Sample Teaching Plan

Sr No	Year	Course	Subject
1	First	Data Science	Pre-Calculus
2			Web Technology
3			R Programming
4			Introduction to Programming
5			EVS
6			Probability & Distribution
7			Descriptive Statistics
8			Database management
9			Calculus
10			Business Communication
11	Second	Data Science	Research Methodology
12			Micro Economics
13			Data WareHouse
14			Data Structure
15			Linear Algebra & Discrete Mathematics

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: I	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: **PRECALCULUS**	Code N0: **USDS105**
Name of the Lecturer: Anil sir	Academic Year: **2022-23**	Total No. of Students: 15

Module I- Fundamentals, Functions, Polynomial and Rational Functions

CO 1: Student should be able to know the real number and expressions, and Functions and its operation
CO 2: Student should be able to know the Quadratic functions and polynomials
CO 3: Student should be able to know the Complex number and its operation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Real Numbers, Exponents and Radicals	CO1	4st Week of august			PPT, Discussion
2	Algebraic Expressions, Rational Expressions , Equations	CO1	4st Week of august			PPT, Discussion
3	Modeling with Equations	CO1	4st Week of august			PPT, Discussion

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4	Inequalities ,Coordinate Geometry	CO1	1st week of sept			PPT, Discussion
5	Graphing Calculators ;Solving Equations and Inequalities Graphically	CO1	1st week of sept			PPT, Discussion
6	Lines, Making Models Using Variation	CO1	1st week of sept			PPT, Discussion
7	What is function? Graphs of Functions, Getting Information from the Graph of a Function	CO1	1st week of sept			PPT, Discussion
8	Average Rate of Change of a Function	CO1	2nd week of sept			PPT, Discussion
9	Transformations of Functions, Combining Functions, One-to- One Functions and Their Inverses.	CO1	2nd week of sept			PPT, Discussion
10	Quadratic Functions and Models, Polynomial Functions and Their Graphs	CO2	2nd week of sept			PPT, Discussion
11	Dividing Polynomials, Real Zeros of Polynomials	CO2	2nd week of sept			PPT, Discussion
12	Complex Numbers, Complex Zeros and the Fundamental Theorem of Algebra, Rational Functions.	CO3	2nd week of sept	Class Test or Project work		PPT, Discussion

Module II-Exponential and Logarithmic Functions, Trigonometric Functions: Unit Circle Approach, Trigonometric Functions: Right Triangle Approach

CO1 – Student should be able to know the Exponential Functions and Logarithmic Functions with modelling
CO2 – Student should be able to know the Unit circle, trigonometric function and inverse of trigonometric function

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CO3 – Student should be able to know the law of Sines and law of Cosines

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	Exponential Functions The Natural Exponential Function	**CO1**	3rd week of sept			PPT, Discussion
14	Logarithmic Functions, Laws of Logarithms	**CO1**	3rd week of sept			PPT, Discussion
15	Exponential and Logarithmic Equations	**CO1**	3rd week of sept			PPT, Discussion
16	Modelling with Exponential and Logarithmic Functions.	**CO1**	3rd week of sept			PPT, Discussion
17	The Unit Circle	**CO2**	3rd week of sept			PPT, Discussion
18	Trigonometric Functions of Real Numbers	**CO2**	3rd week of sept			PPT, Discussion
19	Trigonometric Graphs	**CO2**	3rd week of sept			PPT, Discussion
20	Inverse Trigonometric Functions and Their Graphs, Modelling Harmonic Motion	**CO2**	3rd week of sept			PPT, Discussion
21	Angle Measure, Trigonometry of Right Triangles	**CO2**	3rd week of sept			PPT, Discussion

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22	Trigonometric Functions of Angles	**CO2**	4th week of sept			PPT, Discussion
23	Inverse Trigonometric Functions and Right Triangles	**CO2**	4th week of sept			PPT, Discussion
24	The Law of Sines and The Law of Cosines.	**CO3**	4th week of sept	Class Test or Project work		PPT, Discussion

Module III- Analytic Trigonometry, Sinusoidal Functions,and Inverse Circular Functions

CO1 – Student should be able to know the Trigonometric Identities, trigonometric Equation
CO2 – Student should be able to know the Sinusoidal graph and equation, Inverse Circular Function and application

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	PPT, Discussion
25	Trigonometric Identities, Addition and Subtraction Formulas	CO1	4th week of sept			PPT, Discussion
26	Double-Angle, Half-Angle, and Product- Sum Formulas	CO1	4th week of sept			PPT, Discussion
27	Basic Trigonometric Equations	CO1	1st week of oct			PPT, Discussion
28	More Trigonometric Equations	CO1	1st week of oct			PPT, Discussion
29	A special class of functions	CO1	1st week of oct			PPT, Discussion

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30	Sketching a sinusoidal graph	CO2	1st week of oct			PPT, Discussion
31	Functions not in standard sinusoidal form	CO2	1st week of oct			PPT, Discussion
32	Sinusoidal behaviour.	CO2	2nd week of oct			PPT, Discussion
33	Solving three equations	CO2	2nd week of oct			PPT, Discussion
34	Inverse Circular functions	CO2	2nd week of oct			PPT, Discussion
35	Applications	CO2	2nd week of oct			PPT, Discussion
36	Solving trigonometric equations	CO1	2nd week of oct	Class Test or Project work		PPT, Discussion

Module IV: Polar Coordinates and Parametric Equations, Vectors in Two and Three Dimensions, Systems of Equations and Inequalities

CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number
CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D
CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable
CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrics

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			PPT, Discussion

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36	Polar Coordinates, Graphs of Polar Equations	CO1	2nd week of oct			PPT, Discussion
37	Polar Form of Complex Numbers; DeMoivre's Theorem	CO1	3th week of oct			PPT, Discussion
38	Plane Curves and Parametric Equations	CO1	3th week of oct			PPT, Discussion
39	Vectors in Two Dimensions	CO2	3th week of oct			PPT, Discussion
40	The Dot Product and The Cross Product	CO2	3th week of oct			PPT, Discussion
41	Three-Dimensional Coordinate Geometry, Vectors in three Dimensions	CO2	3th week of oct			PPT, Discussion
42	Equations of Lines and Planes	CO3	4 th week of oct			PPT, Discussion
43	Systems of Linear Equations in Two Variables Systems of Linear Equations in Several Variables	CO3	4 th week of oct			PPT, Discussion
44	Matrices and Systems of Linear Equations	CO4	4 th week of oct			PPT, Discussion
45	The Algebra of Matrices, Inverses of Matrices and Matrix Equations	CO4	4 th week of oct			PPT, Discussion
46	Determinants and Cramer's Rule	CO4	4 th week of oct			PPT, Discussion
47	Partial Fractions, Systems of Nonlinear Equations	CO4	1st week of Nov			PPT, Discussion

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48	Systems of Inequalities	CO4	1st week of Nov	Class Test or Project work		PPT, Discussion
Module V: Conic Sections, Sequences and Series, and Limits: A Preview of Calculus CO1 – Student should be able to know the Conics, Polar equation of conics CO2 – Student should be able to know the Sequence, Types of sequence and mathematical induction with Binomial Theorem CO3 – Student should be able to know the Limits and its operations						
Lecture No.	**Topics to cover**	**CO**	**Date/Day/Time Of conducting**			PPT, Discussion
49	Parabolas, Ellipse, Hyperbolas	CO1	1st week of Nov			PPT, Discussion
50	Shifted Conics, Rotation of Axes	CO1	1st week of Nov			PPT, Discussion
51	Polar Equations of Conics	CO1	2nd week of Nov			PPT, Discussion
52	Sequences and Summation Notation	CO2	2nd week of Nov			PPT, Discussion
53	Arithmetic Sequences	CO2	2nd week of Nov			PPT, Discussion
54	Geometric Sequences	CO2	2nd week of Nov			PPT, Discussion
55	Mathematics of Finance,	CO2	3th week of Nov			PPT, Discussion
56	Mathematical Induction, The Binomial Theorem	CO2	3th week of Nov			PPT, Discussion

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57	Finding Limits Numerically and Graphically	CO3	3th week of Nov			PPT, Discussion
58	Finding Limits Algebraically	CO3	1st week of Dec			PPT, Discussion
59	Tangent Lines and Derivatives	CO3	1st week of Dec			PPT, Discussion
60	Limits at Infinity, Limits of Sequences, Areas	CO3	1st week of Dec	Class Test or Project work		PPT, Discussion

Course Outcomes:
After completion of the course, a student should be able to:

- Apply the knowledge of numbers, graph and functions in real life.
- Apply trigonometry in modelling real life problems.
- Use analytic trigonometry and inverse circular functions to solve variety of problems.
- Apply complex numbers theory to different domains, use vectors and matrices to solve real life problems.
- Identify different types of conics from equations, understand sequences and series and basics of limits and derivatives.

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: I	Medium: **ENGLISH**
Department: Data Science	Title: Web Technology	Code N0: USDS103
Name of the Lecturer: VINOD YADAV/ Aishwarya Shinde	Academic Year: **2023-24**	Total No. of Students: 72

Module I Internet and the World Wide Web, What Is Web Design, User-Centered Design, HTML5

CO 1: Learner understands the reasons for doing research, the applications of research, characteristics and requirements of the research process, types of research and Research paradigms.
CO 2: Learner is applying major approaches to information gathering, the relationship between attitudinal and measurement scales Methods for exploring attitudes in research.
CO 3: Learner is able to analyze data in qualitative and quantitative studies, application of IT in data analysis

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark

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1	What is Internet? Introduction tointernet and its applications, E-mail, telnet.	CO1				
2	FTP, e-commerce, videoconferencing,e	CO1				
3	business.Internetserviceproviders,domainnameserver,internet address	CO1				
4	WorldWide Webanditsevolution,uniformresourcelocator(URL),browsers.	CO1				
5		CO2		Assigment		
6	internetexplorer,Netscapenavigator, opera, Firefox, chrome, Mozilla. search engine, web saver –apache,IIS, proxy server, HTTP protocol	CO1				
7	Defining Web Design, Web Design Themes,LearningWeb Design.	CO2				
8	Usability, Who Are Web Users? CommonUser Characteristics.	CO2				
9	Memory, Response and Reaction Times, Dealingwith Stimulus, Movement Capabilities, The User's World.	CO3				
10	GeneralTypesofUsers,WebConventions,Accessibility, BuildingaUsable Site	CO3				

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11	Introduction, Why HTML5? Formatting text by using tags,usinglists andbackgrounds, Creatinghyperlinks and anchors.	CO3				
12	HLML 5	CO3		Assigment		

Module II- layoutandnavigatio, HTML5 Tables, Forms and Media.

CO 1:.

CO 2:

CO **3:**

CO 4:

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	Creatingnavigationalaids:planningsiteorganization, creating text based navigation bar.	CO3				
14	creatinggraphicsbasednavigationbar,creatinggraphicalnavigationbar,creatingimagemap,redirectingtoanothe URL.	CO3				
15	creatingdivisionbasedlayout s:HTML5 semantic tags,creating divisions.	CO3				
16	creating HTML5semanticlayout, positioning and	CO3				

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	formatting divisions.					
17	Form desigin	CO1		ASSIGNMENT 4		
18	Creating tables: creating simpletable,specifyingthe size of the table,specifyingthe widthof thecolumn.	CO4				
19	Merging table cells, using tables for page layout, Formattingtables.	CO2				
20	applying table borders, applying background and foregroundfills,changingcellpadding,spacingandalignment,creatinguser Form.	CO3				
21	creatingbasicform,usingcheckboxesandoptionbuttons,creatinglists,addi tionalinputtypesinHTML5.	CO3				
22	Incorporatingsoundandvideo:audioand video in HTML5,	CO4				
23	HTML multimedia basics, embedding videoclips,incorporating audio on web page.	CO1				
24	Html 5	CO1- CO4		Assisgement		

Module IIII Introduction to Style Sheets, Formatting Text by Using Style Sheets, DisplayingGraphics.
CO1-
CO2-
CO3-
CO4-

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	Understanding Styles, ConstructingStyle Rules.					
26	Creating Styles for Nested Tags, Creating Classes.					
27	Creating Styles for Nested Tags, Creating Classes.					
28	**Introduction to Style Sheets**			ASSISGMENT		
29	Specifying a Font Family,Specifying a Font Size and Color.					
30	Applying Bold and Italics, ApplyingStrikethroughand Underlining.					
31	CreatingInline Spans ,AdjustingSpacing BetweenLetters**FormattingParagraphsbyUsingStyleSheets.** SettingAllBorderAttributesatOnce,Specifyingthe HorizontalAlignmentofaParagraph,SpecifyingVerticalSpacewithin aParagraph					
32	Indenting Paragraphs, Applying a Border to a Paragraph.					
33	Specifying a Border Style, Setting Border Padding , Specifying Border Width and Color, Formatting Border Sides Individually.					
35	Graphics,Arranging Elements o On thePage,ControllingImageSizeandPadding.					

