ACADEMIC CURRICULAM

UNDERGRADUATE DEGREE PROGRAMME

Bachelor of Computer Applications-

Data Science

(B.C.A DS)

Three Years

Learning Outcome Based Curriculum Framework (LOCF)

Choice Based Flexible Credit System

Academic Year

2021 - 2022

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act, 1956)

Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

Department of Computer Applications

1. Department Vision Statement

Stmt - 1	*Creating the most conducive environment for imparting quality education in Computer Applications*
Stmt - 2	*Contributing effectively to produce globally competent quality professionals in the field of IT and Data Science*
Stmt - 3	*Contributing towards preparing young minds to serve community*

2. Department Mission Statement

Stmt - 1	*Impart student's essential knowledge and skills required for a successful career in Information Technology*
Stmt - 2	*Instill confidence in the students to take up new challenges by grooming them appropriately*
Stmt - 3	*Inculcate in the students a sense of commitment to professional ethics, moral values with emphasis on team work and leadership qualities*
Stmt - 4	*Instill the students with a clear awareness of environmental issues and their relevance to their profession*
Stmt - 5	*Impress upon the students the impact of their work on the nation's economic and social progress*

3. Program Education Objectives (PEO)

PEO - 1	*Offer the students those skill sets and domain knowledge based on needs of IT and dynamic business environment*
PEO - 2	*Provide the students with the capabilities in the areas of analysis, design, development and testing*
PEO - 3	*Kindle the minds of students to take up research and development in Computer Applications with missionary zeal*
PEO - 4	*Train the students to become effective communicators in professional as well as general aspects of life*
PEO - 5	*Prepare the students into balanced individuals who are keen to leave a mark by excelling in their profession*

4. Program Specific Outcomes (PSO)

PSO - 1	*Graduates will acquire a comprehensive knowledge and sound understanding of fundamentals of Data Science.*
PSO - 2	*Graduates will develop practical, analytical and programming skills related to Data Science and Cloud*
PSO - 3	*Graduates will be prepared to acquire a range of general skills, to solve problems, to evaluate information, to develop software tools, to communicate with society effectively and learn independently.*

5. Consistency of PEO's with Mission of the Department

	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	H	H	M	H	M
PEO - 2	H	M	H	H	H
PEO - 3	M	H	M	H	H
PEO - 4	H	H	H	L	M
PEO - 5	L	H	M	H	H

H – High Correlation, M – Medium Correlation, L – Low Correlation

6. Consistency of PEO's with Program Learning Outcomes (PLO)

	Program Learning Outcomes (PLO)														
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
PEO - 1	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PEO - 2	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PEO - 3	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PEO - 4	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PEO - 5	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M

H – High Correlation, M – Medium Correlation, L – Low Correlation

7. Programme Structure- B.C.A. - Data Science
(Bachelor of Computer Applications – Data Science) - Regulation 2020

1. Professional Core Courses (C)
(14 Courses)

Course Code	Course Title	L	T	P	C
UDS21101T	Introduction to Artificial Intelligence	4	0	0	4
UDS21102J	Introduction to Advanced Computing	4	0	4	6
UDS21201J	Introduction to Data Science	4	0	2	5
UDS21202J	Advanced Computing With Distributed Data Processing	4	0	2	5
UDS21301J	Introduction to Deep Learning	4	0	2	5
UDS21302J	Advanced Computing With Python and GCP	4	0	2	5
UDS21303J	Introduction to Natural Language Processing	4	0	2	5
UDS21401J	Deep Learning for Enterprise	4	0	2	5
UDS21402J	Introduction to Computer Vision	4	0	2	5
UDS21403J	Working with Big Data	4	0	2	5
UDS21404J	Data Science for Enterprise	4	0	2	5
UDS21501J	Intelligent Automation	4	0	4	6
UDS21502J	Real-World Computer Vision Applications	4	0	2	5
UDS21601J	Intelligent Automation for Enterprise	4	0	4	6
Total Learning Credits					**72**

2. Discipline Specific Elective Courses (D)
(6 Courses)

Course Code	Course Title	L	T	P	C
UDS21D01J	Advanced Analytics and Data Visualization for Enterprise	4	0	2	5
UDS21D02J	Machine Learning for Enterprise				
UDS21D03T	Digital Transformation	4	0	0	4
UDS21D04T	Working with IIoT Data				
UDS21D05T	Technology Leadership and Innovation Management	4	0	0	4
UDS21D06T	Social Media and Text Analytics				
UDS21D07J	Internship - I	0	0	0	1
UDS21D08J	Internship - II	0	0	0	1
UDS21D09J	Project Work	0	0	12	6
Total Learning Credits					**21**

3. Generic Elective Courses (G)
(4 Courses)

Course Code	Course Title	L	T	P	C
ULT20G01J	Tamil-I				
ULH20G01J	Hindi-I	2	0	2	3
ULF20G01J	French-I				
ULT20G02J	Tamil-II				
ULH20G02J	Hindi-II	2	0	2	3
ULF20G02J	French –II				
UDS21G01T	Role of Mathematics in AI	4	0	0	4
UDS21G02T	Role of Statistics in AI	4	0	0	4
Total Learning Credits					**14**

4. Ability Enhancement Courses (AE)
(2 Courses)

Course Code	Course Title	L	T	P	C
ULE21AE1T	Business English	4	0	0	4
UES20AE1T	Environmental Studies	3	0	0	3
Total Learning Credits					**7**

6. Extension Activity (EA)
(Any 1 Course - Mandatory)

Course Code	Course Title	L	T	P	C
UNS20201L	NSS				
UNC20201L	NCC	0	0	0	0
UNO20201L	NSO				
UYG20201L	YOGA				
Total Learning Credits					**0**

5. Skill Enhancement Courses (S)
(5 Courses+ My India Project)

Course Code	Course Title	L	T	P	C
UDS21S01T	Introduction to Data Engineering	4	0	0	4
UDS21S02T	Introduction to Machine Learning	4	0	0	4
UDS21S03J	Data Engineering for Enterprise	4	0	2	5
UMI20S01L	My India Project	0	0	0	1
UCD20S01L	Soft Skills	0	0	2	1
UCD20S02L	Quantitative Aptitude and Reasoning	0	0	2	1
Total Learning Credits					**16**

7. Life Skill Courses (JK)
(4 Courses)

Course Code	Course Title	L	T	P	C
UJK20201L	Communication Skills	0	0	4	2
UJK20301T	Universal Human Values	2	0	0	2
UJK20401T	Professional Skills	2	0	0	2
UJK20501T	Leadership and Management Skills	2	0	0	2
Total Learning Credits					**8**

Total Learning Credits : 138

As SRMIST strongly encourages the use of SWAYAM (Study Web of Active Learning by Learning by Young and Aspiring Minds) platform, the students are encouraged to choose at least one core/ elective course from SWAYAM on the recommendation of the faculty advisor and the credits will be transferred

8. Implementation Plan

Semester – I

Course Code	Course Title	L	T	P	C
ULT20G01J	Tamil-I				
ULH20G01J	Hindi-I	2	0	2	3
ULF20G01J	French-I				
ULE21AE1T	Business English	4	0	0	4
UDS21101T	Introduction to Artificial Intelligence	4	0	0	4
UDS21102J	Introduction to Advanced Computing	4	0	4	6
UDS21G01T	Role of Mathematics in AI	4	0	0	4
UDS21S01T	Introduction to Data Engineering	4	0	0	4
UCD20S01L	Soft Skills	0	0	2	1
	Total Learning Credits	22	0	8	26
	Total number of hours /week				30

Semester – II

Course Code	Course Title	L	T	P	C
ULT20G02J	Tamil-II				
ULH20G02J	Hindi-II	2	0	2	3
ULF20G02J	French-II				
UDS21201J	Introduction to Data Science	4	0	2	5
UDS21202J	Advanced Computing With Distributed Data Processing	4	0	2	5
UDS21G02T	Role of Statistics in AI	4	0	0	4
UDS21S02T	Introduction to Machine Learning	4	0	0	4
UCD20S02L	Quantitative Aptitude and Reasoning	0	0	2	1
UJK20201L	Communication Skills	0	0	4	2
UNS20201L	NSS				
UNC20201L	NCC	0	0	0	0
UNO20201L	NSO				
UYG20201L	YOGA				
	Total Learning Credits	18	0	12	24
	Total number of hours /week				30

Semester – III

Course Code	Course Title	L	T	P	C
UDS21301J	Introduction to Deep Learning	4	0	2	5
UDS21302J	Advanced Computing With Python and GCP	4	0	2	5
UDS21303J	Introduction to Natural Language Processing	4	0	2	5
UDS21S03J	Data Engineering for Enterprise	4	0	2	5
UMI20S01L	My India Project	0	0	0	1
UDS21D07J	Internship – I	0	0	0	1
UJK20301T	Universal Human Values	2	0	0	2
	Total Learning Credits	18	0	8	24
	Total number of hours /week				31

Semester - IV

Course Code	Course Title	L	T	P	C
UDS21401J	Deep Learning for Enterprise	4	0	2	5
UDS21402J	Introduction to Computer Vision	4	0	2	5
UDS21403J	Working with Big Data	4	0	2	5
UDS21404J	Data Science for Enterprise	4	0	2	5
UJK20401T	Professional Skills	2	0	0	2
	Total Learning Credits	18	0	8	22
	Total number of hours /week				30

Semester –V

Course Code	Course Title	L	T	P	C
UDS21501J	Intelligent Automation	4	0	4	6
UDS21502J	Real-World Computer Vision Applications	4	0	2	5
UDS21D01J	Advanced Analytics and Data Visualization for Enterprise	4	0	2	5
UDS21D02J	Machine Learning for Enterprise				
UES20AE1T	Environmental Studies	3	0	0	3
UDS21D08J	Internship – II	0	0	0	1
UJK20501T	Leadership and Management Skills	2	0	0	2
	Total Learning Credits	17	0	8	22
	Total number of hours /week				27

Semester - VI

Course Code	Course Title	L	T	P	C
UDS21601J	Intelligent Automation for Enterprise	4	0	4	6
UDS21D03T	Digital Transformation				
UDS21D04T	Working with IIoT Data	4	0	0	4
UDS21D05T	Technology Leadership and Innovation Management				
UDS21D06T	Social Media and Text Analytics	4	0	0	4
UDS21D09J	Project Work	0	0	12	6
	Total Learning Credits	12	0	16	20
	Total number of hours /week				28

Total Learning Credits: 138

9. Program Articulation Matrix

Course Code	Course Name	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
UDS21101T	Introduction to Artificial Intelligence	H	H	H	H	H	H	M	M	H	H	M	M	H	H	H
UDS21102J	Introduction to Advanced Computing	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21201J	Introduction to Data Science	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
UDS21202J	Advanced Computing With Distributed Data Processing	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21301J	Introduction to Deep Learning	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
UDS21302J	Advanced Computing With Python and GCP	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21303J	Introduction to Natural Language Processing	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
UDS21401J	Deep Learning for Enterprise	H	H	H	H	H	H	H	H	H	M	H	H	H	H	H
UDS21402J	Introduction to Computer Vision	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21403J	Working with Big Data	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21404J	Data Science for Enterprise	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
UDS21501J	Intelligent Automation	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
UDS21502J	Real-World Computer Vision Applications	H	H	H	H	H	H	H	H	H	H	M	M	H	H	H
UDS21601J	Intelligent Automation for Enterprise	H	H	H	H	H	H	H	H	H	H	M	M	H	H	H
UDS21D01J	Advanced Analytics and Data Visualization for Enterprise	H	H	H	H	H	H	H	H	H	H	M	M	H	H	H
UDS21D02J	Machine Learning for Enterprise	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21D03T	Digital Transformation	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
UDS21D04T	Working with IIoT Data	H	M	H	L	H	H	H	H	H	H	M	H	H	H	H
UDS21D05T	Technology Leadership and Innovation Management	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
UDS21D06T	Social Media and Text Analytics	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
UDS21D07J	Internship - I	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21D08J	Internship - II	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
UDS21D09J	Project Work	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
ULT20G01J	Tamil-I	H	M	H	H	H	H	H	H	H	H	M	H	L	H	H
ULH20G01J	Hindi-I	H	M	H	H	H	H	H	H	H	H	M	H	L	H	H
ULF20G01J	French-I	H	M	H	H	H	H	H	H	H	H	M	H	L	H	H
ULT20G02J	Tamil-II	H	M	H	H	H	H	H	H	H	H	M	H	L	H	H
ULH20G02J	Hindi-II	H	M	H	H	H	H	H	H	H	H	M	H	L	H	H
ULF20G02J	French –II	H	M	H	H	H	H	H	H	H	H	M	H	L	H	H
UDS21G01T	Role of Mathematics in AI	H	H	H	H	H	H	H	H	H	H	L	H	M	M	H
UDS21G02T	Role of Statistics in AI	H	H	H	H	H	H	H	H	H	H	L	H	M	H	H
ULE21AE1T	Business English	M	H	H	H	H	H	H	H	H	H	M	H	L	H	H
UES20AE1T	Environmental Studies	H	H	M	M	M	H	H	M	H	H	H	M	H	H	H
UDS21S01T	Introduction to Data Engineering	H	H	H	H	H	H	M	H	H	M	L	H	M	M	H
UDS21S02T	Introduction to Machine Learning	H	H	H	H	H	H	M	H	H	H	L	H	M	M	H
UDS21S03J	Data Engineering for Enterprise	H	H	H	H	H	H	H	H	M	H	L	M	M	M	H
UMI20S01L	My India Project	M	H	M	M	M	H	H	M	H	H	H	M	L	H	H
UCD20S01L	Soft Skills	M	H	H	H	H	H	H	H	H	H	L	H	L	M	H
UCD20S02L	Quantitative Aptitude and Reasoning	M	H	H	H	H	H	H	H	H	H	M	H	L	H	H
UNS20201L	NSS	M	H	M	M	M	H	H	M	H	H	H	M	L	H	H
UNC20201L	NCC	M	H	M	M	M	H	H	M	H	H	H	M	L	H	H
UNO20201L	NSO	M	H	M	M	M	H	H	M	H	H	H	M	L	H	H
UYG20201L	YOGA	M	H	M	M	M	H	H	M	H	H	H	M	L	H	H
UJK20201L	Communication Skills	M	H	H	H	H	H	H	H	H	H	L	H	L	M	H
UJK20301T	Universal Human Values	M	H	H	H	H	H	H	H	H	H	L	H	L	M	H
UJK20401T	Professional Skills	M	H	H	H	H	H	H	H	H	H	L	H	L	M	H
UJK20501T	Leadership and Management Skills	M	H	H	H	H	H	H	H	H	H	L	H	L	M	H
	Program Average	H	H	H	H	H	H	M	M	H	H	M	H	M	H	H

H – High Correlation, M – Medium Correlation, L – Low Correlation

Course Code	ULT20G01J	Course Name		*Tamil-I*		Course Category	G	Generic Elective Course	L	T	P	C
									2	0	2	3

Pre-requisite Courses	*Nil*		Co-requisite Courses	*Nil*		Progressive Courses	*Nil*			
Course Offering Department	*Tamil*			Data Book / Codes/Standards			*Nil*			

Course Learning Rationale (CLR):	The purpose of learning this course is to:		Learning			Program Learning Outcomes (PLO)																		

		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To enable them to learn the nuances of modern poetry in Tamil	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-2 :	To explore New historicism through the works of art written in Tamil to enlighten the students to understand the changes in the modern society																			
CLR-3 :	Inculcate Ways of life, moralities and ethical factors as an essential part of learning Tamil literature																			
CLR-4 :	Develop strategies of comprehension of texts of different origin																			
CLR-5 :	Strengthen the language of the students both in oral and written																			
CLR-6 :	Express their sentiments, emotions and opinions, reacting to information, situations																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1 :	Extend and expand their savoir-faire through the acquisition of skills to cater the needs of the modern era.	2	75	60		H	H	H	-	H	H	M	H	H	-	H	H	H	H	H
CLO-2 :	Enable the students to appreciate their mother tongue and to Enhance their thinking capacity	2	80	70		H	H	-	H	-	-	H	-	-	H	H	-	H	H	H
CLO-3 :	Make them learn the basic rules of Language and make them communicate better	2	70	65		H	H	H	M	-	-	H	-	-	H	H	-	H	H	H
CLO-4 :	Develop strategies of comprehension of texts based on different culture and life styles	2	70	70		H	-	H	H	H	-	M	-	-	H	H	-	H	H	H
CLO-5 :	Strengthen spoken and written skills of the student	2	80	70		-	H	-	M	-	H	H	-	-	H	H	-	H	H	H
CLO-6 :	Will be able to clear government examinations	2	75	70		H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Duration (hour)		12	12	12	12	12
S-1	SLO-1	தமிழ் இலக்கியப் போக்குகள்	நவீன கவிதை தோற்றம்	தமிழரின் வீரமரபு	சிற்றிலக்கியத் தோற்றம்	மொழி வரலாறு
	SLO-2	இலக்கிய நுட்பங்கள்	நவீன கவிதை வரலாறு	போர் விழுமியங்கள்	சிற்றிலக்கிய வகைமை	மொழிப் பயிற்சி
S-2	SLO-1	தமிழ்க் கவிதை மரபு	நவீன கவிதை செல்நெறிகள்	பரணி அறிமுகம்	சிற்றிலக்கியங்கள்	தமிழும் அகராதியியலும்
	SLO-2	காலந்தோறும் கவிதை உள்ளடக்கம்	செல்நெறிகளில் கோட்பாடுகள்	பரணி இலக்கியங்கள்	முதன்மைச் சிற்றிலக்கியங்கள்	அகரவரிசைப்படுத்தல்

S-3	SLO-1	காலந்தோறும் கவிதை வடிவம் –	கவிதை மொழி	கலிங்கத்துப்பரணி (484)	புதுக்கவிதையும் இதழ்களும்	கலைச்சொல் அறிமுகம்
	SLO-2	தற்கால இலக்கியம்	நவீன கவி மொழியின் நுட்பங்கள்	தலைவனின் வீரம்	மணிக்கொடி இதழ்	கலைச்சொல் உருவாக்க நுட்பங்கள்
S-4	SLO-1	புதுக்கவிதை உருவாக்கம்	நவீன கவி ஆளுமைகள்	தமிழ் இலக்கிய மரபில் தூது	எழுத்து இதழ்	தமிழில் கலைச்சொற்கள்
	SLO-2	புதுக்கவிதை செல்நெறிகள்	நவீன கவி ஆளுமைகளின் கவித்துவம்	தூது இலக்கியங்கள்	வானம்பாடி இதழ்	நிலைபெற்ற கலைச்சொற்கள்
S-5	SLO-1	பாரதியார் – காலத்தின் அடையாளம்	விளிம்புநிலை மனிதர்கள்	அழகர் கிள்ளைவிடு தூது (கண்ணிகள்)	சிறுகதை தோற்றம்	மரபுத்தொடர்
	SLO-2	பாரதியார் -பன்முக ஆளுமை	விளிம்புநிலை இலக்கியம்	தூது மரபில் கிளியும் பாராட்டும்	சிறுகதை வளர்ச்சி	தமிழில் மரபுத்தொடர்கள்
S-6	SLO-1	பாரதியார் - கண்ணன் என் சேவகன்	ராஜா சந்திரசேகரரின் கைவிடப்பட்ட குழந்தை	செய்யுள் மரபில் கலம்பகம்	சிறுகதை – வரலாறு	நாட்டார் வழக்காறுகள்
	SLO-2	கண்ணன் என் சேவகன் கவிதை சொல்லும் வாழ்வியல்	புறக்கணிப்பும் வாழ்வியலும்	கலம்பக இலக்கியங்கள்	சிறுகதை ஆசிரியர்கள்	பழமொழி அறிமுகம்
S-7	SLO-1	20 ஆம் நூற்றாண்டுக் கவிதை மரபில் பாரதிதாசன்	புலம்பெயர்தல்	நந்திக் கலம்பகம் (77)	புதினம் தோற்றம்	தமிழில் பழமொழிகள்
	SLO-2	பாரதிதாசனும் தமிழும்	புலம்பெயர் வாழ்வியல்	மகள் மறுத்தலில் வீரம்	புதினம் வளர்ச்சி	பழமொழியும் பயன்பாடும்
S-8	SLO-1	பாரதிதாசன் – தமிழினி இனிமை,	அனார் - மேலும் சில இரத்தக் குறிப்புகள்	குறவஞ்சி அறிமுகம்	புதினத்தின் வகைமை	தமிழ் இலக்கண நுட்பங்கள்
	SLO-2	தமிழின் பெருமையும் வளமையும்	உள்நாட்டுப் போர்ச்சூழலும் பெண் உளவியலும்	குறவஞ்சி இலக்கியங்கள்	புதின ஆசிரியர்கள்	இலக்கணமும் பயன்பாடும்
S-9	SLO-1	வானம்பாடியில் அப்துல்ரகுமான்	காலந்தோறும் பெண்	குற்றாலக் குறவஞ்சி (9)	அச்சு ஊடக வரலாறு	தமிழில் சொல் வகைகள்
	SLO-2	அப்துல்ரகுமான் கவிதையின் தனித்தன்மைகள்	பெண் இலக்கியம்	மலையும் வாழ்வும்	அச்சு ஊடகமும் தமிழும்	சொல்லும் பயன்பாடும்
S-10	SLO-1	அப்துல்ரகுமான் - அவதாரம்	சுகிர்தராணியின் அம்மா	காப்பிய இலக்கணம்	அச்சு ஊடகமும் உரைநடை வளர்ச்சியும்	பெயர்ச்சொற்கள்
	SLO-2	அவதாரம் - நம்பிக்கையும் வெற்றியின் பாதைகளும்	பெண்மையும் தாய்மையும்	காப்பிய வகைமைகள்	தமிழில் உரைநடை	பெயர்ச்சொற்கள் அறிதல்
S-11	SLO-1	சுற்றுச்சூழலியல்	சமத்துவம்	தமிழில் பௌத்த இலக்கியங்கள்	சுவடிகள்	வினைச்சொற்கள்

	SLO-2	தமிழ்க் கவிதையில் சுற்றுச்சூழலியல்	பாலியல் சமத்துவம்	மணிமேகலை	சிவதருமோத்திரச் சுவடி பெற்ற வரலாறு	வினைச்சொற்கள் அறிதல்
S-12	SLO-1	நரசிம்மன் – மகனே என்னை மன்னித்து விடு	நா. முத்துக்குமாரின் தூர் கவிதை	பெண் சாபமும் காயசண்டிகையும்	புழங்குபொருள் பண்பாடும் தமிழர் வாழ்வியலும்	தமிழில் பெயரடை, வினையடை
	SLO-2	நவீன வாழ்வும் சுற்றுச்சூழலியல் அறிதலும்	தூர் கவிதை முன்வைக்கும் பெண் சமத்துவம்	பெண் வரலாற்றில் சாபங்களின் கதைகள்	கூஜாவின் கோபம்	பெயரடை, வினையடை அறிதல்

Learning Resources	1. குறிஞ்சித்தேன், தொகுப்பும் பதிப்பும் - தமிழ்த்துறை ஆசிரியர்கள், எஸ்.ஆர்.எம். அறிவியல் மற்றும் தொழில்நுட்பக் கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2020
	2. வல்லிக்கண்ணன், புதுக்கவிதை தோற்றமும் வளர்ச்சியும், ஆழி பதிப்பகம், சென்னை, 2018
	3. கா. சிவத்தம்பி, தமிழில் சிறுகதை தோற்றமும் வளர்ச்சியும், என்.சி.பி.எச்., சென்னை, 2013
	4. தமிழ் இணையக் கல்விக்கழகம் - http://www.tamilvu.org/
	5. மதுரை தமிழ் இலக்கிய மின் தொகுப்புத் திட்டம் - https://www.projectmadurai.org/

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	30%	30%	30%	30%	30%	-
	Understand										
Level 2	Apply	40%	40%	50%	50%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	30%	20%	20%	20%	20%	20%	20%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers	
Expert from Higher Technical Institutions	**Internal Experts**
1. Dr. R..Srinivasan Associate Professor, Department of Tamil, Presidency College, Chennai,	1. B.Jaiganesh, Assistant Professor & Head, FSH, SRMIST
	2. T.R.Hebzibah Beulah Suganthi, Assistant Professor, FSH, SRMIST
	3.S.Saraswathy, Assistant Professor, FSH, SRMIST

Course Code	ULH20G01J	Course Name	*HINDI-I*		Course Category	G	Generic Elective Course	L	T	P	C
								2	0	2	3

Pre-requisite Courses	*Nil*		Co-requisite Courses	*Nil*		Progressive Courses	*Nil*		
Course Offering Department	*HINDI*		Data Book / Codes/Standards			*Nil*			

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*To be able to converse well in the Hindi Language*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-2 :	*To read and write and clarity*																		
CLR-3 :	*To be willing listeners and translators –where need be*																		
CLR-4 :	*To acquire the values/thought contents of the writers and practice in it in life.*																		
CLR-5 :	*To find motivation through the various forms of literature and learn to overcome any challenges of life.*																		
CLR-6 :	*To discover the importance of the language in making education as a means of growth in life and not mere literacy.*																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	*To appreciate the Hindi language in its various forms.*	2	75	60	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*To understand the philosophy of life and living through stories.*	2	80	70	-	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	*To help the students learn and develop the fundamentals of life, through One-Act plays.*	2	70	65	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	*To share the richness of thought and content presented in the Hindi language, into other languages so that the readers would stand to gain.*	2	70	70	H	-	H	H	H	-	-	-	-	-	-	H	-	-	-
CLO-5 :	*To guide the students in the learning of the technical aspect of the Hindi language, this would help them in the field of administration.*	2	80	70	-	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	*To encourage the students to communicate with the public, on a large scale with the medium of Main stream and Documentary films.*	2	75	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Kahani kya Hai	Ekanki aur Natak kya hai	Patrkarita ka arambh	Film Samiksha	Takniki Shabdavali
	SLO-2	Jivan ka anubhav	Vidhyarthiyon dono ke antar ko smajhkar apne dwara use prastut kar sakta hai	Vidhyarthiyon ka apne samaj ke prti jagrukta	Film ka prabhav ko smajhna	Vaignik tarike se bhashaon ka avishkaar karna
S-2	SLO-1	Kahani ke Tatva	KANKI KA ARTH	azdi aur Patrkarita ka daiytava	SAMIKSHA KYA HAI	RTH

	SLO-2	Vishleshan karne ki Kshmta	Vidhyarthi ke bhitar vishkleshan ki shamta jagrit	idhyarthiyon ko patrkarita ka ihas smajkar samaj nirman ke ye sahyog dena	Tarkik vishleshan kshmta paida karta hai	idhyarthi uske arth dwara hi uske mahtav smjhenge
S-3	SLO-1	Vo Tera Ghar Ye Mera Ghar Parivar me Buzargon ke Mahtav ko Samjhana	PARIBHASHA	ATRKARITA KA MAHTAVA	SAMIKSHA KE PRAKAR	PARIBHASHA
	SLO-2	Bhartiya Sanskriti Se Vidhyarthiyon ko Jodna	Vidvano ke mat se parichay	atrkarita se bhut se sawal ka madhan ho jata hai	Vidhyarthiyon ka un prkaro ka adhyaan karna jisse vidhyarthi us samiksha ko tayaar kar payenge	ibhinn vidwano dwara di gai aribhasha se us baat ko mjhenge vidhyathi
S-4	SLO-1	Mithaiwala Pyar Bantne se dukh kam hota hai	SWAROOP	TRAKARITA KA ARTH	SAMIKSHA KA UDDESHYA	HABDAVALI KI AVSHYAKTA
	SLO-2	Manavata ka Path	Vidhyarthiyon me iski samajh se ekhan kshmata badegi	ibhinn vidhvono ko padhne se idhyarthiyon ki tarkik kshmta adhti hai ,	Vidhyarthi ke andar smaj ke prati Kartavya bodh paida hoga	aignikon ka awiskar kitna mahtavpurn
S-5	SLO-1	Bechadri Pal Chatro me Utsah Vardhan Karna	PATHYA VACHAN	TRAKARITA KI PARIBHASHA	FILM KA SAMAJIK MAHTAVA	HASHA VAIGYANIK
	SLO-2	Beta-beti ek saman ke mahtav ko smjhana.	Vidhyarthiyon ka path kaushal dhega	vidhvaono ki ukti ek smadhan hi hota hai	Samajik uttar daiytav ko smjhana	hasha vaignikon ki jankari
S-6	SLO-1	Nadi aur Jeevan Paryavaran ke mahtav se awagat karana.	PRASTUTI	RAMUKH SAMACHAR PATR	FILM KA VISHLESHAN	ARYALYIN SHABD
	SLO-2	Manav Jeevan me nadi ki upyogita aur Mahtav.	atak khelne par bahut si takniki ate samajhenge	idhyarthiyon ki jankari badhegi	Vidhyarthi tarkik vishleshan sikhega	habd kaise tayar kiye jate hain idhyorthiyon ko jankari
S-7	SLO-1	Pachees chauka Ded Sau Jamindari Pratha se awagat karana	MAHTVA	V.PATRKARITA	DRISTIKON NIRMAN	ANGREZI SE HINDI ANUVAD
	SLO-2	Asprishya Vicharao ke Prati Sakaratamak Bnana.	atak ka mahtav ko smajhkr amaj ke hito ke sath judna.	V patrkar ke daiytav ko smajkar idhyarthi ise apne rozgar se jod akta hai	Vidhyarthi ka drishtikon nirmit hoga	lindi adhikarai aur anuvadak ke ad ke liye tayaar karna
S-8	SLO-1	Kahani ka Uddeshya	PRASHAN-ABHYAS	HOTO PATRKARITA	DOCUMENTRY FILM	IINDI SE ANGREZI ANUVAD
	SLO-2	Vidhyarthiyon ko Samaj se Jode rakhna	idhyarthiyon ka lekhan kshmata adhna	idhyarthiyon me photo patrkarita e mahtav ka smajh paida hona	Vidhyarthi samajik dharatal ki kathinai ko smajhkar desh se judega	lindi adhikari aur anuvadak ke ad ke liye tayaar karna.
S-9	SLO-1	Kahani Lekhan	UDDESHYA	RASTUTIKARAN	MAIN STREAM FILM	K DIN EK SHABD
	SLO-2	Vidhyarthi Ko likhne ki aur Prerit karna	idhyarthi ko smaj upyog hito ki ankari dena	ifhyarthi apni baat rakhne ki shmta vikstit karta hai	Vidhyarthion ko jivan ke anchue pahluon se bhi sakshaktkar	idhyarthiyon ko rozgaar se jodna
S-10	SLO-1	Seminar	ARICHARCHA	HASHA-SHAILI	FILM KE DARSHAK	TI MAHTVAPURN SHABD
	SLO-2	Vidhyarthiyon dwara Prastuti karan	idhyarthi me vak-kaushal bdhana	idhyarthi ko apni report me hasha-shaili ko sikh kar ek adhiya reporter ban sakta hai	Vidhyarthiyon ka samajik gyan	habdon ke mahtav ko smajhkar se yaad karna

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S-11	SLO-1	Prashan Abhyas	BHASHA SHAILI	PATRKARITA KE NIYAM	FILM AUR BAZAAR	SAMANYA SHABD AUR PARIBHASHIK SHABDAVALI ME ANTAR
	SLO-2	Vidhyarthiyon me Lekhn Kaushal ki kshmata Viksit karna.	Vidhyarthiyon ko bhasha ka mahtav smjhna	Vidhyarthi ise sikh kar ek nyay priya patrkar ban sakta hai	Vidhyarthiyon ko rozgaar se jodna	Vidhyarthiyon ko vaighniko dwara tayaar ki gai bhasha ki samaj
S-12	SLO-1	Path-Punravarti	EKANKI AUR RANGMANCH	PATRKAR KA DAIYTVA	FILM DARSHAK KA MAHTAVA	PARIBHASHIK SHABDAVALI KA MAHTAV
	SLO-2	Pariksha ke liye Saksham	Vidhyarthi isse rangmanch ke mahtav ko smajhenge	Vidhyarthiyon ko patrkar ka daityva sikhkar smaj ke uttar daityva ko nibhana hai	Vidhyarthiyon ko darshak ki ruchiyon se awagat karvana	Rozgaar se vidhyarthiyon ko jodnaw

Learning Resources	The Prescribe Text Book Compiled and Edited by Department of Hindi www.gadyakosh.com www.shabdkosh.com

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	30%	30%	30%	30%	30%	-
	Understand										
Level 2	Apply	40%	40%	50%	50%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	30%	20%	20%	20%	20%	20%	20%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Expert from Higher Technical Institutions	Internal Experts
1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST
	2. Dr. Md.S. Islam Assistant Professor, SRMIST
	3 Dr. S. Razia Begum, Assistant Professor, SRM IST

Course Code	ULF20G01J	Course Name	*FRENCH-I*		Course Category	G	Generic Elective Course	L	T	P	C
								2	0	2	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*		Progressive Courses	*Nil*	
Course Offering Department	*French*		Data Book / Codes/Standards			*Nil*	

| Course Learning Rationale (CLR): | *The purpose of learning this course is to:* | Learning | Program Learning Outcomes (PLO) |

		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*Extend and expand their savoir-faire through the acquisition of current scenario*																			
CLR-2 :	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French																			
CLR-3 :	Make them learn the basic rules of French Grammar.																			
CLR-4 :	Develop strategies of comprehension of texts of different origin																			
CLR-5 :	Strengthen the language of the students both in oral and written																			
CLR-6 :	Express their sentiments, emotions and opinions, reacting to information, situations																			

Column headers (vertical): Level of Thinking (Bloom); Expected Proficiency (%); Expected Attainment (%) | Fundamental Knowledge; Application of Concepts; Link with Related Disciplines; Procedural Knowledge; Skills in Specialization; Ability to Utilize Knowledge; Skills in Modeling; Analyze, Interpret Data; Investigative Skills; Problem Solving Skills; Communication Skills; Analytical Skills; ICT Skills; Professional Behavior; Life Long Learning

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	*To acquire knowledge about French language*	2	75	60		H	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*To strengthen the knowledge on concept, culture, civilization and translation of French*	2	80	70		-	H	-	H	-	H	-	-	-	-	M	-	-	-	-
CLO-3 :	*To develop content using the features in French language*	2	85	75		H	-	-	H	-	H	-	-	-	-	M	-	-	-	-
CLO-4 :	*To interpret the French language into other language*	2	70	80		H	-	H	H	H	-	-	-	-	-	H	-	-	-	-
CLO-5 :	*To improve the communication, intercultural elements in French language*	2	80	70		-	H	-	H	-	-	-	-	-	-	H	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Bonjour, ça va ?	Salut ! Je m'appelle Agnès	Qui est –ce ?	Dans mon sac, j'ai…	Il est comment ?
	SLO-2	Salut	Paul, Valérie, Manish	Les exemples	Da ns ton sac	Les objectifs
S-2	SLO-1	Les pays	Les pronoms personnels sujets	Les professions	La formation du féminin (3)	L'aspect physique
	SLO-2	Les nationalités	Je, Tu, Il/Elle Nous, vous, Ils/Elles	Les exemples	Les féminins	Le corps
S-3	SLO-1	Les animaux domestiques	Les verbes être et avoir	Quelques objets	La phrase interrogative	Le caractère
	SLO-2	Les animaux	Les verbes auxiliaires	Objets	Les interrogatives	Les exemples
S-4	SLO-1	Les jours de la semaine	Les articles définis et indéfinis	La fiche d'identité	*qu'est – ce que.. ?*	Les prépositions de lieu (1)
	SLO-2	Les mois de l'année	Les exemples	La carte d'identité	*Les exemples*	Dans, sur, sous etc..,
S-5	SLO-1	Les nombres de 0 à 69	La formation du féminine (1)	La liaison	*Qu'est – ce que C'est*	Les nombre à partir de 70
	SLO-2	Les nombres	Les féminins	Les activités	*Les objets*	Les exemples
S-6	SLO-1	La famille (1)	La formation du pluriel (1)	L'élision	*Qui est – ce ?*	Allo ?
	SLO-2	Ses parents	Les exemples	Les activités	*Les personnes*	Portable
S-7	SLO-1	L'accent	Les adjectifs possessifs	Intonation descendre	*la phrase négative*	La formation du féminin(3)
	SLO-2	L'accent tonique	Les exemples	Les descendre	*La négation*	Les exemples

S-8	SLO-1	Les articles définis	Entrer en contact : salut	Intonation montante	C'est	Les articles contractés
	SLO-2	Les articles indéfinis	Entrer en contact : demander	Les montantes	Il est	Les articles partitifs
S-9	SLO-1	Bonjour, - Salut !	Dire comment ça va	Dans mon sac	Les verbes du premier group	Les pronoms personnels toniques
	SLO-2	Ca va	Comment allez-vous ?	Des objets	Les exemples	Les pronoms
S-10	SLO-1	Je m'appelle Agnès	Se présenter	Les Mots	Les verbes aller	Les adverbes interrogatifs
	SLO-2	Quel est votre nom	Présenter quelqu'un	Les expressions	Le verbe venir	Les interrogatifs
S-11	SLO-1	Les Mots	Demander	Demander poliment	Demander et répondre poliment	Les verbes du deuxième group
	SLO-2	Les Expressions	Demander le temps	Répondre poliment	Les exemples	Les exemples
S-12	SLO-1	Entrer en contact	Demander la date	Demander des informations personnelles	Demander des informations personnelles	Décrire l'aspect physique
	SLO-2	Se présenter.	Dire la date	Les exemples	Les activités	Décrire le caractère

Learning Resources	*Theory:* 1. "**Génération-AI**" Méthode de français, Marie-Noëlle COCTON, P.DAUDA, L.GIACHINO, C.BARACCO, Les éditions Didier, Paris, 2018. 2. *Cahier d'activités avec deux discs compacts.*

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	40%	50%	50%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	30%	20%	20%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers	
Expert from Higher Technical Institutions	**Internal Experts**
1. Dr. C.Thirumurugan Associate Professor, Department of French, Pondicherry University	*1. Kumaravel K. Assistant Professor & Head, SRMIST*
	2. Ponrajadurai M Assistant Professor, SRMIST

Course Code	ULE21AE1T	Course Name	*BUSINESS ENGLISH*		Course Category	*AE*	Ability Enhancement Course	L	T	P	C
								4	0	0	4

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*		Progressive Courses	*Nil*
Course Offering Department	*English*	Data Book / Codes/Standards			*Nil*	

