SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

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

Kattankulathur, Chengalpattu District 603203,

Tamil Nadu, India

ACADEMIC CURRICULA

UNDERGRADUATE DEGREE PROGRAMMES

Bachelor of Computer Applications (Honors)
In
Data Science

(III to VIII Semester)

(National Education Policy/National Credit Framework)

Learning Outcome-Based Curriculum Framework

Regulations 2024

Faculty of Science and Humanities

Office of the Registrar, SRM IST

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SURUTTAIA UDAIYAR PONNUSAMY

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REGISTRAR

FACULTY OF SCIENCE AND HUMANITIES

ACADEMIC CURRICULA

UNDERGRADUATE DEGREE PROGRAMME

Bachelor of Computer Applications (Honors)
in
Data Science

Four Years

National Education Policy

Learning Outcome-based Curricula Framework

National Credit Framework

Academic Year

2024 - 2025

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

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

Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

1. Department Vision Statement	
Stmt-1	Imparting quality education in Computer Applications and prepare young minds to serve community
Stmt-2	Contributing effectively to produce globally competent quality professionals in the field of Computer Applications
Stmt- 3	Prioritizing adaptability and industry alignment for a unique learning experience

2. Department Mission Statement	
Stmt - 1	Impart student's essential knowledge and skills required for a successful career in Computer Applications
Stmt - 2	Cultivate and foster a conducive environment for scholarly research
Stmt - 3	Inculcate in the students a sense of commitment to professional ethics, moral values with emphasis on teamwork 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

"Stmt" stands for Statement

3. Programme Education Objectives (PEO)	
PEO - 1	To develop skills and domain knowledge to solve real world problems in diverse applications
PEO - 2	To facilitate professional skills and competencies for successful career in the field of Computer Applications
PEO - 3	To possess the knowledge for pursuing advanced studies and entrepreneurial opportunities in the field of Computer Applications
PEO - 4	To kindle the minds of students to take up research and development in Computer Applications with missionary zeal
PEO - 5	To prepare the students as balanced individuals who are keen to leave a mark by excelling in their profession

4. 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	High	High	High	High	Medium
PEO - 2	High	High	Medium	High	High
PEO - 3	High	Medium	Medium	Medium	Low
PEO - 4	Medium	Low	High	Low	Medium
PEO - 5	Low	High	Low	Medium	High

** H – High Correlation, M – Medium Correlation, L – Low Correlation
** H, M, and L have numerical equivalents of 3, 2, 1 correspondingly

5. Programme Learning Outcomes (PLO)	
	Graduate Learning Attributes
PLO - 1	Problem Solving, Critical Thinking, Creativity
PLO - 2	Communication Skills, Collaborating Skills
PLO - 3	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills
PLO - 4	Leadership Qualities, Professionalism, Autonomy, Accountability
PLO - 5	Digital Technology Skills
PLO - 6	Value Inculcation, Multicultural inclusivity
PLO - 7	Environmental Action, Community Engagement
PLO - 8	Entrepreneurial Risk Taking
PSO - 1	Encompassing both theoretical knowledge and real-world applications to solve problems, to evaluate information and to develop software tools
PSO - 2	Practical, analytical, proficient programming skills, and innovative solutions in various domains of Data Science

PSO-Programme Specific Outcome

6. Mapping of PLOs with PEOs										
	PLO - 1	**PLO - 2**	**PLO - 3**	**PLO - 4**	**PLO - 5**	**PLO – 6**	**PLO - 7**	**PLO – 8**	**PSO - 1**	**PSO – 2**
PEO - 1	3	3	3	2	3	1	1	3	3	3
PEO - 2	3	3	3	3	3	2	3	2	3	3
PEO - 3	2	2	2	1	2	2	2	3	3	3
PEO - 4	3	2	3	2	3	3	3	2	3	3
PEO - 5	2	3	2	3	2	3	2	2	2	3

7. Programme Structure

Discipline Core Courses (C)

Course Code	Course Title	Session / Week			C
		L	T	P	
UDS24101J	Programming using Java	3	0	3	4
UDS24102J	Fundamentals of Data Science	3	0	3	4
UMS24103T	Mathematics for Artificial Intelligence	4	0	0	4
UDS24201J	Elements of Distributed Data Processing	3	0	3	4
UDS24202J	Data Structures and Algorithms	3	0	3	4
UMS24203T	Statistics for Artificial Intelligence	4	0	0	4
UDS24301J	Data Engineering for Enterprises	3	0	3	4
UDS24302J	Database Management System	3	0	3	4
UDS24303J	Natural Language Processing	3	0	3	4
UDS24401J	Deep Learning	3	0	3	4
Total Learning Credits					**40**

Discipline Core/Elective Courses (D)

Course Code	Course Title	Session / Week			C
		L	T	P	
UDS24D01J	Advanced Computing with Python	3	0	2	4
UDS24D02J	Machine Learning				
UDS24D03J	Deep Learning with Keras and Tensorflow	3	0	3	4
UDS24D04J	Big Data Analytics with Applications				
UDS24D05J	Intelligent Automation	3	0	3	4
UDS24D06J	Computer Vision				
UDS24D07J	Advanced Analytics and Data Visualization	3	0	3	4
UDS24D08J	Data Science for Business Analytics				
UDS24D09J	Artificial Intelligence and Automation for Enterprises	3	0	3	4
UDS24D10J	Data Wrangling				
UDS24D11T	Research Methodology in Data Science	4	0	0	4
UDS24D12T	Data Analytics for Project Management				
UDS24D13J	Data Warehousing and Data Mining	3	0	3	4
UDS24D14J	Cloud and Grid Computing				
UDS24D15J	Machine Learning for Enterprises	3	0	3	4
UDS24D16J	Real World Computer Vision Applications				
UDS24D17J	Technology Leadership and Innovation Management	3	0	2	4
UDS24D18J	Social Media and Text Analytics				
UDS24D19T	Statistical Analysis and Business Applications	4	0	0	4
UDS24D20T	Applications of Edge IoT and Machine Learning				
Total Learning Credits					**40**

Elective Courses (Minor) (E)					
Course Code	Course Title	Session/ Week			C
		L	T	P	
UDS24E01J	Data Science and Analytics	3	0	3	4
UDS24E02J	Data Analytics using Spreadsheet	3	0	3	4
UDS24E03J	Essentials of Machine Learning	3	0	3	4
UDS24E04J	Programming using R	3	0	3	4
UDS24E05J	Programming using Python	3	0	3	4
UDS24E06J	Introduction to Deep Learning	3	0	3	4
UDS24E07J	Applications of Computer Vision	3	0	3	4
UDS24E08J	Data Visualization Tools	3	0	3	4
Total Learning Credits					32

Multidisciplinary Courses (M)					
Course Code	Course Title	Session / Week			C
		L	T	P	
UDS24M01J	Internet of Things	2	0	2	3
UDS24M02J	Digital Transformation	2	0	2	3
UDS24M03J	Blockchain Technology	2	0	3	3
Total Learning Credits					9

Value Added Courses (V)					
Course Code	Course Title	Hours/ Week			C
		L	T	P	
UCD24V01T	Essentials of Artificial Intelligence	1	0	0	1
UES24V01T	Environmental Studies	2	0	0	2
UCD24V02T	Universal Human Values	2	0	0	2
Total Learning Credits					5

Ability Enhancement Courses (A)					
Course Code	Course Title	Session/ Week			C
		L	T	P	
ULT24AE1J	Tamil – I	2	0	2	3
ULH24AE1J	Hindi - I				
ULF24AE1J	French - I				
ULT24AE2J	Tamil – II	2	0	2	3
ULH24AE2J	Hindi - II				
ULF24AE2J	French - II				
ULE24AE2J	Business English	2	0	2	3
Total Learning Credits					9

Skill Enhancement Courses (S)					
Course Code	Course Title	Session/ Week			C
		L	T	P	
UCD24S01J	Verbal Ability and Skill Development	1	0	2	2
UCD24S02L	Quantitative Aptitude and Logical Reasoning	0	0	2	1
UCD24S03J	Industry Oriented Employability and Leadership Skills	1	0	2	2
UEN24S01L	Communication Skills	0	0	4	2
UCD24S04J	Career Readiness and Professional Skills	1	0	2	2
Total Learning Credits					9

Project Work / Internship (P)					
Course Code	Course Title	Session/ Week			C
		L	T	P	
UDS24P01L	Internship – I	0	0	0	1
UDS24P02L	Internship – II	0	0	0	1
UDS24P03L	Project Work	0	0	4	2
UDS24P04L	Research Project and Dissertation	0	0	24	12
UDS24P05L	Professional Internship				
Total Learning Credits					**16**

Mandatory Courses (Y)					
Course Code	Course Title	Session/ Week			C
		L	T	P	
UNS24Y01L	NSS	0	0	0	0
UNC24Y01L	NCC				
UNO24Y01L	NSO				
UYG24Y01L	YOGA				
UMI24Y01L	My India Project	0	0	0	0
Total Learning Credits					**0**

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Internship - I to be completed during summer vacation of the first year
Internship - II to be completed during summer vacation of the second year

Students from other departments can enroll in Elective Courses (Minor) (E)
Students from all departments will be able to enroll in Multidisciplinary Courses (M).

8. Course Allocation across Semesters

Semester – I					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
ULT24AE1J	Tamil – I	2	0	2	3
ULH24AE1J	Hindi – I				
ULF24AE1J	French – I				
ULE24AE2J	Business English	2	0	2	3
UDS24101J	Programming using Java	3	0	3	4
UDS24102J	Fundamentals of Data Science	3	0	3	4
UMS24103T	Mathematics for Artificial Intelligence	4	0	0	4
UCD24S01J	Verbal Ability and Skill Development	1	0	2	2
Total Learning Credits					**20**

Semester – II					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
ULT24AE2J	Tamil – II	2	0	2	3
ULH24AE2J	Hindi – II				
ULF24AE2J	French – II				
UDS24201J	Elements of Distributed Data Processing	3	0	3	4
UDS24202J	Data Structures and Algorithms	3	0	3	4
UMS24203T	Statistics for Artificial Intelligence	4	0	0	4
UCD24V01T	Essentials of Artificial Intelligence	1	0	0	1
	Multidisciplinary Course – I				3
UCD24S02L	Quantitative Aptitude and Logical Reasoning	0	0	2	1
UNS24Y01L	NSS	0	0	0	0
UNC24Y01L	NCC				
UNO24Y01L	NSO				
UYG24Y01L	YOGA				
Total Learning Credits					**20**

Total Learning Credits of Courses of FIRST year = 40

Semester – III					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
UDS24301J	Data Engineering for Enterprises	3	0	3	4
UDS24302J	Database Management System	3	0	3	4
UDS24303J	Natural Language Processing	3	0	3	4
	Minor Elective – I				4
UDS24P01L	Internship - I	0	0	0	1
	Multidisciplinary Course – II				3
Total Learning Credits					**20**

Semester – IV					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
UDS24401J	Deep Learning	3	0	3	4
UDS24D01J	Advanced Computing with Python	3	0	2	4
UDS24D02J	Machine Learning				
	Minor Elective – II				4
	Minor Elective – III				4
UEN24S01L	Communication Skills	0	0	4	2
UCD24S03J	Industry Oriented Employability and Leadership Skills	1	0	2	2
UMI24Y01L	My India Project	0	0	0	0
Total Learning Credits					**20**

Total Learning Credits of Courses of SECOND year = 40

Semester – V					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
UDS24D03J	Deep Learning with Keras and Tensorflow	3	0	3	4
UDS24D04J	Big Data Analytics with Applications				
UDS24D05J	Intelligent Automation	3	0	3	4
UDS24D06J	Computer Vision				
	Minor Elective – IV				4
	Multidisciplinary Course – III				3
UES24V01T	Environmental Studies	2	0	0	2
UCD24S04J	Career Readiness and Professional Skills	1	0	2	2
UDS24P02L	Internship - II	0	0	0	1
Total Learning Credits					**20**

Semester – VI					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
UDS24D07J	Advanced Analytics and Data Visualization	3	0	3	4
UDS24D08J	Data Science for Business Analytics				
UDS24D09J	Artificial Intelligence and Automation for Enterprises	3	0	3	4
UDS24D10J	Data Wrangling				
	Minor Elective – V				4
	Minor Elective – VI				4
UDS24P03L	Project Work	0	0	4	2
UCD24V02T	Universal Human Values	2	0	0	2
Total Learning Credits					**20**