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36	HyperlinkingfromGraphics, UsingThumbnailGraphics,IncludingAlternateText forGraphics,AddingFigure Captions					
Module V						
Lecture No.	**Topics to cover**	**CO**	**Date/Day/Time Of conducting**			
37	Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ?, UGC-CARE, Web of Science, SCOPUS.					
38	IEEE, ACM, Ethical issues related to publishing, Copyright, Data Privacy, Plagiarism and Self-Plagiarism.					
39	Software for detection of Plagiarism. ShodhShudhhi (PDS), smallseotools.com					
40	**Interpretation of Data and Paper Writing, Use of tools**			ASSIGNMENT 8		
41	Chicago, Turabian, MLA and APA Style					
42	Reference Management Software like EndNote, Zotero or Mendeley; Software for paper formatting like LaTeX/MS Office					
43	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science and					

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	Information Technology Discipline. Google Scholar, shodhganga, IEEE Xplore, ResearchGate, IDELS, DA					
44	**Use of tools / techniques for Research**			ASSIGEMENT 9		
45	Reference Management Software like EndNote, Zotero or Mendeley; Software for paper formatting like LaTeX/MS Office.					
46	Reference Management Software like EndNote, Zotero or Mendeley; Software for paper formatting like LaTeX/MS Office					
47	**Open Office/Google Doc/DropBox Paper**.			ASSIGEMENT 9		
48	**Open Office/Google Doc/DropBox Paper**.			ASSIGEMENT 9		

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: II	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: R Programming	Code N0: USDS203
Name of the Lecturer: Kritika Jain	Academic Year: **2022-23**	Total No. of Students: 15

Module I GettingstartedwithR:
CO 1: Student should be able to know the real number and expressions, and Functions and its operation
CO 2: Student should be able to know the Quadratic functions and polynomials
CO 3: Student should be able to know the Complex number and its operation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	RSoftware:ObtainingRandRStudio,FirstREncounter, ,	CO1	1 week of January			PPT, Group discussion .
2	Getting started: R as a big calculator, Assignment	CO1	1 week of January			PPT
3	Basicoperators, Help with functions and features, Quiz, A few importantpoints on R WorkingwithR	CO1	1 week of January			PPT, Group

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						discussion .
4	:RSoftware,ObtainingRandRStudio,ThedefaultRinterface,RStudioInterface,ExampleDatasetsin R,	CO1	1 week of January			PPT
5	, R Packages, Installing new R libraries, Customizing R Start-, ,	CO1	2 week of January			PPT, Group discussion .
6	UsinglsandrmtomanagingRObjects,TypesofRobjects,AttributesofRObjects,	CO1	2 week of January			PPT, Group discussion .
7	Creatingandaccessingobjects,Modifyingelements, Quick recap, Exercise	CO1	2 week of January			PPT, Group discussion .
8	Importing and readingtextfiles data into RStudio,	CO1	2 week of January			PPT
9	Importing data using R command read.table(),Exercise,ImportingtextfilesUsingscan(),	CO1	3 week of January			PPT, Group discussion .
10	Parsingeachline– Readlines, Writing Data table from R, Exercise, Importaing	CO2	3 week of January			PPT

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11	, Importaing Datafromother Software, Reading data from Excel into R	CO2	3 week of January			PPT, Group discussion .
12	Import/Export fromotherstatisticalsoftware,FromaDatabaseConnection,Samplingand Creatingsimulateddata,Exercise	CO3	3 week of January			PPT, Group discussion

Module II Introduction to programming and writing Functions in R

CO1 – Student should be able to know the Exponential Functions and Logarithmic Functions with modelling

CO2 – Student should be able to know the Unit circle, trigonometric function and inverse of trigonometric function

CO3 – Student should be able to know the law of Sines and law of Cosines

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark

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13	Whydowe want to write functions	**CO1**	4 week of January			PPT, Group discussion .
14	Conditional statements (if, ifelse,switch),	**CO1**	4 week of January			PPT
15	Conditional statements (if, ifelse,switch),	**CO1**	4 week of January			PPT, Group discussion .
16	Repetitiveexecution:ForandWhileloops	**CO1**	4 week of January			PPT
17	TheApplyFunctions,Exercise,	**CO2**	1week of February			PPT, Group discussion .
18	Functionsforparsingtext,ProgramminginR:Moreadvanced	**CO2**	1week of February1week of February			PPT, Group discussion
19	Viewi ngCodeoffunctionsfromRpackages,Exercise-Parsing Real Data	**CO2**	1week of February			PPT, Group discussion .

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20	- WorldPopulation Data from Wikipedia,	**CO2**	1week of February			PPT	
21	Writingfunctions: more technicaldiscussion -Scoping,	**CO2**	1week of February			PPT, Group discussion .	
22	Options for Runningmemoryor CPU intensivejobs in R, Efficient Rcoding	**CO2**	1week of February			PPT	
23	TheRfunctionplot(),Exercise,Customizep lotwithlow-levelplottingcommands	**CO2**	2 week of February			PPT, Group discussion .	
24	,Defaultparameters –par,Interactingwithgraphics,Savingplots,UsefulGraphicsResources	**CO3**	2 week of February			PPT, Group discussion	
Module III- AdvancedGraphics Importing Data- readr: CO1 – Student should be able to know the Trigonometric Identities, trigonometric Equation CO2 – Student should be able to know the Sinusoidal graph and equation, Inverse Circular Function and application							

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	Advanced plotting using Trellis;ggplots2, ,	CO1	2 week of February			PPT, Group discussion .
26	Lattice,	CO1	2 week of February			PPT
27	Examples that Present Panels of Scatterplots using xyplot(),	CO1	2 week of February			PPT, Group discussion .
28	Simpleuseof xyplot	CO1	2 week of February			PPT
29	Functions for Reading Data	CO1	2 week of February			PPT, Group discussion .

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30	FileHeaders,Column Types, String	CO2	3 week of February			PPT, Group discussion
31	String-based Column Type Specification	CO2	3 week of February			PPT, Group discussion .
32	Function-based Column Type Specification Parsing Functions for Writing Data	CO2	3 week of February			PPT
33	Function-based Column Type Specification Parsing Functions for Writing Data	CO2	3 week of February			PPT, Group discussion .
34	Time and Dates, Space- separated Columns,	CO2	3 week of February			PPT
35	Functions for Writing Data	CO2	3 week of February			PPT, Group discussion .
36	CreatingTibbles, IndexingTibbles	CO1	4 week of February			PPT, Group discussion

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Module IV : Reformatting Tables– tidy Pipelines– Magritte: CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrices			**Module IV :TheoreticalDiscreteDistributions** CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrics

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	TidyData,GatherandSpread,ComplexColumn Encodings,	CO1	4 week of February			PPT, Group

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						discussion .
37	ComplexColumn Encodings	CO1	4 week of February			PPT
38	Encodings, Expanding, Crossing, and Completing	CO1	1 week of March			PPT, Group discussion .
39	MissingValues,Nesting Data	CO2	1 week of March			PPT
40	The Problem with Pipelines	CO2	1 week of March			PPT, Group discussion .
41	PipelineNotation,Pipelines and Function Arguments,	CO2	1 week of March			PPT, Group discussion
42	Function Composition,Other PipeOperations	CO3	2 week of March			PPT, Group discussion .
43	CountingStringPatterns,SplittingStrings	CO3	2 week of March			PPT

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44	CapitalizingStrings,W rapping,	CO4	2 week of March			PPT, Group discussion .
45	,Padding,andTrimming,Detecting Substrings	CO4	3 week of March			PPT
46	Extracting Substrings, Transforming	CO4	3 week of March			PPT, Group discussion .
47	CreatingFactors,Concatenation	CO4	3 week of March			PPT, Group discussion
48	Projection,Adding Levels, Reorder Levels	CO4	4 week of March			

Module V: ManipulatingDataFrames–dplyr, Working with Dates – lubridate::

CO1 – Student should be able to know the Conics, Polar equation of conics

CO2 – Student should be able to know the Sequence, Types of sequence and mathematical induction with Binomial Theorem

CO3 – Student should be able to know the Limits and its operations

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	SelectingColumns	CO1	4 week of March			PPT, Group discussion .
50	Filter	CO1	4 week of March			PPT
51	Sorting,	CO1	4 week of March			PPT, Group discussion .
52	Modifying Data Frames	CO2	1 week of April			PPT
53	Modifying Data Frames	CO2	1 week of April			PPT, Group discussion .
54	, Grouping and Summarizing	CO2	1 week of April			PPT, Group discussion
55	, Grouping and Summarizing	CO2	2 week of April			PPT, Group discussion .

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56	JoiningTables,Income inFictional Countries	CO2	2 week of April			PPT
57	JoiningTables,Income inFictional Countries	CO3	3 week of April			PPT, Group discussion .
58	Time Points	CO3	3 week of April			PPT
59	Time Zones	CO3	3 week of April			PPT, Group discussion .
60	Time Intervals	CO3	3 week of April			PPT, Group discussion

Note :- Extra Lectures will be conducted as per the requirement of the students

Course Outcomes:
After completion of the course, a student should be able to:

- Apply the knowledge of numbers, graph and functions in real life.
- Apply trigonometry in modelling real life problems.
- Use analytic trigonometry and inverse circular functions to solve variety of problems.

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- Apply complex numbers theory to different domains, use vectors and matrices to solve real life problems.
- Identify different types of conics from equations, understand sequences and series and basics of limits and derivatives.

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: I	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Intoduction to Programming	Code N0: USDS102
Name of the Lecturer: Mr. Abhijeet Pawaskar	Academic Year: **2023-24**	Total No. of Students: 72

Module I- Introduction to Python Language

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Overview,Features of Python,Execution of a Python Program	CO1				
2	Innards of Python, Frozen Binaries,Python Interpreter,	CO1				
3	Comparison of Python with C and Java,	CO1				
4	InstallingPython,Writing & Executing, IDLE	CO1				
5	Comments,Docstrings,Data types-Numeric, Compound, Boolean,	CO1				
6	Dictionary,Sets,Mapping,BasicElementsofPython, Variables	CO1				
7	Input Function, Output Statements	CO2				

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8	Command Line Arguments	CO2					
9	Control Statements- Loop Statement, The elseSuite,	CO2					
10	The else Suite break Statement, continue Statement	CO2					
11	continue Statement , pass Statement	CO2					
12	Assert Statement, return Statement	CO2					

Module II- Functions, Operators, Arrays and string

CO:

CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt

CO2 – Learner is able to understand the concept of Fast Fourier Transform

CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topics to cover	CO	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	Defining&CallingaFunction,ReturningResults		CO1				
14	Returning MultipleValues,Built- inFunctions,		CO1				
15	ParametersandArguments,RecursiveFunctions,AnonymousorLambdaFunctions		CO1				
16	**Operators**:Arithmeticoperators,Assignmentoperators,Unary minusoperator		CO1				
17	Relationaloperators,Logicaloperators,Bitwiseoperators,		CO1				

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18	Membership operators, IdentityoperatorsPrecedence ofOperators,Associativity ofOperators	CO2				
19	CreatingArrays,IndexingandSlicing,BasicArrayOperation	CO2				
20	Arrays Processing,Mathematical OperationsonArray	CO3				
21	AliasingArrays,SlicingandIndexinginNumPyArrays,Basic	CO3				
22	Slicing. Advanced Indexing Dimensions of Arrays Attributes ofanArray	CO3				
23	CreatingStrings,FunctionsofStrings,WorkingwithStrings,Length of a String, Indexing & Slicing, Repeating& ConcatenationofStrings,CheckingMembership,ComparingStrings,Re movingSpaces,	CO3				
24	FindingSubstrings,CountingSubstrings,StringsareImmutable,SplittingandJoiningStrings,ChangingCase,Checking Starting and Ending of a String, Sorting & Searching in theStrings,FormattingtheStrings, Working withCharacters	CO3				