Course Learning Rationale (CLR): The purpose of learning this course is to,   Learning   Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the critical component for success in the workplace																		
CLR-2 :	develop a foundation for designing effective messages																		
CLR-3 :	Practice drafting and editing																		
CLR-4 :	Prepare clear,precise, readable written document																		
CLR-5 :	Learn to design documents to make information easily accessible																		
CLR-6 :	Make a executive-level reader																		

Column headers for the matrix:
- 1: Level of Thinking (Bloom)
- 2: Expected Proficiency (%)
- 3: Expected Attainment (%)
- PLO 1: Fundamental Knowledge
- PLO 2: Application of Concepts
- PLO 3: Link with Related
- PLO 4: Procedural Knowledge
- PLO 5: Skills in Specialization
- PLO 6: Ability to Utilize
- PLO 7: Skills in Modeling
- PLO 8: Analyze, Interpret Data
- PLO 9: Investigative Skills
- PLO 10: Problem Solving Skills
- PLO 11: Communication Skills
- PLO 12: Analytical Skills
- PLO 13: ICT Skills
- PLO 14: Professional Behavior
- PLO 15: Life Long Learning

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Conversant with the basic forms and formats of Writing	2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 :	Techniques of Business Writing	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 :	To become a skilled writer	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 :	To Prepare precise business documents		85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 :	Improve the Reading skills	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 :	Conduct business meetings	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Listening Skills	Introduction to Communication	Introduction to Writing Business Letters	Introduction to Report Writing	Importance of Business Meetings
	SLO-2	Listening Process	Internal Communication	Importance	Features of Good Report	Types of Business Meetings
S-2	SLO-1	Listening is not the same as Hearing	Stake Holders in Internal Communication	Difference between Personal and Business Letters	Purpose of Report Writing	Conducting Meetings
	SLO-2	Time Spent Communicating	Channels	Structure & Format	Differentiate between Business Report and Engineering report	Common Mistakes made at Meetings
S-3	SLO-1	Purpose of Listening	Internal Tele-Conversation	Types of Business Letters	Steps in Report Writing	Overcoming the mistakes in Meeting
	SLO-2	Principles of Listening	Self-Introduction	Writing E-Mails	Structure of a Report	Employment Communication
S-4	SLO-1	Classification of Listening	Seeking and Giving Information	Principles of E-mail	Types of Reports	Resume and its Contents
	SLO-2	Informational Listening	Giving Messages	E-mail Etiquette	Format of Reports	Types of Resumes
	SLO-1	Critical Listening	Expression of Gratification		Oral Communication Skills	

S-5	SLO-2	Therapeutic or Empathetic Listening		Overcoming problems in E-mail Communication		Reason for a Cover Letter to Apply for a Job
S-6	SLO-1	Other Listening Types	External Communication	Writing Memos, What is a Memo?	Oral Business Presentation	Format of Cover Letter
	SLO-2	Barriers to Effective Listening Process	Stake Holders	Principles of Precis Writing	Purpose, Audience, Locale	Types of Cover Letter
S-7	SLO-1	Categorization of Barriers to Communication	Channels of External Communication	Approaches to memo writing	Steps in Making a Presentation	Group Discussion
	SLO-2	How to resolve the barriers for communication?	Cross Organizational Video-Teleconferencing	Format of a Memo	Research and Planning	Understand the Nature of Discussion
S-8	SLO-1	Reading Skills	Briefing the Organization	Circulars	Structure and Style	Difference between Debate and Discussion
	SLO-2	Effective Reading Strategies - 1 to 5	Description of Product	Guidelines for writing Circulars	Preparation and Presentation	Ways to form and present the arguments
S-9	SLO-1	Effective Reading Strategies - 6 to 10	Description of Process	Format of Circulars	Delivering a Presentation	Ways to Defend
	SLO-2	Purpose of Reading	Description of Services	Notices- Purpose	Making the Self Presentable	Emotional Intelligence: Understanding
S-10	SLO-1	Types of Reading	Holding Meetings over Skype	Format of Notices	Dressing Sense	Understanding Individual Nature
	SLO-2	Techniques for Effective Reading	Communication Network: Scope	Important Points to Note in a Notice	Clear Voice - Dos and Dont's	Zohari Window Model
S-11	SLO-1	Improving Comprehension	Types of Communication Network	Writing Component: Preparing Emails	Planning &Analyzing	Encouraging Fellow Participants
	SLO-2	Reading Component- A Story of bankruptcy	Formal Communication Network	Preparing Memo	Structuring	Making Communication More Friendly
S-12	SLO-1	Reading Component- A Story of bankruptcy	Informal Communication Network	Preparing Circular	Managing Body Language	Knapp's Relationship Escalation Model
	SLO-2	Reading Component- A Story of bankruptcy	Conducting a Elevator Pitch Round	Preparing Notices	Managing Emotions	Convincing Others by using rhetorics

Learning Resources	1. Business English (English, Paperback, Delhi University) 2. Business English: A Complete Guide for All Business and Professional Communications Paperback – by PREM P.BHALLA . 3. Business English (English, Paperback, Geffner Andrea B.)	4. Speak Business English Like an American: (Book & Audio CD) Paperback –, 2014, by Amy Gillett (Author) 5. Practical English Usage, 4th edition: International Edition (without online access): English Paperback – 2017 by Michael Swan 6. Essential Business Words: ebook by Josef Essberger

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	40%	-	40%	-	40%	-	40%	-	40%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
	1. Prof. Daniel David, Prof & Head, Department of English, MCC, Chennai	1. Dr. Shanthichitra, Associate Professor, & Head, Department of English, FSH, SRMIST
		2. Dr K B Geetha, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UDS21101T	Course Name	*INTRODUCTION TO ARTIFICIAL INTELLIGENCE*	Course Category	C	Professional Core Course	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the concept of Artificial Intelligence																		
CLR-2 :	Learn the basic Mathematics and Statistics concepts used in AI																		
CLR-3 :	Understand the effectiveness of machine learning																		
CLR-4 :	Identify the AI implementation framework																		
CLR-5 :	Apply AI concepts to solve business problems																		
CLR-6 :	Solve the problem related to real world application																		

PLO column headers: (1) Level of Thinking (Bloom), (2) Expected Proficiency (%), (3) Expected Attainment (%) | (1) Fundamental Knowledge, (2) Application of Concepts, (3) Link with Related, (4) Procedural Knowledge, (5) Skills in Specialization, (6) Ability to Utilize Knowledge, (7) Skills in Modeling, (8) Analyze, Interpret Data, (9) Investigative Skills, (10) Problem Solving Skills, (11) Communication Skills, (12) Analytical Skills, (13) ICT Skills, (14) Professional Behavior, (15) Life Long Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Understand the Academic and Industry perspectives of AI	2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 :	Learn the concepts of Mathematics used in AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 :	Able to understand the basics of Machine Learmng	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 :	Grasp the Social Awareness of AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 :	Defend the need for AI in providing solution to business problems	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 :	Appreciate the application of AI in real world problem solving	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: AI Defined - Academic Perspective and Industry Perspective** Overview of Intelligence	AI transform your business for ever	Business Intelligence	Machine Learning Architecture	Regulating AI in society
	SLO-2	Components of Intelligence	Defining the Digital Transformation Scenario	Data Science vs Business Intelligence	Machine Learning Libraries	Data-driven policy making
S-2	SLO-1	Artificial Intelligence- Indusry Definition	Starting point of Digital Transformation	Data Science Business Challenges and Business Needs	Machine Learning Technologies	Policymaking in 30 years from now

	SLO-2	Artificial Intelligence-Academic Definition	Defining your Journey to Artificial Intelligence	Data Science Business Benefits	Machine Learning Implementation Framework	Boundaries for AI
S-3	SLO-1	**Unit 2: Present and Futuristic State of AI** Use of Technologies in different sectors of Business	**Unit 5: Role of Mathematics and Statistics in AI** Linear Algebra Overview	Data Science Implementation Framework	**Unit 8: Intelligent Automation** Intelligent Automation Overview	**Unit 10: AI Readiness and Assessment** Organization AI-Readiness
	SLO-2	Present State of AI	Matrix Overview	Data Science Implementation Technologies	Role of Intelligent Automation	AI Readiness tools available
S-4	SLO-1	Future State of AI	Application of Matrix in AI	Data Science Implementation - Healthcare Use Case	Intelligent Automation in Decision Making	Understanding where you in the AI Journey
	SLO-2	Effect of human behaviour by the use of Artificial Intelligence	Vector Overview	Data Science Applications	Artificial Intelligence and Intelligemt Automation Overview	AI Readiness Framework
S-5	SLO-1	Control measure for complex AI systems	Application of vectors in AI	**Unit 7: Introduction to Machine Learning**	Artificial Intelligence and Intelligemt Automation Differences	Six Areas of Focus
	SLO-2	Safety Concerns with the Adevent of Artificial Intelligence	Scalar Overview	Machine Learning Overview	Intelligent Automatiion in Real World	**Unit 11: AI Implementation Framework** AI Framework Overview
S-6	SLO-1	**Unit 3:Real World Applications of AI** Way AI is Changing the World	Application of Scalar in AI	Machine Learning Types	Intelligent Automation Applications	AI Implementation Framework for an Enterprise
	SLO-2	Transforming Government	Introduction to Statistics	Role of Machine learning in real world applications	Working of Intelligent Automation	AI Implementation Strategy
S-7	SLO-1	Bridging Language Divides	Statistical data analysis	Applications of Machine Learning	Benefits of Intelligent Automation	AI Implementation Framework Development
	SLO-2	Creating State of Art	Diagrammatic representation	Machine Learning Techniques	Instruction Driven Automaton Overview	Problem Statement
S-8	SLO-1	Real world use cases in different Sectors	Sampling & its types	Supervised Machine Learning	Instruction Driven Automaton Applications	Model Selection
	SLO-2	Working of AI in Different Sectors	Measures of Central Tendency	Unsupervised Machine Learning	Working of Instruction Driven Automaton	Technology Archiceture
S-9	SLO-1	AI in Health	Measures of Dispersion	Reinforcement Learning	Intelligent Automation Platforms	Model Engineering
	SLO-2	AI in Consumer	Correlation and covariance	Difference B/w Supervised and Unsupervised ML	**Unit 9: Social Awareness of AI, AI on Government and Public Policy** Economic Impact of AI	Model Training/Testing/Retraining/Retesting/Acceptance

S-10	SLO-1	AI in Energy	Different Types of Distributions	Difference B/w Supervised and Reinforcement ML	AI for Public Good	**Unit 12: AI Business Case Development** AI Driving Factors
	SLO-2	AI in Oil and Gas	Estimate Confident Intervals	Difference B/w Unsupervised and Reinforcement ML	AI, Ethics and Regulation	AI Business Challenges
S-11	SLO-1	**Unit 4:Digital Transformation of AI** Digital Transformation Overview	**Unit 6: Role of Data Science** Data Science Overview	Deep Learning overview	Social Challenges of AI	AI Business Needs
	SLO-2	Role of AI in Digital Transformation	Data Analytics Overview	NLP Overview	Juristic Challenges of AI	AI Proposed Solution
S-12	SLO-1	Digital Transformation Tehniques	Data Science vs Data Analytics	CV Overview	Artificial Intelligence and the Future of Public Policy	AI Business Engagement
	SLO-2	4 main areas of Digital Transformation	Data Science vs Business Analytics	RPA Overview	Digitization and Public Policy	Measurable Business Values and ROI

Learning Resources	1. https://deepsphereai.litmos.com/ 2. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2010. 3. Joseph C. Giarratano , Gary D. Riley ,"Expert Systems : Principles and Programming",4th Edition, 2015.	4. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000. CURRICULUM AND SYLLABUS B.TECH. – DATA SCIENCE 79 5. Prateek Joshi, "Artificial Intelligence with Python", Packt Publishing, 2017. 6. https://www.pdfdrive.net/artificial-intelligence-a-modern-approach-3rd-editione32618455.html Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRM IST
		Dr. b.Rebecca Jeyavadhanam, SRMIST

Course Code	UDS21102J	Course Name	*INTRODUCTION TO ADVANCED COMPUTING*	Course Category	C	Professional Core Course	L	T	P	C
							4	0	4	6

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR): The purpose of learning this course is to,   **Learning**   **Program Learning Outcomes (PLO)**

CLR-1 : Understand the concept of computing in recent times
CLR-2 : Learn the basics of In-memory computing
CLR-3 : Understand the Python programming for AI
CLR-4 : Identify the concept of GPU's and TPU's
CLR-5 : Impart the knowledge of Site Reliability Engineering
CLR-6 : Appreciate the applications of advanced computing

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Fundamental Knowledge	2 Application of Concepts	3 Link with Related	4 Procedural Knowledge	5 Skills in Specialization	6 Ability to Utilize Knowledge	7 Skills in Modeling	8 Analyze, Interpret Data	9 Investigative Skills	10 Problem Solving Skills	11 Communication Skills	12 Analytical Skills	13 ICT Skills	14 Professional Behavior	15 Life Long Learning
CLO-1 : Classify different types of Advanced Computing	2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 : Recognize Real-Time Event Processing and usage of Python Programming	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 : Learn Python Programming and Microservice and its Architecture	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 : Understanding about Frameworks for AI implementstion	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 : Grasp the concept of Site Reliability Engineering	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 : Apply Advanced Computing in Real-Time problem solving	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		24	24	24	24	24
S-1	SLO-1	**Unit 1:Advanced Computing Defined** Computing Overview	Business Challenges of Distributed Computing	Parallel Computing Overview	**Unit 8: Basic Python Programming for AI**	Software Requirements for GPU
	SLO-2	History of Computing	Business Benfits of Distributed Computing	Business Benfits of Parallel Computing	Introduction to Python	Its working
S-2	SLO-1	Advanced Computing Overview	Business Benfits of Real Time Computing	Applications of Parallel Computing	Python Getting Started	Features of GPU
	SLO-2	High Performance Computing	Real Time systems	Parallel Computing Framework	Python Syntax	Advantages of GPU
S-3	SLO-1	High Performance Computing Types	Classification of Real Time systems	**Unit 6: Overview of In-Memory Computing**	Python Comments	Business Challenges of GPU

	SLO-2	Business Challenges of Advanced Computing	Applications of Real Time Systems	In-memory Computing Overview	Python Variables	Business Benefits of GPU
S-4	SLO-1	Business benefits of Advanced Computing	**Unit 4: Overview of Serverless Computing**	Business Challenges of In-memory Computing	Python Data Types	**Unit 11: Working with TPU's**
	SLO-2	Role of Advanced Computing in AI Implementation	Serverless Compting Overview	Business Benfits of In-memory Computing	Python Numbers	TPU's Overview
S-5 to S-8	SLO-1	**Lab 1: Understand and Practise Basic/Advanced Computing functions**	**Lab 4: Understand and Create Core Components of Serverless framework**	**Lab 7: Create and Query an In-Memory Column Store Table**	**Lab 10: Write basic python programs for variables, Datatypes, Numebrs, String etc**	**Lab 13: Understand core architectural components of GPU and TPU**
	SLO-2					
S-9	SLO-1	Mulltilingual Computing Overview	API Gateway	Applications of In-memory Computing	Python Casting	GPU Software/Hardware Requirements
	SLO-2	Heritage Computing Overview	Function as a Service	In-memory Computing Framework	Python Strings	Working of GPU/TPU's
S-10	SLO-1	**Unit 2: Overview of Cluster and Cloud Computing** Cluster Computing Oberview	Backend as a Service	In-memory computing features	**Unit 9: Introducing Microservice and its Architecture**	Features of TPU
	SLO-2	Cluster Computers	Business Challenges of Serverless Computing	In-memory Computing systems		Advantages of TPU
S-11	SLO-1	Cluster Computing Architecture	Business Benfits of Serverless Computing	In-memory Computing for Enterprise	Microservices Overview	Business Challenges of TPU
	SLO-2	Cluster Classification	Applications of Serverless Computing	Role of In-memory Computing in AI Applications	Microservices Architecture	Business Benefits of TPU
S-12	SLO-1	Components for Clusters	Serverless Computing Architecture	**Unit 7: Overview of Real-Time Event Processing**	Key Beneits Microservices Architecture	**Unit 12: Overview of Site Reliability Engineering**
	SLO-2	Clusters Middleware	Role of Serverless Computing in AI		Ways to Decompose	
S-13 to S-16	SLO-1	**Lab 2: Set up Cluster of 4 different computer sysems**	**Lab 5: Build a Simple Microservice using a Serverless Framework**	**Lab 8: Perform real-time events processing using Apache Kafka Streams API**	**Lab 11: Build and Deploy an Authenticated Microservice**	**Lab 14: Develop service level indicator and service level Objective compliance**
	SLO-2					
S-17	SLO-1	Clusters Systems	**Unit 5: Overview of Distributed and Parallel Computing**	Real-Time Event Processing Overview	Building and Deploying	Site Reliability Engineering Overview
	SLO-2	Clusters Applications	Distributed Computing Overview	Business Challenges of Real-Time Event Processing	Designing Individual Services	Traditional Ops
S-18	SLO-1	*Beowulf Cluster*	Parallel Computing Overview	Business Benfits of Real-Time Event Processing	Decentralize	Traditional Ops vs SRE
	SLO-2	Role of Cluster Computing in AI	Business Challenges of Distributed Computing	Applications of Real-Time Event Processing	Building Microservices AI Applications	Dev Ops vs SRE

S-19	SLO-1	Unit 3: Overview of Real Time Computing Real Time Computing Overview	Business Benfits of Distributed Computing	Real-Time Event Processing Framework	Unit 10: Working with GPU's	Exploring the Tenets of SRE
	SLO-2	Real Time Computers Overview	Applications of Distributed Computing	Real-Time Event Processing features		Working of SRE
S-20	SLO-1	Real Time Computer Architecture	Distributed Computing Framework	Real-Time Event Processing for Enterprise	GPU's Overview	Role of SRE
	SLO-2	Real Time Computer Framework	Distributed Computing Architecture	Role of Real-Time Event Processing in AI Applications	GPU Hardware Requirements	Role of SRE in AI
S-21 to S-24	SLO-1	Lab 3: Extract real time customer feeds from twitter	Lab 6: Implement a parallel sorting algorithm in MPI	Lab 9: Application of event processing to real-time streaming data	Lab 12: Understand core architectural components of GPU and TPU	Lab 15: Specifying and Choose a good SLI
	SLO-2					

Learning Resources	1. .https://deepsphereai.litmos.com/ 2. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems - Principles and Paradigms", Second Edition, Pearson, 2006.	3. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", John Wiley& Sons, 2011.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mrs. M.Ramla, SRM IST
		Mrs. Anita Jasmine, SRM IST

Course Code	UDS21G01T	Course Name	*ROLE OF MATHEMATICS IN AI*	Course Category	G	Generic Elective Course	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Mathematics and Statistics		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CLR-1 : Create an understanding on the use of Mathematical concepts applied in AI
CLR-2 : Give exposure to Applications of Discrete/Applied/ Finite Mathematics in AI
CLR-3 : Teach the Calculus and Probability and Statistics concepts used in AI
CLR-4 : Identify the application of Matrix and Matrix Algebra in AI
CLR-5 : Impart the knowledge on Graphs and Game theory concepts
CLR-6 : Apply Mathematics and Statistical concepts in AI

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

Column headers for the three Learning columns: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

PLO columns: 1 Fundamental Knowledge, 2 Application of Concepts, 3 Link with Related, 4 Procedural Knowledge, 5 Skills in Specialization, 6 Ability to Utilize Knowledge, 7 Skills in Modeling, 8 Analyze, Interpret Data, 9 Investigative Skills, 10 Problem Solving Skills, 11 Communication Skills, 12 Analytical Skills, 13 ICT Skills, 14 Professional Behavior, 15 Life Long Learning

CLO	Description	Bloom	Prof %	Attain %	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Understand the role of Mathematics in AI	2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 :	Apply the Mathematical thinking in AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 :	Understand and apply the concepts in Calculus and Probability and Statistics in AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 :	Recognize the use of Matrix and Matrix Algebra	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 :	Use concepts in Graphs and Game theory in AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 :	Understand Mathematics and Statistical concepts used in AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: Mathematics in AI**	Formulating Hypothesis Skills	Thinking from Perspectives	Introduction to Probability theory	Mathematics behind Fourier transform
	SLO-2	Role of Mathematics in AI	Comparison Classification Skills	Generalizing/Abstraction	Statistical data analysis	Discrete Fourier Transform
S-2	SLO-1	Fundamentals of Mathematics in AI	Identifying Variables Skills	**Unit 6: Linear Algebra**	Diagrammatic representation	Signal Generation and Phase Shift
	SLO-2	Introduction to Quadratic Equations and functions	Designing Experimental Skills	Overview of Linear Algebra	Sampling & its types	Transfer function for mathematics
S-3	SLO-1	Overview of Differential Calculus Foundations	Estimation and Approximation Skills	Linear Algebra for AI	Measures of Central Tendency	**Unit 11: Graphs their Representation and terminologies**

Session	SLO					
	SLO-2	Intrduction to Differentiation and Derivatives	Reaching Conclusion and Interpretational Skills	Overview of vectors	Measures of Dispersion	Introduction to graph theory
S-4	SLO-1	Introduction to Vector and Vector Muptiplications	Unit 4: Applications of Discrete/Applied/Finite Mathematics in AI	Overview of matrices	Correlation and covariance	Graphs – Terminology and Representation
	SLO-2	Introduction to Matrices	Inifinite Series	Matrix Factorization	Different Types of Distributions	Graph, Vertices,and Edges
S-5	SLO-1	Sampling and Sampling Distributions	Linear Algebra and matrices	Single Value Decomposition	Unit 9: Matrix and Matrix Algebra	Classification of Graphs
	SLO-2	Probabilty Basics	Probability Distributions	Ordinary least Squares	Overview of Matrix and Matrix Algebra	Types of graphs
S-6	SLO-1	Unit 2: Why Mathematics is Required for an AI Implementation.	Predicate logic and Rule Engine	Linear least Squares	Order of matrix	Node, Degree of a Node
	SLO-2	Building Knowledge Based Expert Systems	Markov Chain and Markov Property	Overview of Tensors	Square matrix	Cyclic and Acyclic Graphs
S-7	SLO-1	Develop Problem Solving Skills	Cuve fiiting and Gradient Descent	Unit 7: Calculus	Daignal matrix	Trees and Spanning Trees
	SLO-2	Generate AI Models	Levenberg Marquardt algorithm	Overview of Calculus	Triangular Matrix	Data Structures for representing Graphs
S-8	SLO-1	Interpret AI Models	Computational Linguistics	Calculus for AI	Upper Triangular Matrix	Unit 12: Role of Game Theory in AI
	SLO-2	Abstract Generation of Numerical Results	Multiplayer Perceptrons	Types of Calculus	Lower Triangular Matrix	Introduction to Game Theory
S-9	SLO-1	Conformance Evaluation	Unit 5: Overview of Mathematical Thinking	Integral Calculus	Scalar Matrix	Role of Game Theory in AI
	SLO-2	Integration in Design	Overview of Mathematical Thiniking	Differential Calculus	Column Matrix	Introduction to Games
S-10	SLO-1	Formulate Numerical Models	Thinking like a mathematician	Optimization Techniqies	Unit 10: Laplace Transforms	Type of Games
	SLO-2	Symbolic Proceesing	Effetual Thinking	Overview of Gradient Descent	Overview of Laplace Transform	Symmetric vs. Asymmetric Game
S-11	SLO-1	Unit 3: Mathematical Skills Matrix Required for an AI Implementation	Developing Mathematical Thinking	Convexity	Spectrum Analysis	Nash Equilibrium
	SLO-2	Problem Solving Skill	Addressing Misconceptions	Convergence	Fourier Series	Game theory Strategies
S-12	SLO-1	Knowledge and Reasoning Skill	Focussing on Structure of Mathematics	Unit 8: Probability and Statistics	Fourier Transformation	A Game Playing Process
	SLO-2	Inferential Skills	Developing Multiple Models/Strategies	Introduction to Statistics	Fourier Transformation in Spectrum Analysis	Playing a game on complete and an Incomplete Information?

Learning Resources	.https://deepsphereai.litmos.com/	1. Introduction to Linear Algebra, Gilbert Strang, Fifth Edition (2016) 2. Linear Algebra and Optimization for Machine Learning, Aggarwal, Charu, 2020 3. Introduction to Graph Theory Fourth edition Robin J. Wilson, Addison Wesley, 4. Game Theory & Optimal Decisions. Accessed at: http://euler.fd.cvut.cz/predmety/game_theory/

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.M.Shanmugasundari, SRM IST
		Mrs. Madhumitha, SRM IST

Course Code	UDS21S01T	Course Name	INTRODUCTION TO DATA ENGINEERING	Course Category	S	Skill Enhancement Course	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR): The purpose of learning this course is to, | Learning | Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Impart the conceptual understanding Big Data and Data Engineering																		
CLR-2 :	Give exposure to Big Data Implementation Frameworrk																		
CLR-3 :	Create awareness about Relational and Non-Relational Databases																		
CLR-4 :	Identify the IoT implementation framework																		
CLR-5 :	Apply IoT concepts to solve business problems																		
CLR-6 :	Apply Data Engineering Concepts in real world application																		

Column headers (vertical): Level of Thinking (Bloom) | Expected Proficiency (%) | Expected Attainment (%) | Fundamental Knowledge | Application of Concepts | Link with Related | Procedural Knowledge | Skills in Specialization | Ability to Utilize Knowledge | Skills in Modeling | Analyze, Interpret Data | Investigative Skills | Problem Solving Skills | Communication Skills | Analytical Skills | ICT Skills | Professional Behavior | Life Long Learning

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Understand the role of Big Data in Data Engineering	2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 :	Appreciate the Big Data Tools and Technologies	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 :	Understand and apply Relational and Non-Relational Databases	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 :	Recognize the Role of IoT in Data Engineering	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 :	Apply the concepts if IoT in Real World Applications	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 :	Create model for providing solution to real world problems	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: Data Engineering Defined**	Building and maintaining a data pipeline	Distributed Processing - MapReduce Framework and Pig	Industrial Internet of Things Overview	IIoT Business Engagement
	SLO-2		Data Lake Handling	Apache Hive	Working of Industrial Internet of Things	Measurable Business Values and ROI
S-2	SLO-1	Overview of Data Enginerring	**Unit 4: Big Data Implementation Framework**	NoSQL Databases - HBase	Industrial Internet of Things Devices	**Unit 13: Real World Applications of Internet of Things**
	SLO-2	Exitsence of Data Engineering		Functional Programming and Scala	MQ Telemetry Transport	Role of IIoT in an Enterprise application

S-3	SLO-1	Need for Data Engineering	Introduction to Big Data Implementation Framework	Apache Spark Next Generation Big Data Framework	Machine to Machine Communication in IIoT	Benefits of Industrial Internet of Things
	SLO-2	Benefits ofData Engineering	Big Data Implementation Framework for an Enterprise	Spark Core Processing RDD	Security Consideration while Adopting IIoT	Predictive Maintenance for Monitoring Robots
S-4	SLO-1	Data Engineerng Vs Data Science	Big Data Implementation Strategy	**Unit 7: Introduction to Relational and Non-Relational Databases**	**Unit 10: Role of IIoT in Data Engineering**	Streamline Operations and Bolster Production capacity
	SLO-2	Getting Started	Big Data Implementation Framework Development	Introduction to Relational and Non-Relational Databses	Data Engineering: Heavy Lifting Behind IIoT	Amazon Reinventing Warehousing
S-5	SLO-1	**Unit 2: Introduction to Big Data**	Problem Statement	SQL Querying	IIoT Data System Architecture	Driving Manufacturing Efficiency
	SLO-2		Data Collection	Consolidating Your Data	Data Ingestion, Data Plumbing, and Data Stoarge for Data engineering	Reducing Downtime in Factories using Robotics
S-6	SLO-1	Big data: DeData finition and Taxonomy	Data Integration	Joining Tables	**Unit 11: IIoT Implementation Framework**	Self Driving Tractors
						Digital Innovation in mining and Heavy Equipments
	SLO-2	Types of Big Data	Data Provisioning	Creating Database Objects and Adding Business Logic		Connected Robotics
S-7	SLO-1	Characteristics of Big Data	**Unit 5: Big Data Business Case Development**	**Unit 8: Introduction to ETL, Data Modeling, Data Warehouses**	Overview of IIoT Framework	Intellligent Logistics
	SLO-2	Techniques and Technologies for big data processing			Category of IIoT Implementation	Smart Automotive Manufacturing
S-8	SLO-1	Big Data processing systems	Big Data Driving Factors	Overview of ETL Process	The Knowledge Category of IIoT Implementation	**Unit 14: Working with Machine, Sensor,Wearables, Web Data**
	SLO-2	Big Data Value for the Enterprise	Big Data Business Challenges	ETL Process in Datawarehouses	Hardware Requirements for Implemenatation	
S-9	SLO-1	**Unit 3: Role of Big Data in Data Engineering**	Big Data Business Needs	Process of Extraction	Software Requirements for Implemenatation	Introduction to Machine, Sensor,Wearables, Web Data
	SLO-2		Big Data Proposed Solution	Process of Transformation	Security and Communication Requirements	Data Collection from Sensor,Wearables, Web Data
S-10	SLO-1	Database Optimization	Big Data Business Engagement	Process of Loading	**Unit 12: IIoT Business Case Development**	Data Transfer from Sensor,Wearables, Web Data
	SLO-2	Big Data Collection	Measurable Business Values and ROI	Overview of Data Modelling		Data Integration from Sensor Data,Wearables Data , Web Data
S-11	SLO-1	Big Data Integration	**Unit 6: Big Data Tools and Technologies**	Physical, Conceptual and logical Data Model	IIoT Driving Factors	Identification of Temporal Discrepancies

	SLO-2	ETL Processing		Types of Datawarehouse Models	IIoT Business Challenges	Differences in Counters
S-12	SLO-1	Stream Processing	Introduction to Big Data and Hadoop	Enterprise D/W, Data Mart, Virtual D/W	IIoT Business Needs	Builiding Efficient Usecases
	SLO-2	Performance Optimization	Distributed Storage (HDFS), and YARN	Unit 9: Industrial Internet of Things Defined	IIoT Proposed Solution	Wearable IIoT for human Activinty recognition

Learning Resources	1. .https://deepsphereai.litmos.com/ 2. ArshdeepBahga and Vijay Madisetti, (2015), "Internet of Things - A Hands-on Approach", Universities Press	3. Big Data Analytics , Money Frank Ohlhorst 4. Dieter Uckelmann et.al, (2011), "Architecting the Internet of Things", Springer CunoPfister, (2011), "Getting Started with the Internet of Things", O'Reilly,

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mr.J.Venkatasubramanian, SRM IST
		Mrs. Kanmani, SRM IST

Course Code	UCD20S01L	Course Name	SOFT SKILLS		Course Category	S	Skill Enhancement Course	L	T	P	C
								0	0	2	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department	Career Development Centre	Data Book / Codes/Standards				-

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	expose students to right attitudinal and behavioral aspects and to build the same through activities
CLR-2 :	develop and nurture interpersonal skills of the students through individual and group activities.
CLR-3 :	Increase efficiency and leadership skills and to improve team results.
CLR-4 :	acquire time management skills and develop creative skills
CLR-5 :	understand intercultural communication and etiquettes required in a professional environment
CLR-6 :	instill confidence in students and develop skills necessary to face the challenges of competitive exams and placements

Learning: 1 2 3
Program Learning Outcomes (PLO): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	re-engineer their attitude and understand its influence on behavior	3	80	70	M	M	M	-	M	H	M	-	-	H	H	H	M	H	H
CLO-2 :	acquire inter personal skills and be an effective goal oriented team player	3	80	70	M	M	M	-	M	H	M	-	-	H	H	H	M	H	H
CLO-3 :	understand the importance of time management and creativity	3	85	75	M	M	M	-	M	H	M	-	-	H	H	H	M	H	H
CLO-4 :	build confidence during any presentation	3	85	75	M	M	M	-	M	H	M	-	-	H	H	H	M	H	H
CLO-5 :	develop interpretation skills and intercultural communication	3	85	75	M	M	M	-	M	H	M	-	-	H	H	H	M	H	H
CLO-6 :	help the students succeed in competitive exams and placements	3	80	70	M	M	M	-	M	H	M	-	-	H	H	H	M	H	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	IKIGAI	Interpersonal Skills	Creating brands – activity (posters, flyers, business cards)	Value of Time	Intercultural communication – beliefs, customs and attitude of people in different countries (US, UK, Japan, West Asia, China, Russia)
	SLO-2	IKIGAI	Emotional Intelligence	Creating brands – activity (posters, flyers, business cards)	Diagnosing Time Management	Social and cultural etiquettes
S-2	SLO-1	Attitude	Importance of Team Work	Causes of Stress and Its Impact	Weekly Planner, To do list, Prioritizing work	Communication etiquettes

	SLO-2	Factors influencing Attitude	Team Building Activity	How to Manage Stress and Distress?	Time management activity	Telephone etiquettes
S-3	SLO-1	SWOT Analysis	Leadership skills	Understanding the Circle of Control	Creativity – think out of the box	Dinning etiquettes
	SLO-2	Individual SWOT Analysis – activity	Leadership skills based Activity	Stress Busters	Creativity Activity	Grooming etiquettes
S-4	SLO-1	Extempore Practice Session	Networking skills	Conflicts in Human Relations – reasons	Creativity Assessment Activity	Ice breaking
	SLO-2	Extempore Practice Session	Networking skills based Activity	Approaches to conflict resolution	Creativity Assessment Activity	Designing ice breaker games
S-5	SLO-1	Extempore Practice Session	Negotiation skills	Conflict resolution – case studies	Brainstorming, use of groups and individual brainstorming techniques to promote idea generation	Ice breaker activity
	SLO-2	Extempore Practice Session	Negotiation skills based Activity	Conflict resolution – case studies	Brainstorming session activities	Ice breaker activity
S-6	SLO-1	Extempore Practice Session	Entrepreneurial Skills	Importance and necessity of Decision Making	Brainstorming session	Introduction to resume building
	SLO-2	Extempore Practice Session	Entrepreneurial knowledge, Focus, Investment, Risk tolerance, Resilience, Negotiation, Ethics, Networking	Process of Decision Making, Practical Way of Decision Making, Weighing Positives and Negatives	Brainstorming session	Introduction to resume building

Learning Resources	1. Jeff Butterfield, Soft Skills for Everyone, CENGAGE, India, 2015 2. Dr. K. Alex, Soft Skills, S.Chand Publishing & Company, India, 2014 3. Covey Sean, Seven habits of highly effective teens, Simon & Schuster, New York, 2014	4. Carnegie Dale, How to win friends and influence people, Simon and Schuster, New York, 2016 5. Thomas A Harris, I am ok, you are ok, Arrow, London, 2012 6. Daniel Coleman, Emotional Intelligence, Bloomsbury, India, 2016

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%) #
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
1. Ajay Zener, Director, Career Launcher	-	1. Mr Priyanand, Assistant Professor, CDC, E&T, SRMIST
		2. Ms Sindhu Thomas, Head in charge, CDC, FSH, SRMIST
		3. Ms Mahalakshmi, Assistant Professor, CDC, FSH, SRMIST

Course Code	ULT20G02J	Course Name	*Tamil-II*		Course Category	G	Generic Elective Course	L	T	P	C
								2	0	2	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*		Progressive Courses	*Nil*	
Course Offering Department	*Tamil*		Data Book / Codes/Standards			*Nil*	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning						Program Learning Outcomes (PLO)												

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*To generate in students a sensitivity to gender marginalization and Eco sensitivity.*																		
CLR-2 :	*An evolved consciousness in the minds to accommodate all is developed*																		
CLR-3 :	*The ability to accept all and to co- exist is initiated*																		
CLR-4 :	*To create community connectivity and interdependence is initiated*																		
CLR-5 :	*To instill language skills*																		
CLR-6 :	*To give them all the historical insights*																		

Column headers (PLO): Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%) | Fundamental Knowledge, Application of Concepts, Link with Related, Procedural Knowledge, Skills in Specialization, Ability to Utilize, Skills in Modeling, Analyze, Interpret Data, Investigative Skills, Problem Solving Skills, Communication Skills, Analytical Skills, ICT Skills, Professional Behavior, Life Long Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	To acquire knowledge about Tamil Language	2	75	60	H	H	H	-	-	H	H	H	H	H	H	H	H	H	H
CLO-2 :	To strengthen the knowledge on concept, culture, civilization and translation of Tamil	2	80	70	-	H	-	H	H	H	H	-	-	H	H	H	H	H
CLO-3 :	To develop content using the features in Tamil language	2	70	65	H	-	-	H	-	H	H	H	-	H	H	H	H	H
CLO-4 :	To use Tamil Language and Literature to enhance their creativity	2	70	70	H	-	H	M	H	-	-	-	H	H	H	H	H	H
CLO-5 :	To improve communication and creative expression in Tamil language	2	80	70	-	H	-	H	-	H	H	-	-	H	H	H	H	H
CLO-6 :	To enable the students to speak and write in chaste Tamil	2	75	70	H	H	H	H-	H	H	H	H	H	H	H	H	H	H

Duration (hour)		12	12	12	12	12
S-1	SLO-1	தமிழில் காலந்தோறும் அகமரபு	களப்பிரர் காலம்	பல்லவர் காலம்	சங்ககால வரலாறு	தமிழ்ச் சிறுகதைப் போக்குகள்
	SLO-2	அக இலக்கியப் போக்குகள்	அறமும் வாழ்வியலும்	பல்லவர் கால இலக்கியம்	சங்ககால மக்களின் வாழ்வியல்	தமிழ்ச் சிறுகதையும் தமிழ்ச் சமூக வாழ்வியலும்
S-2	SLO-1	எட்டுத்தொகை நூல்களும் பெயர்களும்	திருக்குறள் - உலகப்பொதுமறை	பக்தியும் தமிழும்	முச்சங்கம் – அறிமுகம்	புதுமைப்பித்தன் - அகல்யை
	SLO-2	எட்டுத்தொகையில் அக நூல்கள்	திருக்குறள் கட்டமைப்பு	பக்தி இலக்கியங்கள்	முச்சங்க வரலாறு	தொன்மம் – கட்டுடைப்பு
S-3	SLO-1	ஐங்குறுநூறு (203)	தமிழில் வினை	சைவ சமய இலக்கியங்கள்	செம்மொழி இலக்கியங்கள்	அகிலன் - ஒருவேளைச் சோறு