Total Learning Credits of Courses of THIRD year = 40

Semester – VII					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
UDS24D11T	Research Methodology in Data Science	4	0	0	4
UDS24D12T	Data Analytics for Project Management				
UDS24D13J	Data Warehousing and Data Mining	3	0	3	4
UDS24D14J	Cloud and Grid Computing				
UDS24D15J	Machine Learning for Enterprises	3	0	3	4
UDS24D16J	Real World Computer Vision Applications				
	Minor Elective – VII				4
	Minor Elective – VIII				4
Total Learning Credits					**20**

Semester – VIII					
Course Code	**Course Title**	**Sessions Per Week**			**C**
		L	**T**	**P**	
UDS24D17J	Technology Leadership and Innovation Management	3	0	2	4
UDS24D18J	Social Media and Text Analytics				
UDS24D19T	Statistical Analysis and Business Applications	4	0	0	4
UDS24D20T	Applications of Edge IoT and Machine Learning				
UDS24P04L	Research Project and Dissertation	0	0	24	12
UDS24P05L	Professional Internship				
Total Learning Credits					**20**

Total Learning Credits of Courses of FOURTH year = 40

8.1 Elective Courses (MINOR) offered by the Department of Computer Applications to other Departments (excluding Department of Computer Applications)

Elective Courses (Minor) (E)						
Semester	**Course Code**	**Course Title**	**Sessions Per Week**			**C**
			L	**T**	**P**	
III	UDS24E01J	Data Science and Analytics	3	0	3	4
IV	UDS24E02J	Data Analytics using Spreadsheet	3	0	3	4
IV	UDS24E03J	Essentials of Machine Learning	3	0	3	4
V	UDS24E04J	Programming using R	3	0	3	4
VI	UDS24E05J	Programming using Python	3	0	3	4
VI	UDS24E06J	Introduction to Deep Learning	3	0	3	4
VII	UDS24E07J	Applications of Computer Vision	3	0	3	4
VII	UDS24E08J	Data Visualization Tools	3	0	3	4
Total Learning Credits						**32**

8.2 Multidisciplinary Courses offered by the Department of Computer Applications to all Departments (including Department of Computer Applications)

Multidisciplinary Courses (M)						
Semester	**Course Code**	**Course Title**	**Sessions Per Week**			**C**
			L	**T**	**P**	
II	UDS24M01J	Internet of Things	2	0	2	3
III	UDS24M02J	Digital Transformation	2	0	2	3
V	UDS24M03J	Blockchain Technology	2	0	3	3
Total Learning Credits						**9**

9. Programme Articulation Matrix

Course Code	Course Name	Programme Learning Outcomes (PLO)									
		1	2	3	4	5	6	7	8	PSO 1	PSO 2
ULT24AE1J	Tamil – I	2	1	1	1	-	1	1	1	-	-
ULH24AE1J	Hindi – I	2	2	1	2	2	1	1	-	-	-
ULF24AE1J	French – I	2	2	1	2	2	1	1	-	-	-
ULE24AE2J	Business English	1	3	3	3	2	1	-	2	1	1
UDS24101J	Programming using Java	3	1	2	2	3	-	-	2	3	3
UDS24102J	Fundamentals of Data Science	3	1	2	3	3	-	-	2	3	3
UMS24103T	Mathematics for Artificial Intelligence	1	1	-	-	1	-	-	-	-	-
UCD24S01J	Verbal Ability and Skill Development	3	2	2	2	1	1	2	1	-	-
ULT24AE2J	Tamil – II	2	1	2	1	-	1	1	1	-	-
ULH24AE2J	Hindi – II	2	2	1	2	2	1	1	-	-	-
ULF24AE2J	French – II	2	2	1	2	2	1	1	-	-	-
UDS24201J	Elements of Distributed Data Processing	3	2	2	2	3	-	-	2	2	3
UDS24202J	Data Structures and Algorithms	3	2	3	3	2	-	-	2	3	2
UMS24203T	Statistics for Artificial Intelligence	1	1	-	-	1	-	-	-	-	-
UCD24V01T	Essentials of Artificial Intelligence	3	2	1	1	1	1	-	2	2	2
	Multidisciplinary Course – I										
UCD24S02L	Quantitative Aptitude and Logical Reasoning	2	1	3	-	2	2	-	-	-	-
UNS24Y01L	NSS	1	2	3	1	1	2	1	1	0	0
UNC24Y01L	NCC	1	2	3	1	1	2	1	1	0	0
UNO24Y01L	NSO	1	2	3	1	1	2	1	1	0	0
UYG24Y01L	YOGA	1	2	3	1	1	2	1	1	0	0
UDS24301J	Data Engineering for Enterprises	3	1	2	2	3	-	-	2	3	3
UDS24302J	Database Management System	3	1	2	2	3	-	-	2	3	3
UDS24303J	Natural Language Processing	3	2	3	2	3	-	-	2	3	3
	Minor Elective – I										
UDS24P01L	Internship - I	3	2	2	1	2	2	2	2	3	3
	Multidisciplinary Course – II										
UDS24401J	Deep Learning	3	1	3	2	3	-	-	2	3	3
UDS24D01J	Advanced Computing with Python	3	1	2	2	3	-	-	2	2	3
UDS24D02J	Machine Learning	3	1	2	2	3	-	-	2	3	3
	Minor Elective – II										

	Minor Elective – III										
UEN24S01L	Communication Skills	2	3	1	2	-	-	2	1	-	-
UCD24S03J	Industry Oriented Employability and Leadership Skills	3	2	2	1	2	2	-	2	2	2
UMI24Y01L	My India Project	2	2	3	2	2	2	1	1	-	-
UDS24D03J	Deep Learning with Keras and Tensorflow	3	1	1	1	2	-	-	1	3	3
UDS24D04J	Big Data Analytics with Applications	3	1	1	1	2	-	-	2	3	3
UDS24D05J	Intelligent Automation	3	1	2	1	3	-	-	1	3	3
UDS24D06J	Computer Vision	3	1	2	2	2	-	-	2	3	3
	Minor Elective – IV										
	Multidisciplinary Course – III										
UES24V01T	Environmental Studies	3	2	1	-	2	1	-	2	2	-
UCD24S04J	Career Readiness and Professional Skills	2	3	1	2	-	-	2	1	-	-
UDS24P02L	Internship - II	3	2	2	3	2	2	3	2	3	3
UDS24D07J	Advanced Analytics and Data Visualization	3	1	1	2	2	-	-	2	3	3
UDS24D08J	Data Science for Business Analytics	3	1	2	1	2	-	-	2	3	3
UDS24D09J	Artificial Intelligence and Automation for Enterprises	3	1	2	2	2	-	-	2	3	3
UDS24D10J	Data Wrangling	3	1	2	2	2	-	-	2	3	3
	Minor Elective – V										
	Minor Elective – VI										
UDS24P03L	Project Work	3	2	2	2	2	1	1	2	3	3
UCD24V02T	Universal Human Values	1	3	3	2	3	2	2	2	1	1
UDS24D11T	Research Methodology in Data Science	3	1	1	2	2	-	-	2	1	3
UDS24D12T	Data Analytics for Project Management	3	2	1	2	2	2	-	2	1	2
UDS24D13J	Data Warehousing and Data Mining	3	1	1	2	2	-	-	2	3	3
UDS24D14J	Cloud and Grid Computing	3	1	2	2	2	-	-	2	3	3
UDS24D15J	Machine Learning for Enterprises	3	1	1	2	2	-	-	2	3	3
UDS24D16J	Real World Computer Vision Applications	3	1	2	2	2	-	-	2	3	3
	Minor Elective – VII										
	Minor Elective – VIII										
UDS24D17J	Technology Leadership and Innovation Management	3	1	2	2	2	-	-	2	3	3
UDS24D18J	Social Media and Text Analytics	3	1	2	2	2	-	-	2	3	3
UDS24D19T	Statistical Analysis and Business Applications	3	1	2	2	2	-	-	2	1	3
UDS24D20T	Applications of Edge IoT and Machine Learning	2	1	2	2	2	-	-	2	2	3
UDS24P04L	Research Project and Dissertation	3	2	3	2	3	2	2	2	3	3
UDS24P05L	Professional Internship	3	2	3	2	3	2	2	2	3	3

Abbreviations

CLR – Course Learning Rationale
CLO – Course Learning Outcomes
PLO – Programme Learning Outcomes
SLO – Session Learning Outcomes
BLoT – Bloom's Level of Thinking
CLA – Continuous Learning Assessment

SEMESTER - I

Course Code	ULT24AE1J	Course Title	Tamil - I	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:
CLR-1	மரபிலிருந்து மாற்றம் பெற்ற புதுக்கவிதை மரபின் சிந்தனைகளை அறியச்செய்தல்
CLR-2	நவீன கவிதையின் வழி மனித வாழ்வியல் விழுமியங்களைத் தெரியச் செய்தல்
CLR-3	சிற்றிலக்கியங்கள், காப்பியங்கள்கற்பிக்கும் தமிழ்ச் சமூகத்தின் வாழ்வியலை அறியச் செய்தல்
CLR-4	நவீன தமிழ் இலக்கிய வளர்ச்சி வரலாற்றைப் புரியச் செய்தல்
CLR-5	மொழிப்பயிற்சி வழி மொழியின் பல்வேறு நுட்பங்களைத் தெரியச்செய்தல்

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skill	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	புதுக்கவிதை உருவாக்கித்தந்த புதிய சிந்தனைக்களங்களை அறிந்து கொள்ளுதல்	✓	✓	-	-	2	75	60	3	-	3	-	-	-	-	3	-	-
CLO-2	நவீன கவிதைகள் வழி மாற்றம் பெற்று வரும் மானுடவிழுமியங்களைத் தெரிந்துகொள்ளுதல்	✓	✓	✓	-	2	80	70	-	-		2		3	3	-	-	-
CLO-3	தமிழ்ச்சமூகத்தின்இடைக்காலவாழ்வியல்முறைகளைஉணர்ந்துகொள்ளுதல்	✓	✓	✓	✓	2	70	65	3	-	3	-		2	-	-	-	-
CLO-4	நவீனஇலக்கியவரலாறுவழிதமிழ்க்கல்விவரலாறு, சமூகவரலாறுபெற்றவளர்ச்சிநிலைகளைத்தெரிந்துகொள்ளுதல்	✓	✓	✓	✓	2	70	70	-	3	-	-	1	2	-	-	-	-
CLO-5	மொழியின்நுட்பங்களைத்தெரிந்துமொழிஆளுமையோடுசெயல்படும் திறன்பெறுதல்	✓	✓	✓	✓	3	80	70	3	3	-	2	-	-	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO – 5
	12	12	12	12	12
SLO-1	தமிழ்க்கவிதைமரபு	நவீனகவிதைதோற்றம், வரலாறு	தமிழரின்வீரமரபு - போர்விழுமியங்கள்	சிற்றிலக்கியத்தோற்றம் – வகைமை	தமிழ்உரைநடைமரபு – உ·வே·சா· வின்பங்களிப்பு
SLO-2	புதுக்கவிதைஉருவாக்கம்,புதுக்கவிதைவளர்ச்சிநெறிகள்	நவீனகவிதைகளில்செல்நெறிகள்	பரணிஅறிமுகம்பரணிஇலக்கியங்கள்	பிள்ளைத்தமிழ் - உலா - தூது	உ·வே· சா· வின்ராஜவைத்தியம்
SLO-3	பாரதியார்பன்முகஆளுமைத்திறன்	கவிதைமொழி - நவீனகவிஆளுமைகள்	தலைவனின்வீரம் - கலிங்கத்துப்பரணி 477, 490	புதுக்கவிதையின்தோற்றமும் மொழியும்	நாட்டுப்புறமரபில்சிறுதெய்வவழிபாடு
SLO-4	பாரததேசம்பாரததேசத்தின்வளம்	கவிதையில்நாட்டுப்புறவடிவம்	தமிழ்இலக்கியமரபில்தூதுஇலக்கியங்கள்	புதுக்கவிதையில்சமூகம் - புதுக்கவிதையும்இதழ்களும்	கழனியூரனின்பொன்காத்தஜயனார்
SLO-5	வெள்ளிப்பனிமலையின்மீதுலவுவோம்…	பெண்களின்கல்விநிலை -இளம்பிறை – அம்மா	தமிழின்பெருமை – தமிழ்விடுதூது (184 – 186)	மணிக்கொடிஇதழ்,எழுத்துஇதழ்,வானம்பாடிஇதழ்	பிழைநீக்கிஎழுதும்நுட்பங்கள்
SLO-6	20 ஆம்நூற்றாண்டுக்கவிதைமரபில்பாரதிதாசன்	ஆண்பெண்சமத்துவமும்ப·கல்பனா – கீறல்விழுந்தமாலைக்காலங்கள்	செய்யுள்மரபில்கலம்பகஇலக்கியங்கள்	சிறுகதைதோற்றம்– சிறுகதைவளர்ச்சி	எழுத்துப்பிழை – ந - ண - னல,ள,ழ, ர, றவேறுபாடுஅறிதல்
SLO-7	பாரதிதாசன் - அழகின்சிரிப்பு ஆல் - ஆயிரம்கிளைகள்கொண்டஅடிமரம்	விளிம்புநிலைவாழ்வியல் : திருநர்களும்சாதனைகளும்	கையறுநிலை – நந்திக்கலம்பகம் - வானுறுமதியை (110)	சிறுகதைவரலாறு - சிறுகதைஆசிரியர்கள்	தொடர்பிழைஒருமைபன்மைவேறுபாடு
SLO-8	ஆல் - ஆயிரம்கிளைகள்கொண்டஅடிமரம்	திருநங்கைகுணவதி - சமூகப்பார்வை	தமிழ்இலக்கியமரபில் குறவஞ்சிஇலக்கியங்கள்	இதழ்களும்சிறுகதையும்	பிறமொழிச்சொற்களைநீக்கிஎழுதுதல், ஷ,ஜ,ஸ,ஹமாற்றொலிகள்
SLO-9	வானம்பாடிக்கவிஞர்களும்மு·மேத்தாவும்	புலம்பெயர்வாழ்வியல் - வலியும்நம்பிக்கையும்	குற்றாலக்குறவஞ்சி – ஆடுமரவீனுமணி (3)	புதினம்தோற்றம் - புதினம்வளர்ச்சிவரலாறு	தமிழில்சொல்வகைகள்சொல்லும்பயன்பாடும்
SLO-10	மனிதநேயம் - மு·மேத்தாவின் மனிதனைத்தேடி	ஸர்மிளாஸெய்யித் – புராதனஊர்	காப்பியஇலக்கணம் - காப்பியவகைமைகள்	புதினத்தின்வகைமைபுதினஆசிரியர்கள்	பெயர்ச்சொற்கள்பெயர்ச்சொற்களும்வகைகளும்
SLO -11	தமிழ்க்கவிதையில்சுற்றுச்சூழலியல்	காலந்தோறும்கவிதைவடிவில்மாற்றங்கள்· ஹைக்கூ – மு·முருகேஷ்	சிலப்பதிகாரம் – அறிமுகம் கட்டுரைக்காதை	தமிழ்இலக்கியத்தில்உரைநடை◌ைக்கூறுகள் - உரைநடையின்தோற்றம்	வினைச்சொற்கள்அறிதல்

