data toolpak)	
	Obtaining Initial BFS solution of Transportation Problem	
	Obtain optimum route/schedule with minimum cost for Transportation Problem and Transhipment Problem	
	Solve Transportation Problem as a LPP (Solver).	
II	**Transhipment Problem and Assignment problem:**	3
	Transportation problem: Extension to Transhipment Problem	
	Experiential Learning:	
	Obtain optimum route/schedule with minimum cost for Transhipment Problem	
	Assignment problem:	6
	Introduction, Mathematical formulation as a linear programming problem, Hungarian method, Variants in Assignment Problem: Unbalanced, Maximization type, Travelling salesman problem: Branch and Bound solution algorithm.	
	Experiential Learning:	9
	i). Solve Assignment Problem	
	ii). Solve Assignment Problem as a LPP(Solver).	
	iii). Solve travelling salesman problem using Solver.	

III	**Project Scheduling**:	
	Network representation of project, Project scheduling: critical path method and PERT, Types of Floats, Crashing: Time and cost trade-off.	6
	Extension to minimal spanning Tree	3
	Experiential Learning:	6
	i). To perform Project scheduling of a given project (Deterministic case-CPM).	
	ii). To perform Project scheduling of a given project (Probabilistic case-PERT).	
	iii). To perform Crashing of a given Project.	
	iv). To Solve Minimal Spanning Tree	

References:

1. PERT and CPM, Principles and Applications: Srinath. 2nd edition, East-West Press Pvt. Ltd.
2. Quantitative Techniques For Managerial Decisions: J.K.Sharma, (2001), MacMillan India Ltd.
3. Mathematical Models in Operations Research: J K Sharma, (1989), Tata
4. McGraw Hill Publishing Company Ltd.
5. Operations Research: S.D.Sharma.11th edition, KedarNath Ram Nath& Company.
6. Operations Research: Kantiswaroop and Manmohan, Gupta. 12thEdition; S Chand & Sons.
7. Schaum Series book in O.R. Richard Bronson. 2nd edition Tata Mcgraw Hill Publishing Company Ltd.
8. Bronson R. : Theory and problems of Operations research, First edition, Schaum's Outline series
9. Operations Research: Methods and Problems: Maurice Sasieni, Arthur Yaspan and
10. Lawrence Friedman,(1959), John Wiley & Sons.
11. Operations Research: H. A.Taha., 6th edition, Prentice Hall of India.
12. Vora N. D. : Quantitative Techniques in Management, Third edition, McGraw Hill Companies.
13. 11. Banerjee B. : Operations Research Techniques for management 1st edition, Business Books.

HSNC University, Mumbai

<u>Board of Studies</u>

In the Subject of Statistics and Data Science & Business Analytics

1) Dr. Asha Jindal- Chairperson of Ad-hoc BOS
2) Dr. S.B. Muley- Member
3) Ms Pratiksha Kadam- Member-
4) Ms Shailaja Rane- Member
5) Dr. Annum Area Ahmed I/C Principal, Rizvi College- Member (Associate Professor from other University)
6) Dr.Suresh Sharma, Department of Statistics, Panjab University- Member(Eminent Scholar)
7) Dr. Santosh Gite,Associate professor, University of Mumbai -Member (Research Institute)
8) Mr. Mukesh Jain, CTO, CapGemini – Industry Expert (Data Scientist - Contributionn in Society at Large from Industry)
9) Mr. Prashant Nair, Director ,Nelson- Industry Expert
10) Rankers and bright students of Department of Statistics, K.C.College,

   i. Ms. Mohadassah Patel
   ii. Ms. Divya Srivastav.