	SLO-2	தலைவனின் நாட்டுப் பெருமை	திருக்குறள் - வினைத்திட்பம் (67)	தேவார மூவர்	பாட்டும் தொகையும்	தொழிற்புரட்சியும் விவசாயமும்
S-4	SLO-1	குறுந்தொகை (130)	உழவும் தமிழர் வாழ்வும்	தேவாரம் – திருஞான சம்பந்தர் பாடல்	எட்டுத்தொகை உருவாக்கப் பின்புலம்	ஆண்டாள் பிரியதர்ஷினி – மாத்திரை
	SLO-2	அகவாழ்வில் நம்பிக்கை வேர்கள்	திருக்குறள் - உழவு (104)	தேவாரம் – திருநாவுக்கரசர் பாடல்	எட்டுத்தொகையும் தமிழர் வாழ்வியலும்	குடும்பம் – கட்டமைப்பு
S-5	SLO-1	பண்டைத் தமிழரின் வாழ்வியல்	சமண சமய இலக்கியங்கள்	திருவாசகம் அறிமுகம்	பத்துப்பாட்டு உருவாக்கப் பின்புலம்	பாரததேவி - மாப்பிள்ளை விருந்து
	SLO-2	பண்டைத் தமிழர் உணர்வியல்	நாலடியார்	மாணிக்கவாசகர் பாடல்	பத்துப்பாட்டும் தமிழர் வாழ்வியலும்	எளிய மனிதர்களின் கதை
S-6	SLO-1	அகநானூறு (44)	இலக்கியங்களில் நட்பு	வைணவ சமய வளர்ச்சிப் போக்கு	பதினெண் கீழ்க்கணக்கு நூல்கள்	சிங்கார வடிவேலு – தவிப்பு
	SLO-2	புறவாழ்வோடு கூடிய அகம்	நட்பில் பிழை பொறுத்தல் (221)	வைணவ சமய இலக்கியங்கள்	பதினெண் கீழ்க்கணக்கும் தமிழர் அற மரபும்	புறக்கணிப்பின் வலி
S-7	SLO-1	கற்றறிந்தார் ஏத்தும் கலி	தமிழர் மருத்துவம்	நாலாயிரத் திவ்யப் பிரபந்தம்	நீதி இலக்கியங்கள்	செய்தி அறிக்கை அறிமுகம்
	SLO-2	கலித்தொகை கட்டமைப்பு	நீதி இலக்கியத்தில் மருத்துவ நூல்கள்	பெரியாழ்வார் பாடல்	நீதி இலக்கியங்களின் பன்முகத் தன்மைகள்	செய்தி அறிக்கை தயாரித்தல்
S-8	SLO-1	கலித்தொகை (149)	திரிகடுகம்	ஆண்டாள் பாடல்	காப்பிய இலக்கணம்	விமர்சனம்
	SLO-2	வாழ்வியல் அறமும் அகமும்	செங்கோல் அரசு	தொண்டரடிப்பொடி ஆழ்வார் பாடல்	காப்பியப் போக்குகள்	இலக்கியம், கலை விமர்சனம்
S-9	SLO-1	தமிழர் புறமரபு	இனியவை நாற்பது அறிமுகம்	தமிழில் இஸ்லாமிய இலக்கியங்கள்	ஐம்பெருங்காப்பியங்கள்	நேர்காணல் அறிமுகம்
	SLO-2	புற இலக்கியங்கள்	இனியவை நாற்பதின் தனித்தன்மைகள்	இஸ்லாமிய இலக்கியங்களின் கொடை	ஐம்பெருங்காப்பியங்களின் சிறப்புகள்	நேர்காணல் – நுட்பங்கள்
S-10	SLO-1	புறநானூறு (235)	இனியவை நாற்பது (14)	சீறாப்புராணம்	தமிழ்ச் சமூகமும் சமயத் தத்துவங்களும்	நேர்காணல் கேள்வி தயாரிப்பு
	SLO-2	கையறுநிலை	இனிமையும் அழகும்	மானுக்குப் பிணைநின்ற படலம் (5 பாடல்கள்)	சமயத் தத்துவங்களும் வாழ்வியல் விழுமியங்களும்	நேர்காணல் பதிவும் எழுது முறையும்
S-11	SLO-1	ஆற்றுப்படை அறிமுகம்	பண்டைக்காலப் போரும் வாழ்வும்	கிறித்தவ சமய இலக்கியங்கள்	பன்னிரு திருமுறை அறிமுகம்	பேச்சுக்கலை அறிமுகம்
	SLO-2	ஆற்றுப்படை மரபுகள்	போர் இலக்கியங்கள்	கிறித்தவ இலக்கியங்களின் கொடை	பன்னிரு திருமுறை வரலாறு	தமிழரின் பேச்சுக்கலை

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S-12	SLO-1	சிறுபாணாற்றுப்படை	களவழி நாற்பது (14)	ஆதிநந்தாவனப் பிரளயம்	நாலாயிரத் திவ்யப் பிரபந்தம் – அறிமுகம்	பேச்சுக்கலையின் வகைகள்
	SLO-2	நல்லியக்கோடனும்பாணர் வாழ்வியலும்	தமிழர் வீரம்	ஏதேன் தோட்ட வருணனை	பன்னிரு ஆழ்வார்கள் வரலாறு	பேச்சுப் பயிற்சி

Learning Resources	1. மெளவல், தொகுப்பும் பதிப்பும் - தமிழ்த்துறை ஆசிரியர்கள், தமிழ்த்துறை, எஸ்.ஆர்.எம். அறிவியல் மற்றும் தொழில்நுட்பக் கல்விநிறுவனம், காட்டாங்குளத்தூர், **603203, 2020.** 2. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2017 3. மு. அருணாசலம், தமிழ் இலக்கிய வரலாறு, நூற்றாண்டு முறை (9ஆம் நூ. முதல் 16 வரை), தி பார்க்கர், சென்னை, 2005 **4.** தமிழ் இணையக் கல்விக்கழகம் - **http://www.tamilvu.org/** 5. மதுரை தமிழ் இலக்கிய மின் தொகுப்புத் திட்டம் - **https://www.projectmadurai.org/**

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	30%	30%	30%	30%	30%	-
	Understand										
Level 2	Apply	40%	40%	50%	50%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	30%	20%	20%	20%	20%	20%	20%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Expert from Higher Technical Institutions	Internal Experts
1. Dr. R..Srinivasan, Associate Professor, Department of Tamil, Presidency College, Chennai.	1. B.Jaiganesh, Assistant Professor & Head, FSH, SRMIST
	2. T.R.Hebzibah Beulah Suganthi, Assistant Professor, FSH, SRMIST
	3.S.Saraswathy, Assistant Professor, FSH, SRMIST

Course Code	ULH20G02J	Course Name	HINDI-II		Course Category	G	Generic Elective Course	L	T	P	C
								2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department	HINDI	Data Book / Codes/Standards			Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To be able to converse well in the Hindi Language																		
CLR-2 :	To read and write and clarity																		
CLR-3 :	To be willing listeners and translators –where need be																		
CLR-4 :	To acquire the values/thought contents of the writers and practice in it in life.																		
CLR-5 :	To find motivation through the various forms of literature and learn to overcome any challenges of life.																		
CLR-6 :	To discover the importance of the language in making education as a means of growth in life and not mere literacy.																		

Level of Thinking (Bloom) | Expected Proficiency (%) | Expected Attainment (%) | Fundamental Knowledge | Application of Concepts | Link with Related Disciplines | Procedural Knowledge | Skills in Specialization | Ability to Utilize Knowledge | Skills in Modeling | Analyze, Interpret Data | Investigative Skills | Problem Solving Skills | Communication Skills | Analytical Skills | ICT Skills | Professional Behavior | Life Long Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	To acquire knowledge about Medieval and Modern Poetry.	2	75	60	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	To consider the relevance of the present trends in Hindi and their contemporary relevance.	2	80	70	-	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	To help develop better understanding of the Hindi language by studying the stories with reference to current reality.	2	70	65	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	To understand the usage of the present Advertising trends and its creative angles with the varied skills of Hindi Language.	2	70	70	H	-	H	H	H	-	-	-	-	-	H	-	-	-	-
CLO-5 :	To make translation of good literature and any relevant document from the Hindi Language to English and Vice-versa.	2	80	70	-	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	To help the learner to tackle Administrative terminologies, help them use Idioms and Phrases in their daily life, with ease.	2	75	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Kavye ke guno se awagat karana – Jaysi	Kahani Idkiyan	VIGYAPAN	ANUVAD	Takniki Shabdavali
	SLO-2	Ishk hakiki evam moksh bhava se awagat karana	Nari Shakti ki sarthakata	Srijnatamak kshmata jagrit karna	Vidhyarthiyon ko sikhaya jayega anuvad kitna upyogi hai	Vaignik tarike se bhashaon ka avishkaar karna
S-2	SLO-1	Surdas – Vatsalya ras se awagat karana	Kahani gunda Prem ki prakashtha se awagat karvana	VIGYAPAN KYA HAI	ARTH	ARTH

	SLO-2	Bhakti Bhavna se vidhyarthiyon ko jodna	Prtantr bharat ki samajik vyavstha se awagat karvana	Shabdavali evam chitratamakta se awagat karvana	Vidhyarthiyon dwara arth smajkar samaj ke liye mahtavpurn karya kar payenge	Vidhyarthi uske arth dwara hi uske mahtav smjhenge
S-3	SLO-1	Tulsidas-Manav mulyon ki prabal bhavna jagrit karna	KAHANI KE TATVA	VIGYAPAN KI BHASHA	PARIBHASHA	PARIBHASHA
	SLO-2	Dharmik Parvarti se awagat karana	Kahani ke tatva ki mahatta se awagat karvana	Bhasha ki abhivyakti ke pryog ko smjhana	Vibhinn vidwano dwara di gai paribhasha se us baat ko smjhenge vidhyathi	Vibhinn vidwano dwara di gai paribhasha se us baat ko smjhenge vidhyathi
S-4	SLO-1	Tiruvaluvaar – naitik mulyon ko jagrit karna	KAHANI KE AAYAM	VIGYAPAN KA PRBHAV	MAHATVA	SHABDAVALI KI AVSHYAKTA
	SLO-2	Vidhyarthiyon ko nitivaan bnana	Vidhyarthiyon ko kahani ke vidhinn ayam se awagat karvana	Shravaya-drishya samgri ke prbhav ki upyogita	Samijik jan-jeevan ke liye anuvad ke mahtav ko smjhana.	Vaignikon ka awiskar kitna mahtavpurn
S-5	SLO-1	Desh prem ki bhavna bharna	LEKHAK PARICHAY	VIGYAPAN AUR BAZAR	UDDESHYA	BHASHA VAIGYANIK
	SLO-2	Krantikari vicharon se Awagat karana	Lekhako ke jivan se awagat karvana	Vidhyarthioyon ko vigyapan se bazar me kaise sthapit kiya ja skata hai batana	Vidhyarthi anuvad ke uddeshya ko smajhkar samaj upyogi karya krne me apni sarthak bhumika nibhayenge	Bhasha vaignikon ki jankari
S-6	SLO-1	Badal Raag- Desh prem ki bhavna bhrna	KAHANI PATH	VIGYAPAN AUR ROZGAR	HINDI-ENGLISH	KARYALYIN SHABD
	SLO-2	Krantikari vicharo se awagat karana	Vidhyarthiyon ko kahani path ke dwara unka vak kausal majbut karna	Vidhyarthi savam ka ad-agency bhi bna paye	Hindi adhikarai aur anuvadak ke pad ke liye tayaar karna	Shabd kaise tayar kiye jate hain vidhyorthiyon ko jankari
S-7	SLO-1	Pret ka Byaan -Bhukhmari evam akaal se awagat karana	KAHANI KA SARANSH	VIGYAPAN KI NIYAM	ENGLISH-HINDI	ANGREZI SE HINDI ANUVAD
	SLO-2	Samajik samanta banaye rkhne ki pravarti jagana	Lekhan kshmata ka vikas hona	Vigyapan ka ek hi niyam bhasha ka kashav jo vidhyarthiyon me viksit kiya jayega	Hindi adhikarai aur anuvadak ke pad ke liye tayaar karna	Hindi adhikarai aur anuvadak ke pad ke liye tayaar karna
S-8	SLO-1	Lahro se dark a nauka paar nhi hoti –chatro ko sahashi bnana	KAHANI KA UDDESHYA	VIGYAPAN KA MAHTVA	ANUVAD KI UPYOGITA	HINDI SE ANGREZI ANUVAD
	SLO-2	Karmaththa purn bhavna ko jagrit karna	Kahani ke uddeshy unke jiwan ke mahtav ko smjhne me sahayk banna	Vartman me uski prasangikta vidhyarthiyon ko smjhana	Vidhyarthiyon ko vibhin karyalayon me hindi adhikari pad ki jankari prapt	Hindi adhikari aur anuvadak ke pad ke liye tayaar karna.
S-9	SLO-1	Javani –rashtr prem ki bhavna jagrit karna	KAHANI KA VISHELESHAN	PRINT VIGYAPAN	ANUVADk KI BHUMIKA	EK DIN EK SHABD
	SLO-2	Vir ras evam virta ki pravati se awagat karana	Vishleshan kshmata viksit hota	Vidhyarthi iski bhasha sikhenge	Vidhyarthiyon ko anuvadak ki bhumika ka mahtav smajh aayega jiske adhar par vo kaam karenge	Vidhyarthiyon ko rozgaar se jodna
S-10	SLO-1	Dhool- saman vyavhar ki pravarti jagana	KAHANI PARICHARCHA	RADIO, TV.VIGYAPAN	SAHITYIK ANUVAD	PRYOJANMULAK SHABD KA MAHTAVA
	SLO-2	Satah se jude rahne ke prerna dena.	Vaad-vivad se vidhyarthiyon me apni baat ko rkhne ki yogyata banna	Vidhyarthiyon ko abhyas karvaya jayega	Vibhinn bhashaon ke sahitya ka anuvad kaise kiya jane ki chunouti ko samjajh payenge	Vidhyarthiyon ko vaighniko dwara tayaar ki gai bhasha ki samaj

S-11	SLO-1	KAVYA BIBM	KAHANI ANDOLAN	Ad agency	ANUVAD KE NIYAM	VIBHINN KSHETRO ME PRYOJANMULAK SHABDO KA MAHATAV
	SLO-2	Vidhyarthiyon ko naye-naye bibm ki jankari prapt hona	Vibhinn kahani andolan se bhi awagat karana	Ad agency aur swarozgaar se jodna	Anuvad ke niyamo ko vidhyarthi smajh payenge	Hindi adhikari pad par karyarat
S-12	SLO-1	SAMUHIK PARICHARCHA	KAHANI KA BADLTA SWAROOP	VIGYAPAN KA SWARUP	SHABDO KA MAHATAV	VAIGYANIK SHABDAVALI KI AVSHYAKATA
	SLO-2	Vidhyarthiyon ki bolne ki kaushal kshamta ko bdhana	Smay ke sath unke swarup ke bdlav ka bhi vidyarthi me samajh paida hona	Vidhyarthiyon ko vigyapan lekha ki barikayon ki samajh utpann hona	Shabda anuvad ke mahtva ko vidhyarthi smajhenge	Vidhyarthiyon ko shabdo ki vaignikta se jodna

Learning Resources	*The Prescribe Text Book Compiled and Edited by Department of Hindi* *www.kavitakosh.org* *www.shabdkosh.com*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	40%	50%	50%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	30%	20%	20%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Expert from Higher Technical Institutions	Internal Experts
1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST
	2. Dr. Md.S. Islam Assistant Professor, SRMIST
	3 Dr. S. Razia Begum, Assistant Professor, SRM IST

Course Code	ULF20G02J	Course Name	*FRENCH-II*		Course Category	G	Generic Elective Course	L	T	P	C
								2	0	2	3

Pre-requisite Courses	*Nil*		Co-requisite Courses	*Nil*		Progressive Courses	*Nil*			
Course Offering Department	*French*		Data Book / Codes/Standards			*Nil*				

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Strengthen the language of the students both in oral and written																		
CLR-2 :	Express their sentiments, emotions and opinions, reacting to information, situations																		
CLR-3 :	Make them learn the basic rules of French Grammar.																		
CLR-4 :	Develop strategies of comprehension of texts of different origin	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-5 :	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French																		
CLR-6 :	*Extend and expand their savoir-faire through the acquisition of current scenario*																		

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*																		
CLO-1 :	*To acquire knowledge about French language*	2	75	60	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*To strengthen the knowledge on concept, culture, civilization and translation of French*	2	80	70	-	H	-	H	-	-	-	-	-	-	M	-	-	-	-
CLO-3 :	*To develop content using the features in French language*	2	70	65	H	-	-	H	-	-	-	-	-	H	-	-	-	-	-
CLO-4 :	*To interpret the French language into other language*	2	70	70	H	-	H	H	H	-	-	-	-	H	-	-	-	-	-
CLO-5 :	*To improve the communication, intercultural elements in French language*	2	80	70	-	H	-	H	-	-	-	-	-	H	-	-	-	-	-
CLO-6 :	To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French	2	75	70	H	-	M-	H	H	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Les loisirs	La routine	Où faire ses courses ?	Découvrez et dégustez	Tout le monde s'amuse
	SLO-2	Les activités	Les exemples	Les courses	Dégustez	Le monde
S-2	SLO-1	Les activités quotidiennes	Les adjectifs interrogatifs	Les aliments	Les articles partitifs	Les sorties
	SLO-2	Les quotidiennes	Les trois formes	Les exemples	Du, De la, De l', Des	Les exemples
S-3	SLO-1	Les matières	Les nombres ordinaux	Les quantités	Le pronom en (la quantité)	Situer dans le temps
	SLO-2	Les exemples	Les nombres	Les exemples	Le bon quantité	Les activités
S-4	SLO-1	Le temps	L'heure	Les commerces	Très ?	Les vêtements
	SLO-2	L'heure	Quelle heure est-il ?	Les activités	Beaucoup ?	Les accessoires
S-5	SLO-1	Les fréquences	Le pronom personnel COD	Les commerçants	La phrase négative (2)	**Les ados au quotidien**
	SLO-2	Les activités	Les exemples	Les exemples	Les négations	**La vie quotidienne**
S-6	SLO-1	Les sons [u]	Les pronominaux	Demander le prix	C'est /Il est	Les adjectifs démonstratifs

	SLO-2	Les sons [y]	Se promener, se coucher etc…,	Dire le prix	Les activités	Ce, Cet, Cette, Ces
S-7	SLO-1	Les loisirs	Les verbes du premier groupe	Les services	L'impératif	La formation du féminin
	SLO-2	Les exemples	Parler, Demander, Poser	Les exemples	Les exemples	Les exemples
S-8	SLO-1	La routine	groupe en –e_er,é_er,-eler,-eter	Les moyens de paiement	Les verbes devoir, pouvoir	Le pronom indéfini on
	SLO-2	Les activités	Appeler, Jeter etc..,	La carte de crédits	Les verbes savoir, vouloir	Les activités
S-9	SLO-1	Les Mots	Le verbe prendre	les sons [ã]	Il faut	Le futur proche
	SLO-2	Les expressions	Les exemples	Les sons [an]	Le verbe impersonnel	S+Aller+Infinitif du verbe
S-10	SLO-1	Exprimer ses gouts	Parler de ses gouts	Découvrez !	Au restaurant : Commander et commenter	Le passe composé
	SLO-2	Les exemples	Des gouter	Dégustez !	Les restaurant	Les exemples
S-11	SLO-1	Exprimer ses préférences	Parler de ses préférences	Au restaurant : commander	Inviter à une invitation	Les verbes voir et sortir
	SLO-2	Les activités	Les exemples	Au restaurant : commenter	Répondre à une invitation	Décrire une tenue
S-12	SLO-1	Décrire sa journée	Décrire sa journée	Inviter à une invitation	Les Mots	écrire un message amical
	SLO-2	Les exemples	Les activités	Répondre à une invitation	Les expressions	Lire un message

Learning Resources	*Theory:* 1. **"Génération-AI"** Méthode de français, Marie-Noëlle COCTON, P.DAUDA, L.GIACHINO, C.BARACCO, Les éditions Didier, Paris, 2018. *2.Cahier d'activités avec deux discs compacts.*

Learning Assesment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	40%	50%	50%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	30%	20%	20%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Expert from Higher Technical Institutions	Internal Experts
1. Dr. C.Thirumurugan Associate Professor, Department of French, Pondicherry University	*1. Kumaravel K. Assistant Professor & Head, SRMIST*
	2. Ponrajadurai M Assistant Professor, SRMIST

Course Code	UDS21201J	Course Name	*INTRODUCTION TO DATA SCIENCE*	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1 : Understand the basics of Data Science		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 : Learning and implementing the fundamentals of Python for data science																			
CLR-3 : Exploring python libraries and data analysis methodologies like Exploratory Data Analysis																			
CLR-4 : Learning basic and advanced concepts in Machine Learning and Deep Learning																			
CLR-5 : Understanding Computer Vision and Data Visualization																			
CLR-6 : Appreciate the applications and implications of Data Science using Python																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 : Learn the fundamentals of Data Science and its methodologies		3	80	70	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H
CLO-2 : Implementation of data science concepts using python		3	85	75	H	H	H	H	H	-	M	-	H	H	-	-	M	H	H
CLO-3 : Execution of various libraries in python		3	75	70	H	H	M	H	H	-	M	-	H	H	-	-	M	H	H
CLO-4 : Knowledge of Machine Learning and Deep Learning using python libraries		3	85	80	H	H	H	-	-	-	-	-	H	M	-	-	M	H	H
CLO-5 : Exploring the data using various OpenCV and Matplotlib		3	85	75	H	M	M	M	M	M	M	-	H	H	-	M	M	H	H
CLO-6 : Apply data science concepts using python		3	80	70	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Data Science Defined**	Modelling Data	Creating Numpy Array Slicing	Getting Exploratory with Data Analysis	Text Processing In NLTK
	SLO-2	*Data Science Overview*	Modelling Evaluation	Numpy Data Types	Initial Data Exploration with Simple Pandas Functions	Text Processing – Tokenizing
S-2	SLO-1	*Data Science Methodologies Overview*	**Unit 4: Data Science Essential Skill Matrix**	Numpy Array Shape and Reshape	Univariate Analysis	Text Processing – Stop Words
	SLO-2	*Data Science Pipeline*	Introduction to Data Science Essential Skill Matrix	Numpy Data Joins, Split, Search	Biivariate Analysis	Text Processing – Stemming
S-3	SLO-1	*Data Engineering*	Mathematics and Statistical Skills	**Unit 7: Scientific Computing with Python (Scipy)**	**Unit 10: Machine Learning with Scikit-Learn**	Text Processing – Part of Speech

	SLO-2	*Data Preparation, Exploration*	Essential Programming Skills	Getting Started with SciPy	Getting started with Machine Learning with Scikit-Learn	Text Processing – Lemmatizing
S-4	SLO-1	**Unit 2: Data Science vs. Business Intelligence vs Artificial Intelligence**	Data Engineering Skills	SciPy Constants	Getting started with Scikit-Learn	**Unit 13: Computer Vision with OpenCV**
	SLO-2	Data Science vs. Business Intelligence	Data Visualization Skills	SciPy Optimizers	Exploring the Famous Iris Dataset	Getting started with Computer Vision
S-5 to S-6	SLO-1 SLO-2	**Lab 1: Perform Analysis on Simple Dataset I for Data Science and Business Intelligence Applications**	**Lab 4: Perform Analysis on Simple Data for Matehematical, Numerical, Data Engineering Processing**	**Lab 7: Apply Scientific functions on a given dataset with SciPy**	**Lab 10: Install, Import Scikit Learn and Explore Iris Dataset with Pandas for ML Modelling**	**Lab 13: Install, Import OpenCV and Explore an Simple Image for Image Processing**
S-7	SLO-1	Data Science vs. Artificial Intelligence	Business and Communication Skills	SciPy Sparse Data	Machine Learning Workflow	Getting started with Computer Vision library OpenCV
	SLO-2	Types of Analysis	Ethical Skills	SciPy Graphs	Simple Machine Learning Implementation with the Iris Dataset	NumPy and Image Basics
S-8	SLO-1	Similarities Between Data Science and Business Intelligence	**Unit 5: Python for Data Science**	SciPy Spatial Data Overview	**Unit 11: Deep Learning with TensorFlow and Keras**	Image Processing with OpenCV
	SLO-2	Data Science alignment with Business Intelligence	Introduction to Python	SciPy Spatial Data Processing		Video Processing with OpenCV
S-9	SLO-1	Data Science Reinforcement with Business Intelligence	Expression and Variables	SciPy Spatial Matlab Arrays	Getting started with Deep Learning with TensorFlow and Keras	Object Detection with OpenCV
	SLO-2	Data Science and Business Intelligence Together: Future	Pythong String Operations	SciPy Interpolation	Getting started with TensorFlow	Object Tracking with OpenCV
S-10	SLO-1	Three Features for Data Science and Business Intelligence	Python Data Structures: List, Tuple, Dictionary, Sets.	**Unit 8: Data Manipulation with Pandas**	Getting started with Keras	**Unit 14: Data Visualization in Python using Matplotlib**
	SLO-2	Getting Started with Data Science, Business Intelligence and AI Journey	Python Conditional Statements		Deep Learning Framework	
S-11 to S-12	SLO-1 SLO-2	**Lab 2: Perform Analysis on Simple Dataset II for Data Science and Business Intelligence Applications**	**Lab 5: Install Python and apply all basic python functions**	**Lab 8: Install, Import Pandas Learn and Explore a Sample Dataset with it**	**Lab 11: Install, Import Tensorflow and Keras. Create a Basic Neural Network with few layers.**	**Lab 14: Install, Import Matplotlib. Explore all the Data Visualization Graphs.**

S-13	SLO-1	**Unit 3: Data Science Methodologies**	Python Branching Statements	Getting Started with Data Manipulation with Pandas	Deep Learning Workflow	Getting started with Data Visualization
	SLO-2	Introduction to Data Science Methodologies	Python Case Statements	Installing and Using Pandas	Deep Learning Model Features	Getting started with Data Visualization Library Matplotlib
S-14	SLO-1	Business Understanding	Loops, Funcions and Exception Handling	Exporing a data file Using Pandas	Deep Learning Model Performance	Bar. Column, Pie Graph using matplolib
	SLO-2	Problem Statement Formulation	Objects and Classes	Reading Data from a Excel file	Simple Deep Learning Implementation with the Iris Dataset	Box Plot using matplolib
S-15	SLO-1	Analytic Understanding	**Unit 6: Mathematical Computing with Python (NumPy)**	Reading Data from a .csv file	**Unit 12: Natural Language Processing with NLTK**	Histogram using matplolib
	SLO-2	Understanding Data Requirements	Getting Started with Numpy	Reading Data from a .txt file		Lineplots and Sub Plots Using Matplotlib
S-16	SLO-1	Data Collection	Creating Numpy Arrays	**Unit 9: Exploratory Data Analysis**	Getting started with Natural Language Processing	Scatter Plot Using Matplotlib
	SLO-2	Data Understanding	Creating Numpy Array Indexing	Getting Exploratory with Data Analysis	Getting started with NLP library NLK	Plot Custimizations, Saving Plots
S-17 to S-18	SLO-1	**Lab 3: Collect and Understand a simple data for a Data Science Application.**	**Lab 6: Install and perform a Numerical Array Processing using NumPy**	**Lab 9: Install and perform a simple Exploratory Data Analysis using Pandas**	**Lab 12: Install and perform a simple text processing using NLTK**	**Lab 15: Creata all Data Visualization Plots using Matlotlib**
	SLO-2					

Learning Resources	.1. https://deepsphereai.litmos.com/ *2. Kenneth A. Lambert, (2011), "The Fundamentals of Python: First Programs", Cengage Learning*	1.Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016. 2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015. 3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Level 3	Evaluate Create	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRM IST
		Mrs. Sudha, SRM IST, RMP

Course Code	UDS21202J	Course Name	ADVANCED COMPUTING WITH DISTRIBUTED DATA PROCESSING	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the concept of advanced computing in recent times																		
CLR-2 :	Learn the basics of cloud computing and serverless computing																		
CLR-3 :	Understand the concept of Real Time Computing																		
CLR-4 :	Identify the concept of Microservice and its Architecture																		
CLR-5 :	Impart the knowledge of Numerical and Scientific Computing with Scala																		
CLR-6 :	Appreciate the applications of advanced computing																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Learn the basics of Traditional Computing	3	80	70	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H
CLO-2 :	Classify different types of Cloud Computing	3	85	75	H	H	H	H	H	-	M	-	H	H	-	-	M	H	H
CLO-3 :	Recognize Web Services and its Architecture	3	75	70	H	H	M	H	H	-	M	-	H	H	-	-	M	H	H
CLO-4 :	Understanding about Python and Scala Programming for AI implementstion	3	85	80	H	H	H	-	-	-	-	-	H	M	-	-	M	H	H
CLO-5 :	Grasp the concept of Google Cloud Platform	3	85	75	H	M	M	M	M	M	M	-	H	H	-	M	M	H	H
CLO-6 :	Apply Advanced Computing in Google Cloud Platform	3	80	70	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Unit 1: Working and Architecture of Cluster Computing Grid Computing and Cloud Computing	Infrastructure -as-a-service	Apache Spark Resilient Distributed Datasets	Typical Application Life Cycle	Overview of Compute Engine
	SLO-2	Overview of Grid Computing	Benefits of Infrastructure -as-a-service	Progamming with Resilient Distributed Datasets	Application Life Cycle with Dynamic Load Balancing	Overview of Kubernetes Engine
S-2	SLO-1	Technology	Unit 4: High Performance Computing	Interactive Spark using PySpark	Use of Dynamic Load Balancing	Overview of Google Cloud Strage

	SLO-2	History of Grid Computing	Introduction to High Performance Computing	Writing Spark Applications	Working of Dynamic Load Balancing	Overview of Cloud SQL and Big Query ML
S-3	SLO-1	Overview of Cloud Computing	Peer to Peer Computing	**Unit 7: OpenMP programming**	**Unit 10: Parallel Meshing and Remeshing**	Overview of Cloud Storage
	SLO-2	History of Cloud Computing	Internet Computing	Getting Started with Memory Programming	Getting Started with Parallel Meshing and Remeshing	Overview of Networking Services
S-4	SLO-1	**Unit 2: Role of Cloud Computing in An AI Implementation**	Grid Computing	Fundamentals of Shared Memory Programming	Large Deformation and Adaptive Remeshing	**Unit 13: Advanced Computing in Google Cloud Platform**
	SLO-2	Cloud Service for AI	Types of Grids	Basic OpenMP Conecpts	Partitioning and Parallel Meshing Technique	Working with Google Cloud GPU
S-5 to S-6	SLO-1	**Lab 1: Study of Cloud Computing & Architecture**	**Lab 4: Case Study on Amazon Web Services**	**Lab 7: Perform a Simple Vector Addition using OpenMP Progreamming**	**Lab 10: Perform a study on Parallel Meshing**	**Lab 13: Perform a study on Google GPU and TPU Options**
	SLO-2					
S-7	SLO-1	Cloud Computing for Improved Productivity	Applications and Architectures of High Performance Grids	Parallel Directive	Parallel Mesh	Connecting Cloud GPU to custom machine types
	SLO-2	Cognitive Computing API's	High Performance Application Development Environment.	Data Scoping Rules	Parallel Mesh Generation	Preemptible Cloud GPU
S-8	SLO-1	Merging AI and Cloud Computing	**Unit 5: High Performance Computing Building Blocks**	Basic Open MP Constructs	**Unit 11: Networking and Storage Options for Advanced Computing**	Machine Learning Performance with Cloud GPU
	SLO-2	Machine Learning Cloud Services	Introduction to High Performance Computing Building Blocks	Open MP Directives		Working with Google Cloud TPU
S-9	SLO-1	Cloud AI Platforms	Models and Protocols	Open MP Calls	Language of Storage	Connecting Cloud TPU to custom machine types
	SLO-2	Types of Cloud Application Development	Components of High Performance Computing	Parallelizing an Existing Code with OpenMP	Understandng the Hard-Dsk Drive	Preemptible Cloud TPU
S-10	SLO-1	Infrastructure-as-a-service	High Performance Computing – Compute	**Unit 8: Message Passing interface (MPI) parallel programming**	Understandng the NAND Flash Drive	**Unit 14: Google Cloud Platform Compute, Kubernetes, App Engine**
	SLO-2	Platform-as-a-service	High Performance Computing – Network		Data Center Storage Configurations	
S-11 to S-12	SLO-1	**Lab 2: Virtualization in Cloud by using KVM and VMware**	**Lab 5: Case Study on Microsoft Azure**	**Lab 8: Write a MPI Program to send data across all processes**	**Lab 11: Perform a study on Networking and Storage Service**	**Lab 14: Perform a study on Google App, Compute, Kubernetes Engine**
	SLO-2					
S-17	SLO-1	**Unit 3: Cloud Computing Buliding Blocks**	High Performance Computing – Storage	Introduction to Messsge Passing Inteface	Modern Storage Technologies	Virtual Machine Instances
	SLO-2	Getting Started with Cloud Computing Building Blocks	High Performance Computing – User Scheduler	Messsge Passing Model	Convergence and Composability	Machine Types
S-13	SLO-1	Cloud Software Building Blocks	High Performance Computing – Compute Cluster	Types of Parallel Computing Model	Cloud Storage	Custom Machine Types

	SLO-2	Cloud Hardware Building Blocks	High Performance Computing – Data Storage	MPI Sources	Data Security and Privacy	Disks and Persistent Disks
S-14	SLO-1	Software-as-a-service	**Unit 6: In memory and Real Time Computing with Scala**	Need for MPI Programming	**Unit 12: Google Cloud Platform Core Infrastructure and Services**	Introduction to Containers
	SLO-2	Benefits of Software-as-a-service	Getting Started with In-memory and Real Time Computing with Scala	Running a MPI Program		Introduction to Kubernetes
S-15	SLO-1	Platform-as-a-service	In-memory computing with Apache Spark	**Unit 9: Dynamic Load Balancing**	Getting Started with Google Cloud Platform	Introduction to App Engine
	SLO-2	Benefits of Platform-as-a-service	Apache Spark Basics	Introduction to Dynamic Load Balancing	Overview of Google App Engine	Key Features of App Engine
S-17 to S-18	SLO-1	**Lab 3: Case study: PaaS (Face Book, Google App Engine**	**Lab 6: Create an Application using Apache Spark. (Ex.: Similarity word count during searching)**	**Lab 9: Perform a study on Asynchronous Dynamic Load Balancer**	**Lab 12: Perform a study on Google Core Infrastructure Services**	**Lab 15: Create a Simple Virtual Machine on Google Compute Service**
	SLO-2					

Learning Resources	.1. https://deepsphereai.litmos.com/ 2. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems - Principles and Paradigms", Second Edition, Pearson, 2006. 3. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", John Wiley& Sons, 2011.	4. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012. 5. .John W.Rittinghouse, James F.Ransome, "Cloud Computing: Implementation "Management, and Security", CRC Press, 2010.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mr.Krishnamoorthy, SRM IST, RMP
		Mrs.Anitha Jasmine, SRM IST

Course Code	UDS21G02T	Course Name	ROLE OF STATISTICS IN AI	Course Category	G	Generic Elective Course	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics and Statistics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR): The purpose of learning this course is to, | Learning | Program Learning Outcomes (PLO)

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Create an understanding on the use of Statistical concepts applied in AI																		
CLR-2 :	Give overview to Applications of Differential/Inferential Statistics in AI																		
CLR-3 :	Clarify the concepts of Correlation and Regression, Distribution and Estimation used in AI																		
CLR-4 :	Learn about the Hypothesis Testing and Methods of Sampling in AI																		
CLR-5 :	Implementation of Statistics in Real Life Applications																		
CLR-6 :	Apply Statistical concepts in AI																		

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Learning the importance of Statistics in AI Implementation	2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 :	Applying Statistics in AI and learning about Statistical Thinking and Descriptive Statistics	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 :	Understanding about Correlation and Regression and Theory of Estimation	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 :	Interpretation of hypothesis testin, Bivariate transformations and sampling methods	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 :	Knowledge of Stochastic processes, Linear Regression, Time Series Analysis	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 :	Realize Statistical concepts used in AI	3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: Statistics in AI**	**Unit 4: Applications of Differential/Inferential Statistics in AI**	**Unit 7: Correlation and Regression**	**Unit 10: Testing of Hypothesis**	**Unit 13: Stochastic processes**
	SLO-2	Getting Started with Statistics for AI	Overview of Differential/Inferential Statistics in AI	Introduction and Correlation I	Getting started with Testing of Hypothesis	Introduction to Stochastic processes
S-2	SLO-1	Fundamentals of Statistics in AI	Differential Statistics	Correlation Coefficient II	Null Hypothesis	Random Variables and Distributions
	SLO-2	Overview of Descriptive Statistics	Inferential Statistics	Testing Correlation I	Alternate Hypothesis	Simple Stochastic Process

S-3	SLO-1	Correlation and Regression	Descriptive Statistics	Testing Correlation II	Testing Hypothesis	Staionary and Auto Regressive Processes
	SLO-2	Probability Theory Concepts	Differential Vs Inferential Statistics	Applications to Measurement	P Value	Discrete Time Markov Chain
S-4	SLO-1	Distribution Function	Population	Range Restriction	Use of P Values in Definition Decision Making	Continuos Time Markov Chain
	SLO-2	Probability Distributions	Sample Group	Simple Regression	Testing Hypothesis about mean of a population	Martingales
S-5	SLO-1	**Unit 2: Why Statistics is Required for an AI Implementation**	**Unit 5: Overview of Statistical Thinking**	**Unit 8: Distributions**	**Unit 11: Bivariate Transformations**	Brownian Methods and its Applications
	SLO-2	Building Knowledge Based Expert Systems	Example of Statistical Thinking	Standard Probability Distributions	Getting Started with Bivariate Transformations	Renewal Processes
S-6	SLO-1	Develop Problem Solving Skills	Numerical Data, Summary Statistics	Sampling Distributions	Transformation of Densities	Branching Processes
	SLO-2	Generate AI Models	Population to Sampled Data	Concept of Sampling and Sampling Distribution	Convolution	Poisson's Processes
S-7	SLO-1	Interpret AI Models	Different Type od Biases	Chi-Square Distribution	Univariate Vs Bivariate Vs Multivariate Transformation	**Unit 14: Real Life Application of Statistics in Linear Regression, Time Series Analysis**
	SLO-2	Abstract Generation of Numerical Results	Associaltion and Dependence	Students Distribution	Distribution of the sum of Poisson variables	Simple Linear Regression for Students Marks Prediction
S-8	SLO-1	Conformance Evaluation	Associaltion and Causation	Snedecor's Distribution	Sum and difference of normal variables	Simple Linear Regression for Patient Weight Reduction
	SLO-2	Integration in Design	Conditional Probabilty and Bayes Rule	Relation among Normal, Chi-Square, t and F Distributions	Distribution of the ratio of normal variables	Simple Linear Regression for Patient Weight Reduction
S-9	SLO-1	**Unit 3: Statistical Skills Matrix Required for an AI Implementation**	**Unit 6: Descriptive Statistics**	**Unit 9: Theory of Estimation**	**Unit 12: Sampling Methods**	Simple Linear Regression for Online Advertising
	SLO-2	Problem Solving Skill	Sampling Techniques	Getting Started with Theory of Estimation	Getting Started with Sampling Methods	Simple Linear Regression for Financial Support Decisions
S-10	SLO-1	Knowledge and Reasoning Skill	Data Classification	Point Estimation	Probabilty Samplng	Time Series - Economic Forecasting
	SLO-2	Inferential Skills	Tabulation	Mean Square Estimation	Overview of simple random sampling	Time Series - Sales Forecasting
S-11	SLO-1	Formulating Hypothesis Skills	Frequency and graphic Representation	Likelihood Estimation	Overview of systematic sampling	Time Series -Budegetary Analysis
	SLO-2	Comparison Classification Skills	Measures of Central Tendency	Method of Moments	Overview of Stratified sampling	Time Series -Stock Market Analysis