SLO -12	இயற்கையும்சமத்துவமும் பழனிபாரதியின்காடு	லிமரைக்கூ – ஈரோடுதமிழன்பன்சென்ரியூ – மாமதயானை	ஊழ்வினை– கோவலனின்முற்பிறப்பு வரலாறு	தமிழில்உரைநடைவளர்த்தஅறிஞர்கள்	தமிழில்பெயரடை, வினையடைஅறிதல்

Resources			
1	முல்லைக்காடு, தொகுப்பும்பதிப்பும் - தமிழ்த்துறைஆசிரியர்கள், எஸ்.ஆர்.எம். அறிவியல்மற்றும்தொழில்நுட்பக்கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2023	4	வல்லிக்கண்ணன், புதுக்கவிதைதோற்றமும்வளர்ச்சியும், ஆழிபதிப்பகம், சென்னை, 2018
2	கா. சிவத்தம்பி, தமிழில்சிறுகதைதோற்றமும்வளர்ச்சியும், என்.சி.பி.எச்., சென்னை, 2013	5	மு.வரதராசன், தமிழ்இலக்கியவரலாறு, சாகித்தியஅக்காதெமி, 1972.
3	மதுரைதமிழ்இலக்கியமின்தொகுப்புத்திட்டம்	6	தமிழ்இணையக்கல்விக்கழகம்

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10%)		(50 % weightage)
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
Total (%)		100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Course Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. P.R.Subramanian, Director, Mozhi Trust, Thiruvanmiyur, Chennai – 600 041.	1	Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literaturel, Pondicherry University, Pondicherry	1	Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST, KTR.
				2	Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
				3	Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
				4	Dr. T.R.Hebzibah beulah Suganthi,Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
				5	Dr. S.Saraswathy, Assistant Professor,Dept. of Tamil, FSH, SRMIST, KTR.

Course Code	ULH24AE1J	Course Title	Hindi - I	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:
CLR-1	To Communicate in Hindi without any inhibition
CLR-2	To appreciate the Hindi Language in its various forms
CLR-3	To analyze the different writing styles
CLR-4	To display moral and social values in the field of social Responsibility and Integrity
CLR-5	To be willing listeners and Translators-where need be

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To Understand the Philosophy of life and living through Stories	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To Examine Travelogue writing and Sketch	✓	✓	✓	-	2	85	75	3	-	2	-	3	-	3	-	-	-
CLO-3	To Identify Irony and essay based writing	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2		-	-	-
CLO-4	Evaluate the various social issues depicted in the prose	✓	✓	✓	✓	3	85	75	2	-	2	3	-		2	-	-	-
CLO-5	To Understand the basic and fundamental principal of Translation	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2		-	-	-

Sessions	CLO - 1	CLO - 2	CLO – 3	CLO - 4	CLO – 5
	12	12	12	12	12
SLO-1	KAHANI KI AVDHARNA	REKHACHITRA & YATRAVITRANT	NIBANDH	NATAK	ANUVAD& PARIBHASHIK SHABDAVALI
SLO-2	SWARUP AUR PARIBHASHA	AVDHARNA EVM SWAROOP	NIBANDH KI AVDHARNA EVM SAWROOP	AVDHARNA EVM SAWROOP	ARTH EVM PARIBHASHA
SLO-3	KAHANI KE TATVA EVM MAHATWA	MAHATVA AUR UDDESHYA	MAHATVA EVM UDDESHYA	TATWA EVM PRAKAR	SWARUP EVM PRAKAR

SLO-4	PARIKSHA- PREMCHAND	GESHA REKHACHITRA	KUTAJ- NIBANDHHAJARI PRASHAD DIVEDI	UDDESHYA	MAHATVA
SLO-5	VISLESHAN	PATH KA VISHLESHAN	LEKHIAK PARICHAY	NATAK KA MAHATVA	UDDESHYA
SLO-6	UDDESHYA	GURU SHISHYA KA SAMBANDH	SHANGHARSHIL JEEVAN	RANGMANCH KA PARICHAY	ANUVAD KA PRAYOJAN EVM PRAYOG
SLO-7	MALBE KA MALIK- MOHAN RAKESH	THELE PAR HIMALAY(YATRAVITRANT)	PATH KA MAHATVA	LEKHAK PARICHAY	SHROT EVM LAKSHYA BHASHA KA GYAN
SLO-8	LEKHAK PARICHAY	YATRAVITRANT KA MAHATVA	BHOLARAM KA JEEV-(VYANGYA) HARISHANKAR PARSHAI	NATAK KA VISLESHAN	ANUVAD KA DAYITVA
SLO-9	BATWARE KA YATHARTH VARNAN	YATRA KA YATHARTH CHITRAN	VYANGYA KI AVADHARNA	LALCH KA DUSHPARINAM	PARIBHASHIK SHABDAVALI
SLO-10	TATKALIN PARISHTHITI KA VARNAN	PATH KA VISLESHAN	PATH KA VIHLESHAN	GURU SHISHYA SAMBANDH	TAKANIKI SHABDAVALI KA MHATVA
SLO-11	KAHANI KA VISHLESHAN	HIMALAY KA LOK JEEVAN	SARKARI TANTRA KA KHOKHLA RUP	MAHATTAKANKSHI KA DUSHPARINAM	VIVIDH PRAYOG
SLO-12	KAHANI KA UDDESHYA	HIMALAY KA VARNANA	SANVEDANSHIL BHAVANA	TATKALIN SAMAJIK VYAVASTHA KI CHARCHA	SHABDAVALI KI AVSHYAKTA

Resources			
1	EDITED BOOK: “SAMANYA HINDI”, SRIJONLOK PUBLICATION, 2023, New Delhi.	4	BHAKTI ANDOLAN AUR SURDAS KA KAVYA – MANAGER PANDEY
2	KABIR – HAZARI PRASAD DWEDI	5	BIHARI – VISHVNATH PRASAD MISHR
3	SURDAS – RAM CHANDRA SHUKL	6	AADHUNIK VIGYAPAN AUR JANSAMPARK – TARESH BHATIA

Assessment										
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *		
		(10 %)		(10 %)		(20 %)		(10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
Total (%)		100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
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2	Aditya Singh, student Member, B.Com IAF, Dept. of Comerce,SRM IST,KTR aa5404@gmail.com			2	Dr. Md.Shwahidul Islam Assistant Professor, SRMIST. shwahidj@srmist.edu.in
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4	ALUMINI - VIPIN KUMAR JHA, Senior Translation Officer anju.bipin.jha@gmail.com			4	Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST Murulidharan- nishamup@srmist.edu.in

Course Code	ULF24AE1J	Course Title	French - I	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:
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

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes										
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To acquire knowledge about French language	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To strengthen the knowledge on concept, culture, civilization, and translation of French	✓	✓	✓	-	2	85	75	3		2	-	3	-	3	-	-	-
CLO-3	To develop content using the features in French language	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-
CLO-4	To interpret the French language into other language	✓	✓	✓	✓	3	85	75	2		2	3	-	-	2	-	-	-
CLO-5	To improve the communication, intercultural elements in French language	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	Contacts, Emma la championne	Les verbes du premier groupe	Qu'est-ce qu'ils font?	Portraits	Les verbes du deuxième groupe –
SLO-2	Les nombres à partir de 31	La liaison	Où est mon sac	Un casting	Les pronoms personnels toniques
SLO-3	Les pays, les nationalités	Entrer en contact	Quelques objets	Le Petit Spirou	Les verbes faire et lire
SLO-4	Les jours de la semaine, Les jours	Présenter et se présenter	Les professions	L'aspect physique	Les Sons
SLO-5	Les mois de l'année, Les animaux domestiques	Demander et dire la date	La formation du féminin (2)	Le caractère	Décrire l'aspect physique
SLO-6	La famille (1)	Une rencontre.	Qu'est-ce que c'est?	les états d'âme	Demander et dire l'heure
SLO-7	La formation du féminin (1)	Contacts	C'est / Il est (1)	Les prépositions de lieu (1)	Elle est comment?
SLO-8	Les adjectifs possessifs	Emma la Championne	La phrase négative (1)	La famille (2)	Portraits

SLO-9	La phrase interrogative	Mots et expressions	Les verbes aller et venir	La formation du féminin	Mots et Expressions
SLO-10	Les nombres	Grammaire	Les formules de politesse	La formation du pluriel (2)	Grammaire.
SLO-11	Intonation et est-ce que	Communication	C'est qui?	Il y a	Communication
SLO-12	Les exemples	Les verbes du ER –groupe	Mots et Expressions	Les articles contractés	Les concepts

Resources			
1	''La Nouvelle Génération-AI'' Méthode de français, Marie-Noëlle COCTON, P. DAUDA, L. GIACHINO, C. BARACCO, Les éditions Didier, Paris, 2018.	4	https://www.elearningfrench.com/learn-french-grammar-online-free.html
2	Cahier d'activités avec deux discs compacts.	5	https://www.lawlessfrench.com/grammar
3	https://www.fluentu.com/blog/french/french-grammar	6	https://blog.gymglish.com/2022/12/15/basic-french-grammar

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *		
		(10 %)		(10 %)		(20 %)		(10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
Total (%)		100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
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2	Mr. Shrivathsan S, Journalist, Senior Sports Reporter/Sub-Editor, Times of India, Chennai shrivathsangilramhanga@gmail.com			2	Miss. Abigail A, Assistant Professor , SRMIST,,VDP abigaila@srmist.edu.in
				3	Mrs.M.Mahalakshmi, Assistant Professor , SRMIST,,RMP mahalakm2@srmist.edu.in

