DATA STORY TELLING AND VISUALIZATION   **Course Code : 313004**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Data Sciences**
Programme Code	**: AI/ AN/ DS**
Semester	**: Third**
Course Title	**: DATA STORY TELLING AND VISUALIZATION**
Course Code	**: 313004**

I. RATIONALE

Effective data storytelling and Visualization can have a positive impact on people and organization. This course enables students to construct data stories, extract meaningful data and represent data for effective visualization so that the audience will be engaged with the content and make critical decisions quicker and more confidently. Data StoryTelling and Visualization builds Business Analysis skills in diploma students to fill the gap between sophisticated data analyses and decision-makers who might not have the skills to interpret the data.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Extract valuable insights from complex data set to engage stakeholders, enhance decision-making and achieve business outcomes.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify the characters in data storytelling.
- CO2 - Eliminate clutter to grab audience attention.
- CO3 - Construct Storytelling for the given incident.
- CO4 - Transform Data to Visuals.
- CO5 - Create data visualization using many distributions.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL			
															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA			
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min		
313004	DATA STORY TELLING AND VISUALIZATION	DST	DSC	2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

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V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 State the importance of context. TLO 1.2 Differentiate between exploratory and explanatory analysis. TLO 1.3 Identify the audience. TLO 1.4 Compose a 3 minute story. TLO 1.5 Choose an effective visual effect of data storytelling.	**Unit - I Introduction to Data StoryTelling** 1.1 Concept / Importance of Context 1.2 Exploratory vs. explanatory analysis 1.3 Who - Your audience, You, What – Action, Mechanism, Tone, How, Example 1.4 What is Data Story, make a figure for the generals 1.5 The 3-minute story, Big Idea, Storyboarding. 1.6 Visual effects of Data Story Telling -Choosing an effective visual - Simple text, Tables, Graphs, Points, Bars - Vertical bar chart, Horizontal bar chart	Presentations Lecture Using Chalk-Board Case Study Video Demonstrations
2	TLO 2.1 Interpret clutter and cognitive load. TLO 2.2 Use Gestalt principles of visual perception. TLO 2.3 Implement Decluttering steps. TLO 2.4 Represent Pre-attentive attributes in text, graphs, page.	**Unit - II Cluttering and Decluttering** 2.1 Clutter is our enemy - Cognitive load, Clutter 2.2 Introduction to Gestalt principles of visual perception 2.3 Decluttering: step-by-step 2.4 Focus audience's Attention – Pre-attentive attributes signal where to look 2.5 Pre-attentive attributes in text and graphs : Size, Color, Position on page	Presentations Demonstration Case Study
3	TLO 3.1 Interpret Affordances, Accessibility, Aesthetics and Acceptance. TLO 3.2 Illustrate dissecting model visuals. TLO 3.3 Compile data to construct data storytelling.	**Unit - III The process of Storytelling** 3.1 Think like a designer-Affordances, Accessibility, Aesthetics, Acceptance 3.2 Dissecting model visuals - line graph, 100% stacked bars 3.3 Lessons in storytelling - The magic of story, Constructing the story, The narrative structure, The power of repetition, Tactics to help ensure that your story is clear 3.4 Pulling it all together for data storytelling 3.5 Final Thoughts - Where to go from here, Building storytelling with data competency in your team or organization	Demonstration Presentations Case Study Flipped Classroom
4	TLO 4.1 Interpret Ugly, Bad, and Wrong Figures. TLO 4.2 Map data onto aesthetics. TLO 4.3 Visualize data using Coordinate Systems and Axes. TLO 4.4 Represent data set using Bar Plots. TLO 4.5 Visualize amounts using various plots.	**Unit - IV Data Visualization** 4.1 Introduction: Ugly, Bad, and Wrong Figures 4.2 Visualizing Data: Mapping Data onto Aesthetics 4.3 Coordinate Systems and Axes 4.4 Directory of Visualizations 4.5 Visualizing Amounts - Bar Plots 4.6 Visualizing Distributions - Histograms and Density Plots. Empirical Cumulative Distribution Functions and Q-Q Plots	Hands-on Demonstration Case Study Cooperative Learning