S-12	SLO-1	Identifying Variables Skills	Measures of Variation	Method of Maximum Likelihood	Overview of Clustered sampling	Time Series - Process and Quality Control
	SLO-2	Designing Experimental Skills	Quartiles and Percentiles	Criteria of Estimation	Non-Probabilty Samplng	Time Series -Census Analysis

| Learning Resources | 1. https://deepsphereai.litmos.com/
2. Pratap Dangeti, Statistics for Machine Learning, Practical Statistics for Data Scientists, 2nd Edition, 2020 Andrew Bruce and Peter Gedeck,
3. Davis Freedman, Robert Pisani and Roger Purves, An Easy to Understand Guide to Statistics and Analytics, Third Edition, By David M. Levine and David F. Stephan, December 2014
4. Robert A. Donnelly and Fatma Abdel-Raou, Statistics, 3E, July | 5. Gupta, S.C. and Kapoor, V.K.: "Fundamentals of Mathematical Statistics", Sultan & Chand & Sons, New Delhi, 11th Ed, 2002.
6. Hastie, Trevor, et al. "The elements of Statistical Learning", Springer, 2009.
7. Ross, S.M., "Introduction to Probability and Statistics", Academic Foundation, 2011.
8. Papoulis, A. and Pillai, S.U. , "Probability, Random Variables and Stochastic Processes", TMH, 2010 |

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.Lakshmipriya, SRM IST
		Ms.Kalaivani, SRM IST

Course Code	UDS21S02T	Course Name	*INTRODUCTION TO MACHINE LEARNING*	Course Category	S	Skill Enhancement Course	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the concept of machine learning		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-2 :	Learn the basics of Demystifying Artifical Intelligent and machine learning																			
CLR-3 :	Understand the effectiveness of machine learning in real world applications																			
CLR-4 :	Identify the ML implementation framework																			
CLR-5 :	Apply ML concepts to solve business problems																			
CLR-6 :	Learn the ML Development Hardware and Software Requirements																			
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1 :	Understand the Academic and Industry perspectives of ML		2	85	80	H	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-2 :	Learn the concepts of ML & AI		3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-3 :	Able to understand the Machine Learmngreal world applications		3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-4 :	Grasp the ML implementation framework		3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-5 :	Defend the need for ML in providing solution to business problems		3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H
CLO-6 :	Appreciate the application of ML in real world problem solving		3	85	80	L	H	H	H	H	H	-	M	M	L	-	H	-	M	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: Machine Learning Defined - Academic and Industry Perspective**	**Unit 3: Machine Learning in Real World Applications**	**Unit 6: Machine Learning Implementation Framework**	Regression Problem in Machine Learning	**Unit 10: Machine Learning Data Requirements**
	SLO-2	Getting Started with Machine Learning	AI Applied in Health – Case Management Analysis	Defining a Problem Statement	Simple Linear Regression Problem	Introduction to Data Collection Strategy

S-2	SLO-1	Machine Learning Academic and Industry Definition	AI Applied in Health - Care Management Analysis	Data Collection/Data Preparation/Data Provisioning	Simple Non- Linear Regression Problem	Type of Data needed
	SLO-2	Features of Machine Learning	AI Applied in Health – Patient Redmission Analysis	Feature Engineering	Multiple Linear Regression Problem	Useful Known Features
S-3	SLO-1	Types of Machine Learning	AI Applied in Consumer – Customer Churm Analysis	Model Engineering	Multiple Non- Linear Regression Problem	Source of Data
	SLO-2	Machine Learning Approaches	AI Applied in Consumer – Maket Segmentation	Model Deployment	Clustering Problem in Machine Learning	Amount of Data needed
S-4	SLO-1	Machine Learning Techniques	AI Applied in Consumer – Inventory Stock Analysis	**Unit 7: Machine Learning Classification and Regression Problems**	Association Rule Learning in Machine Learning	Quality of Data needed
	SLO-2	Business Challenges of Machine Leanining	AI Applied in Energy -Power Outage Analysis	Introduction to Machine Learning Regression Problems	Ranking in Machine Learning	Data Privacy and Security
S-5	SLO-1	Business Benefits of Machine Leanining	AI Applied in Oil and Gas - Drilling Analysis	Introduction to Machine Learning Classification Problems	**Unit 9: Machine Learning Models**	Permission to Collect and use data
	SLO-2	Well Defined Machine Learning Problems	AI Applied in Oil and Gas -Rig and Fleet Analysis	Difference Between Regression and Classification Problems	Supervised Machine Learning Models	Potential concerns you may have with providing data
S-6	SLO-1	Designing a Machine Learning System	**Unit 4: Machine Learning Workflow**	Regression – Linear Regression	Unsupervised Machine Learning Models	**Unit 11: Machine Learning Development Hardware and Software Requirements**
	SLO-2	Features of Machine Learning	Understanding Machine Learning Workflow	Regression – Polynomial Regression	Reinforcemnt Machine Learning Models	Understanding the Hardware Specifications
S-7	SLO-1	Goals of Machine Learning	Problem Statement	Regression – Ridge Regression	Linear Regression Model	Understanding the Software Specifications
	SLO-2	Applications of Machine Learning	Data Engineering	Regression – Lasso Regression	Logistic Regression Model	Configuration of Workstations
S-8	SLO-1	**Unit 2: Demystifying Artificial Intelligence and Machine Learning**	Model Engineering	Classification – Logistic Regression	Decision Tree Regressor	Processor Configuration
	SLO-2	Defining Artificial Intelligence	Model Deployment	Classification – Naïve Bayes	Decision Tree Classifier	Motherboard Configuration
S-9	SLO-1	Defining Machine Learning	**Unit 5: Machine Learning Architecture**	Classification – Random Forest	Random Forest Regressor	RAM Configuration
	SLO-2	Artificial Intelligence and Cognitive Technologies	Understanding Machine Learning Architecture	Classification – Random Forest	Random Forest Classifier	Hard Disk Configuration
	SLO-1	Cognitive Technologies	Data Collection	Classification – XGBoost	XGBoost Classifier	GPU Configuration

		Already is Use				
S-10	SLO-2	Impact of Cognitive Technologies	Data Integration	**Unit 8: What Problem Machine Learning Solves**	Support Vector Machines	Scikit Learn
S-11	SLO-1	Features of Cognitive Technologies	Data Provisioning	Getting Started with Machine Learning Problem Types	Naïve Bayes Classifier	Numpy
	SLO-2	Benefits of Cognitive Technologies	Feature Engineering	Understanding Machine Learning Problem Types	K Nearest Neighbour	Pandas
S-12	SLO-1	Growth of Cognitive Technologies	Model Engineering	Classification Problem in Machine Learning	K-means Clustering	SciPy
	SLO-2	Role of Cognitive Technologies in an Enterpriose Implementation	Model Deployment	List of Classification Models	Hierarchical Clustering	Matplotlib

Learning Resources	1. https://deepsphereai.litmos.com/ 2. Introduction to Machine Learning with Python, By Andreas C. Müller and Sarah Guido, October 2016 3. Essential Machine Learning and Pragmatic AI, By Noah Gift, December 2018	4. Stanford Lectures of Andrew Ng. 5. Machine Learning Yearning by Andrew Ng, deeplearning.ai, 2018 6. Hands-On Unsupervised Learning Using Python, By Ankur A. Patel, March 2019 7. Clustering and Unsupervised Learning, By Angie Ma, Gary Willis and Alessandra Stagliano, August 2017Introduction to Machine Learning , Alex Smola and S.V.N. Vishwanathan

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect, DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.Dhilipan, SRM IST, RMP
		Dr.R.Jayashree, SRM IST

Course Code	UCD20S02L	Course Name	QUANTITATIVE APTITUDE AND REASONING	Course Category	S	Skill Enhancement Course	L	T	P	C
							0	0	2	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Carrer Guidance and Development	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR): The purpose of learning this course is to:

CLR-1 : Demonstrate various principles involved in solving mathematical concepts

CLR-2 : Develop interest and awareness in students regarding profit/ loss, interest calculations and average

CLR-3 : Critically evaluate basic mathematical concepts related to mixtures and alligations, permutation and combination, time and work

CLR-4 : Provide students with skills necessary to generate and interpret data and concepts related to time, speed and distance and blood relation.

CLR-5 : Enable students to understand reasoning skills

CLR-6 : Create awareness in students regarding the various concepts in quantitative aptitude and reasoning skills and also its importance in various competitive exams

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

CLO	Description	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Understand, analyze and solve questions based on numbers, logarithms.	3	80	70	H	H	M	H	L	M	-	H	-	H	-	H	M	-	H
CLO-2 :	Create, solve, interpret and apply basic mathematical models which are applicable in our day to day life	3	80	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-3 :	Understand the concepts of mixtures and alligations, permutation and combinations, probability, time and work and to approach questions in a simpler and innovative method	3	85	70	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-4 :	Understand the concept in time ,speed and distance	3	85	80	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-5 :	Ability to solve the problems on reasoning	3	85	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-6 :	Able to face different competitive exams	3	80	70	M	H	M	H	-	M	-	H	H	M	-	H	M	-	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Classification of numbers	Profit and Loss-Introduction	Mixtures and Alligations-Introduction	Time, Speed and Distance-Problems onTrains	Direction Sense-Introduction
	SLO-2	Test of divisibility	Profit and Loss- Basic Problems	Mixtures and Alligations-Problems	Time, Speed and Distance-Boats&Streams	Direction Sense-Problems
S-2	SLO-1	Unit digit	Statistics-Introduction	Permutation –Introduction& Basics	Data Interpretation – Bar chart	Number Series
	SLO-2	Tailed zeroes	Statistics-Mean,Median,Mode	Combination-Introduction& Basics	Data Interpretation – Pie chart	Word Series
S-3	SLO-1	HCF, LCM	Simple Interest-Introduction,Formulas &Problems	Probability-Introduction &Basics	Data Interpretation – Table	Seating Arrangements - Linear
	SLO-2	HCF, LCM - Solving problems	Compound Interest-Introduction,Formulas &Problems	Probability-Problems	Data Interpretation – Line graph	Seating Arrangements – Circular

S-4	SLO-1	Logarithm –Introduction of log rules	Word problems on Line equations-Introduction	Time and work-Introduction	Data sufficiency-Introduction and Basics	Puzzles-Concepts
	SLO-2	Logarithm –Applications of log rules	Word problems on Line equations- Basic problems	Time and work-Men and Work	Data sufficiency-Problems	Puzzles-Problems
S-5	SLO-1	Percentage -Introduction	Averages-Introduction & Basics	Time and work-Pipes &Cisterns(Introduction)	Blood relation-Introduction	Clocks-Concepts Discussion
	SLO-2	Percentage- Basic problems	Averages-Tricky Problems	Time and work-Pipes &Cisterns(Problems)	Blood relation-Problems	Clocks-Problems
S-6	SLO-1	Percentage-Increasing & Decreasing functions	Ratio and Proportions-Introduction	Time, Speed and Distance-Introduction	Coding – Decoding-Introduction	Calendars-Introduction of basic concept
	SLO-2	Percentage- Miscellaneous problems	Ratio and Proportions-Basics & problems	Time, Speed and Distance-Basic problems	Coding – Decoding-Different types	Calendars-Problems

Learning Resources	1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition 2. Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition 3. Archana Ram, PlaceMentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018	4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition 5. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for competitive examinations, Pearson, 3rd Edition 6. P A Anand, Quantitative Aptitude for competitive examinations, Wiley publications, e book, 2019

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)#
		Practice	Practice	Practice	Practice
Level 1	Remember	30%	30%	30%	30%
	Understand				
Level 2	Apply	30%	30%	30%	30%
	Analyze				
Level 3	Evaluate	40%	40%	40%	40%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Internal Experts
1. Ajay Zener, Director, Career Launcher	1. Dr P Madhusoodhanan, HoD, CDC, E&T, SRMIST
	2. Dr M Snehalatha, Assistant. Professor, CDC, E&T, SRMIST

Course Code	UJK20201L	Course Name	COMMUNICATION SKILLS		Course Category	JK	Life Skill Course	L	T	P	C
								0	0	4	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department	English	Data Book / Codes/Standards			Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:		Learning		Program Learning Outcomes (PLO)

		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To make the students learn the native speakers' accent.																			
CLR-2 :	To educate them about word stress of English																			
CLR-3 :	The enable them to participate in group discussion and debates																			
CLR-4 :	To improve their participation and participation skills																			
CLR-5 :	To improve the listening and speaking abilities in English																			
CLR-6 :	LSRW skills all together is developed in every student																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Understand the native speakers' exact pronunciation	2	75	60	H	H	H	H	-	-	-	H	H	H	H	H	-	-	-
CLO-2 :	Master the sound systems of English	2	80	70	H	H	H	-	-	-	-	H	H	H	H	H	-	-	-
CLO-3 :	Have a better Word stress, Rhythm and Intonation	2	70	65	H	H	H	-	H	H	-	-	H	H	H	H	-	-	-
CLO-4 :	Develop Neutral Accent	2	70	70	H	H	H	-	H	-	-	-	-	-	H	H	-	-	-
CLO-5 :	Participate in any conversation with any native speaker	2	80	70	H	H	-	H	-	H	-	H	H	H	H	H	-	-	-
CLO-6 :	Clear any standardized tests conducted to measure the English language ability like IELTS and TOEFL	2	75	70	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Digital language lab - helps in the listening skills by providing an interactive environment to the students	Learners are enabled to record their speech and listen to it in order to correct their lacuna	Reading software is used to facilitate reading exercises for the students	To enable the students to familiarize with word processor blogging	Students are enabled to learn and pronounce stressed and unstressed words
	SLO-2	The students will be able to converse fluently	One will know himself where he/she has gone wrong	Flow in reading will be improved	online publishing. Will be learnt by the students	The practice will lead them to acquire neutral accent and understand foreign accent
S-2	SLO-1	Students are exposed to functionallanguage	Fluency and Pronunciation to be evaluated	The usage of phonetics will be mandated.	Enable the students in learning situational language	Common topics in IELTS speaking test and TOFEL will be provided to assess the students.

	SLO-2	*This exposure will help them pick up fluency*	*Their standard will measured*	*reading will be done in the class*	Create imaginary situations and students are allowed to engage in conversations	Assessments will be provided for self scrutiny
S-3 – S-4	SLO-1	*Lab 1 In the wall of Pink Floyed to be played for the students*	*Lab 4 Students are given a situation, they need to write a respond for it by writing a letter requesting information or explaining the situation*	*Lab 7 Introduction to the conversation of a native speaker/ interview of a native speaker*	*Lab 10 learners are asked to describe some visual information(table/charts/nature) in their own word*	*Lab 13students will listen to a passage and they need to give a suitable title*
	SLO-2	*The students will be able to understand the isolation of a wall. It helps them to enhance their pronunciation*	*This will lead to understand the English letter conventions*	*Learners will prove the fluency by listening*	*They need to have a well organized thought of it using language accurately in a academic style.*	Assessment on their language competency and vocabulary
S-5	SLO-1	*They get familiarized with pronunciation styles*	*Learners to record and repeat new wordsagain and again*	*New words are to be referred in the reading passages and checked with the help of dictionaries*	*Familiarize the students with e-journals , e-guidance, e-magazines, e-Books, e-Library*	Listening topics in the IELTS listening test and TOFEL will be provided
	SLO-2	*American and British styles are differentiated*	*Untill right prononciation isaquiredis not allowed to go to the Next session*	*Those new words are to be used in different contexts and sentences*	*Help students to access them as much as possible*	Assessment on their listening capacity is to be provided
S-6	SLO-1	*Listening to news bulletins and songswillbeenabled to help them to understand use of vocabulary*	*Learnerscanspeak English and compare the notes and exchange ideas*	*Comprehensive skills are enhanced and checked the level*	Enable the students to versatile writing	Reading topics in the IELTS reading test and TOFEL will be provided to assess the students.
	SLO-2	*Will beenabled ti imitae the exact accent and prononciation*	*From the exchangedideascomprehensive questions willbeasked by the otherstudents*	*The levels are informed to the students and Icuna is explained*	Diffrerence in writing and readingisexplained	Assesment on their capacity is explained
S-7 – S-8	SLO-1	Lab 2TedX will be played for the student	*Lab 5 introduction to semi-formal/ neutral discursive essay will be taught.*	Lab 8 television news will be broadcasted to them	*Lab 11learners are given with a set of images where they need to write a story from it*	*Lab 14 students will listen to the great monologues of the time*
	SLO-2	*It will help them to improve their fluency*	*It will teach them to write coherently and cohesively.*	*It will help them to understand the usage of words and the fluency of speaker*	*It helps them to keen on observation as well as to know their creativity.*	They will learn the importance of pronunciation, stress and pause in a speech
S-9	SLO-1	*To enable to listen to authentic sounds of the target language*	*Give different topics to debate to enable them talk fluently*	*The right pronunciation is checked with an access to articles fiction verses and speeches*	*Focus on writing is done*	writing topics in the IELTS writing test and TOFEL will be provided to assess the students.
	SLO-2	*To enable them imitate the different sounds and accents and make them repeat it*	*To check the pace of their speech*	*Minute details and differences are marked and rectified*	*Conversational skills are enhanced*	Writing skills are assessed and tested

S-10	SLO-1	To enable to practice different accents focusing on intonation and voice modulation	*Dialogue delivery be checked by asking them to prepare for their own e- learning materials*	*Read and repeat passages*	Help in professionalwriting	Model IELTS and TOFEL test will be conducted for the students
	SLO-2	The differences between intonation stress and modulations are explained	*Make the students speak and record*	*Check the ability to repeat the exact pronounciation*	Check and asses theirwritings	Assessment will be provided to the learners
S 11 - S 12	SLO-1	*Lab3 After listening to TedX, students need to jot down set of question.*	*Lab 6 learners will be taught to write a review for a film after watching*	*Lab 9 conversation between two people in every day context will be played for the studetns*	*Lab 12 students will listen to the writers note on publishing a novel/ short story*	*Lab 15 they will listen to grammar usage in the form of visual image and song*
	SLO-2	This will help them to identify the key information in listening text.	*Leaner will need to think for the apt word. Through this language competency will be evaluated*	*It Will help them to understand the target language*	It will helps them to enhance their creativity also the language compétence	They will the foreign language easily and it enhances their competency of it

Learning Resources	**Theory:** 1. Horizon- English Text Book – Compiled and Edited by the faculty of English Departement, FSH, SRMIST, 2020 2. **English Grammar in Use by Raymond Murphy** 3. *Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007*	4. *R.P. Bhatnagar, English for Competitive Examinations, Trinity Press, 3rd Edition,2016* 5. http://www.aptitudetests.org/verbal-reasoning-test 6. https://www.assessmentday.co.uk/aptitudetests_verbal.htm

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)							
		CLA – 1 (20%)		CLA – 2 (20%)		CLA – 3 (30%)		CLA – 4 (30%)#	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	30%	-	30%	-	30%	-	30%
	Understand								
Level 2	Apply	-	30%	-	30%	-	30%	-	30%
	Analyze								
Level 3	Evaluate	-	40%	-	40%	-	40%	-	40%
	Create								
	Total	100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
	1. Prof. Daniel David, Prof & Head, Department of English, MCC, Chennai	1. Dr. Shanthichitra, Associate Professor, & Head, Department of English, FSH, SRMIST
		2. Dr K B Geetha, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UNS20201L/ UNC20201L UNO20201L/ UYG20201L	Course Name	NSS/NCC/NSO/YOGA	Course Category	EA	Extension Activity	L	T	P	C
							0	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	
Course Offering Department		NSS/NCC/NSO/YOGA	Data Book / Codes/Standards		Nil	

Assessment is Fully Internal

Learning Assessment	
Assessment Tools	**Marks**
Continuous Learning Assessment –I (CLA-I)	20 Marks
Continuous Learning Assessment –II (CLA-II)	30 Marks
Continuous Learning Assessment –III (CLA-III)	30 Marks
Continuous Learning Assessment –IV (CLA-IV)	20 Marks
Total Marks	**100 Marks**

SEMESTER – III

Course Code	UDS21301J	Course Name	INTRODUCTION TO DEEP LEARNING	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand Deep Learning througly from academic and Industry perspective																		
CLR-2 :	Give an exposure to working of neural networks, its architecture, components and related technologies																		
CLR-3 :	Learn Deep world Real world applications across Industries																		
CLR-4 :	Deeply understand the Deep Learning workflow, architecture and frameworks involved																		
CLR-5 :	Get to know all the deep learning models involved in build deep learning applications																		
CLR-6 :	Work on an end to end deep learning usecase																		

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Get Hands-on Knowledge, Skills and Expertise to define deep learning from both the academic and industry perspective and all the related concepts.	2	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-2 :	Get a good understanding of all the real-world deep learning applications across different industry verticals	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-3 :	Solve the deep learning problems of classification, Regression, Image Detection, Image Recognition etc.	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-4 :	Understand all the data software, hardware requirements for building deep learning models	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-5 :	Adopt the best strategies for deep learning data collection, pre-processing and model engineering tasks	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-6 :	Get Hands-on Knowledge, Skills and Expertise on a real world usecase implementation	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Deep Learning Defined - Academic and Industry Perspective**	Adding Another input	Model Validation	Popular deep learning frameworks ✓ TensorFlow ✓ Keras ✓ PyTorch ✓ Apache MXnet ✓ Sonnet ✓ DL4J	Benefits
	SLO-2	What is Deep Learning?	Adding more layers	Model Test	**Unit 7: Deep Learning - Neural Networks an Overview**	Challenges
S-2	SLO-1	Deep Learning defined from Academic perspective	Advanced deep learning concepts	Model Outcome	Motivation for Neural Networks	High level decisions
	SLO-2	Deep Learning defined from Industry perspective	**Unit 3: Deep Learning in Real World Applications**	Model Accuracy	Biological Neural Networks	Choosing the hardware components (GPU, TPU)
S-3	SLO-1	Functions of a deep learning system	Deep learning in healthcare	Tune Hyperparameters	Artificial Neural Networks ✓ Neurons ✓ Connections and weights ✓ Propagation functions ✓ Learning rule	Building a Deep learning Hardware system
	SLO-2	What does a deep learning system do?	Deep learning in Retail	Deploy Model	Deep Neural Networks	Benefits
S-4	SLO-1	How a business uses deep learning	Deep learning in Energy	Monitor Predictions	Classification ✓ Classification Models ✓ Convolutional neural networks ✓ Long Short Term Memory ✓ Gated recurrent units	Challenges
	SLO-2	How deep learning works?	Deep learning in Oil & Gas	Manage your models	Regression ✓ Regression Models ✓ Artificial Neural Networks ✓ Deep Neural Networks	High level decisions

					✓ Machine Translation ✓ Language Translation	
S-5 & S-6	SLO-1	**Lab 1:** **Build a simple artificial Neural Networks with 1 layer, with 1 neuron, and the input shape equal to 1, feed some data, use the equaltion y=5x-3, so where x = -2, y=-4 and train the network**	**Lab 4:** **Build a network with at least 3 hidden layers that achieves better than 92% accuracy on validation and test data. You may need to train for more than 10 epochs to achieve this result**	**Lab 7:** **Build a network for classification using the built in MNIST dataset and Use the sigmoid activation function Use the categorical cross entropy loss function.**	**Lab 10:** **Build a Recommendation system using Deep Learning techniques**	**Lab 13:** **Using Generative Adversarial networks perform Image generation**
	SLO-2					
S-7	SLO-1	What are deep learning promises and challenges?	Deep learning in Automobile	**Unit 5: Deep Learning Architectures**	**Unit 9: Deep Learning Models**	Choosing the software components
	SLO-2	Deep Learning Architecture	**Unit 4: Deep Learning Workflow**	Components of a deep learning solution	Supervised Models ✓ Classic Neural Networks ✓ Convolutional Neural Networks ✓ Recurrent Neural Networks	Choosing the OS
S-8	SLO-1	Deep Learning Libraries	Steps in Deep learning in Implementation	Data Generation	Unsupervised Models ✓ Self – Organizing maps ✓ Boltzmann's Machines ✓ Autoencoders	Adding Packages
	SLO-2	Deep Learning Technologies	Data Collection	Data Collection	**Unit 10: Deep Learning Data Requirements**	**Unit 12: Deep Learning Hands On Lab Work - Build, Test and Deploy ML Models (Consumer 1)**
S-9	SLO-1	Deep Learning Implementation Framework	Public Datasets	Training	Data Collection strategy for ML	Customer Churn
	SLO-2	**Unit 2: Demystifying Artificial Intelligence and Deep Learning**	Existing Databases	Evaluation	How much data is needed	Who is going to churn?
S-10	SLO-1	The core of deep learning: ANN	Web Scraping	Task Orchestration	Is your data good enough?	When the churn will occur
	SLO-2	Role of deep neural networks	Crowd source labelling	Prediction	Data Structure	Why(reason) is the churn occurring

		Lab 2:	Lab 5:	Lab 8: **Working Data Collection, Evaluation**	Lab 11:Working on Deep Learning Data Structures	Lab 14: **Deep Learning Hands On Lab Work - Build, Test and Deploy ML Models**
S-11 & S-12	SLO-1	**Using Tensorflow Build a network with a single hidden layer and at least 300,000 trainable parameters**	**Build a network for classification using the built in MNIST dataset**			
	SLO-2					
S-13	SLO-1	Deep learning and machine learning	Data Preparation	Infrastructure	Data Format	Problem statement
	SLO-2	Deep learning vs Data Science	Cleaning Data	Authentication	Data Type	Problem type
S-14	SLO-1	Linear Transformation	Feature Scaling	Interaction	Source System	Data engineering
	SLO-2	Teaching artificial neurons unknown functions	Handling categorical data & text	Monitoring	Target system	Data pipeline
S-15	SLO-1	Error measurement in neural networks	Model Engineering	Building your deep learning Architecture	Training Data	Model selection
	SLO-2	Gradient descent	Test Train Split	**Unit 6: Deep Learning Implementation Framework**	Validation Data	Model engineering
S-16	SLO-1	Loss functions	Handling Imbalanced Data	What is a deep learning framework?	Test Data	Model outcome, analysis, and optimization
	SLO-2	Learning rates	Model Training	Features of a good deep learning framework	Building a Deep learning Hardware system	Model pipeline, Data Visuzlization and User Interface
S-17 & S-18	SLO-1	**Lab 3:** **3.Using Tensorflow build 3 networks, each with at least 10 hidden layers such that:**				
	SLO-2	o The first model has fewer than 10 nodes per layer. o The second model has between 10-50 nodes per layer. o The third model has between 50-100 nodes per layer.	**Lab 6:** **Build a network for classification using the built in MNIST dataset and Use the sigmoid activation function**	**Lab 9:** **Conduct an expermient on Object detection using Convolution Neural Network**	**Lab 12:** **Use Recurrent Neural network to Perform Sentiment Analysis**	**Lab 15:** **Implemeent Transfer learning to retrain models that have been trained on the ImageNet dataset in order to perform classification on the CIFAR dataset.**

Learning Resources	1. https://deepsphereai.litmos.com/ 2. Deep Learning from Scratch, by Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc.	3. Introduction to Deep Learning, Book by Eugene Charniak Deep Learning: A Practical Approach, PB Paperback – 1 January 2018 by Rajiv Chopra

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

 # CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRMIST
		Mrs.M.Ramla, SRMIST

Course Code	UDS21302J	Course Name	ADVANCED COMPUTING WITH PYTHON AND GCP	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to	Learning			Program Learning Outcomes (PLO)															

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the role of advanced computing in building artificial intelligent applications.																		
CLR-2 :	Teach the students the role cloud computing, cluster computing and grid computing plays in building Artificial Intelligent solutions.																		
CLR-3 :	To make the students aware of the high performance computing concepts, their building blocks, business benefits, challenges etc.																		
CLR-4 :	Introduce the students to dynamic load balancing that allows each parallel job to do its application level load balancing																		
CLR-5 :	To explore and deploy Cloud networking technologies, including Virtual Private Cloud (VPC) networks, subnets, and firewalls; interconnection among networks; load balancing; Cloud DNS; Cloud CDN; and Cloud NAT services and Cloud-based storage services for business																		
CLR-6 :	To learn about Google Cloud's computing and storage services available, including Compute Engine, Google Kubernetes Engine, App Engine, Cloud Storage, Cloud SQL, and BigQuery.																		

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Have a strong control over the fundamental concepts of Cloud computing including the ability to clearly define the working definitions of the cloud computing methodologies	2	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-2 :	Have a Strong understanding knowledge and ability of designing enterprise-grade cloud solutions on the various cloud computing services.	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H

			3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-3 :	Have a strong control over the fundamental concepts of high performance computing		3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-4 :	Able to Utilize the right tool and techniques for processing data in-memory and in real-time.		3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-5 :	Gain excellent hands-on skill and understanding of creating VM instances on cloud and be able to create Virtual Private Cloud (VPC) networks, subnets		3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-6 :	Gain Hands-on Knowledge and skills to use Google cloud notebook and vertex AI services and be able to demonstrate the capabilities of deploying them on app engine and cloud run services.		3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H

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Duration (hour)			18	18	18	18	18
S-1		SLO-1	**Unit 1: Working and Architecture of Cluster Computing Grid Computing and Cloud Computing**	**Unit 3: Cloud Computing Building Blocks**	Examples of In-memory Computing	Working of Dynamic Load Balancing	Projects, networks, and subnetworks
		SLO-2	Cluster computing overview	Software Building Blocks ✓ Application Workloads ✓ Virtual Workloads ✓ PaaS ✓ Identity Management ✓ Virtualization	Real Time Computing Overview	Applications of Dynamic Load Balancing	Routes and firewall rules
S-2		SLO-1	Cluster Load Balancing, High Availability Clusters, High Performance Clusters	Hardware Building Blocks ✓ Compute Servers ✓ Storage Servers ✓ Hyper Converged Servers ✓ Physical networks	Business Benefits Real Time Computing Overview	**Unit 10: Parallel Meshing and Remeshing**	VPC Networking
		SLO-2	Working and Architecture of Cluster computing	**Unit 4: High Performance Computing**	Business Challenges Real Time Computing Overview	Meshing Overview, Mesh Topology and Parallel Meshing Overview	Common network designs, Virtual Machines
S-3	SLO-1		Grid computing overview	High Performance Computers	Working of Real Time Computing	Business Benefits, Challenges & Applications of Parallel Meshing	**Unit 14: Google Cloud Platform Compute, Kubernetes, App Engine**

	SLO-2	Computational Grid Computing, Data Grid Computing, Collaborative Grid Computing, Manuscript Grid Computing	High Performance Components	Examples of Real Time Computing Computing	Partitioning and parallel meshing technique	GCP Compute Engine overview
S-4	SLO-1	Working and Architecture of Grid computing	Compute, Network, Storage	**Unit 7: OpenMP programming**	Remeshing Overview, Business Benefits, Business Challenges, Applications of Remeshing	Advantages, Business Benefits, Applications of Compute Engine
	SLO-2	Cloud computing overview	Importance of High-Performance Computers	OpenMP programming Overview	**Unit 11: Networking and Storage Options for Advanced Computing**	Google Compute Engine features ✓ Machine Types ✓ Persistent Disks ✓ Local SSD
S-5 & S-6	SLO-1					
	SLO-2	**Lab 1 :** **Create a Google Compute Engine virtual machine and understand zones, regions, and machine types.**	**Lab 4 :** **Access files in Cloud Storage with the Spring Resource abstraction**	**Lab 7 :** **Set up and write simple programs on Apache Spark and Jupyter Notebooks on Cloud Dataproc**	**Lab 10 :** **Calculate multiplicative inverse of five symmetric matrices of size 2000x2000.**	**Lab 13:** **Use gcloud to create two custom VPC networks with subnets, firewall rules, and VM instances, then test the networks' ability to allow traffic from the public internet.**
S-7	SLO-1	Private Cloud, Public Cloud, Hybrid Cloud and Multi cloud	Business Benefits of High-Performance Computing	Business Challenges of OpenMP Programming	Networking Options for Advanced Computing Overview	Introduction to Containers and Kubernetes
	SLO-2	Working of Cloud computing	Business Challenges of High-Performance Computing	Parallel programming overview	Business Benefits, Business Challenges of Networking	Containers and Container Images
S-8	SLO-1	Architecture of Cloud computing	What can you do with High Performance Computing?	OpenMPparallel region, Worksharing	Storage Options for Advanced Computing Overview	Introduction to Kubernetes, Introduction to Google Kubernetes Engine
	SLO-2	Difference between Cluster vs Grid computing, Cluster vs Cloud computing and Grid vs Cloud computing	High Performance Computing in the cloud	OpenMP data environment, tasking	Business Benefits, Business Challenges for Advanced Computing	Kubernetes Architecture
S-9	SLO-1	**Unit 2: Role of Cloud Computing in An AI Implementation**	**Unit 5: High Performance Computing Building Blocks**	Creating Parallelism	**Unit 12: Google Cloud Platform Core Infrastructure and Services**	Google Cloud App Engine environments

	SLO-2	Merging AI and cloud computing	High Performance Computing Building Blocks Overview	**Unit 8: Message Passing interface (MPI) parallel programming**	Google Cloud Platform Core Infrastructure and Services	**Unit 15: Hands on Python Lab on GCP**
S-10	SLO-1	Machine learning cloud services	Why Is High-Performance Computing Important?	Message Passing interface (MPI) parallel programming	Introduction to Google Cloud, Getting Started with Google Cloud	Hello World
	SLO-2	IoT cloud	Business Benefits of High-Performance Computing	Business Benefits of MPI Programming	The Google Cloud resource hierarchy, Identity and Access Management (IAM)	Add Two Numbers
S-11 & S-12	SLO-1					
	SLO-2	**Lab 2 :** **Creating and Manage IAM Roles on Google Cloud**	**Lab 5 :** **Analyze Clinical Data using BigQuery and AI Platform Notebooks**	**Lab 8:** **Connect to computing resources hosted on Google Cloud Platform via the web**	**Lab 11:** **Create Kubernetes Cluster in Google Cloud Kubernetes engine**	**Lab 14:** **Perform basic networking tasks on Google Cloud, including Compute Engine instances**
S-13	SLO-1	Business Intelligence	Components of High-Performance Computing Solutions	Business Challenges of MPI Programming	Interacting with Google Cloud, Virtual Machines in the Cloud	Square Root of a Number
	SLO-2	AI as a Service on cloud	Compute, Network, Storage	Types of Parallel Computing Models	Storage, Containers, Applicationsin the Cloud	Area of a Circle
S-14	SLO-1	Infrastructure as a Service and AI	**Unit 6: In memory and Real Time Computing**	Error Handling	**Unit 13: Advanced Computing in Google Cloud Platform**	Quadratic Equation
	SLO-2	Platform as a Service and AI	In memory Computing Overview	Running MPI Programs	Interacting with Google Cloud	Swap Two Variables
S-15	SLO-1	Software as a Service and AI	Business Benefits In-memory Computing Overview	**Unit 9: Dynamic Load Balancing**	Using the Google Cloud	Mutiply Two Numbers
	SLO-2	Cloud technologies for AI applications	Business Challenges In-memory Computing Overview	Dynamic Load Balancing Overview	Working with GCP Cloud Console and Cloud Shell	Divide Two Numbers
S-16	SLO-1	Containers	Working of In-memory Computing	Business Benefits of Dynamic Load Balancing	Virtual Networks	Generate random Numbers between 0 and 100
	SLO-2	Kubernetes	Business Benefits of OpenMP Programming	Business Challenges of Dynamic Load Balancing	Virtual Private Cloud	Convert Kms to metre
S-17 &	SLO-1	**Lab 3:**	**Lab 6:**	**Lab 9:**	**Lab 12:**	**Lab 15:**
	SLO-2					

S-18		Create Our First VPC in Google Cloud	Analyze production performance with Cloud Profiler	Build a Fraud Detection model on Cloud AI Platform with TensorFlow Enterprise and BigQuery	Creating a Network Storage Solution Using Google Cloud Filestore	Create a storage bucket and then use it to store some files, retrieve files, and implement version control.

Learning Resources	1. Google Cloud Platform for Developers: Build Highly Scalable Cloud Solutions with the Power of Google Cloud Platform, Book by Steven Porter and Ted Hunter 2. Introduction to Computation and Programming Using Python, Book by John Guttag	3. Python for Google App Engine, By Massimiliano Pippi 4. Python Programming: Using Problem Solving Approach, Book by Reema Thareja

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

\# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.R.Jayashree, SRMIST
		Mrs.S.Chandrakala, SRMIST

Course Code	UDS21303J	Course Name	INTRODUCTION TO NATURAL LANGUAGE PROCESSING	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)															

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To make the participants comfortable with the fundamentals of Natural Language Processing, their working principles and their functions in a business scenario.																		
CLR-2 :	To teach the participants to build intelligent and automated real-world natural language processing applications and use cases spanning healthcare, retail, energy verticals by intelligently analyzing different datasets collected from diverse data sources.																		
CLR-3 :	To teach the participants the various layers of Natural Language processing architecture, detailed steps are involved in transforming raw data into training datasets for critical decision making.																		
CLR-4 :	To teach the students the about the overall process involved in text processing and building an enterprise grade natural language processing solutions																		
CLR-5 :	To learn how to apply Natural language processing models to business problems, build data for efficient data collection, preparation, provisioning, model pipelines for model engineering and validation tasks.																		
CLR-6 :	To bring the learners to an alignment, apply their learning to a real-world business problem, and then performs research, design, development, and delivers an end-to-end Natural language processing solution for a given industry problem. The students will be working either in a group or individually.																		