Course Code	ULE24AE2J	Course Title	Business English	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:
CLR-1	Understand the critical component for success in the workplace and Organize regular speaking practice sessions where students can engage in conversations and discussions related to business scenarios.
CLR-2	Provide students with a collection of audio recordings or online resources that cover various business-related topics. These exercises should include comprehension questions and activities to improve listening skills, such as identifying main ideas, specific details, and understanding different accents.
CLR-3	Practice drafting and editing and Focus on developing skills in organization, clarity, coherence, and the appropriate use of business language and conventions.
CLR-4	Prepare clear, precise, readable written document
CLR-5	Learn to design documents to make information easily accessible

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	Cultivating Critical Thinkers and Creative Communicators	Advancing Knowledge and Scholarship in Language
CLO-1	Communication Proficiency for various business contexts, including emails, reports, presentations, and negotiations.	✓	✓	-	-	2	85	75	3	3	3	3	2	1	-	3	3	3
CLO-2	Conversant with the basic forms and formats of Writing	✓	✓	✓	-	2	85	75	3	2	2	3	2	1	-	-	3	3
CLO-3	Enhance professional writing skills	✓	✓	✓	✓	3	85	75	3	2	2	3	2	1	-	3	3	3
CLO-4	To Prepare precise business documents by evaluating information, formulating arguments, and expressing opinions persuasively in English.	✓	✓	✓	✓	3	85	75	3	3	3	3	2	1	-	-	3	3
CLO-5	Foster collaborative communication skills for teamwork and multicultural business environments	✓	✓	✓	✓	3	85	75	3	3	3	3	2	1	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	Introduction to Listening Skills as an important unit in communicationListening Process	Introduction to Communication Internal Communication	Introduction to Writing Business LettersImportance of writing skills	Introduction to Report WritingFeatures of Good Report	Importance of Business MeetingsTypes of Business Meetings
SLO-2	Listening is not the same as HearingTime Spent Communicating	Stake Holders in Internal CommunicationChannels and methods to use different Channels	Difference between Personal and Business LettersStructure & Format	Purpose of Report WritingDifferentiate between Business Report and Engineering report	Conducting MeetingsCommon Mistakes made at Meetings

SLO-3 & 4	Purpose of listening and Principles of listeningListening Activity- Reflection Of Understanding Of Passive Listening And active listening- presentation by students	Internal Tele-ConversationSelf-Introductionsample tele-conversation- role play	Types Of Business Letters Writing E-Mails Email Writing Practice	Steps in Report WritingStructure of a Report Writing Practice-Hands-On Training	Students will be able to identify and correct common mistakes in sentence structure, grammar, and punctuation.Employment Communication In Official Scenarios- Role Play And Demo- Activity
SLO- 5	Classification of Listening and the purposeInformational Listening and the art of listening	Seeking and Giving InformationGiving Messages	Principles of E-mailE-mail Etiquette	Types of ReportsFormat of Reports	Students will be able to write a well-structured and professional resume that highlights their skills and experiences.Students will be able to create an appealing and professional design for their resumes, including proper formatting and layout.
SLO-6	Critical Listening Therapeutic or Empathetic Listening	Expression of GratificationExternal Communication	Overcoming problems in E-mail Communication	Oral Communication Skills	Reason for a Cover Letter to Apply for a Job
SLO-7 & 8	Other Listening TypesBarriers to Effective Listening ProcessEXPLAINING LISTENING BARRIERS BY STUDENTS	Stake HoldersPRESENTATION ABOUT STAKE HOLDERS	Writing Memos, What is a Memo?Principles of Precis Writing and purposeMemo Writing Example- Activity	Oral Business PresentationPurpose, Audience, LocaleBusiness Presentation Practice And Presentation With Ppt And Demo	Format of Cover LetterTypes of Cover LetterCover Letter Practice Writing
SLO-9	Categorization of Barriers to CommunicationHow to resolve the barriers for communication?	Channels of External CommunicationCross Organizational Video-Teleconferencing	Approaches to memo writingFormat of a Memo	Steps in Making a PresentationResearch and Planning	Group DiscussionUnderstand the Nature of Discussion
SLO- 10	Reading SkillsEffective Reading Strategies - 1 to 10	Briefing the OrganizationDescription of Product	CircularsGuidelines for writing Circulars	Structure and StylePreparation and Presentation	Difference between Debate and DiscussionWays to form and present the arguments
SLO-11 & 12	Purpose of ReadingTypes of ReadingTechniques for Effective ReadingImproving ComprehensionReading Component- A Story ofBankruptcyReading Activity-Pausing At Right Places And Intonation-Fluency And Speed In Reading- Prcatice Hour	Description of ProcessDescription of ServicesHolding Meetings over SkypeCommunication Network: ScopeTypes of Communication NetworkFormal Communication NetworkInformal Communication NetworkConducting a Elevator Pitch RoundTypes Of Communication- Enacting In Different Scenarios	Format of CircularsNotices-PurposeFormat of NoticesImportant Points to Note in a NoticeWriting Component: Preparing EmailsPreparing Memo and circulationof the samePreparing CircularPreparing Notices and the purpose- Writing Activity- Hands-On- Training	Delivering a PresentationMaking the Self PresentableDressing SenseClear Voice - Dos and Dont'sPlanning &AnalyzingStructuringManaging Body LanguageManaging Emotions Body Language And Managing Emotions- Demo And Model Enacting- Activity	Ways to DefendEmotional Intelligence: UnderstandingUnderstanding Individual NatureZohari Window ModelEncouraging Fellow ParticipantsMaking Communication More FriendlyKnapp's Relationship Escalation ModelConvincing Others by using Rhetorics Persuasion Activity- Role Play On Official Scenarios

Resources:			
1	English for Business Studies Student's Book: A Course for Business Studies and Economics Students" by Ian MacKenzie, Cambridge University Press, 2010	5	"English for Business Communication" by Simon Sweeney, Cambridge University Press, 2015.
2	"Business Communication: Building Critical Skills" by Kitty O. Locker and Stephen Kyo Kaczmarek, McGraw-Hill Education, 2021	6	"The Business Writer's Handbook" by Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu, Bedford/St. Martin's, 2021
3	"Business English: A Complete Guide to Developing an Effective Business Writing Style" by Andrea B. Geffner (1997)	7	"English for Business Studies Teacher's Book: A Course for Business Studies and Economics Students" by Ian Mackenzie (1997)
4	"Effective Business Writing: Strategies, Suggestions, and Examples" by Maryann V. Piotrowski (1998)	8	"Effective Business Communication" by Herta A. Murphy and Herbert W. Hildebrandt (1996)

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA– 1		CLA– 2		CLA – 3		CLA – 4 *		
		(10%)		(10%)		(20%)		(10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
	Total (%)	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Krishna Raj, Sutherland Krishna.Raj1@sutherlandglobal.com	1	Dr. J Mangayarkarasi Associate Professor and Head, Dept. of English Ethiraj College for Women Chennai, jmbwilson97@gmail.com	1	Dr V.Vennila, Assistant Professor, Department of English, FSH, SRMISTvennilav@srmist.edu.in
2	Ann Mariya Thomson RA2232105010015, ll M.A English Literature CSH, SRM ISTaz1160@srmist.edu.in	2	Dr. K S AntonysamyAssociate Professor and Head, Dept. of English Loyola College Chennaiantonysamyks@loyolacollege.edu	2	Dr. Shanthichitra, Professor, & Head, Department of English, FSH,SRMIST,hod.doe.ktr@srmist.edu.in

Course Code	UDS24101J	Course Title	Programming using Java	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment		
CLR-1	To understand the principles and concepts of Object Oriented Programming	1	2	3	4	1	2	3
CLR-2	To learn how to extend Java classes with inheritance and dynamic binding.							
CLR-3	To learn how to produce robust programs in Java using Exception Handling							
CLR-4	To achieve parallelism using threading concepts							
CLR-5	To Develop the basics of Graphical User Interface Programming							

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Programme Learning Outcomes									
									1	2	3	4	5	6	7	8	9	10
									Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Use an integrated development environment to write, compile, run, and test simple object-Oriented Java programs	✓	✓	-	-	2	85	75	3	-	2	2	3	-	-	2	2	2
CLO-2	Implement Java programs using classes, objects and also focused on garbage collection.	✓	✓	✓	-	2	85	75	3	2	2	2	2	-	-	3	2	3
CLO-3	Apply Exception handling and Parallelism in java applications	✓	✓	✓	✓	3	85	75	3	2	3	1	3	-	-	3	3	2
CLO-4	Identify and fixed defects and common security issues in code.	✓	✓	✓	✓	3	85	75	3	1	2	3	3	-	-	2	3	3
CLO-5	To gain knowledge in Applets, Event handling using AWT controls.	✓	✓	✓	✓	3	85	75	3	1	3	3	3	-	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	Introduction to Java	Class & Constructors	Inheritance, Interface & Package	Multithreading, Utility Classes, Applet	Event Handling, AWT Control, I/O Streams
	18	18	18	18	18
SLO-1	Origin of Java, Impact of java over internet	Class fundamentals, Defining a Class, Creating Objects, Assigning object Reference Variables	Inheritance Basics, Understanding Types of Inheritance: Single, Multilevel ,Hierarchical Inheritance	Introduction to java Thread model, Creating a Thread by Extending Thread Class	Introduction to Event Handling, Understanding Action Event & Item Event, Key Event & Mouse Even

SLO-2	Java's magic : Byte Code , JVM,	Introduction to method, Accessing class members	Using Super keyword	Creating a Thread by implementing Runnable Interface, Thread Class, Creating multiple threads - Assigning Thread priorities	Text Event, Window Event, Component Even, Introduction to Event Listener Interfaces - Working with Action Listener &, Adjustment Listener
SLO-3	Java Buzz words - Simple, Object Oriented, Robust, Multi-threaded, Architecture-Neutral, Interpreted and High performance, Distributed, Dynamic	Constructors, Characteristics of Constructors - Types of constructors - this Keyword	Method Overriding - Understanding Dynamic Method dispatch	Applying Synchronization - Inter-thread communication	Working with Container Listener, Item Listener, Component Listener - Working with Key Listener & Mouse Listener
SLO-4 - 6	**Lab 1 : Basic Java Program**	**Lab 4 : Classes and Objects**	**Lab 7: Inheritance, Method Overriding, Abstract classes and methods**	**Lab 10: Multi-threading**	**Lab 13: Event Handling**
SLO-7	Evolution of Java – Introduction to Object Oriented Concepts of Java	Java Destructor- Garbage Collection, Finalize ( ) Method, Overloading methods	Introduction to Abstract Keyword - Working with Abstract class and Method & Using final with inheritance	Introduction to Legacy Classes, Working with Vector class, Examples using Vector class	Introduction AWT Controls, Working with Laboratory, Working with Buttons controls
SLO-8	Encapsulation, Polymorphism, Inheritance	Overloading constructors – Using objects as parameters – Argument Passing	Introduction to Package, Creating a Package, Understanding Access Protection	Understanding Stack class - Examples using Stack class	Working with Check Boxes - Working with Checkbox Group controls
SLO-9	Introduction to Lexical Issues of Java	Returning Objects, Recursion	Importing packages – Introduction to Interfaces - Defining an interface	Introduction to Legacy Interfaces - Understanding Enumeration Interface, Examples using Enumeration interface	Working with Choice controls - Working with Lists controls, Working with Text Field controls
SLO-10 - 12	**Lab 2: Writing Simple Conversion Programs**	**Lab 5: Overloading Methods and Constructors, finalize() method**	**Lab 8: Packages and Interfaces**	**Lab 11: Legacy Classes and Interfaces**	**Lab 14: AWT Controls**
SLO-13	White spaces, Identifiers, Literals Comments, Separators ,Keywords, Introduction to Data types of Java - Byte, short, int, long, float, double, chars, Boolean	Introducing Access Control, Understanding Static variables and methods, Understanding Final variables And methods	Implementing Interfaces, How Interfaces are extended?	Introduction to Utility classes, Working with String Tokenizer, Working with Date class, Working with Calendar	Introduction to Layout Manager, Understanding Flow Layout, Understanding Border Layout, Understanding Grid Layout
SLO-14	variable, Declaring a variable, dynamicinitialization of variables - Scope and life time of variables	Working with Nested Class - Understanding Inner Class	What is Exception?, Understanding Exception Types, Introduction to Exception Handling - Working with try and catch	Working with Gregorian Calendar, Working with Random Class, Working with Scanner Class Examples using utility classes	Introduction to I /O Streams