Module III- ListsandTuples , Dictionaries, RegularExpressions, Date and Time in Python

CO:
CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors
CO2 – Learner is able to understand the the concept of Diagonalization of matrix
CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	Lists,ListFunctionsandMethods,ListOperations,Tuples	CO1				
26	CreatingaDictionary,OperatorsinDictionary,	CO2				
27	DictionaryMethods,UsingforLoopwithDictionaries	CO2				
28	OperationsonDictionaries,OrderedDictionaries	CO3				
29	What is a Regular Expression Sequence Character sin Regular Expressions,	CO3				
30	Quantifier sin Regular Expressions	CO3				
31	Special Characters in Regular Expressions, Using Regular Expression on Files	CO3				
32	Retrieving Information from an HTMLFile	CO3				
33	Date and Time, Date and TimeNow,Combining Date and Time, Formatting Dates and Times	CO3				
34	FindingDurationsusing"timedelta",ComparingTwoDates,SortingDates	CO3				

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35	StoppingExecutionTemporarily,KnowingtheTimetakenbyaProgram	CO3				
36	Working withCalendar	CO3				

Module IV: IPython, Introduction to NumPy

CO1 – Learner is able to understand the concept of maxima and minima, saddle point
CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method
CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	Beyond Normal Python, Help and Documentation in IPython,	CO1				
37	Keyboard Shortcuts in the IPython Shell, IPythonMagicCommands,	CO1				
38	InputandOutputHistory,IPythonandShellCommand	CO1				
39	ErrorsandDebugging	CO2				
40	Profiling andTiming Code	CO2				
41	Understanding Data Types in Python	CO2				

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42	TheBasics of NumPy Arrays	CO2				
43	Computation on NumPy	CO3				
44	UniversalFunctions,Aggregations:Min,Max	CO3				
45	EverythingInBetwee n Broadcasting	CO3				
46	Comparisons,Masks,andBooleanLogic,FancyIndexing	CO3				
47	Sorting Arrays	CO3				
48	StructuredData:NumPy'sStructured Arrays	CO3				

Module V: Data Manipulation with Pandas

CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities

CO 2: Learner expresses clear understanding of the concept of network models and game theory

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	Introducing Pandas Objects, DataIndexingandSelection,OperatingonDatainPandas	CO1				
50	HandlingMissi ng Data, Hierarchical Indexing, Combining	CO1				
51	ConcatandAppend, Combining Datasets	CO1				

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52	merge and Join, AggregationandGrouping, Pivot Table	CO1				
53	Vectorized String Operations, WorkingwithTimeSeries.	CO1				
54	High-PerformancePandas: eval()and query()	CO1				
55	Simple Line Plots, Simple ScatterPlots, Visualizing Errors,	CO1				
56	Density and Contour Plots, Histograms,Binnings,and	CO1				
57	CustomizingPlotLegends,CustomizingColorbars,	CO3				
58	,MultipleSubplots,TextandAnnotation,CustomizingTick	CO3				
59	CustomizingMatplotlib:ConfigurationsandStylesheets	CO3				
60	DimensionalPlottinginMatplotlib,GeographicDatawithBase map,Visu alizationwith Seaborn	CO3				

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: II	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: **Environmental Science**	Code N0: **USDS204**
Name of the Lecturer:	Academic Year: **2023-24**	Total No. of Students: 60

Module I Introduction to Environmental Studies

CO 1: Student should be able to know the real number and expressions, and Functions and its operation
CO 2: Student should be able to know the Quadratic functions and polynomials
CO 3: Student should be able to know the Complex number and its operation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Importance of Environmental Education,	CO1	1 week of January			PPT, Group discussion .
2	Environmental Literacy,	CO1	1 week of January			PPT
3	Environmental Engineering	CO1	1 week of January			PPT, Group discussion .
4	Environmentalism,	CO1	1 week of January			PPT

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5	ComponentsofEnvironment and theirInteractions,	CO1	2 week of January			PPT, Group discussion .
6	ComponentsofEnvironment and theirInteractions,	CO1	2 week of January			PPT
7	Man and the Biosphere	CO1	2 week of January			PPT, Group discussion .
8	Impacts ofDevelopmentonEnvironment	CO1	2 week of January			PPT
9	ForestResources,Dams	CO1	3 week of January			PPT, Group discussion .
10	WaterResources,FoodResources	CO2	3 week of January			PPT, Group discussion .
11	FoodResourcesEnergyResources, Land Resources	CO2	3 week of January			PPT
12	Land Resources	CO3	3 week of January			PPT, Group discussion .

Module II Ecology-

CO1 – Student should be able to know the Exponential Functions and Logarithmic Functions with modelling

CO2 – Student should be able to know the Unit circle, trigonometric function and inverse of trigonometric function

CO3 – Student should be able to know the law of Sines and law of Cosines

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	**Ecology** Ecosystem,Ecosystem-AnthroposystemComparison	**CO1**	4 week of January			PPT, Group discussion .
14	BiomeandEcosystem,	**CO1**	4 week of January			PPT
15	,Energy Flow through the Ecosystem,	**CO1**	4 week of January			PPT, Group discussion .
16	Ecological Succession,Food Chainsand Webs, Ecological Pyramids	**CO1**	4 week of January			PPT, Group discussion .
17	Biological MagnificationorBiomagnification, Human versus Natural Food Chains,	**CO2**	1week of February			PPT
18	Biogeochemical Cycles, TheWater Cycle(Hydrologic Cycle),Carbon Cycle, Oxygen Cycle,,Nitrogen Cycle, Forest Ecosystems,, ,	**CO2**	1week of February1week of February			PPT, Group discussion .
19	Grass land Ecosystems, Aquatic Ecosystems	**CO2**	1week of February			PPT, Group discussion .

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20	Genetic Diversity, Species Diversity, Ecosystem Diversity,	**CO2**	1week of February			PPT
21	ValueofBiodiversity,ValueofGenes,Biopiracy,BiogeographicalClassificationofIndia	**CO2**	1week of February			PPT, Group discussion .
22	Indiaas aMegaDiverseNation,EndemicSpeciesofIndia, ,	**CO2**	1week of February			PPT
23	Threats to Biodiversity, Hotspots of Biodiversity, Endangered Species	**CO2**	2 week of February			PPT, Group discussion .
24	Conservation of Biodiversity, Genetic Engineering and Biodiversity	**CO3**	2 week of February			

Module III- Environmental Pollution-

:

CO1 – Student should be able to know the Trigonometric Identities, trigonometric Equation

CO2 – Student should be able to know the Sinusoidal graph and equation, Inverse Circular Function and application

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark

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25	**EnvironmentalPollution** Air Pollution, ,	CO1	2 week of February			PPT, Group discussion .
26	Water Pollution	CO1	2 week of February			PPT
27	Soil Pollution,	CO1	2 week of February			PPT, Group discussion .
28	Marine Pollution, ,	CO1	2 week of February			PPT
29	Noise Pollution, Thermal Pollution	CO1	2 week of February			PPT, Group discussion .
30	SolidWasteManagement	CO2	3 week of February			PPT, Group discussion .
31	Hazardous Waste Management, Pollution Prevention,	CO2	3 week of February			PPT
32	Disaster Management	CO2	3 week of February			PPT, Group discussion .
33	Population Growth, Human Rights	CO2	3 week of February			PPT
34	Value Education, HIV/AIDS, Environment and Human Health, Family Welfare Programmes	CO2	3 week of February			PPT, Group discussion .
35	Women and Child Welfare,	CO2	3 week of February			PPT, Group discussion .
36	Role of Information Technology in Environment and Human Health	CO1	4 week of February			PPT, Group discussion .

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Module IV : SocialIssuesandtheEnvironment

CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number
CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D
CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable
CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrics

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	**SocialIssuesandtheEnvironment** From Unsustainable to Sustainable Development	CO1	4 week of February			PPT, Group discussion .
37	UrbanProblemsRelatedtoEnergy, , ,	CO1	4 week of February			PPT, Group discussion .
38	WaterConservation	CO1	1 week of March			PPT, Group discussion .
39	,WatershedManagement	CO2	1 week of March			PPT

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40	Resettlement and Rehabilitation, EnvironmentalEthics,	CO2	1 week of March				PPT, Group discussion .
41	Acid Rain, Ozone LayerDepletion,	CO2	1 week of March				PPT
42	Greenhouse Effect, Global Warming and Climate Change	CO3	2 week of March				PPT, Group discussion .
43	Pollution Control Boards and Control Pollution Acts in India	CO3	2 week of March				PPT, Group discussion .
44	Nuclear HazardsandAccidents,EnvironmentalImpactAssessment	CO4	2 week of March				PPT
45	Risk Management, Precautionary Principle, Polluter-PaysPrinciple, ,	CO4	3 week of March				PPT, Group discussion .
46	The Beneficiary-Pays Principle, Role of Non-Government Organizations	CO4	3 week of March				PPT
47	ISO14000SeriesofEnvironmentalManagementStandards,	CO4	3 week of March				PPT, Group discussion .
48	Economy and Environment	CO4	4 week of March				

Module V: Environmental Management Sustainable Development

CO1 – Student should be able to know the Conics, Polar equation of conics
CO2 – Student should be able to know the Sequence, Types of sequence and mathematical induction with Binomial Theorem
CO3 – Student should be able to know the Limits and its operations

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	EnvironmentalImpactAssessment,Methodology,WasteasaResource,	CO1	4 week of March			PPT, Group discussion .
50	,Envir onmental Laws, Requirements of a Contract	CO1	4 week of March			PPT, Group discussion .
51	,Environmental Legislations,Powers and Functions of Pollution ControlBoards,	CO1	4 week of March			PPT
52	Case Studies,Environmental Management Plan	CO2	1 week of April			PPT, Group discussion .
53	Environmental Audit, Policies for Quality Improvement	CO2	1 week of April			PPT
54	Problems, Policy	CO2	1 week of April			PPT, Group discussion .
55	Ethics, Laws of Nature, Progress	CO2	2 week of April			PPT
56	Environmental Stress,Sustainability,	CO2	2 week of April			PPT, Group discussion .

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57	Ethics, Laws of Nature, Progress	CO3	3 week of April			PPT
58	Environmental Stress,Sustainability,	CO3	3 week of April			PPT, Group discussion .
59	,Self- purification and Regeneration, ActionPlan	CO3	3 week of April			PPT
60	ComputerizationandInformation Technology	CO3	3 week of April			PPT, Group discussion .

Note :- Extra Lectures will be conducted as per the requirement of the students

Course Outcomes:

After completion of the course, a student should be able to:

- Apply the knowledge of numbers, graph and functions in real life.
- Apply trigonometry in modelling real life problems.
- Use analytic trigonometry and inverse circular functions to solve variety of problems.
- Apply complex numbers theory to different domains, use vectors and matrices to solve real life problems.
- Identify different types of conics from equations, understand sequences and series and basics of limits and derivatives.

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: II	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Probabilitya nd Distributions	Code N0: USDS201
Name of the Lecturer: shenal k	Academic Year: **2022-23**	Total No. of Students: 15

Module I- TheoryofProbability:
CO 1: Student should be able to know the real number and expressions, and Functions and its operation
CO 2: Student should be able to know the Quadratic functions and polynomials
CO 3: Student should be able to know the Complex number and its operation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	**Theory of Probability:** Introduction	CO1	1 week of January			PPT, Group discussion .
2	history	CO1	1 week of January			PPT
3	Different terms,	CO1	1 week of January			Group discussion
4	mathematical tools,	CO1	1 week of January			Group discussion
5	mathematical tools,	CO1	2 week of January			PPT, Group discussion .