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Have a strong control over the fundamental concepts of Natural Language Processing including the ability to clearly define Natural Language Processing from both academic and industry perspective.	2	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-2 :	Gain hands-on solid skills, knowledge and expertise of real-world situations the applicability of tools and techniques in extracting valuable insights from the data of different formats on time.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-3 :	Have solid hands-on skills, knowledge and expertise in Data gathering, Data collection, Model training, and model evaluation with domain-specific components.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

		3	85	80															
CLO-4 :	Have a good Hands-on skills and knowledge to apply all the required processes on texts	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-5 :	Have solid hands-on skills, knowledge and expertise in setting up a data platform for building enterprise-grade natural language processing solutions.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6 :	Design and develop natural language processing solution artifacts and ultimately demonstrate an "end-to-end" machine learning solution for a given problem statement either in a group or individually.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Unit 1: Natural Language Processing Defined - Academic and Industry Perspective	Pattern Mining	Topic Modelling	DeBERTa	Adding Packages
	SLO-2	What is Natural Language Processing?	Evaluation and Deployment	Text Classification	Unit 10: Natural Language Processing Data Requirements	Unit 12: Natural Language Processing Data Requirements
S-2	SLO-1	Natural Language Processing defined from Academic and Industry perspective	Unit 5: Natural Language Processing Architecture	Keyword Classification	How much data is needed	Patient Readmittance with discharge summaries
	SLO-2	Functions of a Natural Language Processing system	Components of machine learning solution	Lemmatization	Is your data good enough?	Who is going to get readmitted?
S-3	SLO-1	What does a Natural Language Processing system do?	Data Generation	Stemming	Data Structure	When will they get readmitted
	SLO-2	How a business uses Natural Language Processing	Data Collection	Part of speech tagging	Data Format	Why will they get readmitted
S-4	SLO-1	How Natural Language Processing works?	Feature Engg pipeline	Coreference resolution	Data Type	Problem statement
	SLO-2	Unit 2: Demystifying Artificial Intelligence and Natural Language Processing	Training	Unit 8: What Problem Natural Language Processing Solves	Source System	Problem type
S-5 & S-6	SLO-1	Lab 1 : Import the nltk package in python and download	Lab 4 : Create a monolingual corpus of 200,000 words. Segment it	Lab 7: Choose a corpus of at least 20,000 words of online text,	Lab 10 : Estimate how much storage space is necessary for the	Lab 13: Extract the the topics from the any texts of your choice
	SLO-2					

S	SLO					
		'stopwords', 'punkt' packages, tokenize the string using the `transformers` package	into words, and compute the frequency of each word. How many distinct words are there? count frequencies of bigrams (two consecutive words) and trigrams (three consecutive words).	and verify Zipf's law experimentally. Define an error measure and find the value of α where Zipf's law best matches your experimental data	index to a 100 billion-page corpus of Web pages. Show the assumptions you made	with Latent dirichlet algorithm
S-7	SLO-1	What are Natural Language Processing promises and challenges?	Evaluation	Machine Translation	Target system	Data engineering
	SLO-2	Natural Language Processing Architecture, Libraries, Technologies and Framework	Task Orchestration	Named Entity Recognition	Training Data	Data pipeline
S-8	SLO-1	Why is Natural Language Processing so important?	Prediction	Text/Classification	Validation Data	Model selection
	SLO-2	Components of Natural Language Processing ✓ Natural language Understanding ✓ Natural language Generation	Infrastructure	Text Summarization	Test Data	Model engineering
S-9	SLO-1	Phases of Natural Language Processing ✓ Lexical Analysis ✓ Syntactic Analysis ✓ Semantic Analysis ✓ Disclosure Integration ✓ Pragmatic Analysis	Authentication	Topic Modelling	Unit 11: Natural Language Processing Data Requirements	Model Outcome
	SLO-2	Unit 3: Natural Language Processing in Real World Applications	Interaction	Keyword Extraction	Building a NLP Hardware system	Model Analysis
S-10	SLO-1	NLP in healthcare	Monitoring	Information Retrieval	Benefits	Model Optiization
	SLO-2	NLP in Retail	Building your NLP Architecture	Automatic Image annotation	Challenges	Model pipeline
S-11 &	SLO-1	Lab 2 :		Lab 8:	Lab 11:	Lab 14:
	SLO-2	With your knowledge of the English language, split 10	Lab 5 :	Create a corpus of spam email and one of non-spam	Write a regular expression or a short program to extract	Extract the the topics from the any texts of your choice

S-						
S-12		sentences of your choice into words and punctuation: Find out the words words that don't usually appear in a standard lexicon? The separators are: whitespaces, quote ('), full-stop/period (.), parenthesis, are kept as tokens, tokenize the earlier sentence.	Write a program to do segmentation of words without spaces. Given a string, such as the URL "thelongestlistofthelongeststuffatthelongestdomainnameatlonglast.com," return a list of component words: ["the," "longest," "list," …]. This task is useful for parsing URLs, for spelling correction when words runtogether, and for languages such as Chinese that do not have spaces between words	mail. Examine each corpus and decide what features appear to be useful for classification: unigram words? bigrams? message length, sender, time of arrival?	company names. Test it on a corpus of business news articles. Report your recall and precision.	using Non-negative Matrix Factorization
S-13	SLO-1	NLP in Energy	Unit 6: Natural Language Processing Implementation Framework	Unit 9: Natural Language Processing Models	High level decisions	Data visualization
	SLO-2	NLP in Oil & Gas	What is a NLP framework?	BERT	Choosing the hardware components (GPU, TPU)	User interface
S-14	SLO-1	NLP in Automobile	Features of a good NLP framework	GPT2	Building a NLP Software system	
	SLO-2	Unit 4: Natural Language Processing Workflow	Popular NLP frameworks ✓ NLTK ✓ Gensim ✓ SpaCy ✓ CoreNLP	XLNet	Benefits	
S-15	SLO-1	Text pre-processing ✓ Contraction Mapping ✓ Tokenization ✓ Noise Cleaning ✓ Spell Checking ✓ Stop words Removal ✓ Stemming ✓ Lemmatization	Unit 7: Natural Language Processing - Techniques an Overview	Electra	Challenges	
	SLO-2	Exploratory Data Analysis	Pattern Recognition	Text to Text Transfer Transformer	High level decisions	
S-16	SLO-1	Text pre-processing	Named Entity Recognition	RoBERTa	Choosing the software components	
	SLO-2	Text Representation & Feature Engineering	Text Summarization	ALBERTA	Choosing the OS	

S-17 & S-18	SLO-1	**Lab 3:** **Design a NLP application which measures the edit distance between words using the chartbased algorithm.** **Provide the filled data structure resulting from the application of the algorithm to the pair "easy" and "tease". Briefly justify your answer.**	**Lab 6:** **Perform word segmentation implementation on a bigger example corpus. E.g., try the first N words in the Brown corpus.**	**Lab 9:** **Create a test set of ten queries, and pose them to three major Web search engines. Evaluate each one for precision at 1, 3, and 10 documents. Can you explain the differences between engines?**	**Lab 12:** **Implement Soft Cosine Similarity in python**	**Lab 15:** **Utilize Word2Vec model for representing words and plot the word embedding from the output of the word2Vec model**
	SLO-2					

Learning Resources	1. The textbook for the course will be the second edition of Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, by Daniel Jurafsky and James H. Martin 2. James A.. Natural language Understanding 2e, Pearson Education, 1994 3. Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000	4. https://www.nltk.org/book/ 5. Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP,2008

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.Pandiyan, SRMIST
		Dr.S.Sivakumar, SRMIST

Course Code	UDS21S03J	Course Name	DATA ENGINEERING FOR ENTERPRISE	Course Category	S	Skill Enhancement Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

CLR-1 :	To introduce the participants to the fundamental concepts of bigdata, its tools and technologies, their working and frameworks
CLR-2 :	To introduce the participants to the fundamental concepts of internet of things, a system of interconnected computers, digital machines, devices etc.
CLR-3 :	To enumerate all the business challenges involved in the data engineering process.
CLR-4 :	To work with the Data mapping, Data Integration, Data Validation, Governance, Quality systems, with their tools and technologies.
CLR-5 :	The Primary Objective of this unit is to work with various structured, unstructured, semi-structured, sensor and machine datasets and process with the right tools, technologies, and libraries available.
CLR-6 :	To use all the tools and technologies to collect data in real-time and create a data pipeline for increasing the business agility and optimization.

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Have a firm understanding of Big data from academic an industry perspective. They will have a solid understanding of big data principle, tools, techniques and frameworks.	2	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-2 :	Have a firm understanding of defining the role Big data and IoT plays in building scalable AI Products.	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-3 :	Have solid hands-on skills, knowledge and expertise in Data gathering, Data collection, Data Mapping, Data Conversion, Data Quality, Data Validation with domain-specific components	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-4 :	Have solid hands-on skills, knowledge and expertise in Collecting data from different enterprise systems and process them efficiently	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-5 :	Able to reading, process, and write data from Big Data and IIoT platforms using the right tools and techniques involved	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-6 :	Get a firm understanding of the fundamental concepts involved in data integration from multiple data sources and processing data in memory.	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Introduction to Big Data**	Business Benefits of Big Data and IIoT together	Data Conversion	Data Validation tools	Data Type and Structure
	SLO-2	Big Data Overview	Big Data tools and support for the industry	Data Quality	Data Validation techniques	Data Source Systems ✓ Oracle ✓ SAP ✓ Twitter ✓ Hadoop ✓ Images ✓ Videos
S-2	SLO-1	Big Data Defined from Academic and Industry Perspective	Approaches to support Big Data and IIoT	Data Validation	Data Governance overview	Data processing tools, techniques and libraries
	SLO-2	Examples of Big Data	**Unit 4: Data Engineering Challenges**	Data Governance	Data Governance in Action	Benefits and Challenges of Data processing from different sources
S-3	SLO-1	Types of Big Data	Data Challenges	Data Pipeline	Data Governance tools	**Unit 10: Working with Big Data and Iiot Platforms - Reading, Processing, Writing, Deleting Data**
	SLO-2	Characteristics of Big Data	Data Type	Building your Data Engineering Architecture	Data Governance techniques	Big Data Sources ✓ Twitter ✓ Facebook ✓ Hadoop ✓ Images ✓ Videos ✓ Reading data from Twitter ✓ Reading data from Facebook ✓ Processing data from Twitter

					✓ Processing data from Facebook ✓ IIoT Data Sources ✓ Sensors ✓ Machine ✓ Industrial Control systems ✓ Website logs ✓ Wearables ✓ Location
S-4	SLO-1	The V's of Big Data	Data format	Unit 6: Enterprise Systems	Data Quality overview	Reading data from Sensors, Website logs, Wearables
	SLO-2	Advantages of Big Data Processing	Data Structure	Data Sources	Data Quality in Action	Processing data from Sensors, Website logs, Wearables
S-5 & S-6	SLO-1 SLO-2	**Lab 1 :** **Install a Virtual machine to setup the Hadoop environment and its ecosystems.**	**Lab 4 :** **Write a Map Reduce program that mines temperature data. temperature sensors collects data each hour from many locations across the world, gather a large volume of log data**	**Lab 7:** **Connect of Facebook using suitable tools, techniques and libraries, import Customer videos and preprocessing them**	**Lab 10 : Checking with the Data quality**	**Lab 13: Working with Big Data and Iiot Platforms - Reading, Processing, Writing, Deleting Data**
S-7	SLO-1	Big Data Technologies	Data Integration from multiple systems	Data Source Systems	Data Quality tools	**Unit 11: Design and Develop a Real-Time Data Collection and Data Streaming Pipeline**
	SLO-2	Big Data Framework	Data Quality Challenges	Relational Databases – Oracle, SQL Server	Data Quality techniques	Data Collection pipeline overview
S-8	SLO-1	**Unit 2: Internet of Things Overview**	Completeness	Datawarehouses – Informatica	**Unit 8: Data Mapping Dictionaries**	Data Collection from different sources
	SLO-2	IoT Overview	Accuracy	DataLake – AWS Redshift	Data Dictionary overview	Data Streaming pipeline overview, working, Architecture, Frameworks
S-9	SLO-1	IoT Defined from Academic and Industry Perspective	Integrity	DataLakehouse - AWS Redshift	Business of Data Dictionary	Data Streaming tools and techniques
	SLO-2	History of IoT	Consistency	**Unit 7: Data Sources - Mapping, Integration, Validation, Governance and Quality**	Data Standards	Business Benefits and challenges of Data Streaming frameworks, Real-time analytics,

						Data Streaming and real-time analytics
S-10	SLO-1	Working of IoT	Conformity	Data Mapping overview	Data File and Formats	**Unit 12: Design and Develop Data Integration and In-memory Data Processing Pipeline**
	SLO-2	Business Challenges	Timeliness	Data Mapping in Action	Data Templates	Data Integration from multiple sources
S-11 & S-12	SLO-1	**Lab 2 :** **Install Hadoop in the below three operating modes:** ✓ **Standlaone** ✓ **Psudo Distributed** ✓ **Fullly distributed**	**Lab 5 :** **Install Hive and create, alter, and drop tables, views, functions, databases and indexes.**	**Lab 8:** **Connect to Facebook and Twitter using suitable tools, techniques and libraries, Intergrate the collected product and customer data**	**Lab 11: Understanding Data File and Formats and Data Templates**	**Lab 14: Design and Develop Data Integration and In-memory Data Processing Pipeline**
	SLO-2					
S-13	SLO-1	Business Benefits	Data Security Challenges	Data Mapping tools	Naming Conventions	In-Memory Data Processing Overview, pipeline, working, Architecture and frameworks
	SLO-2	IoT Technologies	Data Pipeline Maintenance	Data Mapping techniques	Data Mapping Dictionary Usage	In-Memory Data Processing pipeline tools and techniques
S-14	SLO-1	IoT Framework	Data Governance Issues	Data Integration overview	Documentation	Business Benefits and challenges of In-Memory Data Processing pipeline
	SLO-2	**Unit 3: Big Data and IIoT in AI Products and Solutions**	**Unit 5: Data Engineering Architecture**	Data Integration in Action	Communication	**Unit 13:Working with Sensor and machine data**
S-15	SLO-1	Big Data and IoT best together	Components of Data Engineering Process	Data Integration tools	Application design	IoT devices overview, Sensor, Machine Data
	SLO-2	Big Data and IoT in a nutshell	Data Collection	Data Integration techniques	System Analysis	IoT Sensor Data Processing, architecture, Business Benefits, Business Shallenges Data
S-16	SLO-1	Relation Big Data and IIoT	Data Integration	Data Validation overview	**Unit 9: Working with Different Data Sources - Twitter, Hadoop, Oracle, SAP**	Data Analysis Techniques for IoT Sensor Data Processing, Machine Data Processing
	SLO-2	Role of Big Data in IIoT	Data Mapping	Data Validation in Action	Data Sources	IoT Machine Data Processing architecture, Business Benefits, Business Challenges of Machine Data Processing architecture

	SLO-1	Lab 3: Perform the below Hadoop Management Tasks: ✓ Add and Delete Dirctories ✓ Add and Delete files	Lab 6: Connect of twitter using suitable tools, techniques and libraries, import product images and preprocessing them	Lab 9: Working with validation	Lab 12: Working with Different Data Sources - Twitter, Hadoop, Oracle, SAP	Lab 15: Working with Data Analysis Techniques for IoT Sensor Data Processing, Machine Data Processing
S-17 & S-18	SLO-2					

Learning Resources	1. Data Science and Engineering at Enterprise Scale by Jerome Nilmeier Released April 2019 Publisher(s): O'Reilly Media, Inc	2. Enterprise Big Data Engineering, Analytics, and Management, Martin Atzmueller (University of Kassel, Germany), Samia Oussena (University of West London, UK) and Thomas Roth-Berghofer (University of West London, UK)

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

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		Dr. Thilagavathy, SRMIST

Course Code	UMI20S01L	Course Name	My India Project	Course Category	S	Skill Enhancement course	L	T	P	C
							0	0	0	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	
Course Offering Department		Computer Applications	Data Book / Codes/Standards	Nil		

(Assessment Method – Fully Internal)

Assessment Tools	Marks
Review – I (Activities)	50
Review – II (Project report and Presentation)	50
Total	100

Course Code	UDS21D07J	Course Name	INTERNSHIP - I	Course Category	D	DISCIPLINE ELECTIVE	L	T	P	C
							-	-	-	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Demonstrate skills learnt in the real time environment.																		
CLR-2 :	Explore the different industries that are using IT																		
CLR-3 :	Enhance the skills in the system aspects																		
CLR-4 :	Understanding the professional connections with the knowledge learnt																		
CLR-5 :	Applying the skills in problem solving																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	To get an insight of an industry and organization/company	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	H	H
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	H	H
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	H	H
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	H	H
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	H	H

Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
Project Work / Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Internship Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UJK20301T	Course Name	UNIVERSAL HUMAN VALUES	Course Category	JK	Life Skill Course	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To generate in students a sensitivity to current regional and national issues such as gender marginalization Eco sensitivity, vision for the Nation and general humanness																		
CLR-2 :	An expanded consciousness with a mind to accommodate all is developed																		
CLR-3 :	The ability to accept all and to co- exist is initiated																		
CLR-4 :	To create community connectivity and interdependence																		
CLR-5 :	To instill intrinsic link between freedom and responsibility for both individuals and communities																		
CLR-6 :	Make them learn the basic nature of human beings																		

Column headers for the matrix:
1 = Level of Thinking (Bloom), 2 = Expected Proficiency (%), 3 = Expected Attainment (%)
PLO: 1 Fundamental Knowledge, 2 Application of Concepts, 3 Link with Related, 4 Procedural Knowledge, 5 Skills in Specialization, 6 Ability to Utilize, 7 Skills in Modeling, 8 Analyze, Interpret Data, 9 Investigative Skills, 10 Problem Solving Skills, 11 Communication Skills, 12 Analytical Skills, 13 ICT Skills, 14 Professional Behavior, 15 Life Long Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Become sensitive toward every living life and be able to respect every religion recognizing the universal values	2	75	60	H	H	H	H	-	-	-	H	H	H	H	H	-	H	H
CLO-2 :	Every way of life and culture will kindle the curiosity in them to know them and will be able appreciate the beauty in it	2	80	70	H	H	H	H	-	-	-	H	H	H	H	H	-	H	H
CLO-3 :	The presumptuous or prejudiced mentality will be overcome by them	2	70	65	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Critical thinking and accommodative nature will become so natural way of thinking for them	2	70	70	H	H	H	H	H	-	-	-	-	-	H	-	-	-	-
CLO-5 :	They will become aware of the social inequalities and justice	2	80	70	H	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Will be able to explore their own emotions, hopes & fear and be able to describe them verbally	2	75	70	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

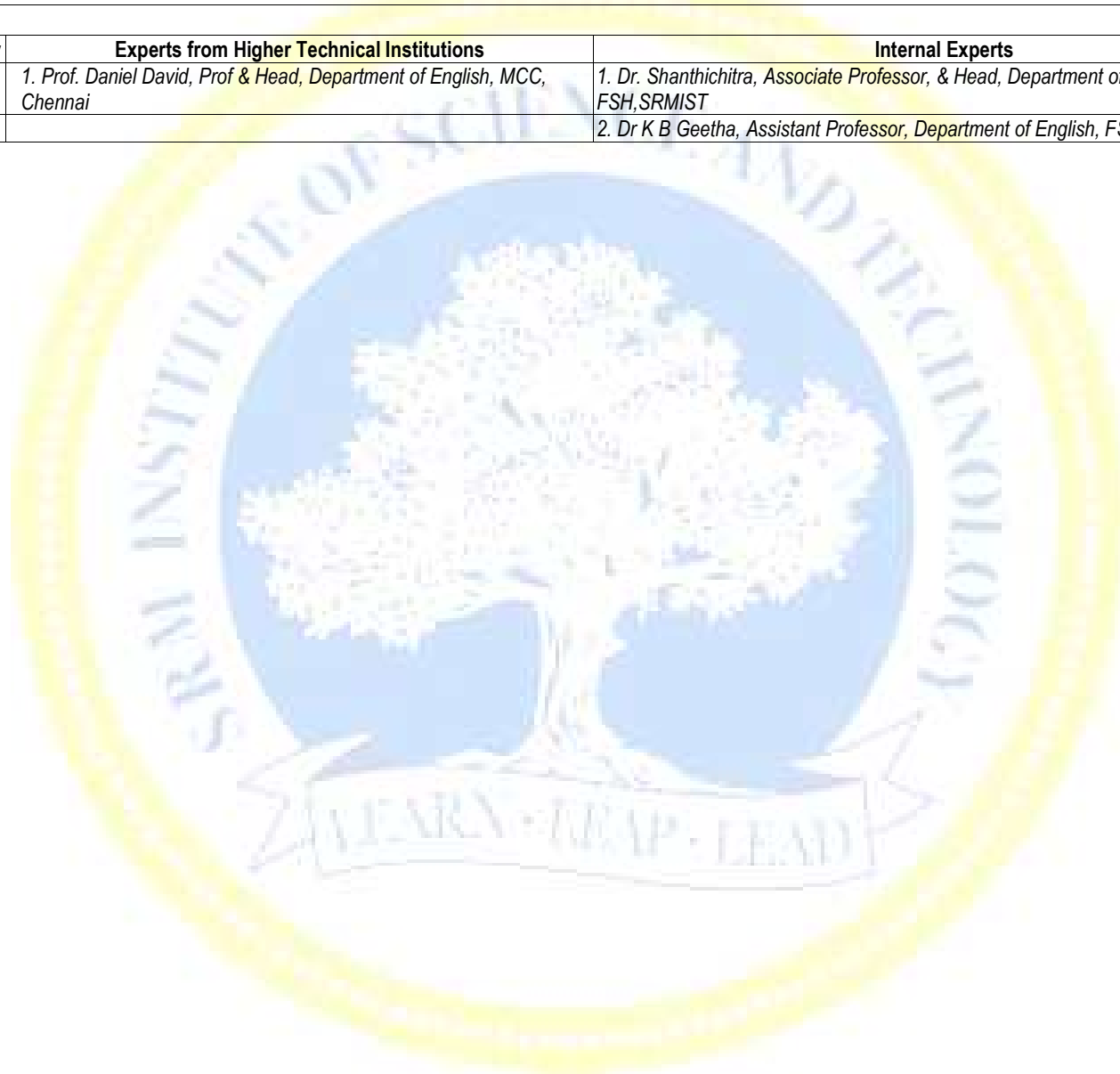|	Duration (hour)	06	06	06	06	06
S-1	SLO-1	What is love? Forms of love. For self, parents, family, friends, spouse, community, nation, humanity and other beings, both for living and non living	Love compassion empathy sympathy and non violence	Narratives and anecdotes from history, literature including local folklore	What will learners lose if they don't practice love and compassion?	Sharing learners' individual and/or group experiences
	SLO-2	Love and Compassion inter relatedness	Individuals who are remembered in history for practicing compassion and love	Practicing Love and Compassion: what will they gain if they practice compassion?	Simulated situations	Case studies

S-2	SLO-1	What is Truth ?	Universal truth, truth as value, as fact,	Veracity, sincerity, honesty among others	Individuals who are remembered in the history who have practiced these values	Practicing truths
	SLO-2	: what will they gain if they practice truth	What will learners lose if they don't practice truth?	Sharing learners' individual and/ or group experiences	Simulated situations	Case studies
S-3	SLO-1	What is non violence – its need, love compassion,	empathy sympathy for others as pre- requisites for non- violence	**Ahimsa as non violence and non killing**	Individuals and their organizations which are known for their commitment for non violence	Narratives and anecdotes about non violence from history and literature including local folklore
	SLO-2	Practicing non violence	What will they gain if they practice non violence	What will learners lose if they don't practice non violence?	Simulated situations	Case studies
S-4	SLO-1	What is righteousness ?	Righteousness and Dharma	Righteousness and priority	Individuals who are remembered in the history who have practicing righteousness.	Narratives and anecdotes about Righteousness from history and literature including local folklore
	SLO-2	Practicing Righteousness	: Sharing learners' individual and/ or group experiences	what will learners lose if they don't practice Righteousness	Simulated situations	Case studies
S-5	SLO-1	What is peace?	Need of peace in Relation with harmony and balance	Narratives and anecdotes about peace from history and literature including local folklore	Individuals who are remembered in the history who have practicing peace	Practicing peace
	SLO-2	What will they gain if they practice peace	what will learners lose if they don't practice peace	Sharing learners' individual and/ or group experiences	Simulated situations	Case studies
S-6	SLO-1	What is service and renunciation	Forms of service , & renunciation Individuals who have recommended service in history	Practicing service and renunciation	Narratives and anecdotes about Service & renunciation from history and literature including local folklore	Individuals who are remembered in the history who have practicing renunciation
	SLO-2	Sharing learners' individual and/ or group experiences on renunciation	Sharing learners' individual and/ or group experiences on service	what will learners lose or gain if they do/don't practice Renunciation and service	Simulated situations	Case studies

Learning Resources	**Theory:** 1. "Universal Human Values: Text Book"– Compiled and Edited by the Faculty of Science and Humanites, SRMIST, 2020.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)							
		CLA – 1 (20%)		CLA – 2 (20%)		CLA – 3 (30%)		CLA – 4 (30%) #	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-
	Understand								
Level 2	Apply	40%	-	40%	-	40%	-	40%	-
	Analyze								
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-
	Create								
	Total	100 %		100 %		100 %		100 %	

\# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
	1. Prof. Daniel David, Prof & Head, Department of English, MCC, Chennai	1. Dr. Shanthichitra, Associate Professor, & Head, Department of English, FSH,SRMIST
		2. Dr K B Geetha, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UDS21401J	Course Name	DEEP LEARNING FOR ENTERPRISE	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR): The purpose of learning this course is to,

		Learning			Program Learning Outcomes (PLO)														

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To make the participants comfortable with the fundamentals of some of the advanced deep learning concepts, their working principles, and their functions in a business scenario.																		
CLR-2 :	To make the participants comfortable with the fundamentals of different deep learning approaches, and ways to implement them using the suitable libraries and deep learning models.																		
CLR-3 :	To make the participants understand the methods of teaching machines in performing cognitive works just as humans do using neural networks.																		
CLR-4 :	To build intelligent and automated real-world deep learning applications and use cases spanning healthcare, retail, energy verticals by intelligently Analyzing different datasets collected from diverse data sources.																		
CLR-5 :	To provide the participants with a sound understanding of a basic neural network including the concepts of neurons, weight, bias etc along with the mathematical concepts used in calculating the error function, enhancing model performance etc.																		
CLR-6 :	To bring the learners to an alignment, apply their learning to a real-world business problem, and then performs research, design, development, and delivers an end-to-end deep learning solution for a given industry problem. The students will be working either in a group or individually.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Have a strong control over the fundamental concepts of advanced deep learning including ability to have a strong foundational grasp the advanced mathematical concepts.	2	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-2 :	Have a strong control over the fundamental concepts of all the deep learning approaches, techniques for selecting the right features and the models involved in predictive analytics.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-3 :	Use all the their cognitive skills and knowledge in applying the right set of deep learning techniques for the problem in hand	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-4 :	Gain hands-on solid skills, knowledge and expertise of real-world situations the applicability of tools and techniques in extracting valuable insights from the data of different formats on time.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-5 :	Get Hands-on Skills, knowledge, and expertise on the architectural components of a basic neural network that facilitates them with the flexibility to go ahead and implement a basic neural network.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6 :	Able build a full scale working convolutional neural networks, including variations such as residual networks.	3	85	80															

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Deep Learning - Deep Dive**	Backpropagation	Cost Function	Improving Activation Maximization with an expert	Eigen Vectors, Eigen Value, Single Value Decomposition
	SLO-2	Optimization for Deep Learning	Gradient Descent	Gradient Descent	Performing Activation Maximization in a code space	**Unit 13: Generative Adversarial Networks (GAN)**
S-2	SLO-1	Aggregated Residual Transformations for Deep Neural Networks	**Unit 4: Deep Learning in Real World Applications**	Stochastic Gradient Descent	Explaining DNN Decisions	Generative Adversarial Models Overview, Discriminative vs Generative Modelling, Examples of Generative models
	SLO-2	Spatial Transformer Networks	Deep learning in Healthcare	Learning Rate	Backward Propagation Techniques	Generative Adversarial Networks Overview, The Generator Model, GAN's and CNN's
S-3	SLO-1	End-to-end Optimized Image Compression	Deep learning in Retail	Batches, Epochs and Iteration	**Unit 9: Deep Neural Net optimization, Tuning**	Conditional GAN's, Why Generative Adversarial Networks, Generative Adversarial Networks Training, Loss Functions
	SLO-2	Generative Adversarial Nets	Deep learning in Energy	**Unit 7: Deep Neural Networks and Tools**	Optimizers overview, Gradient Descent, Stochastic Gradient Descent (SGD), Mini Batch Stochastic Gradient Descent (MB-SGD),SGD with momentum	**Unit 14: Backpropagation, Regularization and Batch Normalization**
S-4	SLO-1	Improved Techniques for Training GANs	Deep learning in Oil & Gas	Deep Neural Network overview	Nesterov Accelerated Gradient (NAG), Adaptive Gradient (AdaGrad)	Back Propagation Overview, Working of Back Propagation algorithm, Need of Back Propagation algorithm, Types of Back Propagation algorithms
	SLO-2	**Unit 2: Deep Learning Approaches**	Deep learning in Automobile	Difference between neural network and deep neural network	Tuning the layers, Hyperparameter Tuning	Feed Forward Networks Overview, Batch Normalization Overview, Working of Batch Normalization
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Learning Algorithms	**Unit 5: Challenges of Deep Learning**	Deep Learning Neural Network overview	learning rate, Momentum β, for RMSprop, etc, Mini-batch size, Number of hidden layers, learning rate decay, Regularization λ	Need of Batch Normalization algorithm, Regularization overview, How does Regularization reduce overfitting

	SLO-2	Supervised Learning	Data Issues	Deep Convolutional Neural Network overview	**Unit 10: Convolutional Neural Network**	Types of Regularization techniques ✓ L2 and L1 regularization ✓ Dropout ✓ Data augmentation ✓ Early stopping
S-8	SLO-1	Unsupervised Learning	Overfitting in neural networks	Improving accuracy of the neural networks	Convolution , ReLU layer, Pooling, Padding, Flattening	**Unit 15: Backpropagation, Regularization and Batch Normalization**
	SLO-2	How to select a Deep Learning Algorithm	Hyperparameter optimization	The problem of explainability	Full Conversion Layer, Softmax, Cross-Entropy	Overview of Gradient descent optimization, Overview of Adagrad Gradient descent algorithm
S-9	SLO-1	Deep Learning Workflow and applications	High Performance Hardware	**Unit 8: Interpretability of Neural Networks**	**Unit 11: Recurrent Neural Network**	Gradient descent with Adagrad ✓ Two-Dimensional Test Problem ✓ Gradient Descent Optimization With AdaGrad ✓ Visualization of AdaGrad
	SLO-2	Challenges and Vision for the future	Neural network is a Black Box	Learned features	RNN intuition, Vanishing Gradient Problem, Tackling Vanishing Gradient Problem	Overview of Adadelta Gradient descent algorithm, Gradient descent with Adadelta
S-10	SLO-1	Analysis of Deep Learning applications	Lack of Flexibility	Feature visualization	Exploding Gradient Problem, Tackling Exploding Gradient Problem	Overview of RMSProp Gradient descent algorithm, Gradient descent with RMSProp
	SLO-2	**Unit 3: Deep Learning Techniques**	Multitasking	Feature Visualization through Optimization	Long Short-Term Memory, Applications of Recurrent Neural Networks	Overview of Adam Gradient descent algorithm, Gradient descent with Adam
S-11 & S-12	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					
S-13	SLO-1	Classic Neural Networks	Deep Learning Security	Connection to Adversarial Examples	**Unit 12: Auto Encoders and dimensionality reduction in networks**	**Unit 16: Deep Learning Hands On Lab Work 2- Build, Test and Deploy ML Models (Health - 3)**
	SLO-2	Convolutional Neural Networks	**Unit 6: Artificial Neural Networks**	Text and Tabular Data	Autoencoders overview	Patient Segmentation
S-14	SLO-1	Recurrent Neural Networks (RNNs)	Neuron	Network Dissection	Types of Autoencoders ✓ Deep Autoencoder ✓ Sparse Autoencoder	Problem statement, Problem type

					✓ Under complete Autoencoder ✓ Variational Autoencoder ✓ LSTM Autoencoders ✓ Hyperparameters of Autoencoders	
	SLO-2	Generative Adversarial Networks	Weight	Network Dissection Algorithm	Applications of Autoencoders ✓ Dimensionality reduction ✓ Anomaly detection ✓ Image denoising ✓ Image compression ✓ Image generation	Data engineering, Data pipeline
S-15	SLO-1	Self-Organizing Maps	Bias	Experiments	Dimensionality Reduction with PCA	Model selection, Model engineering
	SLO-2	Boltzmann Machines	Activation Function	Advantages of Feature visualization	The Curse of Dimensionality	Mode outcome, analysis, and optimization
S-16	SLO-1	Deep Reinforcement Learning	Forward Propagation	Disadvantages of Feature visualization	Principal component analysis	Model pipeline
	SLO-2	Autoencoders	Backward Propagation	Activation Maximization	Eigen Value Decomposition	Data visualization, User interface
S-17 & S-18	SLO-1	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

Learning Resources	1. Machine Learning at Enterprise Scale by Piero Cinquegrana, Matheen Raza Released July 2019, Publisher(s): O'Reilly Media, Inc.	2. Deep Learning for Business Managers Artificial Intelligence Prithwis Mukerjee

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mrs.M.Ramla, SRMIST

Course Code	UDS21402J	Course Name	INTRODUCTION TO COMPUTER VISION	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

CLR-1 :	Inculcate the participants with the fundamentals of computer vision, their working principles and their functions in a business scenario.
CLR-2 :	To teach the participants the functions of a Computer vision techniques involved in training the Computer vision models on different problems like image classification, image detection, Object recognition, object detection etc, with a deep dive into the role the computer vision techniques play in building a scalable enterprise machine learning solutions.
CLR-3 :	To teach the participants to build intelligent and automated real-world Computer vision applications and use cases spanning healthcare, retail, energy verticals by intelligently analyzing different datasets collected from diverse data sources.
CLR-4 :	To teach the participants choosing the right set of frameworks involved in building critical Computer Vision solutions which are efficient, reliable and working at scale.
CLR-5 :	To introduce the participants to the modelling pedigree of Text classification, Image classification, Image detection, Object recognition, and Object detection techniques.
CLR-6 :	To bring the learners to an alignment, applies their learning to a real-world business problem, and then performs research, design, development, and delivers an end-to-end Computer vision for a given industry problem. The students will be working either in a group or individually.

Learning columns: 1 2 3 — Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

PLO columns: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 — Fundamental Knowledge, Application of Concepts, Link with Related Disciplines, Procedural Knowledge, Skills in Specialization, Ability to Utilize Knowledge, Skills in Modeling, Analyze, Interpret Data, Investigative Skills, Problem Solving Skills, Communication Skills, Analytical Skills, ICT Skills, Professional Behavior, Life Long Learning

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 : Have a strong control over the fundamental concepts of Computer vision including the ability to clearly define Computer vision from both academic and industry perspective.	2	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-2 : Gain hands-on solid skills, knowledge and expertise of real-world situations the applicability of tools and techniques in extracting valuable insights from the data of different formats on time.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-3 : Have solid hands-on skills, knowledge and expertise in Data gathering, Data collection, Model training, and model evaluation with domain-specific components.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-4 : Have a good Hands-on skills, knowledge and expertise on applying all the computer vision techniques to real -world industry problems.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-5 : Have solid hands-on skills, knowledge and expertise in applying the right computer vision techniques for the problem statement at hand.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H

CLO-6 :	Design and develop computer vision processing solution artifacts and ultimately demonstrate an "end-to-end" computer vision solution for a given problem statement either in a group or individually.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Computer Vision Defined - Academic and Industry Perspective**	Computer Vision in Energy	**Unit 6: Computer Vision Implementation Framework**	Image Processing Models Canny Edge Detectors	Choosing the software components
	SLO-2	Computer Vision Overview	Computer Vision in Oil & Gas	What is a Computer Vision framework?	Hough Transformers	Choosing the OS
S-2	SLO-1	Computer Vision defined from academic perspective	Computer Vision in Automobile	Features of a good Computer Vision framework	SURF	Adding Packages
	SLO-2	Computer Vision defined from Industry perspective	**Unit 4: Computer Vision Workflow**	Popular Computer Vision frameworks ✓ OpenCV ✓ TensorFlow ✓ Matlab ✓ CUDA ✓ YOLO	Image Classification Models	**Unit 12: Computer Vision Hands On Lab Work - Build, Test and Deploy ML Models (Consumer 1)**
S-3	SLO-1	Challenges of Computer Vision	Computer Vision Workflow Steps	**Unit 7: Computer Vision Techniques an Overview**	ImageNet	Challenges
	SLO-2	Tasks in Computer Vision	Business Problem Identification	Image Processing	CIFAR	High level decisions
S-4	SLO-1	Optical character recognition (OCR)	Success Criteria Definition	Image Processing Techniques	MNIST	Choosing the hardware components (GPU, TPU)
	SLO-2	Medical Imaging	Right Computer Vision Techniques	Image Restoration, Linear Filtering , Independent Component Analysis , Pixelation	Object Detection Models	Building a CV Software system
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Surveillance	Collect Training Data	Template Matching, Image Generation Technique, Filtering Techniques in Image Processing	Fast R-CNN	Benefits
	SLO-2	Fingerprint recognition and biometrics	Label Train and Test Datasets	Linear Filter, Non Linear Filter, Box Filter, Gaussian Filter	Faster R-CNN	Challenges

|						
S-8	SLO-1	**Unit 2: Demytifying Artificial Intelligence and Computer Vision**	Train the computer vision model	Median Filter	**Unit 10: Computer Vision Data Requirements**	High level decisions
	SLO-2	Introduction to Computer Vision	Evaluate the computer vision model	Feature etection and matching	How much data is needed	Customer Image Segmentation
S-9	SLO-1	What is Computer Vision?	Test the model	Harris Corner Detector, SIFT (scale invariant feature transform), SURF (speeded-up robust features), FAST (features from accelerated segment test)	Is your data good enough?	Problem statement
	SLO-2	Object Recognition	Deploy the model	✓ BRIEF (Binary Robust Independent Elementary Features), Harris Corner Detector ✓ SIFT (scale invariant feature transform) ✓ SURF (speeded-up robust features) ✓ FAST (features from accelerated segment test)	Data Structure	Problem type
S-10	SLO-1	Medical Image Analysis	Iterate the steps process	**Unit 8: What Problem Computer Vision Solves**	Data Format	Data engineering
	SLO-2	Content-Based Image Retrieval	**Unit 5: Computer Vision Architecture**	Text Classification	Data Type	Data pipeline
S-11 & S-12	SLO-1					
	SLO-2	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
S-13	SLO-1	Video Data Processing	Components of Computer vision solution	Image Detection	Source System	Model selection
	SLO-2	Virtual Reality and Augmented Reality	Data Ingestion	Image Segmentation	Target system	Model engineering
S-14	SLO-1	Image Processing	Data Pre-processing	Image Classification	Training Data	Model outcome
	SLO-2	Image Processing Techniques Image Restoration, Linear Filtering,Independent Component Analysis, Pixelation,	Multiprocessing	Object Detection	Validation Data	Model analysis

		Template Matching, Image Generation Technique (GAN)				
S-15	SLO-1	Filtering Techniques in Image Processing Linear Filter, Non-Linear Filter	Transfer Learning/Model Processing	Object Recognition	Test Data	Model optimization
	SLO-2	**Unit 3: Computer Vision in Real World Applications**	Data Transformation	Object Classification	**Unit 11: Computer Vision Development Hardware and Software Requirements**	Model pipeline
S-16	SLO-1	Computer Vision in Healthcare	Parallel Processing	**Unit 9: Computer Vision Models**	Building a Computer Vision Hardware system	Data visualization
	SLO-2	Computer Vision in Retail	User Interface and Advanced Analytics	Computer Vision Models overview	Benefits	User interface
S-17 & S-18	SLO-1	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

Learning Resources

Learning Resources	1. R. Jain, R. Kasturi, and B. G. Schunck, Machine Vision , McGraw-Hill, Inc. 1995. 2. Digital Image Processing and Analysis: Application with MATLAB and CVIPtools, 3rd Edition, SE Umbaugh, Taylor&Francis/CRC Press, 2018	3. Computer Vision: Algorithms and Applications by Richard Szeliski. Available for free online. 4. Computer Vision: A Modern Approach (Second Edition) by David Forsyth and Jean Ponce. Available for free online. 5. Elements of Statistical Learning by Trevor Hastie, Robert Tibshirani, and Jerome Friedman. Available for free online (Warning: Direct PDF link). 6. Multiple View Geometry in Computer Vision (Second Edition) by Richard Hartley and Andrew Zisserman. Available for free online through the UM Library (Login required).