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Visualize many distributions along the axes. TLO 5.2 Represent Proportions with the help of case studies. TLO 5.3 Describe Titles, Captions, and Tables. TLO 5.4 Select appropriate Visualization Software and Image file formats. TLO 5.5 Explore freely available Data Visualization Tools.	**Unit - V Visualizing Distributions and Proportions** 5.1 Visualizing Many Distributions at Once 5.2 Visualizing Distributions Along the Vertical Axis and Horizontal Axis 5.3 Visualizing Proportions: A Case for Pie Charts and Side-by-Side Bars 5.4 Titles, Captions, and Tables 5.5 Choosing the Right Visualization Software and Image file formats 5.6 Exploring free Data Visualization Tools for e.g. Tableau, Microsoft Power BI, Google Data Studio and Openheatmap	Demonstration Presentations Case Study Chalk-Board Flipped Classroom

VI.   LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify the audience. LLO 1.2 Interpret the need of the Audience.	1	Identify a project you are working on where you need to communicate in a data-driven way. Reflect upon and write the answers to the following questions. i) Who is your Audience? ii) What does your audience care about? iii) What action does your audience need to take?	2	CO1
LLO 2.1 Identify the Stake. LLO 2.2 Design the big idea.	2	*Identify a project you are working on where you need to communicate in a data-driven way. Reflect upon and write the answers of following questions. a) What is a Stake? i) What are the benefits if your audience acts in the way that you want them to? ii) What are the risks if they do not? b) Form a Big Idea i) Articulate your point of view. ii) Convey what's at stake. iii) Be a complete (and single) sentence.	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs

LLO 3.1 Construct a data story on given incident. LLO 3.2 Determine the audience, communication mechanism, and desired tone. LLO 3.3 Decide effective Visuals.	3	*Determine audience, communication mechanism,desired tone and Select effective Visuals for any incident
		
		(Below is an example for reference only).Teacher shall allocate similar assignments.
		
		  i) Who is your Audience?
		
		  ii) List the primary groups or individuals to whom you'll be communicating.
		
		  iii) If you had to narrow that to a single person, who would that be?
		
		  iv) What does your audience care about?
		
		  v) What action does your audience need to take?
		
		Example: Buses Bunching - Make a data story on bus bunching, (Bus Bunching means when a bus gets delayed and later causes multiple buses to arrive at a single stop at the same time.
			2	CO1

LLO 4.1 Construct a data story on given incident. LLO 4.2 Perform decluttering. LLO 4.3 Choose suitable pre attentive attributes. LLO 4.4 Determine feasibility as per designer's view.	4	*Make a clutter free Data Story on any incident. i) Identify and eliminate clutter. ii)Select suitable pre-attentive attributes. iii)Explore affordances, accessibility, and aesthetics as per designers view.	2	CO2 CO3
LLO 5.1 Compose a Video for Data Storytelling.	5	Create a simple video (up to 3 minutes) telling a story on incidence given in Practical no.3.	2	CO1 CO2 CO3