SLO-15	Introduction to Operators, Working with Arithmetic, Relational, Logical, Bit wise, Conditional, Assignment Operators, Control Statements Overview of Array	Introduction to String Class and String Buffer Class - Working with String Handling Methods, Command Line arguments	Using multiple catch clauses, Working with Finally, Throw and throws, Understanding Built-in Exceptions - Creating user defined Exceptions	Introduction to Applets- Applet Life Cycle, Creating and Executing Applets - Applets Tags in HTML – Graphics Class	Byte Streams classes – Character Streams classes – Examples using Byte and Character
SLO-16 - 18	**Lab 3:Arrays, Control Statements**	**Lab 6:String Class, Command Line Arguments**	**Lab 9:Exception Handling**	**Lab 12 :Utility Classes and Simple Applet Programs**	**Lab 15: Layout Managers, Byte and Character Streams**

Resources			
1	Herbert Schildt,(2007),"Java:The Complete Reference",Twelfth Edition,Tata McGraw publication	4	Arnoldand J.Goslin,(2000),"The Java Programming Language", Fourth Edition, Addision Wesley
2	E. Balagurusamy, "Programming with Java", TataMc-Graw Hill, 5thEdition	5	Horstmann S., Gray Cornell (2001), Core Java 2 Volume In, Fundamentals, Addition Wesley, New York.
3	Amold and Gosling, J. (2000), The Java Programming Language, Addition Wesley, 2nd Edition, New Delhi.	6	Art Gittleman (2002), Ultimate Java Programming, Wiley Publications, New York.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. Brindha S, SRMIST, KTR Campus

Course Code	UDS24102J	Course Title	Fundamentals of Data Science	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
CLR-1	Understand the basics of Data Science	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	Learning the fundamentals of data types																	
CLR-3	Exploring essential skills required as mathematical and statistical analysis																	
CLR-4	Appreciate the applications and implications of Data Science using Python																	
CLR-5	Machine Learning with python																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural Inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Describe the significance of data science and understand the process	✓	✓	-	-	2	85	75	3	-	1	2	1	-	-	1	2	1
CLO-2	Understand different types of data description for data science process	✓	✓	✓	-	2	85	75	3	2	2	2	2	-	-	1	2	3
CLO-3	Gain knowledge on relationships between data	✓	✓	✓	✓	3	85	75	3	1	3	3	3	-	-	1	3	3
CLO-4	Use the Python Libraries for Data Wrangling	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Apply visualization Libraries in Python to interpret and explore data	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO – 3	CLO - 4	CLO - 5
	Introduction to Data Science	Data Science Methodologies	Python for Data Science	Numpy & Data Manipulation	Scientific Computing with Python
	18	18	18	18	18
SLO-1	Introduction, Define data science	Introduction to Data Science Methodologies	Import pandas, Python Conditional Statements Describing Relationships, Correlation	Numpy and pandas Packages, Numpy ndarray	Getting Started with SciPy
SLO-2	Benefits and challenges, Data analytics vs Data mining	Business Understanding, Problem Statement Formulation	Scatter plot, Correlation co-efficient for quantitative data	Vectorization operation, Array indexing and slicing – Array transposing and swapping	SciPy Constants , Optimizers, SciPy Sparse Data , Graphs

SLO-3	Facets of data - Data science process overview, Defining research goals - Retrieving data	Analytic Understanding - Understanding Data Requirements, Data Collection – Data Understanding	Computation formula – Regression and multiple regression line, Least square regression line - Standard error estimation	Mathematical and statistical functions in numpy, Creation of data frame – Accessing rows and columns in data frame	SciPy Spatial Data Processing - SciPy Spatial Matlab Arrays SciPy Interpolation, Data Manipulation with Pandas - Getting Started with Data Manipulation with Pandas
SLO-4 - 6	**Lab 1: Write a Python script to print a statement**	**Lab 4: Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location.**	**Lab 7: Find the correlation Matrix.**	**Lab 10: Install, Import Scikit Learn and Explore Iris Dataset with Pandas for ML Modelling**	**Lab 13: Plot the histogram, bar chart and pie chart on sample data.**
SLO-7	Data preparation – EDA, Build the model - Findings a model	Modelling Data, Modelling Evaluation	Data structure and oops, Python programming procedure	Indexing, selection and filtering, Arithmetic operations in data frame	Reading Data from a Excel file, Reading Data from a .csv file
SLO-8	Data mining, Data warehousing	Data Science mathematical Preliminaries, Statistical inference – Population and samples	Statements – Expressions, Flow of control	Function application and mapping, Python libraries for Data wrangling	Reading Data from a .txt file
SLO-9	Basic statistical description of Data. Data Science Defined	Descriptive statistics – Correlation, Regression	Functions, Numerical data types – Sequence	Basics of numpy arrays – Aggregations Computation on arrays, Comparison, marks and Boolean logic - Fancy indexing, structural array	Data Visualization-Importing matplot lib - Getting started with Data Visualization, Getting started with Data Visualization Library Matplotlib - Density and contour plot
SLO- 10 - 12	**Lab 2: Perform Analysis on Simple Dataset for Data Science and Business Intelligence Applications**	**Lab 5: Install Python and apply all basic python functions and perform Numerical Array Processing using NumPy**	**Lab 8: Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.**	**Lab 11: Explore all the Data Visualization Graphs and Find the outliers using plot.**	**Lab 14: Install, Import Matplotlib. Explore all the Data Visualization Graphs and write a Python program for line chart**
SLO-13	Evolution of data science, Data Science Roles – Data Science Pipeline	Probability - Describing data, Types of data - Types of variables	Strings, tuples, List, Dictionaries	Data manipulation with pandas, Data selection - Data indexing	Visualizing errors, Three-dimensional plotting
SLO-14	Application of data science in various fields - Data Security Issues - Big data and data science hype, Data Science Vs business - Real world examples of role of data science	Describing data with tables and Graphs, Describing data with averages	Class, Constructors – Object Creation, Inheritance	Operations on data - Missing data, Hierarchical indexing – Combining dataset	Bar graph using matplotlib – Pie Graph using matplolib, Column using matplolib - Box Plot using matplolib
SLO-15	Role of Data engineers – Data science impact on business, Data science vs AI vs ML vs Deep learning - Three Features for Data Science and Business Intelligence	Normal distribution - Standard score	Overloading - Text file - binary file, Reading CSV file, writing CSV file - Read and writing Excel File	Aggregation - Group, Pivot table, Getting Started with Numpy - Creating Numpy Arrays	Histogram using matplolib - Lineplots Using Matplotlib - Sub Plots Using Matplotlib, Scatter Plot Using Matplotlib – Plot Customizations, Saving Plots

SLO-16 - 18	**Lab 3: Write a python Program for swapping two numbers and write a Python script for performing subset (), aggregate () functions on iris dataset.**	**Lab 6: Write a Python script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets**	**Lab 9: Install and perform a simple Exploratory Data Analysis using Pandas and Explore a Sample Dataset with it**	**Lab 12: Find the data distributions using box and Scatter plot.**	**Lab 15 : Python program for customizing plot**

Resources

1	Jojo Moolayil, “Smarter Decisions,: The Intersection of IoT and Data Science”, PACKT, 2016.	3	Cathy O’Neil and Rachel Schutt,, “Doing Data Science”, O'Reilly, 2015.
2	David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013	4	Kenneth A. Lambert, (2011), “The Fundamentals of Python: First Programs”, Cengage Learning

Assessment

Bloom’s Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.Ananthi Claral Mary T, SRMIST, KTR Campus

Course Code	UMS24103T	Course Title	Mathematics for Artificial Intelligence	Category	C	Discipline Core Course	L	T	P	C
							4	0	0	4

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

CLR	The purpose of taking this course is to:
CLR-1	To apply the basic concepts and theorems of matrices.
CLR-2	To learn the basic concepts of differentiation, basic concepts of integration and to apply Bernoulli's formula.
CLR-3	To learn the concepts of connectives, validity of arguments and normal forms.
CLR-4	Apply Logic, truth table in computer science.
CLR-5	To Understand the concept of Graphs, isomorphism of graph, Eulerian graph and Hamiltonian graph.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Gain knowledge in basic concepts of matrix method.	✓	✓	-	-	2	85	75	3	-	-	-	-	-	-	-	-	-
CLO-2	Understand the concepts of differentiation and to solve the problems of Radius of curvature.	✓	✓	✓	-	2	85	75		3	-	-	-	-	-	-	-	-
CLO-3	Understand the concepts of integration and to evaluate Bernoulli's formula.	✓	✓	✓	✓	3	85	75	3	-	-	-	-	-	-	-	-	-
CLO-4	Logical knowledge through the Statements, connectives, arguments, validity of arguments and Normal forms using truth tables	✓	✓	✓	✓	3	85	75	-	3	-	-	-	-	-	-	-	-
CLO-5	Understand the concepts of Graphs terminology Sub graphs, Acyclic, Euler path, Hamiltonian Path	✓	✓	✓	✓	3	85	75	-	-	-	-	3	-	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	Matrices	Differentiation and Integration	Logics	Introduction to Graph Theory	Trees
	12	12	12	12	12
SLO-1	Definition and types of matrix- Examples	Introduction to Differentiation- Solving basic problems	Logic -Basic explanation- Statements- simple compound- Symbolic representation	Graphs and Their Representation- Basic Graph terminology- Simple Problems	Trees- Basic Definitions-
SLO-2	Symmetric matrix - Skew symmetric matrix	Minima and maxima of functions of single variable	Connectives explanation- conjunction, disjunction, negation- Simple problems	Drawings of Graphs-Special Families of Graphs- Simple Problems	Basic properties of Trees- Labeled Trees

SLO-3	Hermitian matrix- Skew Hermitian matrix	Problems based on Minima and maxima of functions of single variable	Problems using Truth Tables- Tautology, contradiction- Problems using Truth Tables	Incidence graphs - Simple Problems	Problems based on the concepts- Undirected Trees- Simple Problems
SLO-4	Orthogonal matrix -Unitary matrix	Problems using maxima and minima	Logical equivalence- Simple truth table problems	Adjacency Matrices- Problems- vertex degrees matrices	Binary trees- Rooted Trees and Branches
SLO-5	Eigen vectors of a matrix	Introduction to curvature- Radius of curvature (Cartesian co-ordinate)	Tautological implications- Simple problems	Isomorphism of Graphs- Simple Problems	Spanning Trees- Simple problems
SLO-6	Eigen values and eigen vectors of a matrix	Problems based on radius of curvature	Arguments- validity of arguments- Simple problems	Sub graphs- Acyclic Graphs- Simple Problems	Minimal Spanning Trees- Simple Problems
SLO-7	Cayley Hamilton theorem	Introduction to integration- Basic problems on integration- Integration of polynomial functions- Problems based on Integration of polynomial functions	Normal forms – Minterms and maxterms	Digraphs- Problems using Graphs	Problems based on Minimal Spanning Trees
SLO-8	Problems of order 2 based on Cayley Hamilton theorem	Integration by the method of substitution- Problems based on Integration by the method of substitution	Maxterms with examples- Problems using Truth tables	Paths, cycles and connectivity- Euler path and circuits	Kruskal's Algorithm
SLO-9	Problems of order 3 based on Cayley Hamilton theorem	Integration of rational and irrational functions- Integration of the type $\int \frac{P(x)}{Q(x)}dx$ Integration by the method of partial fraction	Principal disjunctive normal form	Eulerian cycles- Euler path and Circuits-.	Rooted Tree
SLO-10	Cramer's rule- Problems order 2 based on Cramer's rule.	Integration of the form $\int \frac{dx}{ax^2+bx+c}$	Problems using Truth tables	Hamiltonian Path and Circuits	binary Tree and Simple Problems
SLO-11	Problems of order 3 based on Cramer's rule.	Bernoulli's formula for Integral by parts	Principal conjunctive normal form	Problems using Hamiltonian Path- Simple Problems	Expression of Trees- Simple Problems
SLO-12	Problems of order 3 based on Cramer's rule.	Problems based on Bernoulli's formula for Integral by parts.	Problems using Truth tables	Problems using Hamiltonian Path- Simple Problems	Expression of Trees- Simple Problems

Resources

1	Discrete Mathematics with Graph Theory and Combinatorics by T. Veerajan, McGraw Hill Education (India) Pvt Limited, 2007	3	Dr. A. Singaravelu, Allied Mathematics, 7th edition, A. R. Publications, 2015
2	Discrete Mathematics by V, Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan, A. R. Publications, 1996.		

