K L Deemed to be University
Department of CSE -- KLVZA
Course Handout
2020-2021, Even Sem

Course Title	:Data Science
Course Code	:19CS2205S
L-T-P-S Structure	: 2-0-2-2
Pre-requisite	:
Credits	: 3.5
Course Coordinator	:vithya Ganesan
Team of Instructors	:
Teaching Associates	:

Syllabus :CO1: Understand Data science, Exploratory Data Analysis, Data Extraction, Wrangling- Introduction to data science, Big Data Overview, State of the Practice of Analytics, Big Data Analytics in Industry Verticals. Overview of Data Analytics Lifecycle, Discovery, Data Preparation, Model Planning, Model Building, Communicating Results and Findings, Operationalizing. Data science in a big data world- benefits and uses of data science, facets of data, Data science process. Data Analytics Process, Exploratory Data Analysis (EDA), EDA-Quantitative Technique, EDA - Graphical Technique, Data Analytics Conclusion or Predictions. CO2: Visualization and simple metrices: Data Analytics Communication Data Types for Plotting Data Types and Plotting, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Color bars, Multiple Subplots, Text and Annotation, Customizing Ticks. Probability and Independence-Using independence to find probabilities, Pairwise and mutual independence, Bernoulli Scheme, Law of total probability. Random variables-Discrete random variables with infinite number of values, Geometric and Poisson distributions CO3: Variance, covariance, and correlation-Linear transformations of random variables, Functions of random variables, Properties of variance- Sum of random variables. Expected value and variance, Joint probability distribution, Independent random variables, Expected value of product of independent random variables, Variance of sum of random variables, properties of covariance, Correlation of two random variables. Continuous random variables-Probability density function (PDF), Cumulative distribution function (CDF), Transformations of continuous random variables and their PDFs, Independence, covariance, and correlation of continuous random variables. CO4: Inferential Statistical Analysis- Introduction to Inference Methods- Introduction to Bayesian- Estimating a Population Proportion with Confidence- Understanding Confidence Intervals- Assumptions for a Single Population Proportion Confidence Interval- Interpretations & Assumptions for Two Population Proportion Intervals- Confidence Intervals for Differences between Population Parameters. statistical modeling techniques, including linear regression, logistic regression, generalized linear models, hierarchical and mixed effects (or multilevel) models, and Bayesian inference techniques. Hypothesis Testing- Setting Up a Test for a Population Proportion- Setting Up a Test of Difference in Population Proportions, Interview: P-Values, P-Hacking

Text Books :1 Data science Hand book – Field cady- wiley 2 Statistical inference for data science-Brian Caffo 3 Introducing Data science by Davy cielen, Arno D.B.Meysmen, Mohamed Ali

Reference Books :1. Doing Data Science ,Straight talk from the front line- Rachel schutt&cathy o'neil ,o'reilly 2. Probability and Statistics for Data Science-Carlos Fernandez-Granda 3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing, and Presenting Data 1st Edition 4. Hands-On Exploratory Data Analysis with Python, Suresh Kumar Mukhiya Usman Ahmed, Pack 5. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, Willey

Web Links :1.Python Data Science Handbook 2. Coursera, Simplilearn course material

MOOCS :https://www.coursera.org/specializations/mathematics-for-data-science?
Course Rationale : Internet and World Wide Web , currently producing roughly 2.5 quintillion bytes of data each day . Data Science is needed to be transforming each data into impactful action to elucidate world organizational challenges such as understand, explore, methodology and transform the data. Major sustenance to effective management is the perceptions of the complexity, ambiguity, and uncertainty of the environment by using probability and statistical domain in Data Science. This course provides the basic concepts of Data Science which is essential for the student to understand the advanced courses like Machine Learning, Natural Language Processing, Soft Computing, Data Mining, IoT, Big Data Analytics and so on. PYTHON is one of the most useful languages to solve DS problems by using GGplot, Seaborn ,Numpy and Pandas.
Course Objectives : The emphasis of the course is on study of data and its type , understanding the data comparisons by visualization techniques. probability is useful for making decisions about likelihood of events and its inferences and statistics for data classification, regression, and time series analysis