Learning Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.Sivakumar, SRMIST
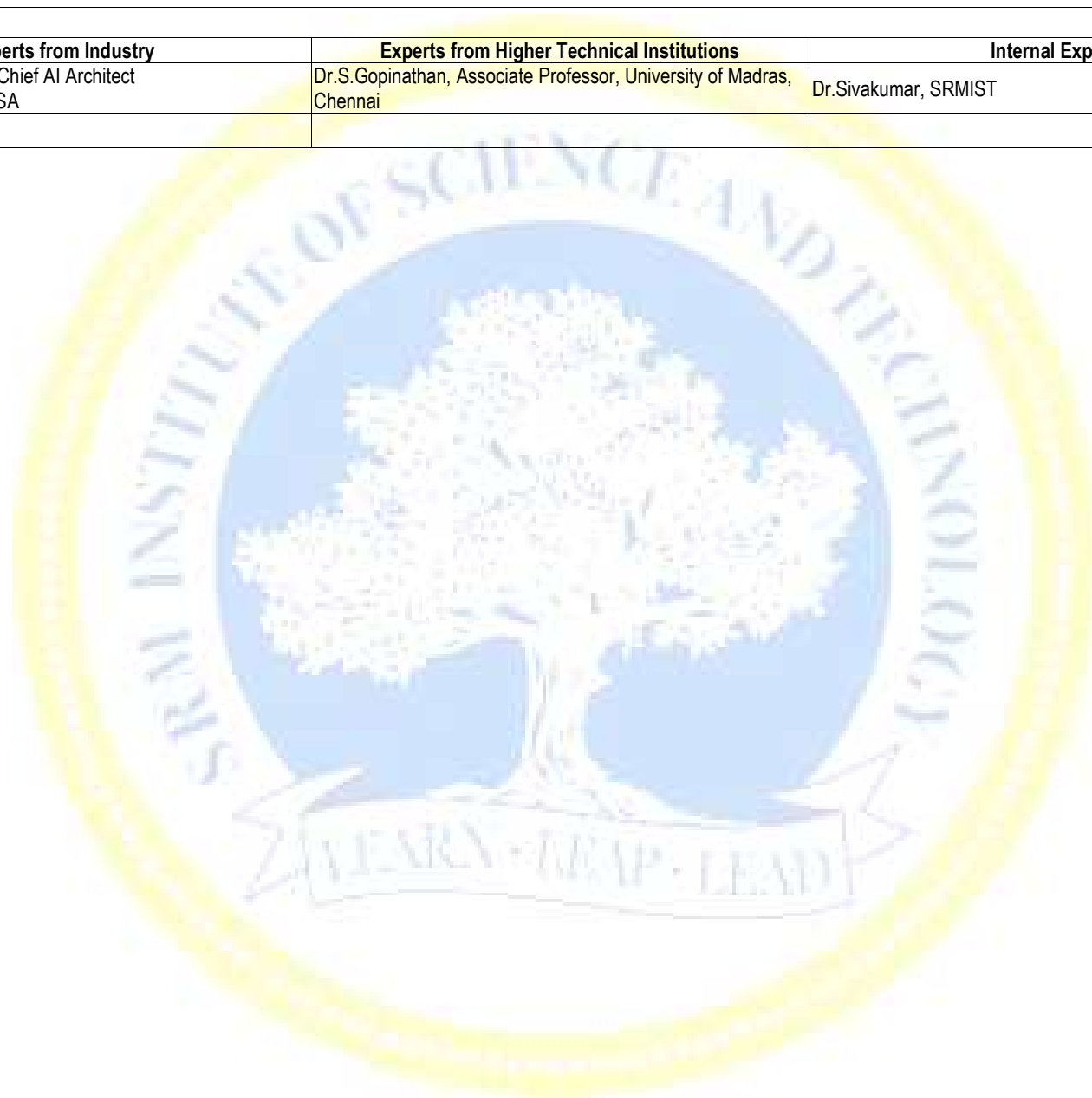
Course Code	UDS21403J	Course Name	WORKING WITH BIG DATA		Course Category	C	Professional Core Course	L	T	P	C
								4	0	2	5

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To provide the participants with the comprehensive knowledge of different types of big data types like the structured, unstructured, semi- structured and streaming datasets.																		
CLR-2 :	To familiarize the participants with the Hadoop and Apache spark the two most popular big data processing frameworks available in the market.																		
CLR-3 :	To understand the Hadoop Ecosystem or a suite which provides various services to solve the big data problems																		
CLR-4 :	To introduce the participants to DataFrames in Apache Spark for large scale Data science applications.																		
CLR-5 :	To to introduce the participants to build real-time streaming data pipelines and real-time streaming applications with Apache Kafka.																		
CLR-6 :	Bring the users to an alignment, applies their learning to a real-world business problem, and then performs research, design, development, and delivers an end-to-end Big Data solution for a given industry problem. The students will be working either in a group or individually.]																		

Column headers for Learning section: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

PLO headers: Fundamental Knowledge, Application of Concepts, Link with Related Disciplines, Procedural Knowledge, Skills in Specialization, Ability to Utilize Knowledge, Skills in Modeling, Analyze, Interpret Data, Investigative Skills, Problem Solving Skills, Communication Skills, Analytical Skills, ICT Skills, Professional Behavior, Life Long Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	To design and develop natural language processing solution artifacts and ultimately demonstrate an "end-to-end" machine learning solution for a given problem statement either in a group or individually.	2	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-2 :	hands-on skills, knowledge and expertise in IoT communication protocols that are modes of communication to ensure optimum security of the data being exchanged between IoT connected devices	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-3 :	publish (write) and subscribe to (read) streams of events, including continuous import/export of your data from other systems.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-4 :	efficiently work with Apache Kafka for process streaming data in real-time, and Publish and subscribe to streams of records	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-5 :	utilize the power of spark and python in a nutshell and process data in a distributed environment	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-6 :	Have a fundamental understanding of all the big data types, tools and techniques that are involved to process data	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

| Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Introduction to Big Data**	Apache Hadoop overview	Apache Kafka Streams	DataFrames in Spark Overview, Features of DataFrames in Spark , Why do we need Spark DataFrames, Sources for Spark DataFrames	NoSQL Databases Overview, Evolution of NoSQL, What makes NoSQL different
	SLO-2	Big Data Tools Overview	Business Benefits of Apache Hadoop	Apache Kafka Stream processing	Creation Spark DataFrames from JSON, Creation Spark DataFrames from existing RDD's, Creation Spark DataFrames from existing csv files, Spark DataFrame Operations	Business Benefits and Challenges of NoSQL, NoSQL vs Relational Databases
S-2	SLO-1	Hadoop	Need of Apache Hadoop	**Unit 5: Map Reduce, its Working and Developing a Map Reduce Application**	select(), withColumn() Transformation, filter() Transformation, orderBy(), sort(), sortWithinPartitions() Transformation	No SQL Data Store Types, No SQL Database management systems
	SLO-2	Apache Strom	Components of Hadoop	Map Reduce overview	distinct(), dropDuplicates() Transformation, join () Transformation, groupBy () Transformation	**Unit 14: Working with IIoT Technologies, Communication Protocols and Data Services**
S-3	SLO-1	MongoDB	Processing Layer (MapReduce)	How does MapReduce Work?	**Unit 9: Introduction to Apache Kafka**	IIoT Communication Protocols overview
	SLO-2	Cloudera	Storage Layer (HDFS)	Business benefits of MapReduce	Apache Kafka overview	IIoT Wireless Communication Protocols overview
S-4	SLO-1	Big Data Technologies Overview	Hadoop YARN	Business Challenges of MapReduce	Event Streaming, Uses of Event Streaming, Apache Kafka as event Streaming platform, Working of Apache Kafka	IIoT Communication Protocols overview
	SLO-2	Data Management	Apache Spark overview	MapReduce Architecture	Apache Kafka overview	IIoT Wireless Communication Protocols overview
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Data Mining	Business Benefits of Apache Spark	MapReduce Example	Event Streaming, Uses of Event Streaming, Apache Kafka as event Streaming platform, Working of Apache Kafka	Business Benefits and Challenges of IIoT Communication Protocols

	SLO-2	In-Memory Analytics	Need of Apache Spark	Implementation of MapReduce	Event, Producers, Consumer, Topic, Partition, Messaging System	Client/Server, pub/sub, Request/Response
S-8	SLO-1	Predictive Analytics	Components of Apache Spark	**Unit 6: Big Data HDFS Ecosystem, Tools and Technologies**	Broker, Kafka API's	RESTful Interface, MQTT, AMQP, OPC UA
	SLO-2	Text Mining	Spark Core Engine	Overview of Hadoop Ecosystem	**Unit 10: Data Streaming Setup and Configuration**	**Unit 15: Hands On Lab Usecase Implementation (Health -3)**
S-9	SLO-1	Big Data Analytics	Spark SQL	Components of Hadoop Ecosystem ✓ HDFS ✓ YARN ✓ MapReduce ✓ Spark ✓ Pig ✓ Hive ✓ Hbase ✓ Mahout ✓ Zookeeper ✓ Oozie	Introduction to Kafka Event Streaming, Understanding Architecture & Working of Kafka Event Streaming	Hospital readmission
	SLO-2	Text Analytics	Spark Streaming	**Unit 7: Introduction to PySpark**	Steps to Set Up Kafka Event Streaming, Set Up Kafka Environment, Create a Kafka Topic to Store Kafka Events, Write Kafka Events into the Topic	Problem statement
S-10	SLO-1	Information extraction	MLib	Spark Overview	Read Kafka Events, Import/ Export Streams of Events Using Kafka Connect, Process Kafka Events Using Kafka Streams, Terminate Kafka Environment	Problem type
	SLO-2	Text Summarization	GraphX	PySpark Overview	**Unit 11: Data Event Ingestion Setup and Configuration**	Data engineering
S-11 & S-12	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					
S-13	SLO-1	Question Answering	**Unit 4: Introduction to Stream Concepts**	Business Benefits and Challenges of PySpark	Introduction to Kafka Event Ingestion, Understanding Architecture & Working of Kafka Event Ingestion	Data pipeline
	SLO-2	**Unit 2: Role of Big Data for Data Engineering - Deep Dive**	Data Stream Overview	Components of PySpark	Steps to Set Up Kafka Event Ingestion, Set Up Kafka Environment	Model selection

S-14	SLO-1	Working with Semi-structured Data	Types of Data Stream ✓ Transactional Data Streams ✓ Measurement Data Streams	SparkSession Overview	Load Sample, Build a data cube, Examine the ingestion spec	Model engineering
	SLO-2	Working with Unstructured Data	Characteristics of Data Streams	SparkContext Overview	**Unit 12: Data and System Interoperability**	Model outcome, analysis
S-15	SLO-1	Working with Images	Examples of Data Streams	SparkConf Overview	Confluent Platform and Apache Kafka Compatibility, Using Confluent Platform system Service Unit Files	Model optimization
	SLO-2	Working with audio	Business Benefits of Data Streams	PySpark RDD, MLib, Serializers	Control Center, Apache Kafka, Kafka Connect	Model pipeline
S-16	SLO-1	Working with video	Business Challenges of Data Streams	**Unit 8: Data Processing, Transformations with Spark DataFrames**	Confluent REST Proxy, ksqlDB (ksql), Schema-Registry (schema-registry),ZooKeeper (zookeeper)	Data visualization
	SLO-2	**Unit 3: Big Data Hadoop and Apache Spark Framework**	Applications of Data Streams	DataFrames in Spark Overview	**Unit 13: Introduction to NoSQL Databases**	User interface
S-17 & S-18	SLO-1	Lab 3: Apache Hadoop overview	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

Learning Resources	1. Michael Berthold, David J. Hand, (2007), "Intelligent Data Analysis", Springer 2. Tom White (2012), " Hadoop:The Definitive Guide" Third Edition, O'reillyMedia	3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge Press, 2012.

Learning Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mrs.M.R.Sudha,SRMIST
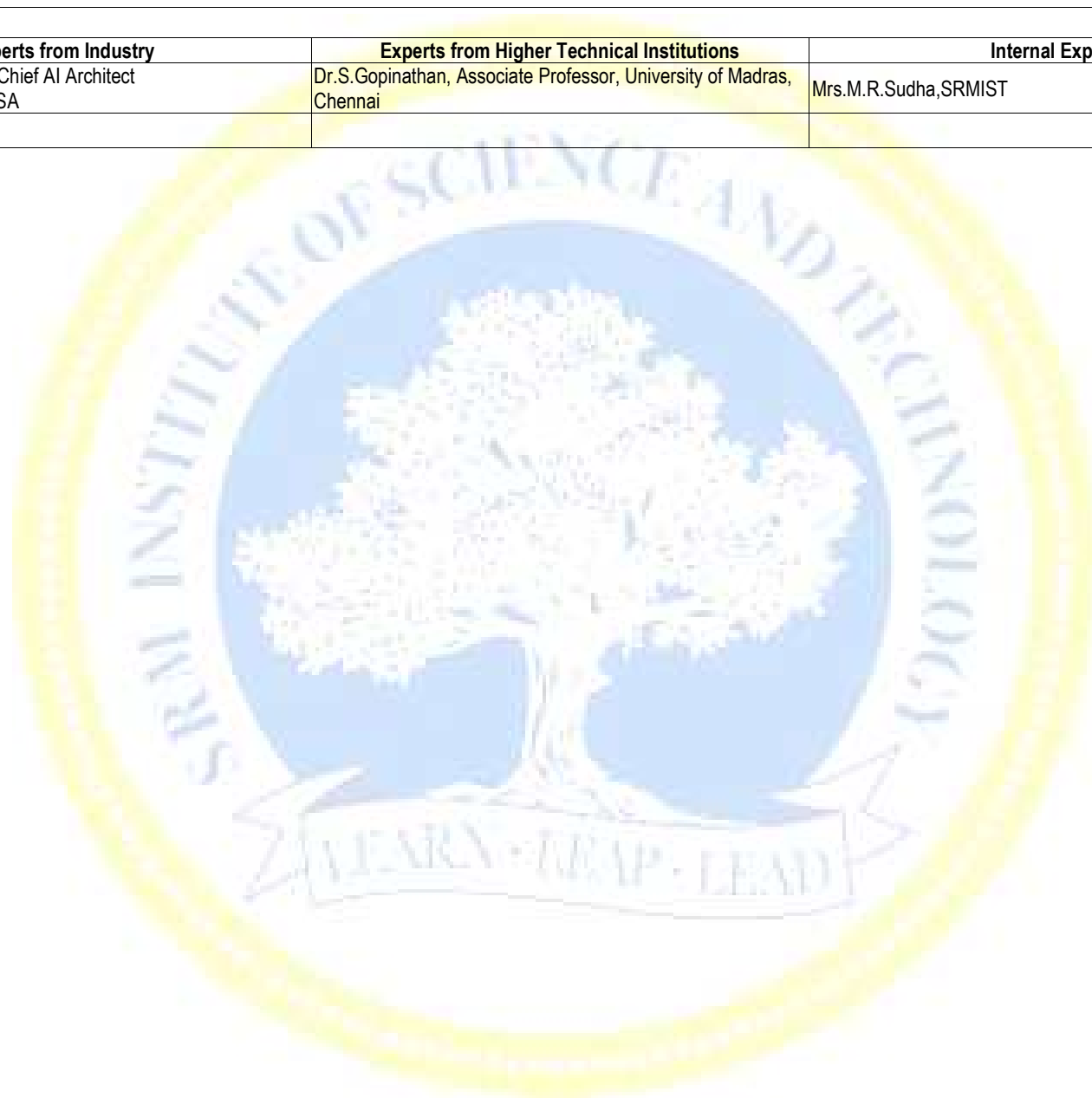
Course Code	UDS21404J	Course Name	DATA SCIENCE FOR ENTERPRISE	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR): The purpose of learning this course is to,

		Learning	Program Learning Outcomes (PLO)

CLR-1 :	To provide the participants with the comprehensive knowledge of different advanced data Science concepts with some the mathematical functions that are the foundational building blocks of the machine learning models
CLR-2 :	To educate the participants with concepts of tree based models in machine learning, it working and applications to represent how different input variables can be used to predict a target value.
CLR-3 :	To educate the participants on Advanced regression techniques used in building machine learning applications.
CLR-4 :	To help the participants understand, diagnose, and refine a machine learning model with the help of interactive visualization techniques, for solving real-world artificial intelligence and data mining problems
CLR-5 :	To educate the participants on the concepts of Sqoop, it working, architecture.
CLR-6 :	To educate the participants on how to Visualize data using charts, graphs, and maps is one of the most impactful ways to communicate complex data.

Learning proficiency levels: 1 2 3 | PLO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

CLO	Description	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Have excellent hands-on skills, knowledge and expertise in creating tree based models for classification and regression tasks in machine learning	2	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-2 :	Have excellent hands-on skills, knowledge and expertise in understanding, diagnosing, and refining a machine learning models for solving real-world artificial intelligence and data mining problems	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-3 :	Be able to collect and transport huge amounts of data such as events, log files, etc. from several sources to one central data store.	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-4 :	Have excellent hands-on skills, knowledge and expertise in Amazon Redshift to create a data warehouse with launch a set of nodes, called an Amazon Redshift cluster	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-5 :	Have excellent hands-on skills, knowledge and expertise in the basic concepts, principles, and major algorithms in text analytics and their potential applications	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-6 :	Effectively use best visualization for your dataset, and interpret common plot types like histograms, scatter plots, line plots and bar plots	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Data Science for Enterprise - Deep Dive**	Generalized Discriminant Analysis (GDA)	Importance Machine Learning Model Analysis	Characteristics of Apache Flume, Business Benefits of Apache Flume	Regular expression, Word tokenization, Named Entity Recognition, Stemming and lemmatization
	SLO-2	Data Science for Enterprise overview	Multi-Dimension Scaling (MDS)	Business Benefits and Challenges of Machine Learning Model Analysis	Applications of Apache Flume, SQOOP vs Flume, SQOOP vs HDFS	Word cloud, Bag-of-words, Term Frequency Inverse Document Frequency
S-2	SLO-1	The core of data mining process	IsoMap	How to perform machine learning model analysis	**Unit 9: Amazon RedShift for Querying Data**	Text Regression (Automated Machine Learning and Deep Learning), Text Classification (Automated Deep Learning)
	SLO-2	Numerical optimization	Autoencoders	**Unit 6: Introduction to structured frameworks like 5W, 5WHYs, and SPIN**	Overview of Amazon Web Services	**Unit 13: Time Series Analysis - Analysis and Forecast of Series of Data that varies with time**
S-3	SLO-1	Streaming algorithms	How Dimensionality Reduction Works with PCA?	5W overview	Overview of Amazon RedShift	Time Series Analysis Overview
	SLO-2	High-dimensional regression and variable selection	Eigenvalue Decomposition	Root cause Analysis overview	Amazon Management Console	Business Benefits of Time Series Analysis Overview
S-4	SLO-1	Compression and error detection	Matrix Decomposition	Business Benefits and Challenges of 5W?	Creating Amazon RedShift Cluster ✓ Cluster Configuration ✓ Database Configuration ✓ Additional Configuration	Business Challenges of Time Series Analysis Overview
	SLO-2	Lossless coding	Eigenvectors	5WHY's overview	Querying AWS Redshift Cluster	When to use Time Series Analysis
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Entropy	Eigenvalues	Business Benefits and Challenges of 5WHY's?	**Unit 10: Building Automated Pipelines with Apache Airflow**	Components of Time Series
	SLO-2	Shannon's theorem	Singular value decomposition	SPIN overview	Apache AirFlow overview	Stationary and Non Stationary Time Series
S-8	SLO-1	**Unit 2: Machine Learning Tree Models - Deep Dive**	**Unit 4: Advanced Regression Techniques**	Business Benefits and Challenges of SPIN	When to use Airflow ✓ Reasons to choose Airflow ✓ Reasons not to choose Airflow	Auto Regressive model for Time series Implementation

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	SLO-2	Tree Based Models Overview	Advanced Regression overview	**Unit 7: Introduction to structured frameworks like 5W, 5WHYs, and SPIN**	Data Pipelines as graphs	ARMA and ARIMA
S-9	SLO-1	Decision Tree Models	What is Regression Analysis?	Linear Optimization overview	Executing a Pipeline graph	Steps of time series implementation
	SLO-2	Classification and Regression Trees	Why do we use Regression Analysis?	MPsolver Interface	Pipeline graph vs sequential scripts	
S-10	SLO-1	How to Create decision tree models	How to select the right Regression Model?	Solving an MP problem	Running pipeline using workflow managers	
	SLO-2	Bias-Variance Trade-off	Polynomial Regression.	Advanced MP problem	Scheduling and executing pipelines	
S-11 & S-12	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					
S-13	SLO-1	Ensemble methods	Stepwise Regression.	Integer Optimization overview ✓ Integer variables ✓ Boolean variables	**Unit 11: Text Analytic Processing**	**Unit 14: Introduction to Data Visualization - Visual Representation of Data**
	SLO-2	Bagging and Random Forests	Ridge Regression.	Solving MIP problem	Text Analytics Overview	Data Visualization Overview
S-14	SLO-1	Boosting and Gradient Boosting	Lasso Regression.	Using Arrays to define a model	Text Analytics Business Benefits	Business Benefits of Data Visualization
	SLO-2	**Unit 3: Machine Learning Tree Models - Deep Dive**	ElasticNet Regression	**Unit 8: Introduction to Apache Sqoop And Apache Flume**	Text Analytics Business Challenges	Business Challenges of Data Visualization
S-15	SLO-1	Dimensionality Reduction Overview	Poisson's Regression	Apache Sqoop Overview, Why do we need Apache Sqoop, Apache Sqoop Architecture	Examples of Text Analytics	Data Visualization Tools
	SLO-2	The Curse of Dimensionality	Non Linear Regression	How to data transfer using sqoop	Analyse your data Import the data Define your tags Model Selection Train Model Test Model	Data Visualization Techniques
S-16	SLO-1	Principal Component Analysis (PCA)	**Unit 5: Advanced Machine Learning Model Analysis and Recursion Techniques**	Importing Data, Exporting Data, Sqoop Connectors	**Unit 12: Text based Predictive Modelliung**	Data Visualization examples
	SLO-2	Linear Discriminant Analysis (LDA)	Machine Learning Model Analysis Overview	Apache Flume Overview, Why do we need Apache Flume	Text Based Predictive Modelling Overview, Steps in Text Based predictive modelling	Bar chart, Column Chart, Pie Chart, Scatter Plot, Data Visualization in Tableau
S-17 &	SLO-1	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

S-18					

| Learning Resources | 1. Vijay Kotu, Bala Deshpande, " Data Science Concepts and Practice", Second Edition, Morgan Kaufmann Publishers, 2019
2. Clinton Sheppard, " Tree-based Machine Learning Algorithms: Decision Trees, Random Forests, and Boosting" 2017
3. Olga Korosteleva, " Advanced Regression Models with SAS and R", First Edition,Published by Chapman and Hall/CRC, 2020
4. John Hearty, " Advanced Machine Learning with Python", Packt Publisher, 2016 | 5. https://data-flair.training/blogs/flume-books/
6. Shruti Worlikar, Thiyagarajan Arumugam, Harshida Patel, " Amazon Redshift, Cookbook", Packt Publisher, 2021
7. Bas P. Harenslak and Julian Rutger de Ruiter, " Data Pipelines with Apache Airflow", Manning Publications, 2021
8. Chengqing Zong, Rui Xia, Jiajun Zhang, "Text Data Mining", First Edition, 2021
9. Claus O. Wilke, " Fundamentals of Data Visualization — A Primer on Making Informative and Compelling Figures", 2019 |

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mrs.Kanmani,SRMIST

Course Code	UJK20401T	Course Name	PROFESSIONAL SKILLS		Course Category	JK	Life Skill Course	L	T	P	C
								2	0	0	2

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil	
Course Offering Department	Career Development Centre		Data Book / Codes/Standards		-			

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 : expose students to the requirements of job market																			
CLR-2 : develop resume building practice																			
CLR-3 : increase efficiency in speaking during group discussions																			
CLR-4 : prepare students for job interviews																			
CLR-5 : instill confidence in students and develop skills necessary to face audience																			
CLR-6 : develop speaking and presentation skills in students																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 : understand the importance of resume preparation and build resume		3	80	70	M	M	L	L	M	H	-	-	-	M	H	L	H	H	H
CLO-2 : acquire group discussion skills		3	85	75	M	M	L	L	M	H	-	-	-	M	H	L	H	H	H
CLO-3 : face interviews confidently		3	85	80	M	M	L	L	M	H	-	-	-	M	H	L	H	H	H
CLO-4 : Ask appropriate questions during an interview		3	85	80	M	M	L	L	M	H	-	-	-	M	H	L	H	H	H
CLO-5 : understand various types of presentation and use presentation skills in projects		3	85	80	M	M	L	L	M	H	-	-	-	M	H	L	H	H	H
CLO-6 : build confidence during any presentation		3	85	80	M	M	L	L	M	H	-	-	-	M	H	L	H	H	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Introduction of resume and its importance	Meaning and methods of group discussion	Meaning and types of interview (face to face, telephonic, video)	Types - Informative, Instructional, Arousing, Persuasive, Decision-making	PowerPoint presentation- body language and stage etiquettes
	SLO-2	Difference between a CV, Resume and Bio Data	Procedure of group discussion	Dress code, background research	Structure of a presentation - Introduction of the event, Introducing the speaker, vote of thanks	PowerPoint presentation- body language and stage etiquettes
S-2	SLO-1	Essential components of a good resume, common errors people make while preparing a resume	Group discussion – simulation	STAR Technique (situation, task, approach and response) for facing an interview	Working with audience - ice-breaking, Creating a 'Plan B',	PowerPoint presentation- practice session
	SLO-2	Resume building format	Group discussion – common errors	Interview procedure (opening, listening skills, closure, asking questions)	Getting the audience in the mood, working with emotions,	PowerPoint presentation- practice session
S-3	SLO-1	Resume building using templates	Group discussion - types - Topic based	Important questions generally asked in an interview	Improvisation and unprepared presentations, man-woman view, feedback - appreciation and critique	PowerPoint presentation- practice session

	SLO-2	*Resume building using templates*	*Group discussion – types – Case study based*	*Important questions generally asked in an interview*	*Improvisation and unprepared presentations, man-woman view, feedback - appreciation and critique*	*PowerPoint presentation- practice session*
S-4	SLO-1	*Resume building activity*	*Group discussion – practice session- Topic based*	*Mock interview – face to face*	*Power point presentation, skit, drama, dance, mime, short films and documentary - Dos and Don'ts*	*PowerPoint presentation- practice session*
	SLO-2	*Resume building activity - Feedback*	*Group discussion - Feedback*	*Mock interview- Feedback*	*Power point presentation, skit, drama, dance, mime, short films and documentary - Dos and Don'ts*	*PowerPoint presentation- practice session*
S-5	SLO-1	*Video resume - Tips and tricks*	*Group discussion – practice session- Topic based*	*Mock interview - face to face*	*PowerPoint presentation - content preparation*	*PowerPoint presentation- practice session*
	SLO-2	*Video resume - Do's and Don'ts*	*Group discussion - Feedback*	*Mock interview - Feedback*	*PowerPoint presentation- logical arrangement of content*	*PowerPoint presentation- practice session*
S-6	SLO-1	*Video resume – Templates*	*Group discussion – practice session- Case study based*	*Mock interview - face to face*	*PowerPoint presentation- using internet source, citations, bibliography*	*PowerPoint presentation- practice session*
	SLO-2	*Video resume - Templates*	*Group discussion - Feedback*	*Mock interview- Feedback*	*PowerPoint presentation- using internet source, citations, bibliography*	*PowerPoint presentation- practice session*

Learning Resources	1. Scott Bennett, The Elements of Resume Style: Essential Rules for Writing Resumes and Cover Letters That Work, AMACOM, 2014 2. David John, Tricks and Techniques of Group Discussions, Arihant, 2012 3. Singh O.P., Art of Effective Communication in Group Discussion and Interview, S Chand & Company, 2014	4. Paul Newton, How to deliver a presentation ; e-book 5. Eric Garner, A-Z of Presentation, Eric Garner and Ventus Publishing ApS, 2012, bookboon.com

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) ##
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Ajay Zener, Director, Career Launcher	-	1. Mr Priyanand, Assistant Professor, CDC, E&T, SRMIST
		2. Ms Sindhu Thomas, Head in charge, CDC, FSH, SRMIST
		3. Ms Mahalakshmi, Assistant Professor, CDC, FSH, SRMIST

Course Code	UDS21501J	Course Name	INTELLIGENT AUTOMATION		Course Category	C	Professional Core Course		L	T	P	C
									4	0	4	6

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department	Computer Applications			Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To make the participants understand the fundamental concepts of intelligent automation, it business benefits, challenges, tools and techniques involved and its overall framework.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To make the participants comfortable with the concepts how leading enterprises keep the customers at bay and delight shareholders who are looking beyond cost reduction and envisioning long-term success.																		
CLR-3 :	To make the participants have a clear understanding of intelligent automation with AI can help to make day to day business operations that are more humane to pleasant one by automating repetitive, monotonous and often tedious tasks																		
CLR-4 :	To provide the participants with enough insights about many of the barriers Intelligent Automation poses within an existing IT landscape of the enterprise and defining an end-to-end solution and then leveraging the appropriate enabling technologies against it.																		
CLR-5 :	To provide the participants with enough insights about many of the barriers Intelligent Automation poses within an existing IT landscape of the enterprise and defining an end-to-end solution and then leveraging the appropriate enabling technologies against it.																		
CLR-6 :	To make the participants a clear view of insights by looking at the success factors and challenges of a successful intelligent automation, then identifying what has most contributed to the success of Intelligent Automation projects.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Have a firm control of the fundamental concepts of intelligent automation and will be able to define intelligent automation from both academic and industry perspective	2	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-2 :	Have a complete control of the differences between intelligent automation and Robotic process automation in terms of processes, tools and techniques, implementation, framework, application etc.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-3 :	Have a firm understanding of how Intelligent automation involves people, organizations and also technologies involving machine learning.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-4 :	have a firm understanding of the barriers Intelligent Automation poses within an existing IT landscape of the enterprise and the possible ways of mitigating them so as to build and deploy an end-to-end solution and then leveraging the appropriate enabling technologies against it.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

CLO-5 :	Have A firm understanding, knowledge and expertise in creating winning strategies for businesses by mitigating all the pitfalls and confront them well ahead before the actual planning phase of implementation.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6 :	Able to design and develop natural language processing solution artifacts and ultimately demonstrate an "end-to-end" intelligent automation solution for a given problem statement either in a group or individually.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		24	24	24	24	24
S-1	SLO-1	**Unit 1: Intelligent Automation Defined**	Greater processing efficiency	Low Highly scaled automation deployments	Agile implementation	Public-private partnerships
	SLO-2	Intelligent Automation Overview	Ease of use	**Unit 7: Adoption and Barriers to Intelligent Automation Adoption**	Democratization of app development	Private-sector initiatives
S-2	SLO-1	Intelligent Automation Defined from academic	Workforce agility, Scalable infrastructure	Barriers of Intelligent Automation Adoption Overview	CIO leadership	Structural change
	SLO-2	Intelligent Automation Defined industry perspective	**Unit 4: Exploring the Possibilities of Intelligent Automation**	Gaining Organizational Engagement	**Unit 10: The value of intelligent automation**	Workforce change
S-3	SLO-1	Business Benefits of Intelligent Automation	Identifying Opportunities for Intelligent Automation	Internal Stakeholder and Governance Processes	Increasing process efficiency	Building a future workforce
	SLO-2	Business Challenges of Intelligent Automation	Identifying Opportunities for Intelligent Automation	Making the Business Case Stack	Improving customer experience	Components of Intelligent Automation Framework
S-4	SLO-1	Intelligent Automation Tools and Techniques and Framework	Start with a Proof of Concept	Not enough Enough Processes to Automation	Optimizing back office operations	Business Objectives
	SLO-2	Intelligent Automation Techniques	Choosing the Right Processes	Lack of Strategy	Reducing costs as well as risks	Business Process Analysis
S-5 to S-8	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Optimizing the work force productivity	Lab 13:
	SLO-2					
S-9	SLO-1	Intelligent Automation Framework	Involving the Business and the IT	Lack of Skill and Talent	More effective monitoring and fraud detection	Develop Automated Processes
	SLO-2	**Unit 2: RPA vs Intelligent Automation**	How Intelligent Automation differs from IT Automation?	Change Management and Culture Readiness	Product and service innovation	Intelligent Operations
S-10	SLO-1	RPA Overview	How Automation is powered by artificial intelligence	**Unit 8: Building a winning intelligent automation strategy**	**Unit 11: Early adopters and positive returns**	**Unit 14: Hands On Lab Usecase Implementation (Consumer-3)**

	SLO-2	Business Benefits of RPA	How Intelligent automation addresses societal and business challenges	Defining your vision	Define your business outcomes first	Self Driving Cars
S-11	SLO-1	Business Drivers of RPA	**Unit 5: Rethinking Industries for Intelligent Automation**	Organizational Design	Process Analysis	Problem statement
	SLO-2	Intelligent Automation Overview	Intelligent Automation to Be More Innovative	Governance and Pipeline	Prioritization &	Problem type
S-12	SLO-1	Business Benefits of Intelligent Automation	Success Factors, Strategy for intelligent automation	Delivery Methodology	Excellence	Data engineering
	SLO-2	Business Drivers of Intelligent Automation	Combining RPA and artificial intelligence	Service Model	Process discovery	Data pipeline
S-13 to S-16	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					
S-17	SLO-1	RPA vs Intelligent Automation	Technology, infrastructure, and cybersecurity	Roles and Responsibilities of candidates	Process Mapping	Model selection
	SLO-2	**Unit 3: Benefits of Intelligent Automation**	Mature process definitions, standards, and processes, Innovative Applications, Preparing the Workforce	Architecture of technology components	Process Mapping	Model engineering
S-18	SLO-1	Working of Intelligent Automation	**Unit 6: Moving Forward With Intelligent Automation**	**Unit 9: Factors for intelligent automation success Tuning**	Data Management & Governance	Mode outcome
	SLO-2	Why is Intelligent Automation important	Implementation challenges of Intelligent Automation	Designating automation as a strategic priority	The Human Factor	Mode Analysis
S-19	SLO-1	How to adopt Intelligent Automation	What Businesses Does Intelligent Automation Work For?	Pursuing people-focused initiatives	Monitoring Intelligent Automation	Model optimization
	SLO-2	,Best practices of AI in Intelligent Automation	How Intelligent Automation Is The Best For Business	Developing an operating model that enables scaling	Skill oriented education	Model pipeline
S-20	SLO-1	Best Intelligent Automation, Accuracy, Speed	How Intelligent Automation is coming of the age	Modularity and packaged business capabilities	Engaging with the workforce	Data visualization
	SLO-2	Service Continuity	More process work is pivoting to machines	Automation guidelines	Lifelong learning programmes and incentives	User interface
S-21 to S-24	SLO-1	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

Learning Resources	1. Pascal Bornet, Ian Barkin & Jochen Wirtz, "Intelligent Automation", 2020 2. Debanjana Dasgupta, "Intelligent Automation Simplified, BPB Publications, 2021

Learning Assessment												
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)									Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #				
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%	
	Understand											
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	
	Analyze											
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%	
	Create											
	Total	100 %		100 %		100 %		100 %		100 %		

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mr. Venkat Subramanian, SRMIST

Course Code	UDS21502J	Course Name	*REAL-WORLD COMPUTER VISION APPLICATIONS*	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CLR-1 : To teach the participants about computer vision and the role it plays in building artificial intelligence solutions, how the machine is trained to understand and interpret the visual world.

CLR-2 : To build intelligent and automated real-world computer vision applications and use cases spanning healthcare, retail, energy verticals by intelligently analyzing different datasets collected from diverse data sources.

CLR-3 : To teach the participants with wide variety of computer vision techniques such as digitization, histogram manipulation, warping, filtering, segmentation, restoration and compression.

CLR-4 : To teach the participants to build computer vision applications involving optical character recognition for converting printed or handwritten text into a digital format.