Assessment						
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10 %)	(10 %)	(20 %)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
	Total (%)	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. D. Arivudai nambi, Anna University, Chennai	1	Dr. N.Viswanathan, , Presidency college , Chennai	1	Dr.S.Saravanakumar, SRM IST
				2	Dr.S.Poongodisathya, SRM IST

Course Code	UCD24S01J	Course Title	Verbal Ability and Skill Development	Category	S	Skill Enhancement Course	L	T	P	C
							1	0	2	2

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

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 to improve team results.
CLR-4	Use the basic mechanics of Grammar.
CLR-5	Instill confidence in students and develop skills necessary to face the challenges of competitive exams and placements

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Re-engineer their attitude and understand its influence on behaviour	✓	✓	-	-	2	85	75	2	3	2	2	-	1	2	3	-	-
CLO-2	Acquire inter-personal skills and be an effective goal-oriented team player	✓	✓	✓	-	2	85	75	3	3	2	3	-	1	2	1	-	-
CLO-3	Learn the importance of inner management and creativity	✓	✓	✓	✓	3	85	75	3	2	2	3	-	1	2	2	-	-
CLO-4	Understand the correct usage of grammar	✓	✓	✓	✓	3	85	75	3	-	3	-	3	1	1	-	-	-
CLO-5	Help the students succeed in competitive exams and placements	✓	✓	✓	✓	3	85	75	3	-	3	-	3	1	1	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	9	9	9	9	9
SLO-1	Introduction to IKIGAI, IKIGAI – Key concepts	Networking skills – relationship building, value exchange, active listening, friendliness and positivity, clear communication	Time management skills - Value of Time, Pomodoro technique.	Basics of Grammar	Sentence Correction
SLO-2	Attitude, Attitude formation and Factors influencing Attitude	Negotiation skills – building rapport and problem-solving	Weekly Planner, To do list, Prioritizing work, Time management activity	Spotting Errors	Sentence completion (Grammar based)

SLO-3	SWOT Analysis, individual SWOT Analysis -SWOT Analysis activity	Entrepreneurial Skills, Entrepreneurial knowledge, Focus, Investment, Risk tolerance, Resilience, Ethics	Creative thinking skills – divergent thinking, Synthesis and collaboration, out-of -the -box thinking	Error spotting based on Parts of Speech	Sentence completion (Vocabulary based)
SLO-4	Presentation skills, Types of presentation, Structure of presentation, Delivery techniques	Creating brands – activity (posters, flyers, business cards)	Creative thinking skills Activity session	Errors how to avoid in Nouns & Pronouns	Cause and Effect - Introduction
SLO-5	Extempore Practice Session I	Stress Management - Causes of Stress and Its Impact	Brainstorming, use of groups and individual brainstorming techniques to promote idea generation	Common Errors: Subject - verb Agreement	Cause and Effect – Practise Session
SLO-6	Extempore Practice Session II	How to Manage Stress and distress, Understanding the circle of control, stress busters	Intercultural communication – beliefs, customs and attitudes of people in different countries (US, UK, Japan, West Asia, China, Russia), Social and cultural etiquettes	Vocabulary - Synonyms - Antonyms - Phrasal verbs-	Theme detection – Introduction - Practice session
SLO-7	Interpersonal Skills, Emotional Intelligence	Conflict Management - Conflict in human relations – reasons, Approaches to conflict resolution	Communication etiquettes, Telephone etiquettes	One Word Substitution - Homophones – Homonyms	Critical Reasoning and Verbal deduction
SLO-8	Importance of Team Work, Team Building activity	Conflict resolutions – Case studies	Ice breaking, Designing ice breaker games	Words often confused	Types of Critical Reasoning- Tips and Tricks
SLO-9	Leadership skills, Leadership skills -based activity	Importance of decision making, Process of decision making, Practical ways of decision making, weighing positives and negatives	Resume writing skills	Idioms and Idiomatic Expressions – Introduction	Word Analogy - Types of Word analogy

Resources

1	Jeff Butterfield, Soft Skills for Everyone, CENGAGE, India,2015	5	Dr. K. Alex, Soft Skills, S. Chand Publishing & Company, India, 2014
2	Covey Sean, Seven habits of highly effective teens, Simon & Schuster, NewYork, 2014	6	Carnegie Dale, How to win friends and influence people, Simon and Schuster, New York, 2016
3	Thomas A Harris, I am ok, you are ok, Arrow, London, 2012	7	Daniel Coleman, Emotional Intelligence, Bloomsbury, India, 2016
4	Norman Lewis, Word Power Made Easy New Revised and Expanded Edition, Goyal publication, 2011	8	Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016.

Assessment									
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)							
		CLA – 1 (20 %)		CLA – 2 (20 %)		CLA – 3 (30 %)		CLA – 4 * (30%)	
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10
2	Understand	15	15	15	15	10	10	10	10
3	Apply	20	25	25	20	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15
6	Create	15	10	10	15	15	15	15	15
Total (%)		100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Course Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089, p.chockalingam1986@gmail.com-	1	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu-	1	Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST, hod.dcgc.ktr@srmist.edu.in
				2	Dr. Sam Israel S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST, samisras@srmist.edu.in
				3	Mrs.Deepalakshmi S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST, deepalas@srmist.edu.in

SEMESTER - II

Course Code	ULT24AE2J	Course Title	Tamil - II	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO 1	PSO 2
CLR-1	சங்க இலக்கியங்கள் வழிதொன்மை அக, புற வாழ்வியலை அறியச்செய்தல்																	
CLR-2	தமிழ்ச் சமூகத்தின் அறவியல் குறித்து தெரியச்செய்தல்																	
CLR-3	பக்தி இலக்கியங்கள் போதித்த மனித மாண்புகளை உணரச்செய்தல்																	
CLR-4	பண்டைத்தமிழ்ச் சமூகத்தின் தொல்இலக்கியங்கள் வளர்ச்சி பெற்றவரலாற்றைப் புரியச் செய்தல்																	
CLR-5	சிறுகதைகள் சொல்லும் வாழ்வியல் நெறி, மொழியின் நுட்பங்கள் ஆகியவற்றைத் தெரியச்செய்தல்																	

CLO	At the end of this course, learners will be able to:																	
CLO-1	பண்டைத் தமிழ்ச் சமூகத்தின்அக, புறவாழ்வியல் இன்றைய சமூகமேம்பாட்டிற்கு வழிகாட்டி நிற்பதை அறிந்து கொள்ளுதல்	✓	✓	-	-	2	75	60	-	3	3	-	-	-	2	-	-	-
CLO-2	தமிழ்ச்சமூகம்அறத்தைவலியுறுத்தியசமூகம்என்பதன்வழிமானுடஅறத்தைத்தெரிந்துகொள்ளுதல்	✓	✓	✓	-	2	80	70	2	-	3	-	-	3	-	-	-	-
CLO-3	பக்திஇலக்கியம்மூலம்இறைத்தந்துவங்களைஅறிந்துமானுடஒற்றுமைமேம்பாட்டைஅறிந்துகொள்ளுதல்	✓	✓	✓	✓	2	70	65	-	3		3		1	-	-	-	-
CLO-4	தொல்தமிழ்ச்சமூகம்இலக்கியம், அரசியல், அறம், பக்திஆகியவற்றில்தழைத்தோங்கியதைத்தெரிந்துகொள்ளுதல்	✓	✓	✓	✓	2	70	70	3	-	3	-	-	3	-	-	-	-
CLO-5	வாழ்வியலின்நெறிகளைச்சொல்லும்கதைகளைப்படைக்கும்திறனோடுமொழிஆளுமையையும்அறிந்துகொள்ளுதல்	✓	✓	✓	✓	3	80	70	3	-	-	2	-	-	-	3	-	-

Sessions	CLO – 1	CLO - 2	CLO - 3	CLO - 4	CLO – 5
	12	12	12	12	12
SLO-1	காலந்தோறும்தமிழ்அகத்திணைமரபு - உள்ளடக்கம்	சங்கமருவியகாலம்அறமும்வாழ்வியலும்	பல்லவர்காலஇலக்கியங்கள்	பண்டைக்காலத்தமிழகம்சங்ககாலமக்களின்வாழ்வியல்	தமிழ்ச்சிறுகதையும்தமிழ்ச்சமூகவாழ்வியலும்
SLO-2	எட்டுத்தொகைநூல்களும்பகுப்புமுறையும்	உலகப்பொதுமறை - திருக்குறள்கட்டமைப்பு	பக்தியும்தமிழும் - பக்திஇலக்கியத்தோற்றநிலை	முச்சங்கஅறிமுகமும்வரலாறும்	புதுமைப்பித்தன் - சங்குத்தேவனின்தர்மம்
SLO-3	ஐங்குறுநூறு – 375, 391	திருக்குறள்வான்சிறப்பு (2)	சைவசமயஇலக்கியங்கள் - சைவக்குரவர்நால்வர்	சங்கஇலக்கியப்பாடுபொருளும்வடிவமும்	நபிச்சமூர்த்தி – வேப்பமரம் - மரபும்நம்பிக்கைகளும்
SLO-4	குறுந்தொகை – 02, 03	திருக்குறள் – புலவிநுணுக்கம் (132) -	தேவாரம் – திருஞானசம்பந்தர் - 2834 திருநாவுக்கரசர் - 4262	எட்டுத்தொகைநூல்களின்வரலாறும்கட்டமைப்பும்	தமிழருவிமணியன் – ஒற்றைச்சிறகு - உறவின்மேன்மை
SLO-5	அகநானூறுநூல்கட்டமைப்பு	தமிழ்இலக்கியமரபில்நீதிஇலக்கியங்கள்	திருவாசகம்- மாணிக்கவாசகர்ஆனந்தபரவசம் – பாடல் 10	பத்துப்பாட்டுநூல்களின்வரலாறும்வாழ்வியலும்	ஆர். சூடாமணி – மூடநம்பிக்கை.
SLO-6	அகநானூறு -238	நாலடியார்வைகலும் - பாடல்எண் 39	வைணவசமயவளர்ச்சிப்போக்கு	பதினெண்கீழ்க்கணக்கும்தமிழர்அறமரபும்	கிருஷ்ணாடாவின்ஸி – காலாஅருகேவாடா
SLO-7	கலித்தொகை – 11	நீதிஇலக்கியத்தில்மருந்துநூல்கள்	நாலாயிரத்திவ்யப்பிரபந்தம் குலசேகராழ்வார்பாடல்- 678	பதினோருநீதிஇலக்கியங்கள்	மொழிப்பயிற்சிசொற்களைஉருவாக்குதல்
SLO-8	தமிழர்புறமரபு- புறநானூறு-107	சிறுபஞ்சமூலம் -64	ஆண்டாள்பாடல் – 574. திருமழிசைஆழ்வார்பாடல்	காப்பியஇலக்கணம் - காப்பியங்களின்வகைமை	எழுத்துகளில்இருந்துசொற்களைக்கண்டுபிடித்தல்
SLO-9	புறநானூறு -110, 112	பழமொழிநானூறுஅறிமுகம் – தனித்தன்மைகள்	தமிழில்இஸ்லாமியஇலக்கியங்கள்	ஐம்பெருங்காப்பியங்கள்	படம்பார்த்துக்கதைஎழுதுதல்

SLO-10	பத்துப்பாட்டும்ஆற்றுப்படைநூல்களும்	பழமொழிநானூறு - 184	சீறாப்புராணம் - விடமீட்டப்படலம் -10 பாடல்கள்	தமிழ்ச்சமூகமும்சமயத்தத்துவங்களும்	படம்பார்த்துக்கவிதைஎழுதுதல்
SLO-11	சிறுபாணாற்றுப்படை: 84-115	பண்டைக்காலப்போரும்வாழ்வும் - புறம்	தமிழில்கிறித்தவஇலக்கியங்கள்	பன்னிருதிருமுறை – அறிமுகம், வரலாறு	கற்பனையும்படைப்பும்– தமிழில்வாசகம்
SLO-12	பட்டினப்பாலை: 40-50	களவழிநாற்பது - 40	கிறித்துவின்அருள்வேட்டல் – திரு.வி.க. அலகிலொளி- 5 பாடல்	நாலாயிரத்திவ்வியப்பிரபந்தம் – அறிமுகம், வரலாறு	விளம்பரத்திற்குவாசகம்எழுதுதல்

Resources			
1	கொன்றை, தொகுப்பும்பதிப்பும் - தமிழ்த்துறைஆசிரியர்கள், தமிழ்த்துறை, எஸ்.ஆர்.எம். அறிவியல்மற்றும்தொழில்நுட்பக்கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2023	4	தமிழண்ணல், புதியநோக்கில்தமிழ்இலக்கியவரலாறு, மீனாட்சிபுத்தகநிலையம், மதுரை, **2017**
2	மு. அருணாசலம், தமிழ்இலக்கியவரலாறு, நூற்றாண்டுமுறை (9ஆம்நூ. முதல் 16 வரை), திபார்க்கர், சென்னை, 2005	5	தமிழ்இலக்கியத்தொடரடைவு
3	மதுரைதமிழ்இலக்கியமின்தொகுப்புத்திட்டம்	6	தமிழ்இணையக்கல்விக்கழகம்

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
Total (%)		100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. P.R.Subramanian, Director, Mozhi Trust, Thiruvanmiyur, Chennai – 600 041.	1	Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literaturel, Pondicherry University, Pondicherry	1	Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST, KTR.
				2	Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
				3	Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
				4	Dr. T.R.Hebzibah beulah Suganthi, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
				5	Dr. S.Saraswathy, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.