COURSE OUTCOMES (COs):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Understand Data science, Exploratory Data Analysis, Data Extraction, Wrangling, Examine the inference from Exploratory data analysis (EDA)	PSO1,PO1,PO3	2
CO2	Demonstrate by organizing, comparing visualization and simple metrices	PSO1,PO3,PO5	3
CO3	Examine and make inferences by applying acquired knowledge, facts, techniques of Probability and Independence in Data Science	PSO1,PO3,PO4	3
CO4	Applying Variance, covariance, and correlation on Data Science	PO4,PSO1,PO3	4
CO5	Implementing Inferential Statistical Analysis	PSO1,PO5	4

COURSE OUTCOME INDICATORS (COIs)::

Outcome No.	Highest BTL	COI-1	COI-2	COI-3	COI-4
CO1	2	**Btl-1** Exhibit the basics of Data Science	**Btl-2** Illustrate and giving descriptions on types of Data and Exploratory Data Analysis		
CO2	3	**Btl-1** Understand the Concepts of visualization	**Btl-2** Compare the data by different types of visualization	**Btl-3** Analyse the suitable visualization techniques for the data	
CO3	3	**Btl-1** Understand about probability	**Btl-2** Interpreting the properties of variance in Data Science	**Btl-3** Analysing past, present and prediction of data using Variance and covariance	

CO4	4	**Btl-1** Understand the Outline of random variable	**Btl-2** Probability density function (PDF), Cumulative (CDF) and its transformations	**Btl-3** Probabilistic reasoning by PDF, CDF in Data Science	**Btl-4** Experiment with PDF, CDF in Data Science
CO5	4	**Btl-1** Illustration of statistical analysis	**Btl-2** Implementation of statistical analysis in Data Science	**Btl-3** Applying statistical formulas in data science	**Btl-4** Experiment with Hypothesis Testing

PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES (POs/PSOs)

Po No.	Program Outcome
PO1	Engineering Knowledge :An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems in engineering
PO2	Problem Analysis :An ability to identify, formulate, research literature, analyze complex engineering problems in mechanical engineering using first principles of mathematics, natural sciences and engineering sciences
PO3	Design/ development of solutions :An ability to design solutions for complex engineering problems and system component or processes that meet the specified needs considering public health & safety and cultural, societal & environment
PO4	Conduct investigations of complex problems :An ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to obtain solutions to engineering problems
PO5	Modern tool usage :Ability to create, select and apply appropriate techniques, resources and modern engineering activities, with an understanding of the limitations
PO6	The engineer and society :Ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO7	Environment and sustainability Ability to demonstrate the knowledge of engineering solutions, contemporary issues understanding their impacts on societal and environmental contexts, leading towards sustainable development
PO8	Ethics : An ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice
PO9	Individual and team work :An ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
PO10	Communication :Ability to communicate effectively oral, written reports and graphical forms on complex engineering activities
PO11	Project management and finance :Ability to demonstrate knowledge and understanding of the engineering and management principles and apply those one’s own work, as a member and leader in team, to manage projects and in multi-disciplinary environments
PO12	Lifelong learning An ability to recognize the need for and having the preparation and ability to engage independent and life-long learning in broadest context of technological change
PSO1	An ability to design and develop software projects as well as Analyze and test user requirements.
PSO2	An Ability to gain working Knowledge on emerging software tools and technologies.

Lecture Course DELIVERY Plan:

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	EvaluationComponents
1	CO1	COI-1	Course Handout explanation and Introduction to DS, Big Data Overview	R BOOK [1], CH 1.1-1.1, Page no 1-11	PPT	End Semester Exam,SEM-EXAM1
2	CO1	COI-1	State of the Practice of Analytics, Big Data Analytics in Industry Verticals.	R BOOK [1], CH 1.2-1.4, Page no 11-22	PPT	End Semester Exam,SEM-EXAM1
3	CO1	COI-1	Overview of Data Analytics Lifecycle, Discovery, Data Preparation, Model Building, Communicating Results	R BOOK [1], CH 2.1-2.8, Page no 25-59	PPT,Talk	End Semester Exam,SEM-EXAM1
4	CO1	COI-1	Data science in a big data world-benefits and uses of data science, facets of data, Data science process	T BOOK [1], CH 1.1-2.2, Page no 1-55	PPT,Talk	End Semester Exam,SEM-EXAM1
5	CO1	COI-2	Data Analytics Process, Exploratory Data Analysis (EDA), EDA-Quantitative Technique	R BOOK [4], CH 1, Page no 1	PPT,Talk	End Semester Exam,SEM-EXAM1
6	CO1	COI-2	EDA - Graphical Technique, Data Analytics Conclusion or Predictions	R BOOK [4], CH 2, Page no 36	PPT,Talk	End Semester Exam,SEM-EXAM1
7	CO2	COI-1	Data Analytics Communication Data Types for Plotting Data Types and Plotting, Simple Line Plots	T BOOK [2], CH 2, Pg No:11-34	PPT,Talk	End Semester Exam,SEM-EXAM1
8	CO2	COI-1	Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends	T BOOK [2], Ch2, Pg No-44-69 T BOOK [4], CH 4 , Page no -237-255	PPT,Talk	End Semester Exam,SEM-EXAM1
9	CO2	COI-1	Customizing Color bars, Multiple Subplots, Text and Annotation, Customizing Ticks	T BOOK [4], Ch4, Pg no:255-28	PPT,Talk	End Semester Exam,SEM-EXAM1