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6	Axiomatic approach to probability	CO1	2 week of January				PPT
7	Axiomatic approach to probability	CO1	2 week of January				Group discussion
8	Mathematical notation,	CO1	2 week of January				Group discussion
9	multiplication and, conditional probability	CO1	3 week of January				PPT
10	conditional probability	CO2	3 week of January				Group discussion
11	Bay es theorem,	CO2	3 week of January				PPT, Group discussion .
12	Geometric probability.	CO3	3 week of January				PPT

**Module II- Random Variables and Distribution Functions **

CO1 – Student should be able to know the Exponential Functions and Logarithmic Functions with modelling

CO2 – Student should be able to know the Unit circle, trigonometric function and inverse of trigonometric function

CO3 – Student should be able to know the law of Sines and law of Cosines

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	**Random Variables and Distribution Functions:** Random Variable,	**CO1**	4 week of January			Group discussion
14	distribution function,	**CO1**	4 week of January			PPT
15	discreterandomvariable,	**CO1**	4 week of January			Group discussion
16	discreterandomvariable,	**CO1**	4 week of January			PPT, Group discussion .
17	continuousrandomvariable,	**CO2**	1week of February			PPT, Group discussion .
18	continuousrandomvariable,	**CO2**	1week of February1week of February			PPT
19	joint probability Law,	**CO2**	1week of February			PPT, Group discussion .
20	joint probability Law,	**CO2**	1week of February			PPT
21	transformation of one-Dimensional random variable,	**CO2**	1week of February			PPT, Group discussion .
22	transformation of one-Dimensional random variable,	**CO2**	1week of February			PPT

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23	transformation of two- dimensional random variable	**CO2**	2 week of February			PPT, Group discussion .
24	transformation of two- dimensional random variable	**CO3**	2 week of February			PPT

Module III- MathematicalExpectationandGeneratingFunctions

CO1 – Student should be able to know the Trigonometric Identities, trigonometric Equation
CO2 – Student should be able to know the Sinusoidal graph and equation, Inverse Circular Function and application

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	**:**Mathematical expectation,	CO1	2 week of February			PPT, Group discussion .
26	Expectation of a Function of aRandom Variable,	CO1	2 week of February			PPT
27	Expectation of a Function of aRandom Variable,	CO1	2 week of February			PPT, Group discussion .
28	, Addition Theorem of Expectation	CO1	2 week of February			PPT
29	,Multiplication Theorem of Expectation, Expectation of a Linear Combination of Random Variables	CO1	2 week of February			PPT, Group discussion .

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30	Covariance,	CO2	3 week of February				PPT
31	Variance of a Linear Combination ofRandom Variables,	CO2	3 week of February				PPT, Group discussion .
32	Moments of Bivariate Probability Distributions	CO2	3 week of February				PPT
33	Condi tionalExpectation and Conditional Variance,	CO2	3 week of February				PPT, Group discussion .
34	Moment Generating Function,Cumulants,CharacteristicFunction,Chebychev'sInequality	CO2	3 week of February				PPT
35	Convergence in- Probability, Weak Law of Large Numbers	CO2	3 week of February				PPT, Group discussion .
36	,BorelCanteliLemma, ProbabilityGenerating Function	CO1	4 week of February				PPT

Module IV :TheoreticalDiscreteDistributions

CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number
CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D
CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable
CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrics

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	Introduction,BernoulliDistribution	CO1	4 week of February			PPT, Group discussion .
37	BernoulliDistribution	CO1	4 week of February			PPT
38	BernoulliDistribution	CO1	1 week of March			PPT, Group discussion .
39	BinomialDistribution,	CO2	1 week of March			PPT
40	,PoissonDistribution	CO2	1 week of March			PPT, Group discussion .
41	NegativeBinomialDistribution,	CO2	1 week of March			PPT
42	GeometricDistribution,	CO3	2 week of March			PPT, Group discussion .
43	HypergeomeiricDistribution	CO3	2 week of March			PPT

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44	HypergeomeiricDistribution	CO4	2 week of March			PPT, Group discussion .
45	MultinomialDistribution,	CO4	3 week of March			PPT
46	Discrete Uniform Distribution,	CO4	3 week of March			PPT, Group discussion .
47	PowerSeries Distribution	CO4	3 week of March			PPT
48	PowerSeries Distribution	CO4	4 week of March			PPT, Group discussion .

Module V: Theoretical Continuous Distributions

CO1 – Student should be able to know the Conics, Polar equation of conics
CO2 – Student should be able to know the Sequence, Types of sequence and mathematical induction with Binomial Theorem
CO3 – Student should be able to know the Limits and its operations

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	:Rectangular or UniformDistribution,NormalDistribution,	CO1	4 week of March			PPT, Group discussion .

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50	Rectangular or UniformDistribution,NormalDistribution,	CO1	4 week of March			PPT
51	,GammaDistribution	CO1	4 week of March			PPT, Group discussion .
52	BetaDistribution of First Kind,Beta,	CO2	1 week of April			PPT
53	Distribution of SecondKind,	CO2	1 week of April			PPT, Group discussion .
54	TheExponentialDistribution,	CO2	1 week of April			PPT, Group discussion .
55	TheExponentialDistribution,	CO2	2 week of April			PPT
56	LaplaceDoubleExponentialDistribution,	CO2	2 week of April			PPT, Group discussion .
57	Compo undDistributions,Pearson\sDistributions,	CO3	3 week of April			PPT
58	WeibulDistribution,CauchyDistribution,CentralLimitTheorem,	CO3	3 week of April			PPT, Group discussion .
59	VariateTransformations,Orde rStatistics,Truncated Distributions	CO3	3 week of April			PPT
60	VariateTransformations,Orde rStatistics,Truncated Distributions	CO3	3 week of April			PPT, Group discussion .

Note :- Extra Lectures will be conducted as per the requirement of the students

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Course Outcomes:

After completion of the course, a student should be able to:

- Apply the knowledge of numbers, graph and functions in real life.
- Apply trigonometry in modelling real life problems.
- Use analytic trigonometry and inverse circular functions to solve variety of problems.
- Apply complex numbers theory to different domains, use vectors and matrices to solve real life problems.
- Identify different types of conics from equations, understand sequences and series and basics of limits and derivatives.

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: I	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Descriptive statistic	Code N0:
Name of the Lecturer Kritika Jain	Academic Year: **2022-23**	Total No. of Students: 15

Module I- Introduction to Statistics and Use in Business:

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Meaning of Statistics as a Science ,Importance of Statistics Scope of Statistics: In the field of Industry	CO1	4st Week of august			PPT, Discussion
2	BiologicalSciences Medical Sciences Economics Sciences, Social Sciences Management Sciences Agriculture, Insurance	CO1	4st Week of august			PPT, Discussion
3	Information Technology Education and Psychology Statistical organizations in India and their functions : CSO, ISI NSS, IIPS IIPS (Devnar,Mumbai) , Bureau of Economics	CO1	4st Week of august			PPT, Discussion

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	and statistics					
4	Information Technology Education and Psychology Case Study	CO1	1st week of sept			PPT, Discussion
5	Method of sampling: Concept of population and sample Finite ,Infinite population ,Notion of SRS, SRSWOR and SRSWR	CO1	1st week of sept			PPT, Discussion
6	Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio scale Linear and circular scale	CO1	1st week of sept			PPT, Discussion
7	Types of Data: Primary data, Secondary data, Collection of data and concept of a questionnaire and a schedule	CO2	1st week of sept			PPT, Discussion
8	Cross-sectional data ,time series data, failure data Industrial data, and directional data. Tabulation. Dichotomous classification- for two and three attributes, Verification for consistency	CO2	2nd week of sept			PPT, Discussion
9	Associationofattributes:Yule'scoefficientofassociationQ.Yule' scoefficient of Colligation Notionofastatisticalpopulation:Finitepopulationinfinitepopulation, homogeneouspopulationandheterogeneouspopulation	CO2	2nd week of sept			PPT, Discussion
10	Dichotomous classification- for two and three attributes, Verification for consistency Associationofattributes:Yule'scoefficientofassociationQ.Yule'	CO2	2nd week of sept			PPT, Discussion

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	scoefficient of Colligation Notionofsa mple,random sampleandnon-randomsample.					
11	Univariate frequency distribution of discrete and continuous variables Cumulative frequency distribution relative frequency distribution Graphical representation of frequency distribution by Histogram	CO2	2nd week of sept			PPT, Discussion
12	frequency polygon Cumulative frequency curve Stem and leaf diagram Check sheet Para to diagram	CO2	2nd week of sept	Class Test or Project work		PPT, Discussion

Module II- Measuresofcentral tendencies Measures of Dispersion,Skewness&Kurtosis

CO:
CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt
CO2 – Learner is able to understand the concept of Fast Fourier Transform
CO3 – Learner is able to solve the problems on determinants and application of determinant

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	Conceptofcentraltendencyof data.Requirementsofgoodmeasure	CO1	3rd week of sept			PPT, Discussion
14	Locationalaverages:Median,Mode,andPartitionValues: Quartiles, Deciles,andPercentiles,BoxPlot,Percentileranks	CO1	3rd week of sept			PPT, Discussion
15	MathematicalaveragesArithmeticmean(Simple,weighted mean,combinedmean), Geometricmean, Harmonicmean	CO1	3rd week of sept			PPT, Discussion
16	Empiricalrelationbetweenmean, medianand model	CO1	3rd week of sept			PPT, Discussion
17	Meritsanddemeritsofusingdifferentmeasures&theirapplicability	CO1	3rd week of sept			PPT, Discussion
18	PartitionValues:Quartiles,DecilesandPercentiles,BoxPlot,Percentile ranks	CO2	3rd week of sept			PPT, Discussion
19	Conceptofdispersion.Requirementsofgood measure	CO2	3rd week of sept			PPT, Discussion

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20	Absolute and Relative measures of dispersion: Range, QuartileDeviation,Mean absolutedeviation, Standarddeviation	CO3	3rd week of sept			PPT, Discussion
21	VarianceandCombinedvariance,rawmomentsandcentralmoments and relations betweenthem. Their properties	CO3	3rd week of sept			PPT, Discussion
22	KarlPearson's,Bowley'sandCoefficientofskewnessbasedonmomen	CO3	4th week of sept			PPT, Discussion
23	KarlPearson's,Bowley'sandCoefficientofskewnessbasedonmomen	CO3	4th week of sept			PPT, Discussion
24	MeasureofKurtosis	CO3	4th week of sept	Class Test or Project work		PPT, Discussion

Module III- Meansquaredeviation:

CO:

CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors

CO2 – Learner is able to understand the the concept of Diagonalization of matrix

CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	PPT, Discussion

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25	Definition	CO1	4th week of sept			PPT, Discussion
26	minimality	CO2	4th week of sept			PPT, Discussion
27	property of mean square deviation (withproof),	CO2	1st week of oct			PPT, Discussion
28	Variance and standard deviation: Definition	CO3	1st week of oct			PPT, Discussion
29	merits and demerits	CO3	1st week of oct			PPT, Discussion
30	effectofchangeoforiginandscale,	CO3	1st week of oct			PPT, Discussion
31	combinedvariance(derivationfor 2 groups)	CO3	1st week of oct			PPT, Discussion
32	combined standard deviation	CO3	2nd week of oct			PPT, Discussion
33	, generalization for *n*groups	CO3	2nd week of oct			PPT, Discussion
34	Measuresofdispersionforcomparison:coefficientofrange	CO3	2nd week of oct			PPT, Discussion
35	coefficient of quartile deviation and coefficient of mean deviation	CO3	2nd week of oct			PPT, Discussion
36	coefficientofvariation (C.V.)	CO3	2nd week of oct	Class Test or Project work		PPT, Discussion

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Module IV: Correlationandregression analysis CO:
CO1 – Learner is able to understand the concept of maxima and minima, saddle point
CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method
CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			PPT, Discussion
36	Scatter Diagram,	CO1	2nd week of oct			PPT, Discussion
37	Product moment correlation coefficient and its properties.	CO1	3th week of oct			PPT, Discussion
38	Spearman's Rank correlation.(With and without ties)	CO1	3th week of oct			PPT, Discussion
39	Concept of line arregression	CO2	3th week of oct			PPT, Discussion

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40	Principle of least squares.	CO2	3th week of oct			PPT, Discussion
41	Fitting a straight line by method of least squares.	CO2	3th week of oct			PPT, Discussion
42	Regression coefficients	CO2	4 th week of oct			PPT, Discussion
43	Correlation coefficient.	CO3	4 th week of oct			PPT, Discussion
44	Relation between regression coefficients andcorrelation coefficient.	CO3	4 th week of oct			PPT, Discussion
45	Fittingofcurvesreducibletolinearformbytransformation.Conceptan	CO3	4 th week of oct			PPT, Discussion
46	Use of coefficient of determination(R^2).	CO3	4 th week of oct			PPT, Discussion
47	Fitting a quadratic curve by method of least squares.	CO3	1st week of Nov			PPT, Discussion
48	Case study	CO3	1st week of Nov	Class Test or Project work		PPT, Discussion
Module V: TimeSeries CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities **CO 2:** Learner expresses clear understanding of the concept of network models and game theory						