Course Code	ULH24AE2J	Course Title	Hindi - II	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:
CLR-1	They get to learn Ancient ,Medieval,and Modern poetry
CLR-2	To understand the Significance of poems of great poets like Kabir,Tulsidas,Bihari and Dhananand
CLR-3	To Enhance and Enrich their knoeledge through poetry
CLR-4	Media based understanding for employability
CLR-5	Job Oriented writing skills

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To provide a brief Introduction of Hindi poetry(Bhaktikal,Reetikal and Aadhunikkal)	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To Discuss the origin and development of various forms of poetry in Hindi	✓	✓	✓	-	2	85	75	3	-	2	-	3	-	3	-	-	-
CLO-3	Focus on Evaluating the social changes through poetry	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-
CLO-4	To Examine Transcreation in advertisement	✓	✓	✓	✓	3	85	75	2	-	2	3	-	-	2	-	-	-
CLO-5	To guide the students in the learning of the technical aspect of the Hindi Languge,this would help them in the field administration	✓	✓	✓	✓	3	85	75	-	3		3	3	2	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO – 5
	12	12	12	12	12
SLO-1	BHAKTI KALIN KAVITA	RITI KALIN KAVITA	ADHUNIK KAVITA	VIGYAPAN	PATRA LEKHAN&PARIBHASHIK SHABDAVALI
SLO-2	BHAKTIU KALIN KAITA KI AVADHARNA	AVADHARNA EVM SAWROOP	AVADHARNA EVM SAWROOP	AWADHARNA EVM SAROOP	AVADHARNA EVM SAROOP
SLO-3	SWARUP EVM MAHATWA	RITI KAL VIBHAJAN	MAHATVA EVM UDDESHYA	ARTH EVM PARIBHASHA	ARTH EVM PARIBHASHA

SLO-4	BHAKTIKAL KI PRASANGIKTA	MAHATVA EVM UDDESHYA	MATHLI SHARAN GUPT- NAR HO NA NIRASH KARO MAN KO	VIGYAPAN KE PRAKAR	PRAYOJAN EVM PRYOG
SLO-5	DOHE- KABIRDAS	DOHE- BIHARI	KAVI PARICHAYA EVM KAVITA KA VISHLESHAN	VIGYAPAN KI VISHESHTAYEN	PRAKAR EVM MAHATVA
SLO-6	SANT PARICHAY	KAVI PARICHAYA	SURYAKANT TRIPATHI NIRALA- VAR DE VEENAVADINI VAR DE	VIGYAPAN KA MAHATVA	VYAKTIGAT PATRA
SLO-7	DOHE KA VISLESHAN	DOHE KA VISLESHAN	KAVI PARICHAYA EVM VISHLESHAN	VIGYAPAN KI BHASHA	AUPCHARIK PATRA
SLO-8	GURU KA MAHATVA	DOHE- GHANANAND	NAGARJUN-- AKAL AUR USKE BAD	VIGYAPAN AUR ROZGAR	PARIBHASHIK SHABDAVALI
SLO-9	DOHE- TULSHIDAS	SNEH KI SARLTA KA VARNAN	AKAL KA VASHTAVIK CHITRAN	PRINT EVM ELECTRONIC VIGYAPAN	SHABDAVALI KI AVSHYAKTA
SLO-10	DOHE KA VISLESHAN	PREM KA MAHATVA	KATTIS- BADRINARAYAN	VIGYAPAN KI VYAPAKTA	KARYALYIN SHABDAVALI
SLO-11	DAYA KA MAHATVA	GHANANAND KI KAVYA SHAILI KA MAHATVA	SAMBAND VICCHED KI PARICHARCHA	VIGYAPANLEKHAN KI KALA	EK DIN EK SHABD
SLO-12	RAM KI MAHIMA	DHOHA PARICHARCHA	KAVYA PARICHARCHA	UDDESHYA	HINDI SE ANGREJI AUR ANGREJI SE HINDI SHABD

Resources

1	EDITED BOOK: ““SAMANYA HINDI”, SRIJONLOK PUBLICATION, 2023, NEW DELHI.	4	BHAKTI ANDOLAN AUR SURDAS KA KAVYA – MANAGER PANDEY
2	KABIR – HAZARI PRASAD DWEDI	5	BIHARI – VISHVNATH PRASAD MISHR
3	SURDAS – RAM CHANDRA SHUKL	6	AADHUNIK VIGYAPAN AUR JANSAMPARK – TARESH BHATIA

Assessment										
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *		
		(10 %)		(10 %)		(20 %)		(10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
	Total (%)	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	MS. REETHA GOVINDAN,Senior Manager (Rajbhasha) ritushivani@yahoo.com	1	Dr. S. PADMAPRIYA, PROF& HEAD, PONDICHERRY University, kalapet, puducherry-605014 padmapriya.srirka@gmail.com	1	Dr.S Preeti. Associate Professor & Head, SRMIST-hod.hindi.ktr@srmist.edu.in
2	Aditya Singh, student Member, B.Com IAF, Dept. of Comerce,SRM IST,KTR aa5404@gmail.com			2	Dr. Md.Shwahidul Islam Assistant Professor, SRMISTshwahidj@srmist.edu.in
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4	ALUMINI - VIPIN KUMAR JHA, Senior Translation Officer anju.bipin.jha@gmail.com			4	Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST Murulidharan- nishamup@srmist.edu.in

Course Code	ULF24AE2J	Course Title	French - II	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

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

CLR	The purpose of learning this course is to:
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
CLR-5	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To acquire knowledge about French language	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To strengthen the knowledge on concept, culture, civilization, and translation of French	✓	✓	✓	-	2	85	75	3	-	2	-	3	-	3		-	-
CLO-3	To develop content using the features in French language	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-
CLO-4	To interpret the French language into other language	✓	✓	✓	✓	3	85	75	2		2	3	-	-	2		-	-
CLO-5	To improve the communication, intercultural elements in French language	✓	✓	✓	✓	3	85	75		3		3	3	2				

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	Temps libre	Le pronom indéfini on	Vendre	Il faut	Les gallicismes
SLO-2	Les loisirs	Les adjectifs interrogatifs	Acheter	Le verbe devoir	Les pronoms personnels COI
SLO-3	Les moments de la journée	Les prépositions avec les noms géographiques	Les aliments	Le verbe pouvoir	Le pronom Y
SLO-4	Les matières scolaires	Les verbes prendre et sortir	Les emballages	Le verbe vouloir	Des pronoms compléments
SLO-5	Les activités quotidiennes, Les quotidiennes	Les sons	Les quantités	Demander et dire le prix	Les nombres ordinaux
SLO-6	Le temps, L'heure	Parler de ses gouts	Les commerces	Faire des achats	Les verbes écrire et voir
SLO-7	La fréquence	Parler de ses préférences	Les commerçants	Les activités	Le E caduc ou instable

SLO-8	Les sons [u], Les sons [y]	Parler de sa routine	L'impératif	Les activités	Présenter ses vœux
SLO-9	L'heure, Quelle heure est-il ?	A la recherche d'un cadeau	Les articles partitifs	Mots et expressions	Présenter ses félicitations
SLO-10	Les pronoms personnels COD	Temps libre	Très ou beaucoup (de)	Communication	Répondre à une invitation
SLO-11	Les pronominaux, Se promener, se coucher etc…,	Mots et expressions	Le pronom en (la quantité)	Les sorties	Écrire un message amical
SLO-12	Les verbes du premier groupe, Parler, Demander, Poser	Grammaire– Communication	La phrase négative (2	Les fêtes	Parler au téléphone

Resources			
1	''La Nouvelle Génération-AI'' Méthode de français, Marie-Noëlle COCTON, P. DAUDA, L. GIACHINO, C. BARACCO, Les éditions Didier, Paris, 2018.	4	https://www.elearningfrench.com/learn-french-grammar-online-free.html
2	Cahier d'activités avec deux discs compacts.	5	https://www.lawlessfrench.com/grammar
3	https://www.fluentu.com/blog/french/french-grammar	6	https://blog.gymglish.com/2022/12/15/basic-french-grammar

Assessment										
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *		
		(10 %)		(10 %)		(20 %)		(10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
Total (%)		100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. Kavaskar Danasegarane, Language Specialist, Process Expert Maersk Global Service Center Pvt. Ltd Mailkavas18@gmail.com	1	Dr. C.Thirumurugan ,Professor, Department of French, Pondicherry University drcthirumurugan@gmail.com	1	Mr. Kumaravel K. Assistant Professor & Head, SRMIST,KTR., hod.french.ktr@srmist.edu.in
2	Mr. Shrivathsan S, Journalist, Senior Sports Reporter/Sub-Editor, Times of India, Chennai shrivathsangilramhanga@gmail.com			2	Miss. Abigail A, Assistant Professor , SRMIST,,VDP abigaila@srmist.edu.in
				3	Mrs.M.Mahalakshmi, Assistant Professor , SRMIST,,RMP mahalakm2@srmist.edu.in

Course Code	UDS24201J	Course Title	Elements of Distributed Data Processing	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
CLR-1	Understand the concept to advanced computing in recent times
CLR-2	Learn the basics of cloud computing and cloud database
CLR-3	Understand the concept of MongoDB
CLR-4	Identify the concept to of Apache Spark
CLR-5	Impart the knowledge of distributed data processing with Scala

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk	PSO-1	PSO-2
CLO-1	Learn the basics of Traditional Computing, distributed file processing	✓	✓	-	-	2	85	75	3	-	-	1	2	-	-	2	2	2
CLO-2	Classify different types of Distributed file system, distributed databases	✓	✓	✓	-	2	85	75	3	2	1	2	2	-	-	1	2	3
CLO-3	Recognize Cloud computing and Architecture	✓	✓	✓	✓	3	85	75	3	1	3	1	3	-	-	1	1	3
CLO-4	Understand RMI, RPC, MongoDB, openMP and Scala Programming	✓	✓	✓	✓	3	85	75	3	3	2	3	3	-	-	2	3	3
CLO-5	Grasp the concept to of Google CloudPlatform	✓	✓	✓	✓	3	85	75	3	3	2	3	3	-	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	Introduction to Distributed Systems	Distributed database Management	Query Processing	MongoDB & Introduction to HDFS	Distributed Algorithms
	18	18	18	18	18
SLO-1	Introduction to Distributed Systems, Characterization of Distributed Systems	Distributed database Management System, Functions of distributed data base system	Query Processing, Query Processing Problem	SQL to MongoDB Mapping, How to optimize query performance	Distributed Algorithms, Introduction to distributed computing models
SLO-2	DS issues and Goals, Types of distributed systems, Distributed File system	Distributed databases - Homogeneous and Heterogeneous Databases, Distributed Data storage	Layers of Query Processing, Query Processing in Centralized Systems	Benefits of MongoDB query, MongoDB projection and Embedding	Asynchronous message passing model, Time and message complexity