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	EvaluationComponents
10	CO2	COI-2	Probability and Independence-Using independence to find probabilities, Pairwise and mutual independence	T BOOK [1], CH 2, Page No:21-55	PPT,Talk	End Semester Exam,SEM-EXAM1
11	CO2	COI-3	Bernoulli Scheme, Law of total probability	T BOOK [1], CH 7, Pg no:125-144	PPT,Talk	End Semester Exam,SEM-EXAM1
12	CO2	COI-3	Random variables-Discrete random variables with infinite number of values,	T BOOK [1], CH 7, Pg no:125-144 T Book[3] , CH	PPT,Talk	End Semester Exam,SEM-EXAM1
13	CO3	COI-1	Variance, covariance, and correlation-Linear transformations of random variables, Functions of random variables, Properties of variance-Sum of random variables	R BOOK [2], CH 2, Pg no:11-33	PPT,Talk	SEM-EXAM1
14	CO3	COI-1	Expected value and variance, Joint probability distribution, Independent random variables	R BOOK [2], CH 2, Pg no:35-60	PPT,Talk	End Semester Exam,SEM-EXAM2
15	CO3	COI-1	Expected value of product of independent random variable, Variance of sum of random variables	R BOOK [3], CH 2, Pg no:60-63	PPT,Talk	End Semester Exam,SEM-EXAM2
16	CO3	COI-2	properties of covariance, Correlation of two random variables	T BOOK [2], CH 4, Pg no: 45-50	PPT,Talk	End Semester Exam,SEM-EXAM2
17	CO3	COI-2	Continuous random variables-Probability density function (PDF), Cumulative distribution function (CDF)	T BOOK [2], CH 6, Pg no: 51-60	PPT,Talk	End Semester Exam,SEM-EXAM2
18	CO4	COI-1	Inferential Statistical Analysis-Introduction to Inference Methods- Introduction to Bayesian- Estimating a Population Proportion with Confidence	R BOOK [2], CH 10, Pg no:179-183	PPT,Talk	End Semester Exam,SEM-EXAM2

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	EvaluationComponents
19	CO4	COI-1	Inferential Statistical Analysis- Introduction to Inference Methods- Introduction to Bayesian- Estimating a Population Proportion with Confidence	R BOOK [2], CH 10, Pg no:179-183	Chalk,Talk	End Semester Exam,SEM-EXAM2
20	CO4	COI-2	Understanding Confidence Intervals- Assumptions for a Single Population Proportion Confidence Interval- Interpretations & Assumptions for Two Population Proportion Intervals	T BOOK [2], CH 4 Page no 23-33	PPT,Talk	End Semester Exam,SEM-EXAM2
21	CO4	COI-2	Confidence Intervals for Differences between Population Parameters	T BOOK [2], CH 9, Pg no:155-168	PPT,Talk	End Semester Exam,SEM-EXAM2
22	CO4	COI-3	Statistical modelling techniques, including linear regression, logistic regression,	R BOOK [2], CH 12 Page no 202-208	PPT,Talk	End Semester Exam,SEM-EXAM2
23	CO4	COI-3	Generalized linear models ,Hierarchical and mixed effects (or multilevel) models, and Bayesian inference techniques	T BOOK [2], CH 9 Page no 87-93	PPT,Talk	End Semester Exam,SEM-EXAM2
24	CO4	COI-4	Hypothesis Testing- Setting Up a Test for a Population Proportion- Setting Up a Test of Difference in Population Proportions, Interview: P-Values, P-Hacking	T BOOK [2], CH 10 Page no 96-98	PPT,Talk	End Semester Exam,SEM-EXAM2

Lecture Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 Student will understand the importance of DS.