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Construct a data story on given incident. LLO 6.2 Record the Observations of the given data story.	6	*Create a data story for Vehicle(Bicycle/Bike/Car/Bus etc.) Rental System. *(Below is an example for reference only).Teacher shall allocate similar assignments.* *Example: Create a data story with respect to the following observations:* *i)What are the most popular pick-up locations across the city for Citi Bike rental?* *ii)How does the average trip duration vary across different age groups, and over time?* *iii)Which age group rents the most bikes?* *iv)How does bike rental vary across the two user groups (one-time users vs. long-term subscribers) on different days of the week?* *v)Do factors like weather and user age impact the average bike trip duration?*	2	CO1 CO2 CO3
LLO 7.1 Narrate the Data story by composing a video consisting of various visual props.	7	*Create a video (up to 5 minutes) telling a story on given Incidence. Record a video of yourself speaking, or narrate while showing visual props or sketches, or screencast a PowerPoint presentation, etc. Choose how you present the story. Produce a single video file (formatted as a .mov file) *Teacher shall suggest various incidents to the students.*	2	CO1 CO2 CO3
LLO 8.1 Create a bar chart from the recorded data.	8	Create a bar chart for data visualizations on Practical No. 6.	2	CO1 CO2 CO3
LLO 9.1 Explore Real life example of storytelling of any Musical/Social App.	9	*Construct a Case study on data storytelling for any Musical/Social App. *Example: Spotify takes the data from our listening habits and spins it into an exciting audio and visual experience.Teacher shall allocate similar case study.*	2	CO2 CO3 CO4
LLO 10.1 Write a python program for data cleaning.	10	*Implementation of a python program that performs data cleaning on any dataset.	2	CO2 CO3 CO4
LLO 11.1 Plot a Histogram using Single Distribution.	11	Create Bar chart for data visualization using Single distribution. *Example: Histogram of the ages of the train/flight passengers.Teacher shall allocate similar assignments.*	2	CO4 CO5
LLO 12.1 Create worksheet using Visualization tool.	12	Develop a worksheet, add filters and create chart using dataset by using any Visualization tool.	2	CO4 CO5
LLO 13.1 Create Histogram using Many Distribution.	13	* Create Bar chart for data visualization using Many distribution. *Example: Histogram of the gender and ages of the train/flight passengers.Teacher shall allocate similar assignments.*	2	CO4 CO5

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 14.1 Perform dataset loading to plot grouped bars. LLO 14.2 Write a python program to create grouped bars from the loaded data.	14	Implementation of a python program that loads a dataset and plot grouped bars.	2	CO3 CO4 CO5
LLO 15.1 Perform dataset loading to plot a pie chart. LLO 15.2 Write a python program to create pie chart from the loaded data.	15	Implementation of a python program that loads any dataset and plot a pie chart.	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) : NOT APPLICABLE

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hardware: Personal computer, (i3-i5 preferable), RAM minimum 4 GB onwards	All
2	Operating system: Windows 7 onwards	All
3	Software: Python IDE, Video Makers/Editors, Visualization tools	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Data StoryTelling	CO1	4	0	0	0	0
2	II	Cluttering and Decluttering	CO2	6	0	0	0	0
3	III	The process of Storytelling	CO3	6	0	0	0	0
4	IV	Data Visualization	CO4	7	0	0	0	0
5	V	Visualizing Distributions and Proportions	CO5	7	0	0	0	0
		Grand Total		**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Each Practical will be assessed considering 60% weightage to the process, 40% weightage to the product.

Summative Assessment (Assessment of Learning)

- End Semester Exam based on Practical performance and Viva-voce.

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XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	2	-	-	-	-	-			
CO2	1	2	1	1	-	-	-			
CO3	1	2	1	2	1	1	1			
CO4	1	3	2	2	1	1	1			
CO5	1	3	2	2	1	1	1			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Cole Nussbaumer Knaflic	Storytelling with data – a data visualization guide for business professionals	Cole Nussbaumer Knaflic Wiley ISBN: 978-1-119-00225-3
2	Claus O. Wilke	Fundamentals of Data Visualization	O'Reilly ISBN:978-1-492-03108-6.
3	Kenneth A Lambert, B.L. Juneja	Fundamentals of PYTHON	CENGAGE Learning, ISBN:978-81-315- 2903-4

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/106106182	30 hours course for Python which teaches how to practice and culture the art of programming with Python as a language.
2	https://careerfoundry.com/en/tutorials/data-analytics-for-be ginners/storytelling-with-data/	A step-by-step tutorial for data storytelling.
3	https://blog.hubspot.com/marketing/great-data-visualization-examples	A guide that offers applicable ways to ensure your data visualization is effective, and provide examples for inspiration along the way.
4	https://www.udemy.com/course/mastering-the-art-of-data-visua lization-2020/	Online course with certification that Unlock the Power of Data Visualization and Analytics to Drive Data-Driven Insights.
5	https://online.hbs.edu/blog/post/data-visualization-tools	Top data visualization tools with navigation links for business professionals by Harvard Business School.

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

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