CLR-5 : To teach the participants about medical imaging that helps in mimicking the tasks performed by human vision.

CLR-6 : To understand all that is involved in building a computer vision use case for tracking the predicting customer Instore wait time at the store using all the computer vision techniques out there

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1 :	Be exposed to the role of computer vision techniques play in building real-world artificial intelligence solution by training the machines to understand and interpret the visual world.	2	85	80	H	H	H	H	H	H	*H*	*H*	H	M	M	H	H	H	H
CLO-2 :	Have hands-on skills and knowledge, expertise in training a generative model by framing the problem as a supervised learning problem with two sub-models.	3	85	80	H	H	H	H	H	*H*	*H*	H	H	M	M	H	H	H	H
CLO-3 :	collect and utilize related computer vision tasks that involve identifying objects in digital photographs	3	85	80	H	H	H	*H*	*H*	*H*	H	H	H	M	M	H	H	H	H
CLO-4 :	Have a firm control on the concepts of augmented reality, the business benefits of augmented reality, its challenges of implementation etc.	3	85	80	H	H	*H*	*H*	*H*	H	H	H	H	M	M	H	H	H	H
CLO-5 :	Get hands-on skills, knowledge and expertise in creating a full scale Medical Image based on computer vision techniques	3	85	80	*H*	*H*	*H*	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6 :	Have have excellent capabilities of demonstrating their expertise in building a full scale Customer In-store Wait Time Usecase end to end	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

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Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Role of Computer Vision in AI**	Deepface	Satellite to Map Image Translation Dataset	**Unit 9: Augmented Reality with Computer Vision.**	Data pipeline
	SLO-2	Computer Vision Overview	Yolo	How to Develop and Train a Pix2Pix Model	Augmented Reality with Computer Vision Overview	Model selection
S-2	SLO-1	Relationship between Computer Vision & AI	**Unit 4: Basic Image and Digital Image Processing**	How to Translate Images With a Pix2Pix Model	How does Augmented Reality work?	Model engineering
	SLO-2	Tasks in Computer Vision	Image Processing with OpenCV Overview	How to Translate Google Maps to Satellite Images	Sign Translation	Mode Outcome
S-3	SLO-1	Image Processing	Edge Detection and Image Gradients	**Unit 6: Facial Recognition with Computer Vision**	Text Detection	Mode Analysis
	SLO-2	Image Recognition	Dilation, Opening, Closing, And Erosion	Facial Recognition with Computer Vision Overview	Visual Tracking and Augmented Reality	Model Optimization
S-4	SLO-1	Object Detection	Perspective Transformation	Face Detection Algorithm	Implementation Steps	Model pipeline
	SLO-2	Object Segmentation	Image Pyramids	Face Detection Implementation	Evaluation	Data visualization
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Object Recognition	Cropping	Test Photographs	**Unit 10: Medical Image Analysis with Computer Vision**	User interface
	SLO-2	**Unit 2: Computer Vision AI Applications**	Scaling	Alternative to OpenCV	Medical Image Analysis with Computer vision overview.	**Unit 12: Customer In-store Wait Time Analytics**
S-8	SLO-1	Computer Vision in Health	Interpolations	**Unit 7: Object Detection with Computer Vision.**	Working of Medical Image Analysis	Customer In-store Wait time analysis
	SLO-2	Computer Vision in Retail	Re-Sizing	Object Detection with Computer	Common Imaging Techniques	Problem statement
S-9	SLO-1	Computer Vision in Energy	Thresholding	Object Detection with Computer Vision Overview	Computer vision models in Medical Imaging	Problem type
	SLO-2	Computer Vision in Oil and Gas	Adaptive Thresholding	Benefits of Object Detection	Role of AI in medical Imaging	Data engineering
S-10	SLO-1	Computer Vision in Automobile	Binarization	Working of Object Detection	Diagnostic Assistance	Data pipeline
	SLO-2	**Unit 3: Computer Vision Libraries**	Sharpening	Create a custom object detector	Screening and Triaging	Model selection
S-11 &	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					

| S	SLO					
S-12						
S-13	SLO-1	OpenCV	Blurring	Use a Pretrained object Detector	Monitoring	Model engineering
	SLO-2	TensorFlow	Contours	Other object Detection methods	Charting	Mode outcome
S-14	SLO-1	CUDA	Line Detection Using Hough Lines	**Unit 8: Optical Character Recognition with Computer Vision.**	Applications of Medical Image Analysis	Model Analysis
	SLO-2	Viso Suite	Finding Corners	Optical Character Recognition Computer Vision Overview	**Unit 11: Computer Tracking understanding of Consumer Interaction and Improving Store Layout Optimization**	Model optimization
S-15	SLO-1	Matlab	Counting Circles And Ellipses	How does Optical Character Recognition work?	Customer Interaction and Store optimization	Model pipeline
	SLO-2	Keras	**Unit 5: Image Transformation using Generative Adversial Networks**	OCR Applications in the Real World	Problem statement	Data visualization
S-16	SLO-1	SimpleCV	Image Transformation overview	Text Recognition with Tesseract OCR	Problem type	User interface
	SLO-2	BoofCV	What Is the Pix2Pix GAN?	The Different Ways for Text Detection	Data engineering	
S-17 & S-18	SLO-1	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

Learning Resources	1. The Computer Vision Workshop by Hafsa Asad, Vishwesh Ravi Shrimali, Nikhil SinghPublisher(s): Packt Publishing 2. Augmented Reality: Principles & Practice by Schmalstieg/Hollerer 3. Guide to Medical Image Analysis: Methods and Algorithms (Advances in Computer Vision and Pattern Recognition) by Klaus D. Toennies	**References:** 1. Computer Vision Theory and Projects in Python for Beginners by AI Sciences Publisher(s): Packt Publishing 2. Computer Vision: Python OCR and Object Detection Quick Starter by Abhilash Nelson

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										

	Total	100 %	100 %	100 %	100 %	100 %

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Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mrs.Anitha Jasmine, SRMIST
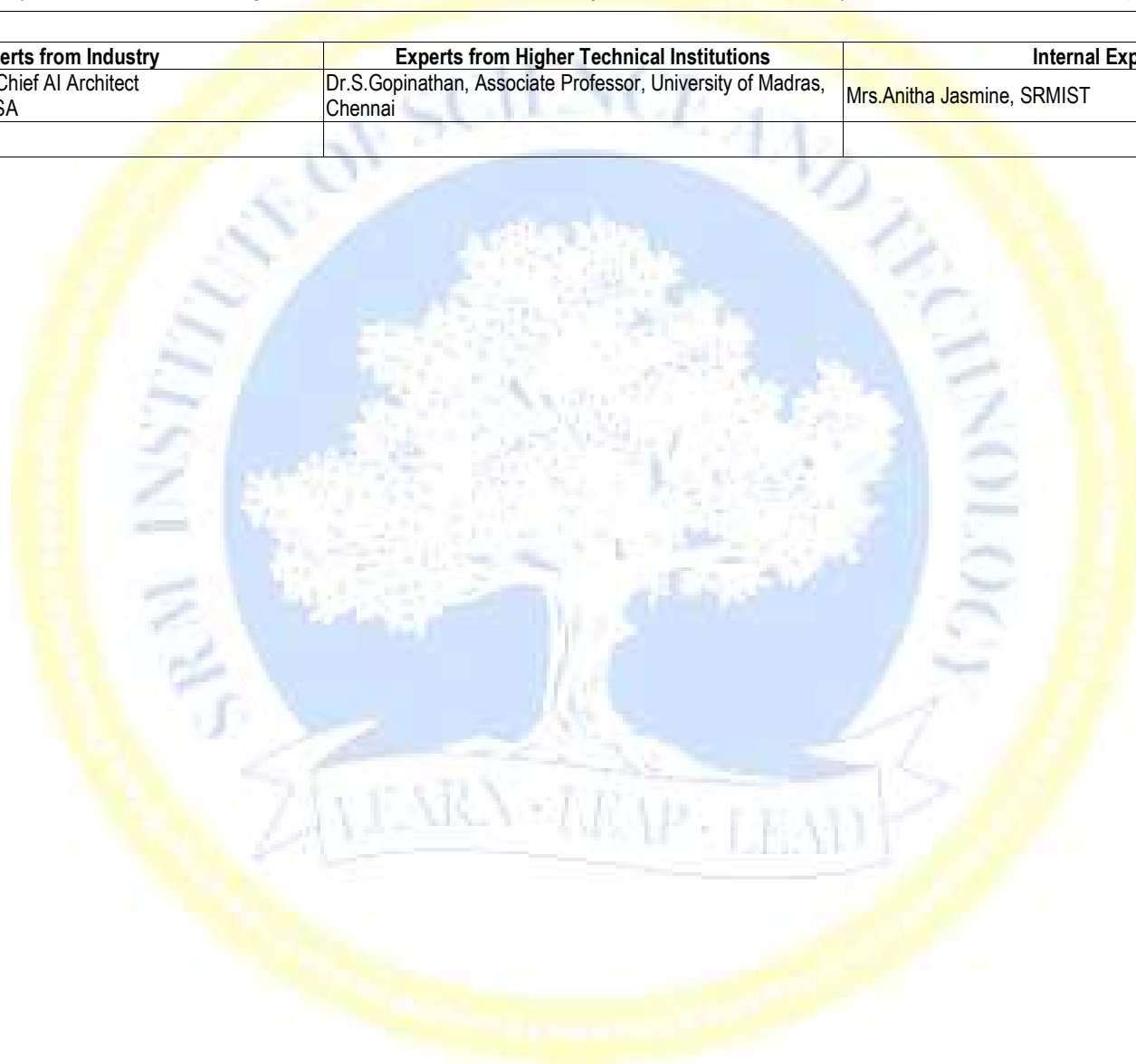
Course Code	UDS21D01J	Course Name	ADVANCED ANALYTICS AND DATA VISUALIZATION FOR ENTERPRISE	Course Category	D	Discipline Specific Elective	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR): The purpose of learning this course is to,

		Learning			Program Learning Outcomes (PLO)														

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CLR-1 : To make the participants learn how to make sense of data by creating informative and engaging reports and dashboards.

CLR-2 : To provide the participants with the ways of analyzing the data in a better way, create visual representation of data that helps companies increase their profits through better analysis and better business decisions

CLR-3 : To teach the participants with one of the leading data visualization tool used in the market for data analysis and prediction called SAP SAC.

CLR-4 : To let the participants provide with the details of Creating Stories that are main part of SAP Analytics to explore data and to find deep insight using charts and tables.

CLR-5 : To educate the participants about some of best practices to keep Analytics Designer running smoothly.

CLR-6 : To provide the participants with main innovations that are present in SAP Analytics Cloud (SAC) for planning.

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

Column headers for learning metrics: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

PLO headers: 1 Fundamental Knowledge, 2 Application of Concepts, 3 Link with Related Disciplines, 4 Procedural Knowledge, 5 Skills in Specialization, 6 Ability to Utilize Knowledge, 7 Skills in Modeling, 8 Analyze, Interpret Data, 9 Investigative Skills, 10 Problem Solving Skills, 11 Communication Skills, 12 Analytical Skills, 13 ICT Skills, 14 Professional Behavior, 15 Life Long Learning

CLO	Description	Bloom	Prof %	Attain %	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1	Have a strong hands-on skills knowledge and expertise in transforming data into more useful visuals with the use of charts and visuals.	2	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-2	Get a strong hands-on skill, knowledge and expertise in creating beautiful stories that are an integral part of SAP analytics	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-3	Get a strong hands-on skill, knowledge and expertise in creating beautiful stories using analytical applications that are an integral part of SAP analytics	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-4	Be introduced to the scripting world in SAP analytics for cloud for creating analytical applications	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-5	Use a hybrid solution where SAC serves as a front-end on top of your BPC backbone called Financial Planning in SAP SAC.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6	Use all three types of Smart Predict scenarios– Classification, Regression & Time-Series – provided by SAC to address prediction on different business use cases	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

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Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Foundations of Data Visualization**	Bar Chart	Data Modelling in SAP SAC	Creating Analytic Applications in SAP Data Warehouse Cloud	Pall the right information on the page
	SLO-2	Data Visualization Overview	Column Chart	Data Visualization in SAP SAC	Defining Busy Indicator	Select the right type of dashboard
S-2	SLO-1	Business Benefits of Data Visualization	Pie Chart	Predictive modelling in SAP SAC	Using Popups	**Unit 13: Financial Planning in Analytics Designer**
	SLO-2	Business Challenges of Data Visualization	Scatter Plot	**Unit 7: Creating Stories in SAP SAC**	**Unit 10: Scripting in SAP SAC Analytic Applications**	Financial Planning in Analytics Designer overview
S-3	SLO-1	When to use Data Visualization	Entitle a specific audience and mark their needs	Stories in SAP SAC Overview	Scripting in SAP SAC overview	Business Benefits of Financial Planning in SAP SAC
	SLO-2	Types of Data Visualization	Choose the right visual	Business Benefits of SAP SAC Stories	Create a new Script object	Cost center Planning
S-4	SLO-1	Data Visualization tools and techniques	Apply Text Carefully and Intentionally	Steps to Create stories in SAP SAC	Create a new function	Product Cost Planning
	SLO-2	**Unit 2: Why Would a Company Want to Visualize Data**	Use the predictable pattern for layouts	Save the Story	Edit the script function	Sales and Profitability Planning
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Solving data inefficiencies and data visuals	Select the right data visualization tool	**Unit 8: Typical Workflow in creating an Analytic Application?**	Create a new argument for the function	Project Planning
	SLO-2	Speed of Decision Making	Use attractive colors for telling data stories	Analytic Application in SAP SAC Overview	Save the Analytic application	Internal Order Planning
S-8	SLO-1	Identify Data Inaccuracies	**Unit 5: Types of Data Visualization**	Place the widget in the canvas	**Unit 11: Scripting in SAP SAC Analytic Applications**	Capital Expense Planning
	SLO-2	Access real-time information	Types of Data Visualization	Choose the Data Visualization Component	Widgets in SAP SAC overview	Financial Statement Planning
S-9	SLO-1	Promote Storytelling	Business Benefits of Data Visualization	Add more widgets	Uses of Widgets in SAP SAC	**Unit 14: Predictive Modelling in SAP SAC**
	SLO-2	Exploring business Insights	Charts	Add Scripts to your widgets	Create a New Widget	Predictive Modelling in SAP SAC Overview
	SLO-1	Discover latest Trends	Tables	Save the Analytic application	Adding a Custom Widget	Predictive Modelling in SAP SAC Overview

S-10	SLO-2	Tailor made Reports	Graphs	**Unit 9: Creating Stories using Analytic Application in SAP SAC**	Modifying the Custom Widget	Business Benefits of Predictive Analytics in SAP SAC
S-11 & S-12	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					
S-13	SLO-1	**Unit 3: What Does the Future Hold for Visualizing Data**	Maps	Analytic Application in SAP SAC Overview	**Unit 12: Scripting in SAP SAC Analytic Applications**	Steps to implement Predictive modelling in SAP SAC
	SLO-2	Future of Data Visualizations	Infographics	Create a New Analytic Application	SAP SAC Best Practices	Identify the ML Scenario
S-14	SLO-1	Location Based Analysis	Dashboards	Changing the Name of Widgets	Consider your audience	Data Acquisition
	SLO-2	Storytelling will become crucial	**Unit 6: Types of Data Visualization**	Adding Comments to Widgets and Table Cells	Determine your goals	Data Acquisition
S-15	SLO-1	Interactive Dashboards	SAP Analytics for Cloud Overview	Working with the Comment Widget in an Analytic Application	Choose relevant KPIs	Data Discovery
	SLO-2	Data Visualizations for everyone	Features of SAP SAC	Copying and Pasting Widgets and Scripting Objects	Tell a story with your data	Data Processing
S-16	SLO-1	**Unit 4: Techniques and Best Practices Techniques**	Business Benefits of SAP SAC	Copying and Pasting Widgets from Story to Analytic Application	Provide context	Model Creation
	SLO-2	Data Visualization techniques Overview	Key Capabilities of SAP SAC	Restoring Deleted Widgets or Scripting Objects	Pall the right information on the page	Generating Predictions
S-17 & S-18	SLO-1	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:
	SLO-2					

| Learning Resources	**Text books:** 1. Data Visualization: a successful design process by Andy Kirk Publisher(s): Packt Publishing link : https://www.oreilly.com/library/view/data-visualization-a/9781849693462/ 2. SAP Analytics Cloud by Abassin Sidiq publisher : SAP press with Rheinwerk publisher	**References:** 1. The Truthful Art: Data, Charts, and Maps for Communication by Alberto Cairo Publisher(s): New Riders 2. Learning SAP Analytics Cloud by Riaz Ahmed Publisher(s): Packt Publishing

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										

	Total	100 %	100 %	100 %	100 %	100 %

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Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.B.Rebecca Jeyavadhanam, SRMIST
		Mrs.M.R.Sudha, SRMIST
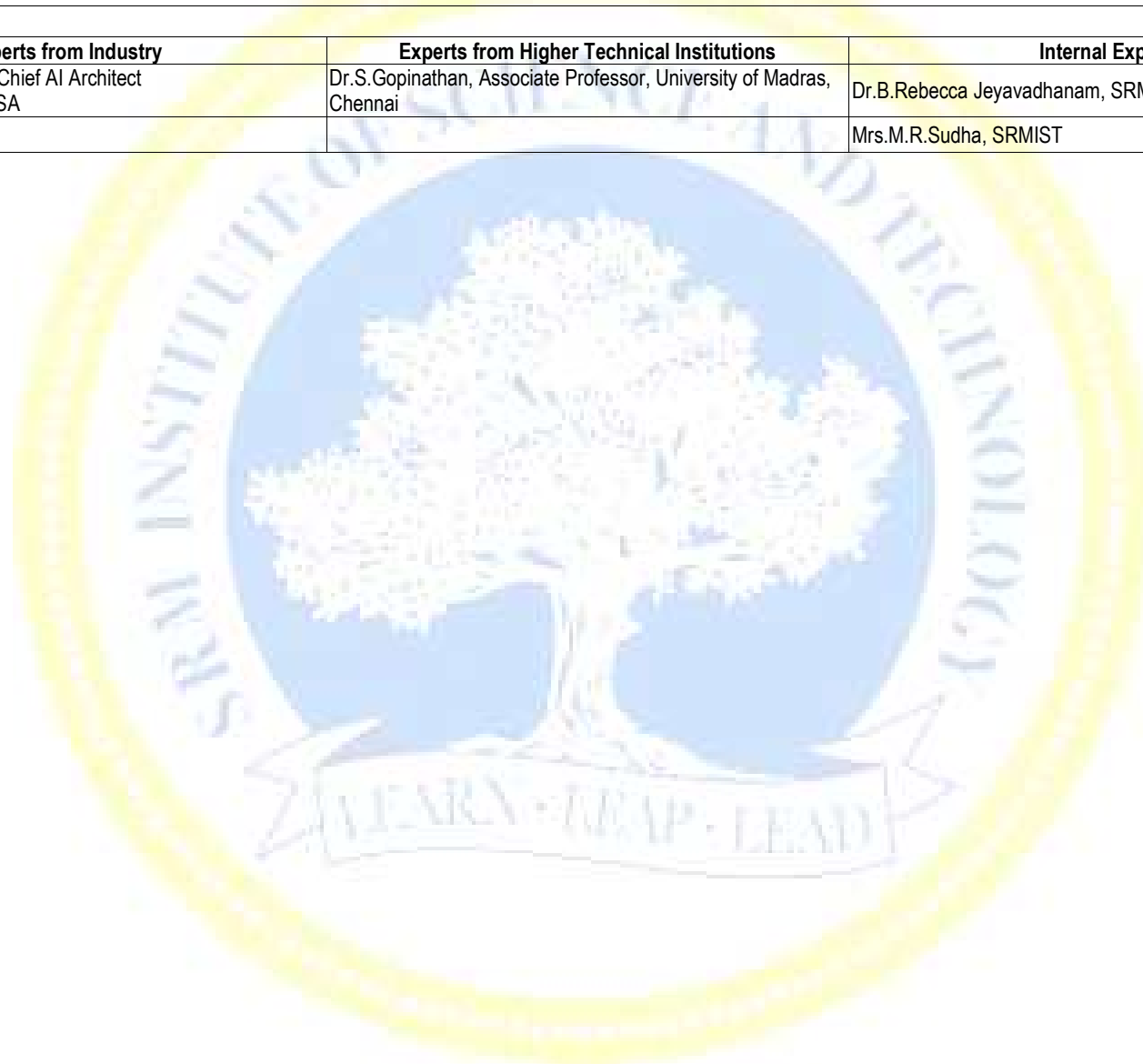
Course Code	UDS21D02J	Course Name	*MACHINE LEARNING FOR ENTERPRISE*	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,		Learning			Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To make the participants comfortable with the fundamentals of some of the advanced machine learning concepts, their working principles, and their functions in a business scenario.																		
CLR-2 :	To make the participants understand the methods of teaching machines in performing cognitive works just as humans do.																		
CLR-3 :	To Teach the participants to build intelligent and automated real-world machine learning applications and use cases spanning healthcare, retail, energy verticals by intelligently Analyzing different datasets collected from diverse data sources.																		
CLR-4 :	To Select the right set of features the model training in order for the model to learn only the required information eliminating anomalies, outliers, noise and other unnecessary information.																		
CLR-5 :	To understand all the steps and process involved the in model engineering process for training, validating, testing, deploying machine learning models in the production system for the user consumption.																		
CLR-6 :	To make the learners come to an alignment, apply their learning to a real-world business problem, and then performs research, design, development, and delivers an end-to-end machine learning solution for a given industry problem. The students will be working either in a group or individually.																		

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 : Have skills and expertise to train, validate, test, deploy the models in the production for the consumption of users.	2	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-2 : Have a firm understanding of the importance and challenges of learning agents that make decisions is of vital importance today	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-3 : a hands-on skills and knowledge to develop an ensembled based learning system by combining diverse machine learning models together	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H

CLO-4 :	Have a hands-on skills, expertise and knowledge to develop Recommendation systems using collaborative filtering or a content-based techniques that suggests an user with Products they are likely to buy, movies to watch etc.	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-5 :	Have a hands-on skills, expertise and knowledge to use and design automated approaches for determining Machine Learning pipelines efficiently.	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H
CLO-6 :	to design and develop machine learning solution artifacts and ultimately demonstrate an "end-to-end" machine learning solution for a given problem statement either in a group or individually.	3	85	80	H	H	H	M	H	H	H	H	H	H	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Machine Learning - Deep Dive**	✓ Classification ✓ Binary Class Classification ✓ Multi Class Classification	**Unit 10: Supervised Machine Learning - Classification Type Problems**	Value Based Learning	How does a recommendation engine work? ✓ Data Collection ✓ Data Storage ✓ Filtering the Data
	SLO-2	Machine learning advanced concepts	✓ Clustering ✓ Density-based methods ✓ Hierarchical methods. ✓ Partitioning methods ✓ Grid-based methods	Decision Tree Classification	Policy Based Learning	Why Recommendation systems are needed, What can be Recommended
S-2	SLO-1	Representations, measurements, data types	Neural networks	Random Forest Classification	Model Based Learning	User and Item matching,Types of Recommendation systems, Content based Recommendation systems, Collaborative filtering
	SLO-2	Density Estimation	✓ Anomaly Detection ✓ Point Anomalies ✓ Contextual Anomalies ✓ Collective Anomalies	Linear Support Vector machines	Markov Decision Processes, Bellman Equations	**Unit 18: Auto Machine Learning (Auto ML)**

S-3	SLO-1	Regression, Variance – Bias Trade-off	**Unit 4: Machine Learning in Real World Applications**	Non- Linear Support Vector machines	Reinforcement Learning Models, Monte-Carlo Methods	AutoML overview, Types of AutoML
	SLO-2	Gaussian Processes	✓ Machine learning in Healthcare ✓ Machine learning in Retail ✓ Machine learning in Energy ✓ Machine learning in Oil & Gas ✓ Machine learning in Automobile	Logistic Regression	Temporal-Difference Learning	Working of AutoML, AutoML in Google Cloud, AutoML in Microsoft Azure
S-4	SLO-1	Linear Discriminant Functions	**Unit 5: Data Preprocessing for Machine Learning Models**	Gaussian Naïve Bayes	SARSA: On-Policy TD control, Q-Learning: Off-policy TD control, Deep Q-Network	When to use AutoML, Business Benefits, Business Challenges of Auto Machine Learning
	SLO-2	Support Vector Machines	Data Pre-processing overview, Why is Data Pre-processing Important, Data Pre-processing Best Practices	Multinomial Naïve Bayes	**Unit 15: Reinforcement Learning Real World Example - Self Driving Cars**	AutoML Regression, AutoML Classification, AutoML Time Series Forecasting, AutoML Computer Vision
S-5 & S-6	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-7	SLO-1	Structured SVM's	Steps in Data Pre-processing for machine learning models ✓ Data Collection ✓ Data Integration ✓ Data Preparation ✓ Data Provisioning	**Unit 11: Supervised Machine Learning - Classification Type Problems**	Self Driving Cars Overview	**Unit 19: Machine Learning Hands On Lab Work 2- Build, Test and Deploy ML Models (Consumer 2)**
	SLO-2	Ensemble methods	**Unit 6: Feature Engineering**	K-Means Clustering	Components of Self Driving Car system ✓ Cameras ✓ LIDAR ✓ RADAR ✓ Ultrasonics	Customer Segmentation
S-8	SLO-1	Non-parametric Bayesian methods	Features overview, Why are Features Important, Feature Engineering overview, Why is Feature Engineering Important	Density Based Clustering	Scene Understanding, Localization and Mapping	Problem statement

	SLO-2	**Unit 2: Machine Learning Approaches**	Problem Feature Engineering Solves, Importance of Feature Engineering, Feature Engineering Best Practices	Dimensionality Reduction	Planning and Driving policy, Control	Problem type
S-9	SLO-1	Learning Algorithms	Feature Extraction, Feature Selection, Feature Construction, Feature Learning	Collaborative Filtering	State Space Representation	Data engineering
	SLO-2	Supervised Learning	Iterative process of feature engineering	Association Rule Learning	Action Space Representation	Data pipeline
S-10	SLO-1	Unsupervised Learning	Iterative process of feature engineering	Apriori - Association Measures ✓ Support ✓ Confidence ✓ Lift	Reward Function	Model selection
	SLO-2	Semi-Supervised Learning	Decompose Date-Time	**Unit 12: Unsupervised Machine Learning - Clustering Problems**	Discrete Q-Learning Agent	Model engineering
S-11 & S-12	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:
	SLO-2					
S-13	SLO-1	Reinforcement Learning	**Unit 7: Model Engineering (Model Selection, Model Train, Test, Validate, Analyze, Deploy)**	K-Means Clustering Density Based Clustering Hierarchical Clustering	Deep Q-Network Agent, Deep Q-Training	Model outcome
	SLO-2	Similarity Algorithms	Model Selection Model Training Model Validation Model Testing Model Outcome Model Analysis Model Deployment Model Re-training Model Re-testing	**Unit 13: Unsupervised Machine Learning - Association**	**Unit 16: Machine Learning Ensemble Learning Techniques Including Bagging, Boosting**	Model analysis
S-14	SLO-1	How to select a Machine Learning Algorithm	**Unit 8: Supervised Machine Learning**	Association Rule Learning	Ensembling Techniques overview	Model optimization
	SLO-2	Machine Learning Workflow and applications	Continuous Target Variable, Discrete Target Variable	Apriori - Association Measures ✓ Support	Basis Ensembling Techniques in machine learning ✓ Max Voting	Model pipeline

				✓ Confidence ✓ Lift	✓ Averaging ✓ Weighted Average	
S-15	SLO-1	Challenges and Vision for the future	Perceptron classifier Support Vector Machines (SVM) Decision tree classifier K-nearest classifier Naive Bayes classifier	**Unit 14: Reinforcement Learning**	Advanced Ensembling Techniques in machine learning ✓ Stacking ✓ Blending ✓ Bagging ✓ Boosting	Data visualization
S-15	SLO-2	Analysis of machine learning applications	Decision Tree Classification Random Forest Regression Random Forest Classification	Agent, Action, Environment	Bagging and Boosting Algorithms ✓ Bagging meta-estimator ✓ Random Forest ✓ AdaBoost ✓ GBM ✓ XGB ✓ Light GBM	User interface
S-16	SLO-1	**Unit 3: Machine Learning Techniques**	**Unit 9: Supervised Machine Learning - Regression Type Problems**	State,Reward, Policy, Value	**Unit 17: Machine Learning Recommendation Systems**	
S-16	SLO-2	✓ Simple Non-Linear Regression ✓ Multiple Linear Regression ✓ Multiple Non-Linear Regression	Simple Linear Regression Multiple Linear Regression Polynomial Regression Ridge Regression Lasso Regression Logistic Regression Decision Tree Regression	Q-Value or Action Value, Working of Reinforcement Learning	Recommendation systems overview	
S-17 & S-18	SLO-1					
S-17 & S-18	SLO-2	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:

Learning Resources	1. Statistical and Machine-Learning Data Mining Techniques for Better Predictive Modeling and Analysis of Big Data, Third Edition -Bruce Ratner 2. Data Mining Practical Machine Learning Tools and Techniques, 3. Second Edition - Ian H. Witten	

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

 # CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRMIST
		Dr. M. Pandiyan, SRMIST

Course Code	UES20AE1T	Course Name	ENVIRONMENTAL STUDIES	Course Category	AE	Ability Enhancement Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil		
Course Offering Department	Computer Applications	Data Book / Codes/Standards		Nil			

Course Learning Rationale (CLR): The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To teach the importance of environment																			
CLR-2 :	To impart the knowledge about ecosystem																			
CLR-3 :	To teach about Biodiversity																			
CLR-4 :	To create awareness about environmental pollution																			
CLR-5 :	To understand about Environment Protection																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	To gain knowledge on the importance of natural resources and energy	2	75	60	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	To understand the structure and function of an ecosystem	2	80	70	-	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	To imbibe an aesthetic value with respect to biodiversity, understand the threats and its conservation and appreciate the concept of interdependence	2	70	65	H	-	-		-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	To understand the causes of types of pollution and disaster management	2	70	70	H	-	H	H	H	-	-	-	-	-	-	-	-	-	-
CLO-5 :	To observe and discover the surrounding environment through field work	2	80	70	-	H	-	H	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Environmental Studies- Concept	Concept of an ecosystem	Biodiversity at Global, National And Local Levels	Causes, Effects and Control Measures of Nuclear hazards	Need for equitable utilization
	SLO-2	Scope and Importance of Environmental Studies	Ecosystem degradation and Resource utilization	India as a Mega Diversity Nation		Equity – Disparity
S-2	SLO-1	Need for public awareness.	Structure and Functions of an ecosystem	Threats to biodiversity: habitat loss, poaching of wildlife	Solid Waste Management Causes, Effects and Control Measures of Urban and Industrial Waste	Urban – rural equity issues
	SLO-2	Institutions in Environment	Producers, consumers and decomposers	man-wildlife conflicts		The need for Gender Equity
S-3	SLO-1	People in Environment	Energy flow in the ecosystem	Endangered species of India	Role of Individuals In Pollution Prevention	Preserving resources for future generations
	SLO-2	Awareness about Environmental Studies	The water cycle , The Carbon cycle , The Oxygen cycle , The Nitrogen cycle , The energy	Endemic species of India		The rights of animals

			cycle and, Integration of cycles in nature			
S-4	**SLO-1**	Introduction to natural resources- Associated Problems	Ecological succession	Environmental Pollution- Definition	Disaster management- Nature Floods, Earthquakes	The ethical basis of environment education and awareness
	SLO-2	Renewable and Nonrenewable resources	Food chains, Food webs and Ecological pyramids			
S-5	**SLO-1**	Forest resources	Ecosystem, Introduction, Types, Characteristic features, Structure and functions	Causes, Effects and Control Measures of Air Pollution	Cyclones Landslides	The conservation ethic and traditional value systems of India
	SLO-2	Water Resources	Forest ecosystem			
S-6	**SLO-1**	Mineral Resources	Grassland ecosystem	Causes, Effects and Control Measures of Water Pollution	Social Issues and the Environment From Unsustainable to Sustainable Development	Wasteland Reclamation
	SLO-2	Food Resources	Desert ecosystem			
S-7	**SLO-1**	Energy Resources	Aquatic ecosystems (ponds, lakes, streams)	Causes, Effects and Control Measures of Soil Pollution	Water Conservation	Climate change & Global warming
	SLO-2	Land Resources	Aquatic ecosystems (rivers, estuaries, oceans)			
S-8	**SLO-1**	Renewable and non-renewable resources- Wind	Value Of Biodiversity	Causes, Effects and Control Measures of Marine pollution	Rain Water Harvesting Watershed	Acid rain & Ozone layer depletion
	SLO-2	Renewable and non-renewable resources- geothermal	Consumptive Value And Productive Value			
S-9	**SLO-1**	Renewable and non-renewable resources- Solar	Social Value and Ethical Value	Causes, Effects and Control Measures of Noise Pollution	Environmental Ethics: Issues and Possible Solutions	Nuclear Accidents and Nuclear Holocaust
	SLO-2	Renewable and non-renewable resources- Biomass	Aesthetic Value and Option Value	Causes, Effects and Control Measures of Thermal Pollution	Resource consumption patterns	

Learning Resources	**Theory:** 1. Bharucha Erach, (2013), Textbook of Environmental Studies for Undergraduate Courses (Second edition). Telangana, India: Orient BlackSwan. 2. Basu Mahua, Savarimuthu Xavier, (2017), SJ Fundamentals of Environmental Studies. Cambridge, United Kingdom: Cambridge University Press 3. Dr.R.Jeyalakshmi.2014.,Text book of Environmental Studies, Devi publications, Chennai 4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										

Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Academic	Internal Experts
1. Mr. Suresh S, Program Head, Hello FM	1. Dr. G Balasubramania Raja, Prof & Head, Manonmaniam Sundranar University Mail- gbs_raja@yahoo.com	1. Dr. Rajesh R, Head, SRM IST
		2.Dr.S.Albert Antony Raj, Associate Professor and Head, SRMIST

Course Code	UDS21D08J	Course Name	INTERNSHIP - II	Course Category	D	DISCIPLINE SPECIFIC ELECTIVE	L	T	P	C
							-	-	-	1

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards			Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Demonstrate skills learnt in the real time environment.																			
CLR-2 :	Explore the different industries that are using IT																			
CLR-3 :	Enhance the skills in the system aspects																			
CLR-4 :	Understanding the professional connections with the knowledge learnt																			
CLR-5 :	Applying the skills in problem solving																			

PLO column headers: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%), Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Research Skills, Team Work, Scientific Reasoning, Reflective Thinking, Self-Directed Learning, Multicultural Competence, Ethical Reasoning, Community Engagement, ICT Skills, Leadership Skills, Life Long Learning

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	To get an insight of an industry and organization/company	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	H	H
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	H	H
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	H	H
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	H	H
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	H	H

Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment					
Project Work / Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)		
	Review – 1	Review – 2	Internship Report	Viva-Voce	
	20%	30 %	30 %	20 %	

Course Code	UJK20501T	Course Name	Leadership and Management Skills	Course Category	JK	Life Skill Courses	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Development Centre	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	help students to develop essential skills to influence and motivate others																		
CLR-2 :	Inculcate emotional and social intelligence and integrative thinking for effective leadership																		
CLR-3 :	create and maintain an effective and motivated team to work for the society																		
CLR-4 :	nurture a creative and entrepreneurial mindset																		
CLR-5 :	make students understand the personal values and apply ethical principles in professional and social contexts	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLR-6 :	manage competency-mix at all levels for achieving excellence with ethics																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	examine various leadership models and understand / assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision	3	80	75	L	M	H	-	M	M	-	-	-	M	H	L	-	H	H
CLO-2 :	learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc	3	80	75	L	M	H	-	M	M	-	-	-	M	H	L	-	H	H
CLO-3 :	understand the basics of entrepreneurship and develop business plan	3	75	70	L	M	H	-	M	M	-	-	-	M	H	L	-	H	H
CLO-4 :	apply the design thinking approach for leadership	3	75	70	L	M	H	-	M	M	-	-	-	M	H	L	-	H	H
CLO-5 :	appreciate the importance of ethics and moral values for making of a balanced personality	3	75	70	L	H	H	-	M	M	-	-	-	M	H	L	-	H	H
CLO-6 :	be an integral human being	3	75	70	L	H	H	-	M	M	-	-	-	M	H	L	-	H	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Leadership - definition	Team building	Management – definition	Women in management	Entrepreneurship
	SLO-2	Leadership – qualities	Team dynamics	Manager – traits	Global gender perspective in business. Do women make good managers? - discussion	Entrepreneurship
S-2	SLO-1	Leadership – styles	Work delegation	Scheduling work	Confronting problems faced by women managers – case study	Successful Indian entrepreneurs – case study
	SLO-2	Leadership – styles	Work delegation – activity	Scheduling work – activity	Confronting problems faced by women managers – case study	Successful Indian entrepreneurs – case study
S-3	SLO-1	Difference between leader and boss	Decision making	Strategic planning	Successful women managers – documentary screening	Successful women entrepreneurs – case study

|						
	SLO-2	Case study (based on leadership styles)	Decision making - activity	Strategic planning	Successful women managers – documentary screening	Successful women entrepreneurs – case study
S-4	SLO-1	Case study (based on leadership styles)	Motivation	Change management	Women labour force in work place	Ethics – definition
	SLO-2	Case study (based on leadership styles)	Motivating for results	Change management – activity	Problems faced by women labour force in work place - case study	Corporate ethics
S-5	SLO-1	Leadership in diverse organizational structures, cultures and communications	Argumentation, Persuasion	Energy management	Sexual harassment of women at workplace (prevention, prohibition, and redressal) Act, 2013	Essential elements of business ethics
	SLO-2	Leadership in diverse organizational structures, cultures and communications	Negotiation , Networking	Novel ways to manage energy in work place – activity	Documentary screening - Sexual harassment of women at workplace	Activity (students formulate ethical code of their business organization)
S-6	SLO-1	Leading the organisation through stability and turbulence	Budget planning	Work force management	Transgender persons protection of rights act, 2019	Ethical dilemma
	SLO-2	Case study	Taking risk	Grievance redressal policy in organisations	Documentary screening –based on inclusiveness of the third gender in workplace	Ethical dilemma - case study