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			PPT, Discussion
49	a) Definition of time series	CO1	1st week of Nov			PPT, Discussion
50	Its component	CO1	1st week of Nov			PPT, Discussion
51	Models of time series.	CO1	2nd week of Nov			PPT, Discussion
52	Estimation of trend	CO1	2nd week of Nov			PPT, Discussion
53	Method of semi average	CO1	2nd week of Nov			PPT, Discussion
54	Method of Moving average	CO1	2nd week of Nov			PPT, Discussion
55	Method of least squares(linear trend only)	CO1	3th week of Nov			PPT, Discussion
56	Estimation of seasonal component	CO1	3th week of Nov			PPT, Discussion

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57	Method of simple average	CO3	3th week of Nov			PPT, Discussion
58	Ratio to moving average	CO3	1st week of Dec			PPT, Discussion
59	Ratio to trend method	CO3	1st week of Dec			PPT, Discussion
60	Case Study	CO3	2st week of Dec	Class Test or Project work		PPT, Discussion

Note :- Extra Lectures will be conducted as per the requirement of the students

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: II	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: DATA BASE MANAGEMENT	Code N0: USDS202
Name of the Lecturer: Vinod Yadav	Academic Year: **2022-23**	Total No. of Students: 15

Module I- Introduction & DBMS Architecture:

CO 1: Student should be able to know the real number and expressions, and Functions and its operation
CO 2: Student should be able to know the Quadratic functions and polynomials
CO 3: Student should be able to know the Complex number and its operation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	**Introduction & DBMS Architecture:** Why Databases? Data versusInformation, Introducing the Database, ,	CO1	1 week of January			PPT, Group discussion .
2	Data versusInformation, Introducing the Database, ,	CO1	1 week of January			PPT
3	Role and Advantages of theDBMS,TypesofDatabases,WhyDatabaseDesignIsImportant	CO1	1 week of January			Group discussion
4	Evolution of File System Data Processing, Problems with File SystemDataProcessing, DatabaseSystems	CO1	1 week of January			Group discussion

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5	Data Modeling and Data Models, The ImportanceofData Models,	CO1	2 week of January			PPT	
6	, Data Model Basic Building Blocks, Business Rules	CO1	2 week of January			PPT, Group discussion .	
7	TheEvolutionof Data Models, Degrees ofDataAbstraction	CO1	2 week of January			PPT	
8	Entities,attributes	CO1	2 week of January			PPT	
9	Relationships,ConnectivityandCardinality,ExistenceDependence,	CO1	3 week of January			PPT, Group discussion .	
10	RelationshipStrength,WeakE ntities,RelationshipParticipation	CO2	3 week of January			PPT	
11	,RelationshipDegree,RecursiveRelatio nships,Associative(Composite)Entities,.	CO2	3 week of January			PPT, Group discussion .	
12	Developing an ER Diagram,Database Design Challenges: ConflictingGoals	CO3	3 week of January			PPT	
Module II Advanced Data Modeling							

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CO1 – Student should be able to know the Exponential Functions and Logarithmic Functions with modelling
CO2 – Student should be able to know the Unit circle, trigonometric function and inverse of trigonometric function
CO3 – Student should be able to know the law of Sines and law of Cosines

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	**Advanced Data Modeling:** The Extended Entity Relationship Model,Entity Clustering, ,	**CO1**	4 week of January			PPT, Group discussion .
14	Model,Entity Clustering, ,	**CO1**	4 week of January			PPT
15	Model,Entity Clustering, ,	**CO1**	4 week of January			Group discussion
16	, Entity Integrity: Selecting Primary Keys,	**CO1**	4 week of January			Group discussion
17	, Entity Integrity: Selecting Primary Keys,	**CO2**	1week of February			PPT, Group

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						discussion .
18	DesignCases:LearningFlexibleDatabaseDesign	**CO2**	1week of February1week of February			PPT
19	DesignCases:LearningFlexibleDatabaseDesign	**CO2**	1week of February			Group discussion
20	DatabaseTablesandNormalization, TheNeedforNormalization,	**CO2**	1week of February			Group discussion
21	TheNormalizationProcess,ImprovingtheDe sign,	**CO2**	1week of February			PPT, Group discussion .
22	SurrogateKeyConsiderations,	**CO2**	1week of February			PPT
23	Higher- LevelNormalForms,NormalizationandDatabaseDesign	**CO2**	2 week of February			Group discussion
24	,Denormalizatio n,Data-Modeling Checklist	**CO3**	2 week of February			Group discussion

Module III- StructuredQueryLanguage(SQL):

CO1 – Student should be able to know the Trigonometric Identities, trigonometric Equation

CO2 – Student should be able to know the Sinusoidal graph and equation, Inverse Circular Function and application

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	IntroductiontoSQL,BasicSELECTQueries,	CO1	2 week of February			PPT, Group discussion .
26	BasicSELECTQueries,	CO1	2 week of February			PPT
27	BasicSELECTQueries,	CO1	2 week of February			Group discussion
28	SELECTStatementOption	CO1	2 week of February			Group discussion
29	SELECTStatementOption	CO1	2 week of February			PPT, Group discussion .
30	FROMClauseOptions,	CO2	3 week of February			PPT
31	ORDERBYClauseOptions,	CO2	3 week of February			Group discussion

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32	ORDERBYClauseOptions,	CO2	3 week of February			Group discussion
33	WHEREClauseOptions	CO2	3 week of February			PPT, Group discussion .
34	AggregateProcessing,Subqueries,SQLFunctions,	CO2	3 week of February			PPT
35	RelationalSetOperators,Crafting	CO2	3 week of February			Group discussion
36	Crafting SELECT Queries	CO1	4 week of February			Group discussion

Module IV : AdvancedSQL

CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number
CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D
CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable
CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrics

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	**AdvancedSQL:**DataDefinitionCommands,	CO1	4 week of February			PPT, Group discussion.
37	CreatingTableStructures, Altering Table Structures	CO1	4 week of February			PPT
38	Data ManipulationCommands,VirtualTables:CreatingaView,	CO1	1 week of March			Group discussion
39	Sequences,ProceduralSQL, EmbeddedSQL	CO2	1 week of March			Group discussion
40	TheInformationSystem,	CO2	1 week of March			PPT, Group discussion.
41	TheSystemsDevelopmentLifeCycle	CO2	1 week of March			PPT
42	TheDatabaseLifeCycle,	CO3	2 week of March			Group discussion
43	ConceptualDesign,DBMSSoftwareSele ction	CO3	2 week of March			Group discussion
44	ConceptualDesign,DBMSSoftwareSele ction	CO4	2 week of March			PPT, Group

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						discussion .
45	LogicalDesign,PhysicalDesign,	CO4	3 week of March			PPT
46	DatabaseDesignStrategies	CO4	3 week of March			Group discussion
47	Centra lized versus DecentralizedDesign	CO4	3 week of March			Group discussion
48	Centra lized versus DecentralizedDesign	CO4	4 week of March			

Module V: Transaction Management and Concurrency Control:

CO1 – Student should be able to know the Conics, Polar equation of conics
CO2 – Student should be able to know the Sequence, Types of sequence and mathematical induction with Binomial Theorem
CO3 – Student should be able to know the Limits and its operations

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	What Is a Transaction? Concurrency Control with Locking Methods,	CO1	4 week of March			PPT, Group

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						discussion .
50	ConcurrencyControlwithLockingMethods	CO1	4 week of March			PPT
51	Concurrency ControlwithTimeStampingMethods,ConcurrencyControlwithOptimisticMethods,	CO1	4 week of March			Group discussion
52	ANSILevelsofTransactionIsolation,DatabaseRecovery Management	CO2	1 week of April			Group discussion
53	DatabasePerformance-Tuning Concepts, Query Processing,	CO2	1 week of April			PPT, Group discussion .
54	Indexes and Query Optimization, Optimizer Choices,	CO2	1 week of April			PPT
55	SQL PerformanceTuning, QueryFormulation,DBMSPerformanceTuning,QueryOptimizationExamples	CO2	2 week of April			Group discussion
56	Data as a CorporateAsset	CO2	2 week of April			Group discussion
57	The Need for a Database and Its Role in an Organization,Introductionof a Database:SpecialConsiderations	CO3	3 week of April			PPT, Group

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						discussion .
58	The Evolutionof DatabaseAdministration,TheDatabaseEnvironment'sHumanComponent,Security,	CO3	3 week of April			PPT
59	DatabaseAdministrationTools,DevelopingaDataAdministration Strategy,	CO3	3 week of April			Group discussion
60	The DBA's Role in the Cloud, The DBAatWork:Using Oracle forDatabase Administration	CO3	3 week of April			Group discussion

Note :- Extra Lectures will be conducted as per the requirement of the students

Course Outcomes:

After completion of the course, a student should be able to:

- Apply the knowledge of numbers, graph and functions in real life.
- Apply trigonometry in modelling real life problems.
- Use analytic trigonometry and inverse circular functions to solve variety of problems.

Lecture

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: II	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: **Calculus**	Code N0: **USDS205**
Name of the Lecturer: Anil Yadav	Academic Year: **2022-23**	Total No. of Students: 15

Module I Continuity and Derivatives
CO 1: Student should be able to know the real number and expressions, and Functions and its operation
CO 2: Student should be able to know the Quadratic functions and polynomials
CO 3: Student should be able to know the Complex number and its operation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Limits at Infinity	CO1	1 week of January			PPT, Group discussion .
2	HorizontalAsymptotes,.	CO1	1 week of January			PPT
3	Derivatives and Rates of Change	CO1	1 week of January			Group discussion
4	The Derivative as aFunction	CO1	1 week of January			Group discussion

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5	Derivatives of Polynomials	CO1	2 week of January			PPT
6	Exponential Functions,	CO1	2 week of January			PPT, Group discussion .
7	The Product and Quotient Rules ,The ChainRule	CO1	2 week of January			PPT
8	Implicit Differentiation,	CO1	2 week of January			Group discussion
9	Derivatives of Logarithmic Functions	CO1	3 week of January			Group discussion
10	Rates of Change in the Natural and Social Sciences	CO2	3 week of January			PPT
11	Exponential Growth andDecay, Related Rates	CO2	3 week of January			PPT, Group discussion .
12	Linear Approximations and Differentials, Hyperbolic Functions.	CO3	3 week of January			PPT

Module II: Integrals

CO1 – Student should be able to know the Exponential Functions and Logarithmic Functions with modelling

CO2 – Student should be able to know the Unit circle, trigonometric function and inverse of trigonometric function

CO3 – Student should be able to know the law of Sines and law of Cosines

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Group discussion
13	Integrals intro	**CO1**	4 week of January			PPT
14	Areas and distances,	**CO1**	4 week of January			PPT, Group discussion .
15	The Definite Integral,	**CO1**	4 week of January			PPT
16	The Fundamental Theorem of Calculus,	**CO1**	4 week of January			Group discussion
17	Indefinite Integrals and the Net Change Theorem	**CO2**	1week of February			Group discussion
18	The Substitution Rule	**CO2**	1week of February1week of February			PPT
19	Integration by Parts,	**CO2**	1week of February			PPT, Group discussion .
20	Trigonometric Integrals, Trigonometric Substitution,	**CO2**	1week of February			PPT
21	Integration of Rational Functions byPartial Fractions,	**CO2**	1week of February			Group discussion
22	Strategy for Integration	**CO2**	1week of February			Group discussion

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23	Integration Using Tables and Computer Algebra Systems	**CO2**	2 week of February			PPT
24	Approximate Integration, Improper Integrals	**CO3**	2 week of February			PPT, Group discussion .