Session Outcome: 2 Student Know about CO’s , Syllabus and Evaluation plan of the course

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance/popup question	1	Talk	Group Discussion

10	Course Handout explanation	1	Talk	Group Discussion
10	Applications of DS	2	PPT	Just in-time teaching
10	Introduction to DS, Big Data Overview	2	PPT	Just in-time teaching
10	Quiz through LMS	2	PPT	Quiz/Test Questions

SESSION NUMBER : 2

Session Outcome: 1 . Student will understand Big Data Analytics.

Session Outcome: 2 Student will learn the real world applications in Industry Verticals.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Recap, popup question	2	Talk	--- NOT APPLICABLE ---
10	State of the Practice of Analytics	1	PPT	Brain storming session
10	Clarification of doubts	2	PPT	--- NOT APPLICABLE ---
20	Big Data Analytics in Industry Verticals	2	PPT	Group Discussion

SESSION NUMBER : 3

Session Outcome: 1 Students will learn about problem Data Analytics Lifecycle.

Session Outcome: 2 Students will learn Model Building, Communicating Results.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Recap, popup question	1	PPT	Group Discussion
10	Overview of Data Analytics Lifecycle, Discovery, Data Preparation	1	PPT	Just in-time teaching
10	Clarification of doubts	2	PPT	Brain storming session
10	Model Building, Communicating Results	2	PPT	Group Discussion
10	Discussion/Conclusion	1	Talk	Group Discussion

SESSION NUMBER : 4

Session Outcome: 1 Student will learn several benefits and uses of data science that can be used to solve problems.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	2	Talk	--- NOT APPLICABLE ---
20	Data science in a big data world- benefits and uses of data science	1	PPT	Group Discussion
5	CREATING A BREAKOUT ROOM	1	Talk	Debate
10	facets of data, Data science process	1	Talk	Group Discussion
10	Conclusion	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 1 Student will learn Exploratory Data Analysis (EDA) to use in Data Science.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
20	Data Analytics Process, Exploratory Data Analysis (EDA),	1	PPT	Group Discussion
10	CREATING A BREAKOUT ROOM	1	PPT	Group Discussion
10	EDA-Quantitative Technique	1	PPT	Group Discussion
5	Conclusion	1	Talk	Debate

SESSION NUMBER : 6

Session Outcome: 1 . Student will learn the EDA - Graphical Technique to solve problems.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
10	EDA - Graphical Technique	2	PPT	Group Discussion
10	CREATING A BREAKOUT ROOM	2	PPT	Group Discussion

20	Data Analytics Conclusion or Predictions Assignment/Quiz (ALM)	2	PPT	Group Discussion
5	Conclusion	1	Talk	Debate

SESSION NUMBER : 7

Session Outcome: 1 Students will learn about Local Search Algorithms

Session Outcome: 2 2. Students will learn about state space search based problems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Recap, Popup question	2	Talk	--- NOT APPLICABLE ---
20	Data Analytics Communication Data Types for Plotting	2	PPT	Group Discussion
10	CREATING A BREAKOUT ROOM	2	Talk	Group Discussion
10	Data Types and Plotting, Simple Line Plots	2	PPT	Brain storming session

SESSION NUMBER : 8

Session Outcome: 1 Students will learn Visualization Techniques

Session Outcome: 2 Students understand Plots and Histogram

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	2	Talk	Group Discussion
10	Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms	2	PPT	Brain storming session
10	CREATING A BREAKOUT ROOM	2	PPT	Group Discussion
20	Binnings, and Density, Customizing Plot Legends	2	PPT	Group Discussion
5	Conclusion	2	Talk	Group Discussion