Learning Resources	1. Craig E Johnson, Meeting the ethical challenges of leadership, Sage publications, 2018 2. Allan R Cohen, David L Bradford, Influence without authority, Wiley, 2018 3. T V Rao, Managers who make a difference: Sharpening your management skill, Random house India, 2016 4. Alexander Osterwalder, Business Model Generation,Wiley, 2013 5. Deborah Tannen, Talking from nine to five: Women and men in the workplace, Harper Collins publishers, 2010 6. Amish Tandon, Law of sexual harassment at workplace: Practice and procedure,Niyogi books, 2017 7. Rashmi Bansal, Connect the dots, Westland books, 2012

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) ##
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

\# CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

\## CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
1. Ajay Zener, Director, Career Launcher	-	1. Ms Sindhu Thomas B, Assistant Professor & Head in Charge, CDC, FSH, SRMIST
		2. Mr Rajsekar, Assistant Professor, CDC, FOM, SRMIST
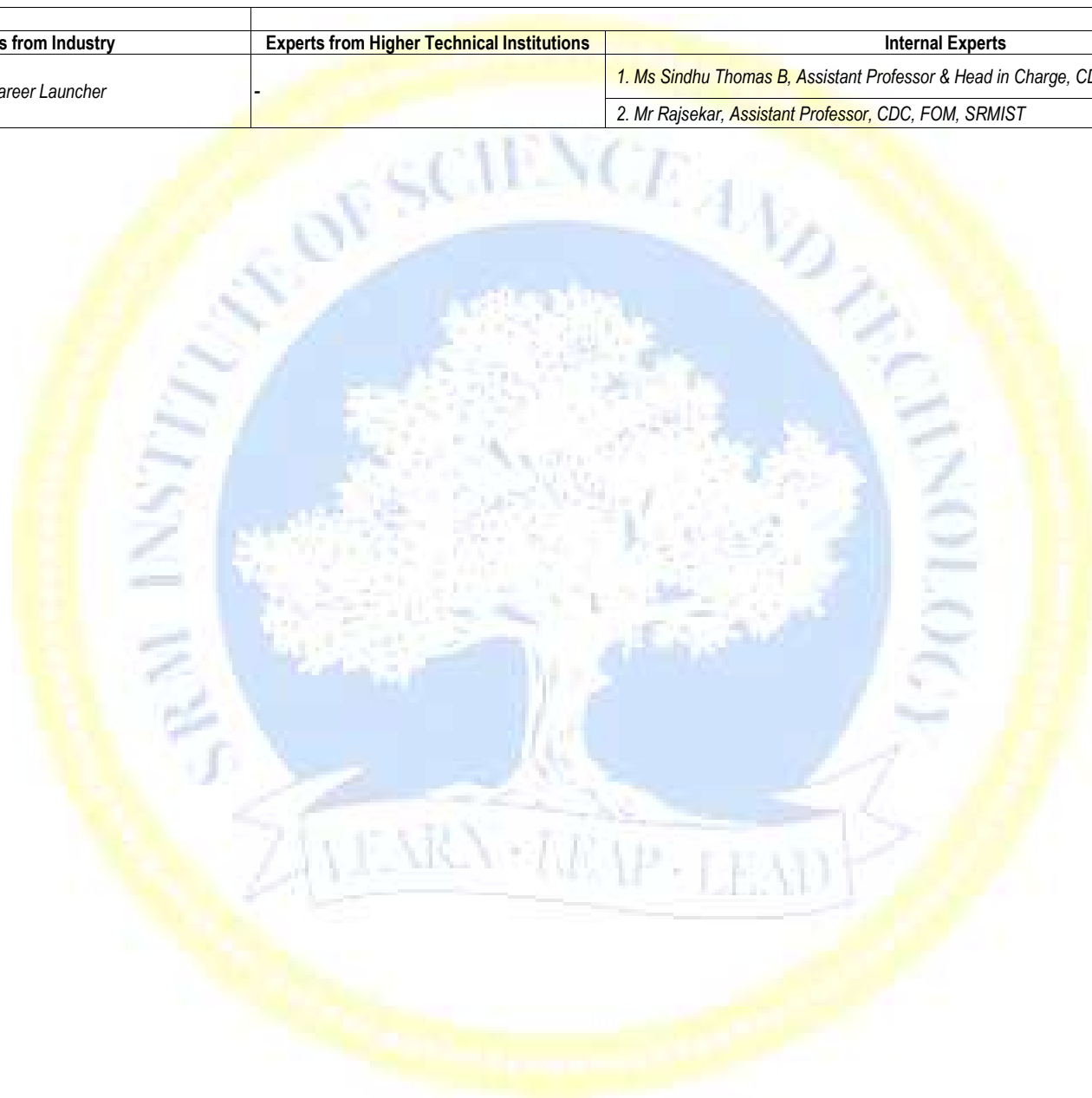
Course Code	UDS21601J	Course Name	*INTELLIGENT AUTOMATION FOR ENTERPRISE*	Course Category	C	Professional Core Course	L	T	P	C
							4	0	4	6

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department	Computer Applications			Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)														
CLR-1 :	To teach the participants how a traditional automation is implemented in the industry to build solutions and how different they are from the intelligent automation	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To get a clear Understanding of Business Process automation, the role they play in an automation process																		
CLR-3 :	To get a clear Understanding of Robotic Process automation, the role they play in an automation process																		
CLR-4 :	To Inculcate the Technical Architecture, Framework, Components of an intelligent automation process.																		
CLR-5 :	To have a clear understanding of intelligent automation real-world applications across different verticals																		
CLR-6 :	To explore the Best Practises, Policies methodologies for a successful intelligent automation, right processes to automate, doing a pilot run etc.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Differentiate between traditional and intelligent automation, have a complete understanding of each of the automation lifecycle.	2	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-2 :	Have an Excellent knowledge on the technologies and applications behind intelligent automation and the future it holds for the organizations	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-3 :	Have Excellent exposure to intelligent automation real world applications across industry verticals.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-4 :	Demonstrated knowledge of Business process automation and its working, technical architecture and framework.	3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-5 :	Demonstrated knowledge of Robotic process automation and its working, technical architecture and framework.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6 :	Have a firm control to explain the best practices, right business processes to automate, Change management etc.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		24	24	24	24	24
S-1	SLO-1	**Unit 1: Traditional Automation**	Managing Business processes for Digital Transformation	Improving Accuracy and reliability	Components of Intelligent Automation Framework	Rule-based methods
	SLO-2	Traditional Automation Overview	**Unit 4: Business Process Automation**	Improving Customer Experience	Business Objectives	Rule-based methods
S-2	SLO-1	History of Traditional Automation	Business Process Automation overview	Keeping up with Compliance and Regulations	Business Process Analysis	Repetitive processes
	SLO-2	Principles and theories of Traditional Automation	How does Business Process Automation work?	Intelligent Automation market	Business Process Redesign	Structured Processes
S-3	SLO-1	Business Benefits of Traditional Automation	Business Benefits of Business Process Automation	Intelligent Automation market share	Develop Automated Processes	Doing a Pilot Run
	SLO-2	Business Challenges of Traditional Automation	Business Challenges of Business Process Automation	Intelligent Automation market size	Intelligent Operations	Doing a Pilot Run
S-4	SLO-1	Traditional Automation vs Intelligent Automation	Types of Business Process Automation	Intelligent Automation market growth	**Unit 10: Intelligent Automation Implementation Framework**	Team
	SLO-2	Traditional Automation vs Robotic Process Automation	When to use Business Process Automation	What is Intelligent Process Automation's Role in the Future of Automation	Healthcare	Tools
S-5 to S-8	SLO-1	Lab 1 :	Lab 4 :	Lab 7:	Lab 10 :	Lab 13:
	SLO-2					
S-9	SLO-1	**Unit 2: Intelligent Automation**	Best Practices for Business Process Automation	Building the business cases for intelligent	Personalized Treatment	Adoption of New Technology
	SLO-2	Intelligent Automation Overview	Business Process Automation Tools and technologies.	**Unit 7: Intelligent Automation Technologies and Architecture**	Medical Imaging	Traditional Delivery Models
S-10	SLO-1	Components of Intelligent Automation	**Unit 5: Robotic Process Automation**	Intelligent Automation Defined Once and for All	Consumer	Change Management
	SLO-2	Business Benefits of Intelligent Automation	Robotic Process Automation overview	Process Orchestration	On-line Shopping	Evaluate the ROI
S-11	SLO-1	Business Challenges of Intelligent Automation	Business Benefits of Robotic Process Automation	Artificial Intelligence and Machine Learning	Warehouse Logistics	
	SLO-2	Examples of Intelligent Automation	Business Challenges of Robotic Process Automation	Robotic Process Automation	Transaction security	
S-12	SLO-1	Future of Intelligent Automation	Why Robotic Process Automation?	Components of Intelligent Automation	Manufacturing	
	SLO-2	Technologies behind Intelligent Automation	Robotic Process Automation Market	Architecture	Automated Factory Floor	
	SLO-1	Lab 2 :	Lab 5 :	Lab 8:	Lab 11:	Lab 14:

S-13 to S-16	SLO-2					
S-17	SLO-1	Applications of Intelligent Automation	Robotic Process Automation Drivers	Strategies and roadmaps	Automated Workflow	
	SLO-2	**Unit 3: Traditional Business Automation vs. Intelligent Industrial Automation**	Robotic Process Automation Economics	Best practices and methodologies for Intelligent Automation	Machine Vision	
S-18	SLO-1	Traditional Business Automation Overview	Robotic Process Automation Strategy	**Unit 8: Real World Intelligent Automation Applications - Insurance, Finance, Life Sciences, and Manufacturing**	Transportation	
	SLO-2	Traditional Business Management Overview	Robotic Process Automation Implementation	Intelligent Automation in Insurance	Autonomous cars	
S-19	SLO-1	Difference Between Business Automation and Business Management	Robotic Process Automation Implementation Examples	Intelligent Automation in Finance	Route Optimization	
	SLO-2	Working of Business Automation	**Unit 6: Robotic Process Automation**	Intelligent Automation in Life Sciences	Supply Planning	
S-20	SLO-1	How business automation improves business processes	Intelligent Automation Industry Needs Overview	Intelligent Automation in Manufacturing	**Unit 11: Intelligent Automation Best Practices and Adoptions**	
	SLO-2	Digital Transformation for traditional businesses	Reducing Costs and Improving Productivity	**Unit 9: Intelligent Automation Implementation Framework**	Find the Right Process to Automate	
S-21 to S-24	SLO-1					
	SLO-2	Lab 3:	Lab 6:	Lab 9:	Lab 12:	Lab 15:

| Learning Resources | 1. Automating Open-Source Intelligence Algorithms for OSINT by Robert Layton, Paul A. Watters 2. Genetic Algorithms and Machine Learning for Programmers Create AI Models and Evolve Solutions -Frances Buontempo | |

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										

Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mr.J. Venkat Subramaniyan, SRMIST
		Dr.S.Sivakumar, SRMIST

Course Code	UDS21D03T	Course Name	DIGITAL TRANSFORMATION		Course Category	D	Discipline Specific Elective	L	T	P	C
								4	0	0	4

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR): The purpose of learning this course is to,

| Learning | | Program Learning Outcomes (PLO) | | | | | | | | | | | | | | | |

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CLR-1 : Enable the participants hone their skills, tools, and techniques to lead digital transformation in an business Organization

CLR-2 : To Inculcate the principles of digital business models, rapid innovation, and data-driven thinking.

CLR-3 : Get Exposed to gaining leadership skills to navigate an era of technology shifts and disruptive business models

CLR-4 : Able to deliver methodologies for organizations to deconstruct their value chain to gain a competitive advantage over their competitors

CLR-5 : Look into the major business drivers of digital transformation, opportunities they create and opportunities they have already created, the challenges they bring to the table

CLR-6 : Methodically explain the framework fundamental duality and the different enablers of digital transformation.

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

Column headers (PLO 1–15):
1. Fundamental Knowledge
2. Application of Concepts
3. Link with Related Disciplines
4. Procedural Knowledge
5. Skills in Specialization
6. Ability to Utilize Knowledge
7. Skills in Modeling
8. Analyze, Interpret Data
9. Investigative Skills
10. Problem Solving Skills
11. Communication Skills
12. Analytical Skills
13. ICT Skills
14. Professional Behavior
15. Life Long Learning

First three columns: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

CLO	Description	Level	Prof	Attn	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1	Create a system for correct data gathering and incorporating it at a higher level for business intelligence.	2	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-2	Have excellent skills and knowledge to lead process innovation and efficiency across units	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-3	Understand the customer needs and building impactful insights that help a great deal in drive the business growth.	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-4	Have excellent skills and knowledge for providing a great digital experience high customers expectations..	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-5	Encourage digital culture with improved collaboartaion to help move the entire organization ahead digitally.	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H
CLO-6	Have excellent knowledge in processes helpingg to improve efficiency and profitability for business organizations undergoing digital transformation	3	85	80	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H

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Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: Digital Transformation Defined**	AI-digitized supply chains	Digital Transformation in Automobile	Internet Of Things	Building bridges between technologies
	SLO-2	Digital Transformation defined from academic perspective	Improved decision making and productivity	**Unit 5: Digital Transformation Business Cases**	Mobile	Bridging technologies and innovation
S-2	SLO-1	Digital Transformation defined from industry perspective	**Unit 3: Role of AI in Digital Transformation**	Creating a Roadmap	Augmented Reality	**Unit 10: Digital Transformation Implementation Framework**
	SLO-2	Business Benefits of Digital Transformation	How can AI be applied in the digital transformation process	Destination	Cloud Technology	What is a digital transformation implementation framework?
S-3	SLO-1	Business Challenges of Digital Transformation	AI-driven digital transformation	Means of getting to the destination	Artificial Intelligence and Machine Learning	Why do organizations need to digitally transform
	SLO-2	Role of Digital Transformation in AI	Challenges ahead	Key digital transformation activities	Digital Twin	The benefits of a digital transformation framework
S-4	SLO-1	Opportunities for Digital Transformation	Role of Augmented analytics	Main milestones	API Based Integration	Choosing the right digital transformation framework
	SLO-2	The Process of Digital Transformation	Role of Automation	Define Metrics	Robotic Process Automation	Things to avoid
S-5	SLO-1	Digital Business Models	Enhanced Consumer engagement and insights	User Lifetime Value	Additive Manufacturing	Things in return
	SLO-2	**Unit 2: Industry Demand and Business Needs for Digital Transformation**	AI-digitized supply chains	Inbound and outbound marketing performance	**Unit 8: Security and Data Privacy**	**Unit 11: Digital Transformation Implementation Framework**
S-6	SLO-1	Digital Transformation a window of future	Improved decision making and productivity	Customer Experience	Digital Transformation Strategy ✓ Process ✓ Model ✓ Domain ✓ Culture	Amazon Business - Improving Customer experience
	SLO-2	Business Drivers towards digital Transformation	**Unit 4: Role of Intelligent Automation and Data Science in Digital Transformation**	Use Organizational Change Management	Technology for digitally transforming business processes ✓ Team Collaboration ✓ CRM ✓ Storage ✓ Project Management ✓ Accounting ✓ Payroll ✓ Communication	Netflix – On-demand Subscription based video services
S-7	SLO-1	Digital Transformation across industries	Why are Businesses Undergoing Digital Transformations?	**Unit 6: Digital Transformation Business Cases**	How is data security at risk from digital transformation	Tesla Connected Car Technology

	SLO-2	Innovation from digital transformation	Future of Intelligent Automation Data Transformation	Destination	Mitigate data security risks	Glassdoor Recruitment
S-8	SLO-1	Competitive Edge over others	Future of Data science in Data Transformation	Means of getting to the destination	Investing in Privacy Tools	Under Armour Connected Fitness
	SLO-2	Changing Operational processes through digital transformation	How does Data Science Benefit to Business?	Key digital transformation activities	Ensuring Digital Transformation Strategy is Secure	**Unit 12: Digital Transformation Best Practices and Adoptions**
S-9	SLO-1	Changing organizational model	Authorizing decision-making via a data-driven approach	Main milestones	**Unit 9: Global Digital Deployment and Rollout Strategy**	Define of the business problem
	SLO-2	**Unit 3: Role of AI in Digital Transformation**	Classifying warnings, opportunities, and scopes via data-insights	Define Metrics	Review your strategy	Prioritize collaboration between teams
S-10	SLO-1	How can AI be applied in the digital transformation process	Adding more values with Machine learning	User Lifetime Value	Components for deploying your strategy	Ensure a culture that allows for change
	SLO-2	AI-driven digital transformation	**Unit 5: Real-World Applications of Digital Transformation**	Inbound and outbound marketing performance	Building Bridges between IT and the Business	Ensure a culture that allows for change
S-11	SLO-1	Challenges ahead	Digital Transformation in Healthcare	Customer Experience	Building bridges between the business and information/processes	Introduce a corporate governance system
	SLO-2	Role of Augmented analytics	Digital Transformation in Retail	Use Organizational Change Management	Building bridges for actionable intelligence	Look through the perspective of customers or users
S-12	SLO-1	Role of Automation	Digital Transformation in Energy	**Unit 7: Digital Transformation Technologies and Infrastructure**	Building human bridges in a digital transformation strategy	Take risks and try new methods
	SLO-2	Enhanced Consumer engagement and insights	Digital Transformation in Oil and Gas	Big Data And Real-Time Analytics	Bridges to build new ecosystems	Mind the technology legacy cost

Learning Resources	1. https://deepsphereai.litmos.com/ 2. Jyothi R. Korem, Srinivas R. Pingali, Shankar Prakash, (2021), "Digital Transformation Strategies - Theory and Practice, SAGE publishing, 2021 3. Daniel R. A. Schallmo , Christopher A. Williams, (2018), "Digital Transformation Now! - Guiding the Successful Digitalization of Your Business Model", Springer, 2018	4. Alp Ustundag ,Emre Cevikcan , (2017), "Industry 4.0: Managing The Digital Transformation" , Springer Series in Advanced Manufacturing 5. Alexander Borek and Nadine Prill, (2020), Driving Digital Transformation through Data and AI, Kogan Page

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										

Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRMIST
		Dr. B.Rebecca Jeyavadhanam, SRMIST

Course Code	UDS21D04T	Course Name	Working with IIoT Data		Course Category	D	Discipline Specific Elective		L	T	P	C
									4	0	0	4

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CLR-1 : To teach the participants with the fundamental concepts of Industrial IoT, the business benefits, challenges involved in implementing an IIoT based solutions.

CLR-2 : to teach the participants about how AI and Big Data together merge with IIoT, and develop new processes within organisations and supply chains, which bring about huge digital transformations.

CLR-3 : To teach the participants the basic building blocks of the IoT system sensors, processors, gateways, applications

CLR-4 : To educate the participants on Implementing, deploying, and maintaining IIoT infrastructure which can be a tricky proposition at best. It covers device connectivity and security, which expands the breadth and depth of all connected devices, providing additional value for the user with increased profitability and growth.

CLR-5 : To provide insights about set of integrated software capabilities to improve asset management decision making and operational visibility and control for plants, infrastructure and equipment's using the IIoT Technologies.

CLR-6 : To provide the participants with enough insights about how IIoT is applied in creating real-world applications from connected cars, smart homes, connected wearables, smart cities and connected healthcare.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Have a firm understanding and control over the fundamental concepts of Industrial IoT, Industrial IoT protocols, business drivers of an industrial IoT based solution etc	2	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-2 :	Have strong hands-on knowledge, skill and expertise on how AI and Big Data together merge with IIoT, and develop new processes within organisations and supply chains, which bring about huge digital transformations.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-3 :	A Firm control of IIoT architecture and protocols in the communications layer, that the systems use to exchange actionable information	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-4 :	Have the ability of developing capability of IIoT to extract value from data, diminish costs, improve tasks and present new plans of action	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-5 :	Have the ability to understand all the privacy risks surrounding an IIoT implementation and how these risks can be mitigated for an efficient process.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H
CLO-6 :	Have insights about how IIoT is applied in creating real-world applications from connected cars, smart homes, connected wearables, smart cities and connected healthcare.	3	85	80	H	H	H	H	H	H	H	H	H	M	M	H	H	H	H

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Duration (hour)		12	12	12	12	12
S-1	SLO-1	Unit 1: Understanding IIoT fundamentals	Utilizing the right Business Strategy	Secure Telemetry	Unit 8: IIoT Implementation Framework	Unit 12: Working with Sensor Data
	SLO-2	IIoT Overview	Find Experts within Your Organisation	Software Updates and maintenance	IIoT Implementation Framework Overview	Industrial Control Systems
S-2	SLO-1	Business Benefits of IIoT	Keep Your Customer Front and Centre	Embedded devices in IIoT	Categories of IIoT Implementation Framework	Industrial Applications
	SLO-2	Business Challenges of IIoT	Agile Decision Making and Rapid Prototyping	Unit 6: IIoT Architecture and Protocols	IIoT Architecture	Reading Data from Sensors
S-3	SLO-1	Future of IIoT	Data Driven Design	IIoT Architecture overview	Category of Implementation	Business Benefits of Reading Sensors Data
	SLO-2	Impact of IIoT	Data as a Service	Perception Layer	Knowledge Category of IIoT	Business Challenges of Reading Sensors Data
S-4	SLO-1	Overview of the IIoT technology components	Real-Time Visibility	Network Layer	Unit 9: Security Considerations Using IIoT	Unit 13: Working with Machine Data
	SLO-2	Common Cloud Protocols	Predictive Maintenance	Processing Layer	Security Considerations Using IIoT Overview	Industrial Control Systems
S-5	SLO-1	IIoT business models	Inventory Planning	Application Layer	Securing IIoT Local Area Networks (LAN)	Industrial Applications
	SLO-2	How IIoT changes business models	Unit 4: Building Blocks of IIoT	List of IIoT Protocols	Safe Data Transmission	Reading Data from Machines
S-6	SLO-1	IIoT Usecases	Building Blocks of IIoT Overview	MQTT	Secure Network Ports	Business Benefits of Reading Machine Data
	SLO-2	Unit 2: Evolution of IIoT	Applications	AMPQ	Secure User Endpoints	Business Challenges of Reading Machine Data
S-7	SLO-1	Milestones in IIoT Evolution	Gateways	CoAP	Secure Remote Access	Unit 14: Working with Machine Data
	SLO-2	IIoT Architecture	Processors	Unit 7: Various Platforms for IIoT	Unit 10: Opportunities with IIoT	Industrial Control Systems
S-8	SLO-1	Physical Layer	Sensors	Platforms for IIoT overview	Opportunities with IIoT Overview	Industrial Applications
	SLO-2	Edge Computing Layer	IoT layers	Benefits of IIoT Platforms	Improving data competence and knowledge	Reading Data from Wearables
S-9	SLO-1	Application Layer	Application	Types of IIoT platforms	Demand-driven manufacturing	Business Benefits of Reading Data from Wearables
	SLO-2	Economic Impact of IIoT	Management Service	Words of Caution with Industrial IoT Platform Vendors	Improvement of production processes	Business Challenges of Reading Data from Wearable
S-10	SLO-1	Challenges in IIoT adoption	Gateway and Network	Power of AI and IIoT	New levels of factory automation	Unit 15: Working with Web Logs

	SLO-2	Hardware Platforms	Sensors Connectivity and Network	Google Cloud IoT	Unit 11: Opportunities with IIoT	Industrial Control Systems
S-11	SLO-1	Data Planning	Unit 5: IIoT Design and Development Consideration	Cisco IoT Cloud Connect	Smart robotics	Industrial Applications
	SLO-2	Privacy and Security	Industrial IoT Enablement	Salesforce IoT Cloud	Reinventing warehousing	Reading Data from Web Logs
S-12	SLO-1	Technologies supporting IIoT Growth	Secure Onboarding	IBM Watson IoT	Minimize downtime in factories	Business Benefits of Reading Data from Web Logs
	SLO-2	Unit 3: How IIoT is Transforming Digital World	Configure, Monitor and Control	ThingWorx	Self-driving tractors, Air as a service, Connected Robotics, Intelligent Robotics, Smart Automotive manufacturing	Business Challenges of Reading Data Web Logs

Learning Resources	1. https://deepsphereai.litmos.com/ 2. Sudip Misra, Chandana Roy, Anandarup Mukherjee, (2021), "Introduction to Industrial Internet of Tings and Industry 4.0", CRC Press, Taylor & Francis Group 3. Giacomo Veneri, Antonio Capasso, (2018), "Hands-On Industrial Internet of Things - Create a powerful Industrial IoT infrastructure using Industry 4.0", Packt publishing	4. Sravani Bhattacharjee, (2018), "Practical Industrial Internet of Things Security – A Practitioner's guide to securing connected industries", Packt publishing 5. Alena Traukina, Jayant Thomas, Prashant Tyagi, Kishore Reddipalli, (2018), "Industrial Internet Application Development – Simplify IIoT development using the elasticity of Public cloud and Native Cloud Services", Packt publishing

Learning Assessment

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		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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		Mrs.K.Kanmani, SRMIST

Course Code	UDS21D05T	Course Name	TECHNOLOGY LEADERSHIP AND INNOVATION MANAGEMENT	Course Category	D	Discipline Specific Elective	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning			Program Learning Outcomes (PLO)

CLR-1 :	Teach the participants how to lead transformational growth by developing an understanding of exponential and digital technologies and innovations
CLR-2 :	Learn how to apply prevalent best practices within business organizations, sectors, and industries
CLR-3 :	Make the participants understand, embrace, and deploy the appropriate innovations at scale for business organizations to not only survive but thrive.
CLR-4 :	Learn to create new opportunities and shape the future of their organizations and industries by harnessing transformational technologies.
CLR-5 :	Understand how business leaders are provided with responsibility to drive tech innovation and strategy across their organization
CLR-6 :	Understand how companies get up-to-speed on the latest technologies and business applications to offer superior solutions to clients

Learning columns: 1 2 3 | PLO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Walk away with cocepts of how digital transformation offers a technology-based solution to a business problem that you face in your organization	2	85	80	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
CLO-2 :	Have excellent Knowledge of Frameworks that help with the practical application of AI-related modeling and possibilities of implementing AI-driven solutions in your business	3	85	80	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
CLO-3 :	Have excellent Techniques that advance their leadership acumen with a focus on topics that will help you gain maximum traction on your tech initiatives	3	85	80	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
CLO-4 :	Understand the various applications of AI in business and the opportunities being created by advances in AI	3	85	80	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
CLO-5 :	Understand applications of digital strategies successfully adopted by global brands, and contemplate which strategies might prove most effective in your organization	3	85	80	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
CLO-6 :	Inculacate the impact of digital transformation on business models and study the disruptive products that transforms industry verticals	3	85	80	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**Unit 1: Management - General vs. Business**	Issues in Technology Innovation Management	Performance Measurement, Performance Management, and Improvements	Steps of technology implementation ✓ Plan ✓ Design ✓ Implement ✓ Support	**Unit 9: Technology Assessment: Technology Choice, Technology Assessment Process**
	SLO-2	Management Overview	Research Methods in Technology Innovation Management	Need of Technology Forecasting	Automation overview	Technology Assessment overview, Importance of technology assessment
S-2	SLO-1	Principles of Management	Customer Value Creation in Technology Firms	Technology Lifecycle	Automation and business cases	Business Benefits and challenges of technology assessment
	SLO-2	Financial Management	Management of Software Engineering Projects	Technological Roadmaps and Forecasting	Business case for automation	Various elements in technology assessment, Steps to conduct technology assessment
S-3	SLO-1	Business Environment	Integrated Product Development	**Unit 5: Technology Adoption and Diffusion**	**Unit 7: Technological Change and Impact of Technological Change**	Evaluating and Choosing Technologies, Evaluating Criteria
	SLO-2	Human Resource Management	Designing Innovation Communities	Technology Adoption and Diffusion Overview	Technology change Overview	**Unit 10: Technology and Innovation Business Case Development**
S-4	SLO-1	Marketing Research	**Unit 3: Program, Project, People, and Product Management**	Technology Adoption Lifecycle	Process of Technology Changes	Business cases overview
	SLO-2	Communication skills	Program Management overview, Foundations of Program Management	Stages of Technology Adoption Lifecycle	Importance of Technology Changes	Data and assumptions
S-5	SLO-1	Leadership skills	Program Management Life Cycle and Methodologies, Program Management Skills	How a Business leverages from Technology Adoption Lifecycle	Characteristics of Technology Changes	Business cases – organizational context, Business case opportunity identification
	SLO-2	Business laws	Projects, Programs, and Portfolios, Role and Responsibilities of a Program Manager	Why Companies need to focus on Technology Adoption Lifecycle	Example of Technology Changes	Business case considerations, Effective Decision-making structures, Business case opportunities
S-6	SLO-1	Customer Relations Management	Leading a Program, Leading a Program vs Leading a project	How Technology Adoption works	Impacts of Technology Changes	Building a business case for introducing new technologies
	SLO-2	Computer Applications	Project Management overview, Foundations of Project Management	Business Benefits of Improving Adoption rates	Emerging Technologies	**Unit 11: Evaluating Industry Trend, Market Demand, and Business Needs**
S-7	SLO-1	Operations Management	Project Management Life Cycle and Methodologies,Project	Technology Adoption Challenges	Impact on the workforce	Market Research and competitive analysis

S	SLO					
			Management Skills, Role of a Project Manager			
	SLO-2	Organizational Behavior	Organizational structure and culture, People Management overview, Foundations of People Management	Diffusion of Innovation	Implications for public policy	Use market research to find customers
S-8	SLO-1	Economics	People Management Life Cycle and Methodologies, People Management Skills, Getting Work Done Through Others	Companies and Technological Diffusion	**Unit 8: Corporate Learning, Research, and Innovation**	Find a Market advantage, Five Force analysis
	SLO-2	Business Fundamentals	Assessment and Evaluation, Building Peer Networks, Essentials of communication	Pattern of Technological Diffusion	Organizational learning	Rivalry among competitors in an industry
S-9	SLO-1	Retail Management	Managing Self, Product Management overview, Foundations of Product Management	Product Diffusion	Obstacles to organizational learning	Threat of potential new entrants, Threat of Substitutes for an Industry's Offerings
	SLO-2	Understanding Industry and Markets	Product Management Life Cycle and Methodologies, Product Management Skills, Managing Innovative Product Teams	Characteristics of Technology Diffusion	Building a learning organization	Power of Suppliers to an Industry, Power of an Industry's Buyers
S-10	SLO-1	Digital Marketing	Roles and Responsibilities of the Product Manager, Marketing Challenges and Guiding Principles, Customer Development and Crossing the Chasm	**Unit 6: Implementation of New Technology, Automation, and Business Case Development**	Implementing an Effective Corporate Learning Strategy	Limitations of Five Forces Analysis, Market Demand Analysis ✓ Market identification ✓ Business cycle ✓ Product niche ✓ Evaluate competition
	SLO-2	Leadership and Ethics	**Unit 4: Technology Acquisition and Forecasting**	Implementing New Technologies overview	Corporate research overview	**Unit 12: Evaluating Industry Trend, Market Demand, and Business Needs**
S-11	SLO-1	Strategic Management	Acquisition Laws, Regulations, and Policies	Marketing Perspective	Importance of Corporate research	Technology Leader overview, Technology steward overview, Aspects of Technology Leadership
	SLO-2	**Unit 2: Technology and Innovation Management**	Business Planning, Need and Establishing the Acquisition Team	Framework for implementation	Business Benefits of Corporate research	Assessment and forecasting ✓ Technology assessment ✓ Technology forecastin
S-12	SLO-1	Principles of Technology Innovation Management	Planning for IT Acquisitions	Multiple internal markets	Why is corporate innovation needed	Technology management and transfer, Technology assessment techniques, Adopting Project management methodologies from different industries

| | SLO-2 | Technology Entrepreneurship | Acquisition Strategy, Plan, and Implementation | Promotion vs hype | Getting started with corporate innovation | Build in time to experiment and fail, Taking the management out of project management |

| Learning Resources | 1. https://deepsphereai.litmos.com/
2. V. K. Narayanan, Gina Colarelli O'Connor, (2010), "Encyclopedia of Technology and Innovation", John Wiley & Sons Ltd
Scott Shane, (2008), "The Handbook of Technology and Innovation Management", John Wiley & Sons Ltd | 3. Robert S. Friedman, Desiree M. Roberts, Jonathan D. Linton, (2008), "Principle Concepts of Technology and Innovation Management: Critical Research models", Information science reference
4. Marc J. de Vries, (2021), "Innovation Research in Technology and Engineering Management – A Philosophical Approach", Routledge
Mark Dodgson, David Gann, Ammon Salter, (2008), "The Management of Technological Innovation – Strategy and Practice", Oxford University Press |

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRMIST
		Mrs.M.Ramla, SRMIST

Course Code	UDS21D06T	Course Name	SOCIAL MEDIA AND TEXT ANALYTICS	Course Category	D	Discipline Specific Elective	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department		Computer Applications		Data Book / Codes/Standards	Nil

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

CLR-1 : *To leverage the power of the R eco-system to extract, process, analyze, visualize and model social media data*

CLR-2 : *Visualize and analyze data from social media platforms to understand and model complex relationships using various concepts and techniques*

CLR-3 : *Understand the fundamentals of text mining*

CLR-4 : *Utilize text for prediction techniques*

CLR-5 : *Understand the relevance between information retrieval and text mining*

CLR-6 : *Analyze different case studies related to text mining*

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

CLO	Outcome	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, aInterpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	*Understand the basics of social media analytics and R language*	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	*Analyze data from major social media channels such as Twitter & Flickr*	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	*Acquire knowledge on fundamentals of text mining*	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	*Perform prediction from text and evaluate it*	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	*Perform document matching*	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	*Understand how text mining is implemented*	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Getting Started with R and Social Media Analytics	Visualizing data	Overview of Text Mining	Using Text for Prediction	Finding Structure in a Document Collection
	SLO-2	Understanding Social Media	Managing packages	What's Special About Text Mining?	Recognizing that Documents Fit a Pattern	
S-2	SLO-1	Advantages and Significance of Social Media	Data analytics - Analytics workflow	Structured or Unstructured Data	How Many Documents Are Enough?	Clustering Documents by Similarity
	SLO-2	Disadvantages and Pitfalls of Social Media	Machine learning techniques	Is Text Different from Numbers?	Document Classification	Similarity of Composite Documents
S-3	SLO-1	Social media analytics	Supervised learning, Unsupervised learning	What Types of Problems Can Be Solved?	Learning to Predict from Text	k-Means Clustering
	SLO-2	A typical social media analytics workflow	Text analytics	Document Classification	Similarity and Nearest-Neighbor Methods	

S-4	SLO-1	Data access, Data processing and normalization, Data analysis and Insights	Understanding Twitter, APIs	Information Retrieval	Document Similarity	Hierarchical Clustering
	SLO-2	Opportunities and Challenges	Registering an application	Clustering and Organizing Documents	Decision Rules	
S-5	SLO-1	Getting started with R	Connecting to Twitter using R	Information Extraction	Decision Trees	The EM Algorithm
	SLO-2	Environment setup	Extracting sample Tweets	Prediction and Evaluation	Scoring by Probabilities	
S-6	SLO-1	Data types	Trend analysis	From Textual Information to Numerical Vectors	Linear Scoring Methods	What Do a Cluster's Labels Mean?
	SLO-2	Data structures-Vectors		Collecting Documents	Evaluation of Performance - Estimating Current and Future Performance	Applications, Evaluation of Performance
S-7	SLO-1	Arrays	Sentiment analysis	Document Standardization	Getting the Most from a Learning Method	Case Study: Market Intelligence from the Web
	SLO-2	Matrices	Key concepts of sentiment analysis –Subjectivity, Sentiment polarity	Tokenization	Errors and Pitfalls in Big Data Evaluation	
S-8	SLO-1	Lists	Opinion summarization	Lemmatization-Inflectional Stemming	Information Retrieval and Text Mining	Case Study: Lightweight Document Matching for Digital Libraries
	SLO-2	Data Frames	Features	Stemming to a Root	Is Information Retrieval a Form of Text Mining?	
S-9	SLO-1	Functions - Built-in functions	Sentiment analysis in R	Vector Generation for Prediction	Key Word Search	Mining Social Media
	SLO-2	User-defined functions		Multiword Features	Nearest-Neighbor Methods	
S-10	SLO-1	Controlling code flow - Looping constructs	Follower graph analysis	Labels for the Right Answers, Feature Selection by Attribute Ranking	Measuring Similarity -Shared Word Count	E-mail Filtering
	SLO-2	Conditional constructs	Flickr Data Analysis	Sentence Boundary Determination	Word Count and Bonus, Cosine Similarity	
S-11	SLO-1	Advanced operations	Accessing Flickr's data	Part-of-Speech Tagging	Web-Based Document Search - Link Analysis	Emerging Directions
	SLO-2	apply, lapply	Understanding Flickr data	Word Sense Disambiguation	Document Matching	Summarization
S-12	SLO-1	sapply,tapply	Understanding interestingness – similarities	Phrase Recognition, Named Entity Recognition, Parsing	Inverted Lists	Active Learning
	SLO-2	mapply	Are your photos interesting? - Preparing the data -Building the classifier	Feature Generation	Evaluation of Performance	Learning with Unlabeled Data

Learning Resources	1. Raghav Bali, Dipanjan Sarkar, Tushar Sharma, (2017), "Learning Social Media Analytics with R", Packt Publishing.	2. Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, (2015), "Fundamentals of Predictive Text Mining", Second Edition, Springer London.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Mrs.S.Chandrakala,SRMIST
		Mrs. Kanmani, SRM IST

Course Code	UDS21D09J	Course Name	PROJECT WORK	Course Category	D	Discipline Specific Elective Course	L	T	P	C
							0	0	12	6

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To understand the basics of software development																		
CLR-2 :	To know about life cycle of the software development																		
CLR-3 :	To explore risk and people management for software development																		
CLR-4 :	To learn about different software tools for software development.																		
CLR-5 :	To know about different techniques related to software development.																		
CLR-6 :	To Learn About documentation process for software development																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	To conceptualize a novel idea / technique into a product	3	80	70	H	H	M	H	L	M	-	H	-	H	-	H	M	-	H
CLO-2 :	To think in terms of multi-disciplinary environment	3	80	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-3 :	To understand the management techniques of implementing a project	3	85	70	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-4 :	To experience on the challenges of teamwork	3	85	80	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-5 :	To prepare a presentation in a professional manner	3	85	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-6 :	To prepare document all aspects of design work.	3	80	70	M	H	M	H	-	M	-	H	H	M	-	H	M	-	H

Students can choose problems of their own interest to develop software package using the programming languages/tools available. There will be two reviews conducted during the project period for all the students .At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination.

Learning Assessment					
Project Work	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)		
	Review – 1	Review – 2	Project Report	Viva-Voce	
	20%	30 %	30 %	20 %	

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