Module III :Applications of differentiation Applications of Integration :
CO1 – Student should be able to know the Trigonometric Identities, trigonometric Equation
CO2 – Student should be able to know the Sinusoidal graph and equation, Inverse Circular Function and application

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Group discussion
25	**Applicationsofdifferentiation:** Maximum and Minimum Values,	CO1	2 week of February			Group discussion
26	The Mean Value Theorem,	CO1	2 week of February			PPT
27	Derivatives and Shape of a Graph	CO1	2 week of February			PPT, Group discussion .
28	Indeterminate Forms and L' Hospital's Rule, Curve Sketching	CO1	2 week of February			PPT
29	Indeterminate Forms and L' Hospital's Rule, Curve Sketching	CO1	2 week of February			Group discussion
30	Graphing with Calculus *and* Calculators	CO2	3 week of February			Group discussion

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31	Optimization Problems, Newton's Method.	CO2	3 week of February			PPT
32	Areas between Curves, Volumes, Volumes by Cylindrical Shells	CO2	3 week of February			PPT, Group discussion .
33	Work, Average Value of a Function, Arc Length	CO2	3 week of February			PPT
34	Area of a Surface of Revolution,	CO2	3 week of February			Group discussion
35	Applications to Physics and Engineering,.	CO2	3 week of February			Group discussion
36	Applications to Economics and Biology ,Probability	CO1	4 week of February			PPT

Module IV : Parametric Equations and Polar Coordinates

CO1 – Student should be able to know the Polar Coordinate and Polar form of Complex Number
CO2 – Student should be able to know the Plane curve, Vectors and products of vectors, 3D and Vectors in 3D
CO3 – Student should be able to know the Equations, Linear Equation in two variable and in several variable
CO4 – Student should be able to know the solution of linear equation by determinants method, algebra of matrics

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	**Parametric Equations and Polar Coordinates:** Curves Defined by Parametric Equations,	CO1	4 week of February			PPT, Group discussion .
37	Curves Defined by Parametric Equations,	CO1	4 week of February			PPT

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38	Calculus with Parametric Curves	CO1	1 week of March			Group discussion
39	Polar Coordinates	CO2	1 week of March			Group discussion
40	Areas and Lengths in Polar Coordinates,	CO2	1 week of March			PPT
41	Conic Sections, Conic Sections in Polar Coordinates.	CO2	1 week of March			PPT, Group discussion .
42	Double Integrals over Rectangles, Iterated Integrals	CO3	2 week of March			PPT
43	Double Integrals over General Regions,	CO3	2 week of March			Group discussion
44	Double Integrals in Polar Coordinates	CO4	2 week of March			Group discussion
45	Applications of Double Integrals,	CO4	3 week of March			PPT
46	,Triple Integrals	CO4	3 week of March			PPT, Group discussion .
47	Triple Integrals in Spherical Co-ordinates	CO4	3 week of March			PPT
48	Change of Variables in Multiple Integrals	CO4	4 week of March			Group discussion

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Module V: Partial Derivatives Differential Equations :

CO1 – Student should be able to know the Conics, Polar equation of conics

CO2 – Student should be able to know the Sequence, Types of sequence and mathematical induction with Binomial Theorem

CO3 – Student should be able to know the Limits and its operations

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			PPT
49	Functions of Several Variables	CO1	4 week of March			PPT, Group discussion .
50	Limits and Continuity	CO1	4 week of March			PPT
51	Partial Derivatives	CO1	4 week of March			Group discussion
52	Tangent Planes and Linear Approximations	CO2	1 week of April			Group discussion
53	TheChain Rule,.	CO2	1 week of April			PPT
54	Maximum and Minimum Values	CO2	1 week of April			PPT, Group discussion .
55	Lagrange Multipliers.	CO2	2 week of April			PPT
56	Modelling with Differential Equations,	CO2	2 week of April			Group discussion
57	Direction Fields and Euler's Method	CO3	3 week of April			Group discussion

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58	Euler's Method, Separable Equations	CO3	3 week of April			PPT
59	Models for Population Growth,	CO3	3 week of April			PPT, Group discussion .
60	Linear Equations, Predator-Prey Systems	CO3	3 week of April			PPT

Note :- Extra Lectures will be conducted as per the requirement of the students

Course Outcomes:
After completion of the course, a student should be able to:

- Apply the knowledge of numbers, graph and functions in real life.
- Apply trigonometry in modelling real life problems.
- Use analytic trigonometry and inverse circular functions to solve variety of problems.
- Apply complex numbers theory to different domains, use vectors and matrices to solve real life problems.
- Identify different types of conics from equations, understand sequences and series and basics of limits and derivatives.

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STUDY PLAN & IT'S EXECUTION

Class /Div.: FY.**Data Science**	Semester: I	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Business Communication and Information Ethics	Code N0: USDS104
Name of the Lecturer Saurabh despandey	Academic Year: **2022-23**	Total No. of Students: 15

Module I- InterpretationofCommunication

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	**InterpretationofCommunication**	CO1	3 week of sept			PPT, Discussion
2	Basics of communication	CO1	3 week of sept			PPT, Discussion
3	Basics of communication	CO1	3 week of sept			PPT, Discussion
4	Non- verbal communication,	CO1	3 week of sept			PPT, Discussion

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5	Non- verbal communication,	CO1	3 week of sept			PPT, Discussion
6	Barriers to communication	CO1	4 week of sept			PPT, Discussion
7	Barriers to communication	CO2	4 week of sept			PPT, Discussion
8	Letter components and layout,	CO2	4 week of sept			PPT, Discussion
9	Planning a letter	CO2	4 week of sept			PPT, Discussion
10	Process of letter writing	CO2	4 week of sept			PPT, Discussion

Module II- Businesscommunicationatworkplace

CO:
CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt
CO2 – Learner is able to understand the concept of Fast Fourier Transform
CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topic to cover Businesscommunicationatworkplace	CO ver	CO	Date/Day/Time Of conducting	CE planned with model & Date	Execution of CE Date	Remark
11	Email communication,		CO1	1 week of oct			PPT, Discussion

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12	Email communication,	CO1	1 week of oct	Class Test or Project work		PPT, Discussion
13	Memos and memo reports	CO1	1 week of oct			PPT, Discussion
14	Memos and memo reports	CO1	1 week of oct			PPT, Discussion
15	Employment communication	CO1	2 week of oct			PPT, Discussion
16	Employment communication	CO2	2 week of oct			PPT, Discussion
17 ,18,19,	Notice,	CO2	2 week of oct			PPT, Discussion
20,21,22	Agenda and minutes of meeting	CO3	2 week of oct			PPT, Discussion
24,25	Agenda and minutes of meeting	CO3	2 week of oct	Class Test or Project work		PPT, Discussion
26	Brochures.	CO3	3 week of oct			PPT, Discussion

Module III- ReportWriting:

CO:

CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors

CO2 – Learner is able to understand the the concept of Diagonalization of matrix

CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	PPT, Discussion
27,28	Effective writing	CO1	3 week of oct			PPT, Discussion
29,30	Effective writing	CO2	3 week of oct			PPT, Discussion
31	Types of business reports,	CO2	3 week of oct			PPT, Discussion
32,33	Types of business reports,	CO3	3 week of oct			PPT, Discussion
34,35	Structure of reports	CO3	4 week of oct			PPT, Discussion
36,37	Structure of reports	CO3	4 week of oct	Class Test or Project work		PPT, Discussion
38	Gathering Information.	CO3	4 week of oct			PPT, Discussion
39,40	Gathering Information.	CO3	4 week of oct			PPT, Discussion

Module IV: Report Writing

CO:
CO1 – Learner is able to understand the concept of maxima and minima, saddle point
CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method
CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			PPT, Discussion
41	Organisation of material	CO1	4 week of oct			PPT, Discussion
42,43	Organisation of material	CO1	1 week of Nov			PPT, Discussion
44	Writing abstracts and summaries,	CO1	1 week of Nov			PPT, Discussion
45	Writing abstracts and summaries,	CO2	1 week of Nov			PPT, Discussion
46	Writing definition	CO2	1 week of Nov			PPT, Discussion
47	Writing definition	CO2	1 week of Nov			PPT, Discussion
48	Visual aids	CO2	1 week of Nov	Class Test or Project work		PPT, Discussion
49,50	Visual aids	CO3	2 week of Nov			PPT, Discussion
51,52	User Instruction Manual	CO3	2 week of Nov			PPT, Discussion
53,54,	User Instruction Manual	CO3	3 week of Nov			PPT, Discussion

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Module V: InformationEthics

CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities

CO 2: Learner expresses clear understanding of the concept of network models and game theory

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			PPT, Discussion
55	**InformationEthics** Ethicsaftertheinformationrevolution,whatisinformationethics?The method ofabstraction.	CO1	4 week of Nov			PPT, Discussion
56	Ethics after the information revolution	CO1	1 week of Dec			PPT, Discussion
57	What is information ethics?	CO1	1 week of Dec			PPT, Discussion
58	What is information ethics?	CO1	1 week of Dec			PPT, Discussion
59	The method of abstraction	CO1	2week of Dec			PPT, Discussion
60	The method of abstraction	CO1	2 week of Dec	Class Test or Project work		PPT, Discussion

Note :- Extra Lectures will be conducted as per the requirement of the students

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STUDY PLAN & IT'S EXECUTION

Class /Div.: **SY.Data Science**	Semester: III	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Research Methods and Ethics	Code N0: USDS301
Name of the Lecturer: Vinod yadav	Academic Year: **2023-24**	Total No. of Students: 15

Module I- Research Methodology-An Introduction

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Meaning of Research, Objectives of Research,	CO1				
2	Motivation in Research Types of Research	CO1				
3	Research Approaches, Significance of Research	CO1				
4	Research Methods versus Methodology, Research and Scientific Method	CO1				

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5	, Importance ofKnowing How Research is Done, Research Process	CO1				
6	Criteria of Good Research, Problems Encountered by Researchers in India	CO1				
7	What is a Research Problem?, Selecting the Problem	CO2				
8	Selecting the Problem, Necessity of Defining the Problem,	CO2				
9	Technique Involved in Defining a Problem, An Illustration	CO2				
10	Meaning of Research Design, Need for Research Design,	CO2				
11	Features of a Good Design, Important Concepts Relating to Research Design					
12	Different Research Designs, Basic Principles of Experimental Designs					

Module II- Sampling Design , Measurement and Scaling Techniques, Methods of Data Collection

CO:

CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt

CO2 – Learner is able to understand the concept of Fast Fourier Transform

CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topic to be covered	CO	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE Date	Remark
11	Census and Sample Survey, Implications of a Sample Design,	CO1					

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12	Steps in Sampling Design, Criteria of Selecting a Sampling Procedure	CO1				
13	Characteristics of a Good Sample Design, Different Types of Sample Designs, How to Select a Random Sample?	CO1				
14	Random Sample from an Infinite Universe, Complex Random Sampling Designs,	CO1				
15	Measurement in Research, Measurement Scales, Sources of Error in Measurement,	CO1				
16	, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling	CO2				
17	Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques	CO2				
18	Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires,	CO3				
19	Collection of Data through Schedules Difference between Questionnaires and Schedules, Some Other Methods of Data Collection,	CO3				
20	Collection of Secondary Data, Selection of Appropriate Method for Data Collection,	CO3				
	,Case Study Method, Guidelines for Constructing Questionnaire/Schedule					

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	Guidelines for Successful Interviewing					
	Difference between Survey and Experiment					

Module III- Processing and Analysis of Data, Sampling Fundamentals

CO:
CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors
CO2 – Learner is able to understand the the concept of Diagonalization of matrix
CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	Processing Operations, Some Problems in Processing, Elements/Types of Analysis,)	CO1				
25	Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness)	CO2				
26	Measures of Relationship, Simple Regression Analysis, Multiple Correlation and Regression,	CO2				
27	PartialCorrelation, Association in Case of Attributes, Other Measures, SummaryChart Concerning Analysis of Data	CO3				

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28	Need for Sampling, Some Fundamental Definitions,	CO3				
29	Important Sampling Distributions, Central Limit Theorem, Sampling Theory	CO3				
30	Sandler's *A*-test, Concept of Standard Error, Estimation	CO3				
31	Estimating Population Proportion, Sample Size and its Determination	CO3				
32	Determination of Sample Size through the Approach Based on Precision Rate and ConfidenceLevel					
33	Determination of Sample Size through the Approach, Based on Bayesian Statistics					
33	What is a Hypothesis?Basic Concepts Concerning Testing of Hypotheses					
34	, Procedure for Hypothesis Testing,Flow Diagram for Hypothesis Testing,					
35	Measuring the Power of aHypothesis Test, Tests of Hypotheses, Important Parametric Tests,					
36	Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Limitations of the Tests of Hypotheses					

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Module IV: Interpretation of Data and Paper Writing

CO:
CO1 – Learner is able to understand the concept of maxima and minima, saddle point
CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method
CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
37	Layout of a Research Paper,	CO1				
38	Journals in Computer Science	CO1				
39	Impact factor of Journals, When and where to publish ?,	CO1				
40	UGC-CARE, Web of Science, SCOPUS, IEEE, ACM,	CO2				
41	Ethical issues related to publishing, Copyright, Data Privacy	CO2				
42	Plagiarism and Self-Plagiarism, Software for detection of Plagiarism.ShodhShudhhi (PDS),	CO2				
43	smallseotools.com Use of Encyclopedias, Research Guides, Handbook etc.,	CO2				
44	Academic Databases for Computer Science and Information Technology Discipline	CO3				