SESSION NUMBER : 9

Session Outcome: 1 Students will learn Multiple subplots

Session Outcome: 2 Students know about Text and Annotation

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods

10	Recap, Popup question	2	Talk	Group Discussion
10	Customizing Color bars, Multiple Subplots	3	PPT	Brain storming session
10	CREATING A BREAKOUT ROOM	3	Talk	Debate
10	Text and Annotation, Customizing Ticks	3	PPT	Brain storming session
10	Conclusion	1	Talk	Just in-time teaching

SESSION NUMBER : 10

Session Outcome: 1 Students will learn about Probability and Independence

Session Outcome: 2 Students will understand Pairwise and mutual independence

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
10	Probability and Independence-Using independence to find probabilities,	2	PPT	Just in-time teaching
10	Clarification of doubts	2	PPT	Brain storming session
20	Pairwise and mutual independence	2	PPT	Brain storming session
5	Quiz through LMS	1	Talk	Quiz/Test Questions

SESSION NUMBER : 11

Session Outcome: 1 Students will learn about Bernoulli Scheme, Law of total probability

Session Outcome: 2 Students will understand by Problems on Bernoulli Scheme

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, popup question	1	Talk	--- NOT APPLICABLE ---
10	Bernoulli Scheme, Law of total probability	3	PPT	Group Discussion
10	CREATING A BREAKOUT ROOM	3	PPT	Just in-time teaching
20	Problems on Bernoulli Scheme Assignment/Quiz (ALM	3	PPT	Brain storming session
5	Conclusion	1	Talk	Just in-time

				teaching

SESSION NUMBER : 12

Session Outcome: 1 Students will learn Discrete random variables with infinite number of values

Session Outcome: 2 Students apply formula of Geometric and Poisson distributions for identifying randomness

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
10	Random variables-Discrete random variables with infinite number of values	3	PPT	Brain storming session
10	CREATING A BREAKOUT ROOM	3	PPT	Brain storming session
20	Problems on Geometric and Poisson distributions Assignment/Quiz (ALM)	3	PPT	Brain storming session
5	Conclusion	2	Talk	One minute paper

SESSION NUMBER : 13

Session Outcome: 1 .Students will learn about Linear transformations of random variables

Session Outcome: 2 Students uses Sum of random variables in DS

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	3	Talk	--- NOT APPLICABLE ---
10	Variance, covariance, and correlation-Linear transformations of random variables	1	PPT	Brain storming session
10	Clarification of doubts	1	PPT	Leading question
20	Functions of random variables, Properties of variance- Sum of random variables	1	PPT	Case Study
10	Quiz through LMS	1	Talk	Immediate feedback

SESSION NUMBER : 14

Session Outcome: 1 Students will learn the difference between Joint probability distribution

Session Outcome: 2 Hand on training on Problems on Independent random variables for students

Time(min)	Topic	BTL	Teaching-Learning	Active Learning

			Methods	Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
10	Expected value and variance, Joint probability distribution	1	PPT	Group Discussion
10	CREATING A BREAKOUT ROOM	2	PPT	Brain storming session
20	Problems on Independent random variables Assignment/Quiz (ALM)	1	PPT	Brain storming session
5	Conclusion	1	Talk	Just in-time teaching

SESSION NUMBER : 15

Session Outcome: 1 Students will learn about product of independent random variable

Session Outcome: 2 Students know the usages of random variables in DS

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
10	Expected value of product of independent random variable	1	PPT	Fish Bowl
20	Variance of sum of random variables	1	PPT	Brain storming session
10	Conclusion	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 16

Session Outcome: 1 Students will learn about properties of covariance

Session Outcome: 2 2. Students know the usages of correlation in DS

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
20	properties of covariance	2	PPT	Group Discussion
5	CREATING A BREAKOUT ROOM	2	PPT	Brain storming session
20	Problems on Correlation of two random variables as Assignment/Quiz (ALM)	2	PPT	Fish Bowl

SESSION NUMBER : 17

Session Outcome: 1 Students will learn theorem on Probability density function (PDF)

Session Outcome: 2 Students will learn theorem on Cumulative distribution function (CDF)

Session Outcome: 3 Hands on training on PDF, CDF problems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
20	Continuous random variables-Probability density function (PDF)	3	PPT	Debate
20	Cumulative distribution function (CDF)	3	PPT	Brain storming session
5	Conclusion	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 18

Session Outcome: 1 Students will learn about Transformations of continuous random

Session Outcome: 2 Students will learn difference between independence, covariance, and correlation