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45	Google Scholar, shodhganga, IEEE Xplore, ResearchGate, IDELS, DASH	CO3				
46	Chicago, Turabian, MLA and APA Style	CO3				
47	Reference Management Software like EndNote, Zotero or Mendeley					
48	; Software for paper formatting like LaTeX/MS Office/ **Scrivener/Open Office/Google Doc/DropBox Paper**					

Module V: Ethics in business research, Think like a Researcher

CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities

CO 2: Learner expresses clear understanding of the concept of network models and game theory

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	What Are Research Ethics?	CO1				
50	Ethical Treatment of Participants,	CO1				
51	, Ethics and the Sponsor, Researchers and TeamMembers,	CO1				
52	Professional Standards, Resources for Ethical Awareness	CO1				
53	The Language of Research, Concepts, Constructs, Definitions	CO1				

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54	Variables, Propositions and Hypotheses, Theory, Models,	CO1				
55	Research and the Scientific Method, Sound Reasoning for Useful Answers					
56	Introduction, The Internet as object of analysis,					
57	Using websites to collect data from individuals. Virtual ethnography					
58	Qualitative research using online focus groups					
59	Qualitative research using online personal interviews					
60	Online social surveys, Ethical considerations in e-research, The state of e-research					

Note :- Extra Lectures will be conducted as per the requirement of the students

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STUDY PLAN & IT'S EXECUTION

Class /Div.: **SY.Data Science**	Semester: III	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Microeconomics	Code N0: USDS303
Name of the Lecturer:Aishwarya Shinde	Academic Year: **2023-24**	Total No. of Students: 15

Module I- First Principles, Economic Models

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	What is the difference between macro and micro economics?	CO1				
2	The central choices of economic decision making: what, how and for whom to produce	CO1				
3	The participants in the market economy Key concepts used in economic analysis: Scarcity, choice, opportunity cost	CO1				
4	Marginal analysis and choice Ceteris Paribus or _everything else held constant.'	CO1				

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5	Positive and normative economicsandusing theories and models to measure economic events Criteria for evaluation of economic policy and policy proposals	CO1				
6	Economic systems – the market economy, mixed economies & command economies	CO1				
7	Review of expressing relationships between economic variables using graphs	CO2				
8	Trade-offs and Trade: Defining the used in the production of goods and services	CO2				
9	The production possibility frontier applied to the concept of opportunity cost/tradeoffs and to marginal costs and benefits; increasing marginal opportunity costs.	CO2				
10	Productive efficiency; inefficient choices and unattainable choices, Using the frontier to illustrate economic growth,	CO2				
11	attainmentof new resources, technological change, and more efficient production.	CO2				
12	Comparative advantage and the gains from trade Thecircular flow of income, product and services in the economyresources	CO2				
Module II- Supply and Demand: Product and Resource Markets						

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CO:
CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt
CO2 – Learner is able to understand the concept of Fast Fourier Transform
CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topics to cover	CO	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE Date	Remark
13	**Supply and Demand: Product and Resource Markets** – Role of households (consumers) and firms What is a market? Consumer demand and the -		CO1				
14	Law of Demand‖ Law of Demand: the inverse relationship between price and quantity demanded Change in quantity demanded vs. shift in demand:		CO1				
15	the concept of -ceteris paribus‖ Causes of a shift in demand: changes in income, expectations, number of consumers, tastes and preferences;		CO1				
16	Normal and inferior goods Law of Supply: The positive relationship between price and quantity supplied.Change in quantity supplied vs. a shift in supply Causes of a shift in Supply:		CO1				
17	changes in cost of resources, prices of related goods, technology, expectations of producers, number of		CO1				

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	producers					
18	Applications (examples) of Demand and Supply graphs; Market demand, market supply and market equilibrium Government pricecontrols: price ceilings, price floors	CO2				
19	Theory and Policy: The Business Cycle in MarketEconomies; short-term vs. long-term growth trend Expansion, peak, decline	CO2				
20	, trough Emergence of modern-day macroeconomic policy tomoderate effects of recessions:	CO3				
21	Keynesian policy/governmentspending and taxation to stimulate aggregate demand Components ofaggregate demand and aggregate supply Shifts in the AD and AS curves: What do they show? m;	CO3				
22	The roots of macroeconomics: JohnMaynard Keynes and the Great Depression Classical vs. Keynesianeconomics; the short-run vs. long run model of macroeconomic equilibrium;	CO3				
23	The Keynesian short-run model and the classical economists' long-run model Keynes' challenge to Say's Law: theDemand Driven Economy Wage and Price	CO3				

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	inflexibility;					
24	The role of Government Concerns of Inflation (boom times) and deflation (severe economic downturns) The impact of recession on trade imbalances	CO3				

Module III- Unemployment and Inflation

CO:
CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors
CO2 – Learner is able to understand the the concept of Diagonalization of matrix
CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	**Unemployment and Inflation:** How is the labor force defined?	CO1				
26	Measuring employment and unemployment.Who is not counted in the Government's official count of the unemployed	CO2				
27	Types of unemployment; cyclical unemployment and the business cycle.).	CO2				

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28	. The difference between the _household survey'(the civilian labor force) and the _establishment survey' (number of payroll jobs added by employers).	CO3				
29	The labor force participation rate Unemployment and the changes in the global economy	CO3				
30	**Gross Domestic Product:** Measuring the economy's output of goods and services;	CO3				
31	Government Sector: federal state and local government in the economy The financial sector; the international sector;	CO3				
32	The threemarkets: goods and service, labor market, money market Nominal andreal GDP;	CO3				
33	The difference between GNP and GDP Expenditure Measure of GDP:	CO3				
34	consumption by households, businesses, government and the rest of the world (Net exports) Income Measureof GDP:	CO3				
35	Income from labor, rent, interest, proprietors' income, profit Value added approach vs.	CO3				
36	measure of final goods and services produced What GDP Does Not Include; alternative measures of GDP	CO3				

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Module IV Measuring inflation the consumer price index:

CO:

CO1 – Learner is able to understand the concept of maxima and minima, saddle point

CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method

CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	**Measuring inflation the consumer price index:** What does it say about the state of the economy	CO1				
37	Real vs. nominal income and	CO1				
38	Real vs. nominal income	CO1				
39	earningsReal and Nominal rates of interest	CO2				
40	Costs and causes of inflation	CO2				
41	Defining fiscal policy: taxation and spending to achieve macroeconomic goals	CO2				
42	The role of government in the U.S. economy Fiscal policy and the Recession of 2007 – 2009	CO2				
43	The Employment Act of 1946 A history of U.S. fiscal policy since the early 20th century	CO3				

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44	The multiplier effect Government spending and taxation Automatic stabilizers	CO3				
45	The income tax, unemployment insurance	CO3				
46	Discretionary taxand spending policy Progressive, proportional and regressive taxes and their impacts Fiscal Policy Lags	CO3				
47	The circular flow diagram with government spending and taxation Budget deficits and surpluses;	CO3				
48	Government debt and deficits: Are they the same thing?	CO3				

Module V : Money, Banking and the Federal Reserve System

CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities

CO 2: Learner expresses clear understanding of the concept of network models and game theory

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	**Money, Banking and the Federal Reserve System:** What is money?	CO1				
50	Commodity and fiat monies; the barter system Money as a medium of exchange; Money supply defined:	CO1				

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51	M1 and M2 Gold and the money supply: Why was the gold standard adopted (1873) and	CO1				
52	why was it later eliminated (1971)? Monetary role of banks; Establishment of bank reserves;	CO1				
53	The T-account (assets and liabilities) Bank regulation: the FDIC deposit insurance; capital requirements; the discount window at the Fed.	CO1				
54	**Monetary Policy:** The structure of the Federal Reserve System	CO1				
55	How the Fed regulates the money supply: reserve requirements, the discount rate, open market operations; the goals of monetary policy	CO1				
56	The federal funds rate; fed funds market Banking legislation and deregulation since the 1980's Growth of the -Shadow Banking System‖ and the financial crisis of 2007-2009	CO1				
57	The role of credit, debit cards and electronic money in the money supply Role of financial intermediarie	CO3				

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58	modern depository institutions Savings and Loan crisis of the late 1980'	CO3				
59	The financial crisis of 2008 and the Federal Reserve's policy response How the banking system creates and expands money in circulation	CO3				
60	The difference between treasury bonds and bonds issued by the Fed Fed Policies during the 2007 – 2009 Recession	CO3				

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STUDY PLAN & IT'S EXECUTION

Class /Div.: **SY.Data Science**	Semester: III	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Data ware housing	Code N0: USDS304
Name of the Lecturer:Abhijeet Pawasker	Academic Year: **2023-24**	Total No. of Students: 15

Module I THE COMPELLING NEED FOR DATA WAREHOUSING

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	THE COMPELLING NEED FOR DATA WAREHOUSING: Escalating	CO1				
2	Need for Strategic Information, Failures of Past Decision-Support Systems	CO1				
3	Operational Versus Decision-Support Systems, ,	CO1				
4	Data Warehousing—The Only Viable Solution, Data Warehouse Defined	CO1				
5	The Data Warehousing Movement, Evolution of Business	CO1				

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	Intelligence ,					
6	The Building Blocks: Defining Features, Data Warehouses and Data Marts,	CO1				
7	Architectural Types, Overview of The Components, Metadata in The Data Warehouse	CO2				
8	Continued Growth in Data Warehousing, Significant Trends,	CO2				
9	Emergence of Standards, Web-EnabledData Warehouse	CO2				
10	Understanding Data Warehouse Architecture, Distinguishing Characteristics, Architectural Framework, Technical Architecture, Architectural Types	CO2				
11	THE SIGNIFICANT ROLE OF METADATA: Why Metadata Is Important	CO2				
12	Metadata Types By Functional Areas, Business Metadata,Technical Metadata, How To Provide Metadata	CO2				
Module II- PRINCIPLES OF DIMENSIONAL MODELING						

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CO:
CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt
CO2 – Learner is able to understand the concept of Fast Fourier Transform
CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topics to cover	CO	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE Date	Remark
13	PRINCIPLES OF DIMENSIONAL MODELING: From Requirements toData Design, ,		CO1				
14	From Requirements toData Design, ,		CO1				
15	The Star Schema		CO1				
16	Star Schema Keys,		CO1				
17	Advantages of The Star Schema, Star Schema: Examples		CO1				
18	Star Schema: Examples		CO2				
19	Updates to The Dimension Tables,		CO2				
20	Miscellaneous Dimensions, The Snowflake Schema		CO3				
21	Aggregate Fact Tables, Families of Stars		CO3				

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22	Overview ETL Requirements and Steps, Data Extraction	CO3				
23	Data Transformation, Data Loading, ETL Summary,	CO3				
24	Other IntegrationApproaches	CO3				

Module III- INTRODUCTION TO DATA MINING

CO:

CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors

CO2 – Learner is able to understand the the concept of Diagonalization of matrix

CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	INTRODUCTION TO DATA MINING: Introduction to Data Mining, Need of Data Mining, What Can Data Mining	CO1				
26	What Can Data Mining Do and Not Do?	CO2				
27	Data Mining Applications	CO2				
28	, Data Mining Process, Data Mining Techniques,	CO3				
29	Difference between Data Mining and Machine Learning	CO3				

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30	About Weka, Installing Weka, Understanding Fisher's Iris Flower Dataset, ,	CO3				
31	Preparing the Dataset, Understanding ARFF, Working with a Dataset in Weka,	CO3				
32	Working with the Iris dataset in RData Preprocessing: Need for Data Preprocessing	CO3				
33	, Data Preprocessing Methods CLASSIFICATION: Introduction to Classification	CO3				
34	, Types of Classification, Input and Output Attributes, Guidelines for Size and Quality of the Training Dataset,	CO3				
35	, Introduction to the Decision Tree Classifier, Naive Bayes Method	CO3				
36	Understanding Metrics to Assess the Quality of Classifiers	CO3				

Module IV: CLUSTER ANALYSIS

CO:

CO1 – Learner is able to understand the concept of maxima and minima, saddle point

CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method

CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			

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36	CLUSTER ANALYSIS: Introduction to Cluster Analysis,	CO1				
37	Applications of Cluster Analysis,	CO1				
38	Applications of Cluster Analysis,	CO1				
39	Desired Features of Clustering, Distance Metrics,	CO2				
40	Desired Features of Clustering, Distance Metrics,	CO2				
41	Major Clustering Methods/Algorithms,	CO2				
42	Partitioning Clustering,	CO2				
43	Web Mining and Search Engines: Introduction,	CO3				
44	Web Content Mining,Web Usage Mining, Web Structure Mining,	CO3				
45	Hyperlink Induced Topic	CO3				
46	Induced Topic Search algorithm, Introduction to Modern Search Engines,	CO3				
47	Working of aSearch Engine, PageRank Algorithm	CO3				

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48	Precision and Recall	CO3				
Module V INTRODUCTION TO ASSOCIATION RULE MINING CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities **CO 2:** Learner expresses clear understanding of the concept of network models and game theory						
Lecture No.	**Topics to cover**	**CO**	**Date/Day/Time Of conducting**			
49	INTRODUCTION TO ASSOCIATION RULE MINING: Defining Association Rule Mining,	CO1				
50	Association Rule Mining	CO1				
51	Representations of Items for Association Mining,	CO1				
52	The Metrics to Evaluate the Strength of Association Rules	CO1				
53	The Metrics to Evaluate the Strength of Association Rules	CO1				
54	, The Naive Algorithm for Finding Association Rules, ,	CO1				
55	Approaches for Transaction Database Storage	CO1				
56	THE APRIORI ALGORITHM Closed and Maximal Itemsets,	CO1				

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57	TheApriori–TID Algorithm for Generating Association Mining Rules,	CO3				
58	TheApriori–TID Algorithm for Generating Association Mining Rules,	CO3				
59	DirectHashing and Pruning (DHP), Dynamic Itemset Counting (DIC)	CO3				
60	Mining Frequent Patterns without Candidate Generation (FP Growth)	CO3				

Note :- Extra Lectures will be conducted as per the requirement of the students

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STUDY PLAN & IT'S EXECUTION

Class /Div.: **SY.Data Science**	Semester: III	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: DATA STRUCTURE	Code N0: USDS302
Name of the Lecturer: Snehal Kangane	Academic Year: **2023-24**	Total No. of Students: 15

Module I- Python Objects & Object-Oriented Programming ,Python Data Types and Strutures

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	Goals, Principles, and Patterns,	CO1				
2	Overview of data types and objects, ,	CO1				
3	Classes and object programming	CO1				
4	Class Definitions, Inheritance, Data encapsulation and properties,	CO1				
5	Namespaces and Object-Orientation, Shallow and Deep Copying	CO1				

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6	Modules for data structures and algorithms- Collections, Deques, ChainMap objects Counter,	CO1				
7	, Counter objects, Ordered dictionaries defaultdict, Learning about named tuples Arrays	CO2				
8	An introduction to algorithms,,	CO2				
9	Algorithm design paradigms Recursion and backtracking,Backtracking	CO2				
10	Divide and conquer - long multiplication The recursive approach	CO2				
11	Runtime analysis Asymptotic analysis Big O notation	CO2				
12	Composing complexity classes Omega notation, Theta notation, Amortized analysis	CO2				

Module II- Lists and Pointer Structures, Singly linked lists

CO:

CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt

CO2 – Learner is able to understand the concept of Fast Fourier Transform

CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	**Lists and Pointer Structures**:Arrays-Pointer structures	CO1				

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14	Arrays-Pointer structures	CO1				
15	Singly linked list class,	CO1				
16	The append operation, A faster append operation,	CO1				
17	, Getting the size of the list, Improving list traversal,	CO1				
18	Deleting nodes, List search, Clearing a list	CO2				
19	A doubly linked list node Doubly linked list classAppend operation	CO2				
20	operation The delete operation List search	CO3				
21	Appending elements, Deleting an element in a circularlist	CO3				
22	Iterating through a circular list	CO3				
23	Stack implementation, Push operation, Pop operation	CO3				
24	Peekoperation, Bracket-matching application	CO3				

Module III- Queues, Trees

CO:

CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors

CO2 – Learner is able to understand the the concept of Diagonalization of matrix

CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	**Queues**:List-based queues, Stack-based queues	CO1				
26	Node-based queues,	CO2				
27	Application of queues Media player queues	CO2				
28	Terminology, Tree nodes, **Tree traversal**	CO3				
29	Depth-first traversal-In-order traversal and infix notation,	CO3				
30	Pre-order traversal and prefixnotation,	CO3				
31	Post-order traversal and postfix notation, Breadth-firsttraversal	CO3				
32	Binary search trees,Binary search treeimplementation, Binary search tree operations,	CO3				
33	Finding the minimumand maximum nodes	CO3				
34	Inserting nodes Deleting nodes, Searching the tree	CO3				
35	Benefits of a binary search tree, Balancing trees, Expression trees	CO3				

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36	Parsing a reverse Polish expression, **Heaps**, **Ternary search tree**	CO3				

Module IV: Hashing and Symbol Tables, Graphs and Other Algorithms

CO:

CO1 – Learner is able to understand the concept of maxima and minima, saddle point

CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method

CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	Hashing- Perfect hashing functions	CO1				
37	Hash tables-Storing elements in a hash table	CO1				
38	Hash tables-Storing elements in a hash table	CO1				
39	Retrieving elements from the hash table	CO2				
40	Testing the hash table,	CO2				
41	Using [] with the hash table	CO2				
42	Non- string keys, Growing a hash table,	CO2				
43	Open addressing, Chaining, Symbol tables	CO3				

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44	Graphs-Directed and undirected graphs,	CO3				
45	Weighted graphs, Graph representations,Adjacency lists,	CO3				
46	Adjacency matrices, Graph traversals- Breadth-first traversal	CO3				
47	Depth-first search, Other useful graph methods	CO3				
48	Priority queues and heaps- Insert operation, Pop Operation, Selection Algorithm	CO3				

Module V : Sorting, Selection Algorithms

CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities

CO 2: Learner expresses clear understanding of the concept of network models and game theory

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	Sorting algorithms- Bubble sort algorithms,	CO1				
50	Bubble sort algorithms	CO1				
51	Bubble sort algorithms	CO1				
52	Insertion sort algorithms	CO1				
53	Selection sort algorithms	CO1				

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54	Quick sort algorithms	CO1				
55	Selection by sorting	CO1				
56	Randomized selection- Quick Select,	CO1				
57	Deterministic selection-Pivot selection	CO3				
58	Median of medians Partitioning step	CO3				
59	The brute-force algorithm	CO3				
60	The Rabin-Karp algorithm	CO3				

Note :- Extra Lectures will be conducted as per the requirement of the students

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STUDY PLAN & IT'S EXECUTION

Class /Div.: **SY.Data Science**	Semester: III	Medium: **ENGLISH**
Department: Data Science	Title of the Paper: Linear Algebra & Discrete Mathematics	Code N0: USDS305
Name of the Lecturer:Vivekanand Upadhyay	Academic Year: **2023-24**	Total No. of Students: 15

Module I- Matrices and Gaussian Elimination and Vector Spaces

CO 1: Learner is able to perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition.
CO 2: Learner is able to describe how the vector space are solved with matrix , linear independence and linear transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
1	**Background and Introduction:** Differential Equations, Matrix Analysis,	CO1				
2	Matrix Analysis,	CO1				
3	,Matrix Eigenvalue Problem	CO1				
4	Errors and Approximation	CO1				
5	IterativeMethods	CO1				
6	Special Matrices and Applications	CO1				
7	Numerical Solution of Equations	CO2				

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8	Bisection Method,	CO2					
9	RegulaFalsi Method	CO2					
10	Fixed- Point Method	CO2					
11	Newton's Method, Secant Method	CO2					
12	Equations with SeveralRoots	CO2					

Module II- Orthogonality and Determinants

CO:

CO1 – Learner is able to solve the problem on orthogonal vectors, Subspace, orthogonal Bases , Gram-Schmidt

CO2 – Learner is able to understand the concept of Fast Fourier Transform

CO3 – Learner is able to solve the problems on determinants and application of determinant

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
13	**Numerical Solution of Systems of Equations:** Linear Systems of Equation	CO1				
14	**Numerical Solution of Systems of Equations:** Linear Systems of Equations,	CO1				
15	Numerical Solution of Linear Systems,	CO1				
16	, Gauss EliminationMethod,	CO1				
17	Gauss EliminationMethod,	CO1				
18	, LU Factorization Methods	CO2				

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19	, LU Factorization Methods	CO2				
20	, Iterative Solution of Linear Systems,	CO3				
21	, Iterative Solution of Linear Systems	CO3				
22	Ill-Conditioning and Error Analysis, Systems of Nonlinear Equations	CO3				
23	Ill-Conditioning and Error Analysis,	CO3				
24	Systems of Nonlinear Equations	CO3				

Module III- Eigenvalues and Eigenvectors

CO:

CO1 – Learner is able to understand the concept Eigenvalues and Eigenvectors

CO2 – Learner is able to understand the the concept of Diagonalization of matrix

CO3 – Learner is able to make the solution of difference equation and powers Ak, eAt complex matrices and similarity transformation

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting	CIE planned with mode & Date	Execution of CIE date	Remark
25	Introduction of Eigenvalues and Eigenvectors	CO1				
26	Diagonalization of a Matrix	CO2				

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27	Diagonalization of a Matrix	CO2				
28	Difference Equations and Powers *Ak*	CO3				
29	Difference Equations and Powers *Ak*	CO3				
30	Difference Equations and Powers *Ak*	CO3				
31	Differential Equations and *eAt,*	CO3				
32	Differential Equations and *eAt,*	CO3				
33	Complex Matrices	CO3				
34	Complex Matrices,	CO3				
35	Similarity Transformations	CO3				
36	Similarity Transformations	CO3				

Module IV: Positive Definite Matrices and Computations with Matrices

CO:

CO1 – Learner is able to understand the concept of maxima and minima, saddle point

CO2– Learner is able to understand the concept tests for Positive Definiteness, Singular Value Decomposition, Minimum Principal, Finite Element Method

CO3– Learner is able to understand the concept of matrix , matrix norms, computation of Eigenvalues and solution of Ax=b by Iterative Methods

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Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
36	Minima	CO1				
37	Maxima	CO1				
38	Saddle Points	CO1				
39	Tests for Positive Definiteness	CO2				
40	Singular Value Decomposition	CO2				
41	MinimumPrinciples	CO2				
42	The Finite Element Method	CO2				
43	Computations with Matrices: Introduction	CO3				
44	Matrix Norm and ConditionNumber	CO3				
45	Matrix Norm and ConditionNumber	CO3				
46	Computation of Eigenvalues	CO3				
47	Computation of Eigenvalues	CO3				
48	Iterative Methods for $Ax = b$	CO3				

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Module V: Linear Programming and Game Theory

CO1 – Learner is able to understand the concept of linear Inequalities and simplex method to solve linear Inequalities, dual problems on linear inequalities

CO 2: Learner expresses clear understanding of the concept of network models and game theory

Lecture No.	Topics to cover	CO	Date/Day/Time Of conducting			
49	**Numerical Solution of Boundary-Value Problems:** Second-Order BVP	CO1				
50	, Boundary Conditions Shifted Inverse Power Method: Estimation of theEigenvalue Nearest a Specified Value,	CO1				
51	Higher-Order BVP, Shooting Method, Finite-Difference Method	CO1				
52	**Matrix Eigenvalue Problem:**Matrix Eigenvalue Problem,)	CO1				
53	Power Method: Estimation of the Dominant Eigenvalue, , Shifted Power Method, Deflation Methods	CO1				
54	, Inverse Power Method:Estimation of the Smallest Eigenvalue,)	CO1				
55	Shifted Inverse Power Method: Estimation of theEigenvalue Nearest a Specified Value,	CO1				
56	Shifted Power Method, Transformation to Hessenberg Form (Nonsymmetric Matrices)Eigenvalue,	CO1				
57	Deflation Methods, A Note on the Terminating Condition Used in HouseholderQR	CO3				

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58	Householder Tridiagonalization and QR Factorization Methods	CO3				
59	Transformation to Hessenberg Form (Nonsymmetric Matrices)Condition Used in HouseholderQR,	CO3				
60	A Note on the Terminating Condition Used in HouseholderQR, Transformation to Hessenberg Form (Nonsymmetric Matrices)	CO3				

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