Session Outcome: 3 Students will learn pros and cons of different types of Transformation

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
20	Transformations of continuous random variables and their PDFs	4	PPT	Quiz/Test Questions
20	Independence, covariance, and correlation of continuous random variables	4	PPT	Just in-time teaching
5	Conclusion	4	Talk	Debate

SESSION NUMBER : 19

Session Outcome: 1 Students will Learn on inference Methods

Session Outcome: 2 Students Estimating a Population Proportion with Confidence

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	4	Talk	--- NOT

				APPLICABLE ---
20	Inferential Statistical Analysis- Introduction to Inference Methods	1	PPT	Group Discussion
20	Introduction to Bayesian- Estimating a Population Proportion with Confidence	1	PPT	Brain storming session
5	Conclusion	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 20

Session Outcome: 1 Students will learn Single Population Proportion Confidence Interval

Session Outcome: 2 Students understand the population proportion intervals

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
20	Understanding Confidence Intervals- Assumptions for a Single Population Proportion Confidence Interval	2	PPT	Group Discussion
20	Interpretations & Assumptions for Two Population Proportion Intervals	2	PPT	Brain storming session
5	Conclusion	2	Talk	Debate

SESSION NUMBER : 21

Session Outcome: 1 Students will learn the Differences between Population Parameters

Session Outcome: 2 Student will learn about Problems on Population Parameters

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Recap, Popup question	2	Talk	--- NOT APPLICABLE ---
20	Confidence Intervals for Differences between Population Parameters	2	PPT	Brain storming session
10	Clarifying doubts	2	PPT	Brain storming session
10	Problems on Population Parameters	2	PPT	Group Discussion

SESSION NUMBER : 22

Session Outcome: 1 Students will learn Statistical modelling techniques

Session Outcome: 2 Students will learn basics of Problems on logistic regression

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
20	Statistical modelling techniques, including linear regression	3	PPT	Group Discussion
20	Problems on logistic regression, generalized linear models Assignment/Quiz (ALM)	3	PPT	Group Discussion
5	Conclusion	3	Talk	Immediate feedback

SESSION NUMBER : 23

Session Outcome: 1 Students will learn about Hierarchical and mixed effects

Session Outcome: 2 Students will learn Bayesian inference techniques

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
30	Hierarchical and mixed effects (or multilevel) models	4	PPT	Brain storming session
10	Examples, Semantics and problems on Bayesian inference techniques	4	PPT	Group Discussion
5	Quiz through LMS	1	Talk	Group Discussion

SESSION NUMBER : 24

Session Outcome: 1 Students will learn about Test of Difference in Population Proportions

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap, Popup question	1	Talk	--- NOT APPLICABLE ---
10	Hypothesis Testing- Setting Up a Test for a Population Proportion- Setting Up a Test of Difference in Population Proportions,	4	PPT	Group Discussion
10	Interview: P-Values, P-Hacking	4	PPT	Group Discussion
25	Quiz	1	Talk	Quiz/Test Questions

Tutorial Course DELIVERY Plan: NO Delivery Plan Exists

Tutorial Session wise Teaching – Learning Plan

No Session Plans Exists

Practical Course DELIVERY Plan:

Tutorial Session no	Topics	CO-Mapping
1	To solve Data preparation Process by Python Commands	CO5
2	To solve problems using Phases of Data Analysis Process	CO5
3	To solve EDA	CO5
4	to solve problems using visualization	CO5
5	To solve Joint, Conditional Probability	CO5
6	To solve Probability Density Function Techniques	CO5
7	Cumulative distribution function (CDF)	CO5
8	To solve problems using Statistical notations	CO5
9	To solve problems using Exercises on Confidence	CO5
10	To solve problems using Hypothesis Testing	CO5

Practical Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 To solve Data preparation Process by Python Commands

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 to solve problems using Phases of Data Analysis Process

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 1 To solve EDA

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 1 to solve problems using visualization

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 1 to solve Joint, Conditional Probability

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE

SESSION NUMBER : 6

Session Outcome: 1 to solve Probability Density Function Techniques

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 1 Cumulative distribution function (CDF)

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 8

Session Outcome: 1 To solve problems using Statistical notations

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 1 To solve problems using Exercises on Confidenc

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT

				APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 1 To solve problems using Hypothesis Testing

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

Skilling Course DELIVERY Plan:

Skilling session no	Topics/Experiments	CO-Mapping
1	Applications on data preparation Process using PYTHON	CO5
2	Applications on able to do data Analysis Process	CO5
3	to solve problems for EDA	CO5
4	Applications of PYTHON import libraries	CO5
5	Applications of probabilistic functions	CO5
6	Applications of Probability Density Function (PDF)	CO5
7	Applications on Cumulative distribution function (CDF)	CO5
8	Applications of statistical notation	CO5
9	Applications of confidence interval	CO5
10	Applications of Hypothesis Testing	CO5

Skilling Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 Applications on data preparation Process using PYTHON

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 data Analysis Process

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 1 Applications EDA

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 1 Applications of PYTHON import libraries

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE

SESSION NUMBER : 5

Session Outcome: 1 Applications of probabilistic functions

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
50	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 6

Session Outcome: 1 Applications of Probability Density Function (PDF)

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 1 Applications on Cumulative distribution function (CDF)

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 8

Session Outcome: 1 Applications of statistical notation

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT

				APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 1 Applications of confidence interval

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 1 Applications of Hypothesis Testing

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
60	Experiment	3	LTC	--- NOT APPLICABLE ---
40	Evaluation	3	LTC	--- NOT APPLICABLE ---

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDEDED PROBLEM-SOLVING EXERCISES etc:

Week	Assignment Type	Assignment No	Topic	Details	co

COURSE TIME TABLE:

	Hour	1	2	3	4	5	6	7	8	9
Day	Component									
Mon	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Tue	Theory	--	--	--	--	--	--	--	--	--

	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Wed	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Thu	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Fri	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Sat	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Sun	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--

REMEDIAL CLASSES:

Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified according

SELF-LEARNING:

Assignments to promote self-learning, survey of contents from multiple sources.

S.no	Topics	CO	ALM	References/MOOCS

DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

S.no	Advanced Topics, Additional Reading, Research papers and any	CO	ALM	References/MOOCS

EVALUATION PLAN:

Evaluation Type	Evaluation Component	Weightage/Marks		Assessment Dates	Duration (Hours)	CO1	CO2	CO3	CO4	CO5
End Semester Summative Evaluation Total= 40 %	Skill Sem-End Exam	Weightage	7.5		120					7.5
		Max Marks	100							100
	Poster Presentation	Weightage	5		60					5
		Max Marks	100							100
	End Semester Exam	Weightage	20		120	5	5	5	5	
		Max Marks	100			25	25	25	25	
	Lab End Semester Exam	Weightage	7.5		120					7.5
		Max Marks	100							100
In Semester Formative Evaluation Total= 35 %	Skilling Continuous Evaluation	Weightage	10		60					10
		Max Marks	100							100
	Hackathon	Weightage	5		60					5
		Max Marks	100							100
	Continuous Evaluation - Lab Exercise	Weightage	10		60					10
		Max Marks	100							100
	Continuous Evaluation -Project	Weightage	5		60					5
		Max Marks	100							100
	MOOCs Review	Weightage	5		60					5
		Max Marks	100							100
In Semester Summative Evaluation Total= 25 %	Semester in Exam-I	Weightage	7.5		120	3.75	3.75			
		Max Marks	50			25	25			
	Semester in Exam-II	Weightage	7.5		120			3.75	3.75	
		Max Marks	50					25	25	
	MOOCs Certification	Weightage	5		60					5
		Max Marks	100							100
	Prototype Demonstration	Weightage	5		60					5
		Max Marks	100							100

ATTENDANCE POLICY:

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course
In every course, student has to maintain a minimum of 85% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 75% to 85% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments

DETENTION POLICY :

In any course, a student has to maintain a minimum of 85% attendance and In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY :

Supplement course handout, which may perhaps include special lectures and discussions

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Supplement course handout, which may perhaps include special lectures and discussions

Name of Faculty	Delivery Component of Faculty	Sections of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty:

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

Most of the notices are available on the LMS platform.

All notices will be communicated through the institution email.

All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR

(vithya Ganesan)

Signature of Department Prof. Incharge Academics & Vetting Team Member

Department Of CSE

HEAD OF DEPARTMENT:

Approval from: DEAN-ACADEMICS
(Sign with Office Seal) [object HTMLDivElement]