SLO-3	Design and implementation of distributed file systems, Features of DFS	Why Distributed storage is important? Distributed cloud storage – Features of distributed cloud storage	Tutorial: Parsing, Translation	Tutorial: Distributed operating systems, Shell commands to manage HDFS	Tutorial: Clock synchronization, Message Ordering and Group communication
SLO 4-6	**Lab 1: Write a program to implement Remote Method Invocation**	**Lab 4: Virtualization in Cloud by using KVM and VMware**	**Lab 8 : Creation of Queries in MongoDB**	**Lab 11: Example programs-Hadoop Streaming**	**Practice: Lab 14: Writing spark applications**
SLO-7	File Models, File accessing models	Distributed Transactions, How distributed transactions work	Optimization, Code generation	Different types of distributed operating Systems, Features of distributed operating system	Simple programs using Scala, Termination Detection Algorithm and Reasoning with Knowledge
SLO-8	File caching schemes, File Replication	Essential properties of distributed transactions (ACID), Commit protocols - Distributed one phase commit Distributed two phase commit	Example Query Processing in Distributed Systems, Mapping global query to local Optimization of Distributed	Examples of distributed OS, Advantages and Disadvantages of distributed OS	OpenMP programming, Getting Started with Memory Programming
SLO-9	Network file System, Andrew file System	Tutorial: Objectives of Concurrency control in Distributed Databases Concurrency Control anomalies, Methods of concurrency control Serializability and recoverability	Queries, Centralized Query Optimization	Design and implementation of distributed operating system, Hadoop Distributed system	Tutorial: Fundamentals of Shared Memory Programming, Basic OpenMP Conecpts
SLO 10-12	**Lab 2: Write a Program to implement Remote Procedure Call**	**Lab 5: Mongodb Atlas – Installation Lab 6: MongoDB CRUD operations**	**Lab 9: Write a program to sort a single field in Mongodb**	**Lab 12: Writing a Hadoop MapReduce program in python**	**Lab15: Write a MPI Program to send data across all processes Perform a Simple Vector Addition using OpenMP Programming**
SLO-13	Working and Architecture of Cluster Computing and Grid Computing, Architecture of Cloud Computing	Distributed Serializability, Enhanced lock based and timestamp based protocols, Heterogeneous distributed databases	Data localization, Fragmented query ordering	Introduction to HDFS and its features, Apache Hadoop HDFS architecture	Parallel Directive, Data Scoping Rules
SLO-14	Types of Cloud Application Development Infrastructure-as-a-service, Platform-as-a-service, Benefits of Software-as-a-service	Cloud based databases Why use a cloud- database, Types of cloud-based database, Advantages of cloud based databases	Update Document in Mongodb, Bulk write operations in MongoDB	Cluster in Hadoop- MapReduce, Import /Export Data between HDFS and RDBMS Apache Spark	Basic OpenMP Constructs, OpenMP Directives, OpenMP Calls Parallelizing an Existing Code with OpenMP
SLO-15	What is DDMS, Advantages and isadvantages of DDBS	Replication in MongoDB Indexing in MongoDB, Distributed Query Optimization Algorithm	Delete documents in MongoDB, HDFS Commands-Hadoop	Kafka Stream, Apache Spark : spark SQL-spark RDD-MLlib, MLflow, structured streaming	Message Passing Interface (MPI) parallel programming - Introduction to Message Passing Interface, Message Passing Model
SLO 16-18	**Lab 3: Case study: PaaS (FaceBook, GoogleAppEngine)**	**Lab 7: Data modeling in MongoDB**	**Lab 10: Hadoop installation – Setting up a Single Node**	**Lab 13: Create an Application using Apache Spark. (Ex.: Similarity word count during searching)**	**Practice: Lab16: Create a Simple Virtual Machine on Google Compute Service**

Resources			
1	AndrewS.Tanenbaum, Maarten Van Steen,"Distributed Systems–Principles andParadigms",SecondEdition,Pearson,2006.	2	Buyya R.,BrobergJ., GoscinskiA.,"CloudComputing:PrinciplesandParadigm", JohnWiley&Sons,2011.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.S.Lakshmi, SRMIST, KTR Campus

Course Code	UDS24202J	Course Title	Data Structures and Algorithms	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
CLR-1	Utilize the different data types
CLR-2	Utilize linked list in developing applications
CLR-3	Utilize stack and queues in processing data for real-time applications
CLR-4	Utilize tree data storage structure for real-time applications
CLR-5	Utilize algorithms to find shortest data searching graphs for real-time application development

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Identify linear and non-linear data structures. Create algorithms for searching and sorting	✓	✓	-	-	2	85	75	3	1	2	2	1	-	-	2	2	1
CLO-2	Create the different types of linked lists and evaluate its operations	✓	✓	✓	-	2	85	75	3	2	1	3	2	-	-	1	2	1
CLO-3	Construct stack and queue data structures and evaluate its operations	✓	✓	✓	✓	3	85	75	3	1	3	2	3	-	-	1	3	2
CLO-4	Create tree data structures and evaluate its types and operations	✓	✓	✓	✓	3	85	75	3	3	3	3	3	-	-	2	3	3
CLO-5	Create graph data structure, evaluate its operations, implement algorithms to identify shortest path	✓	✓	✓	✓	3	85	75	3	3	3	3	3	-	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	Introduction to Data Structures	**Stack, Queues**	**Tree Traversals**	**Sorting**	**Graphs**
	18	**18**	**18**	**18**	**18**
SLO-1	Introduction to theory of Data structures, Data representation	Introduction to stack, Representation of stack through array	Tree Traversals –In order, preorder, Tree Traversals - Post order	Introduction to sorting, Different types of sorting	Graph Terminology, Representation of graph–Arrays
SLO-2	Abstract Data type, Classification of data types	Representation of Stack through linked list, Operations on stack	Binary Search Tree, Threaded Binary Search Tree	Bubble sort, Example	Representation of graph– Linked list, Graph Traversal –BFS, Example
SLO-3	Asymptotic Notation, Algorithm Analysis – Recursion - Example	Disadvantages of Stack, Polish Notations, Applications –Evaluation of Expression - Infix to Postfix expression – Towers of Hanoi, Recursion	Binary Search Tree: Construction, Binary Search Tree: Insertion – Binary Search Tree: Searching – Binary Search Tree: Searching	Insertion Sort – Example, Quicksort - Example	Graph Traversal–DFS – Example - Topological Sorting
SLO 4-6	**Lab 1: Recursion**	**Lab 4: Stack and its Applications**	**Lab 7: TreeTraversals**	**Lab 10: Implementation of Bubble and Insertion sort**	**Lab 13: Implementation of shortest path algorithm**
SLO-7	Introduction to Data structures, Data Structures and its uses	Queue, Representation of Queue using Arrays And Linked list	Applications of trees, Applications of BST	Selection sort, Example	Shortest Path Algorithm-Introduction, Shortest Path Algorithm: Dijkstra
SLO-8	Linear and Non Linear Data Structures, Operations on data structure	Operations on Queue, Circular Queue	Expression trees, Example	Merge sort, Example	Applications of Graph, Minimum spanning tree
SLO-9	Array types, Array operations – Applications of arrays - Dynamic memory allocation	Double ended Queue, Priority Queue- Reversing a Queue using another queue – Applications of Queue	AVLTree, AVLTree Rotations - Applications of AVL tree	Radix sort, Heap Sort Example Comparison of sorts	Prims, Example
SLO 10-12	**Lab 2: Arrays**	**Lab 5: Queue implementation using array and pointers**	**Lab 8: Implementation of BST Heap Data Structure**	**Lab 11: Implementation of Quick sort and Merge sort**	**Lab 14: Implementation of minimum Spanning tree**
SLO-13	Introduction to lists, Linked list operations	Introduction to non-linear data Structures, TreeADT and Terminologies	Minimum Heap Construction, Example	Introduction to searching, Linear Search, Binary Search	Kruskals –Example, Algorithm Design And Analysis
SLO-14	Types of Linked Lists, Linked list vs. Arrays - Application of linked list	Tree Terminologies, Tree Representation - Tree Types and Operations	Minimum Heap Deletion Construction, Maximum Heap Construction	Comparison of different search, Define Hashing – Hash functions	Greedy Algorithms, Example

SLO-15	Performance Analysis and Measurement of algorithm, Efficiency of algorithm - Time complexity and space Complexity	Binary Tree Representation, Properties of binary tree	Maximum Heap Deletion Construction, Applications of Heaps and AVLtrees	Hashing: Collision avoidance Hashing: Separate chaining, Open addressing, Advantages of Hashing	Divide And Conquer – Example, Backtracking - Example
SLO 16-18	**Lab 3: Linked List**	**Lab 6: Implementation of binary tree using Arrays**	**Lab 9: Heap Implementation**	**Lab 12: Implementation of Graph using Array**	**Lab 15: Implementation of binary search using divide and conquer strategy**

Resources

1	SeymourLipschutz,(2014),"Data Structures with C",McGraw Hill Education,Special Indian Edition	2	SRD Group,(2013),"Data structures using C",McGraw Hill,2nd Edition,
3	R.F.Gilberg,B.A.Forouzan,(2005),"Data Structures",ThomsonIndi,2nd Edition,	4	A.V.Aho,J.EHopcroft,J.D.Ullman,(2003),"Data structures and Algorithms",1st Edition,Pearson Education
5	Mark Allen Weiss,"Data Structures and Algorithm Analysis in C",2nd Edition, Pearson Education	6	Reema Thareja,(2011),"Data Structures Using C",1st Edition, Oxford Higher Education

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Course Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.S.Arunarani, SRMIST, KTR Campus

Course Code	UMS24203T	Course Title	Statistics for Artificial Intelligence	Category	C	Discipline Core Course	L	T	P	C
							4	0	0	4

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

CLR	The purpose of taking this course is to:
CLR-1	To provide foundations in Statistics
CLR-2	To provide a strong foundation of organizing the data, diagrammatic and graphical presentation.
CLR-3	To apply Statistical techniques in AI
CLR-4	To provide the application of correlation and regression in AI.
CLR-5	To analyze the sample data in order to estimate or predict characteristics of the larger population from which the sample is drawn.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes										
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CLO-1	To understand the statistical modeling and its limitations, and have skill in description, interpretation and exploratory analysis of data by graphical and other means	✓	✓	-	-	2	85	75	3	-	-	-	-	-	-	-	-	-
CLO-2	To calculate and apply measures of central tendency - grouped and ungrouped data cases.	✓	✓	✓	-	2	85	75	-	3	-	-	-	-	-	-	-	-
CLO-3	To understand and apply measures of dispersion - grouped and ungrouped data cases.	✓	✓	✓	✓	3	85	75	3		-	-	-	-	-	-	-	-
CLO-4	Find the relationship between two or more variables using correlation and regression.	✓	✓	✓	✓	3	85	75	-	3	-	-	-	-	-	-	-	-
CLO-5	Perform Test of Hypothesis for small sample. Learn non-parametric test such as the Chi- Square test for Independence and Goodness of Fit, Perform the Analysis of Variance - One way Classifications.	✓	✓	✓	✓	3	85	75	-	-	-	-	3	-	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	Nature and scope of statistical methods	**Measures of Central tendency**	**Measures of Dispersion**	**Correlation Analysis**	**Conditional Probability, Testing of Hypotheses**
	12	**12**	**12**	**12**	**12**
SLO-1	Definition of statistics, Numerical Data, Nature and Importance of statistics, Functions of statistics	Measures of Central tendency i. Definition ii. Functions of average iii. Characteristics of a typical average Arithmetic mean, Individual series	Range – Individual, Discrete series and Continuous series	Correlation - Definition and uses, Types of correlation, Methods for Finding Correlation Coefficient, Properties of correlation coefficient	Random experiment, types of events with Examples, Definition of probability, addition and multiplication law
SLO-2	Limitations, Distrust of Statistics, Classification: Meanings, Objects	Arithmetic mean Discrete series, Arithmetic mean Continuous series	Quartile Deviation - Individual and Discrete series	Karl Pearson's Correlation Co-efficient	Problems based on addition and multiplication law, Conditional probability - formula
SLO-3	Rules of classification, Types of classification, Characteristics of good classification- Tabulation: Parts of Tabulation, Rules of Tabulation, Types of tables - Objective of Tabulation	Arithmetic mean Cumulative series	Quartile Deviation - Continuous series	Spearman's Rank Correlation, Coefficient with non-repeated Ranks	Problems on conditional probability, Definition of Baye's theorem
SLO-4	Components of Good Table, Rules of construction of the table	Arithmetic mean Merits and Demerits, Median Individual series, Median Discrete series,	Mean Deviation about Mean – Individual Series, Mean Deviation about Mean – Discrete series, Mean Deviation about Mean – Continuous series	Spearman's Rank Correlation, Coefficient with repeated Ranks	Problems on Baye's theorem, Definition of probability distribution and its Type- Testing of Hypotheses
SLO-5	Difference between classification and tabulation.	Median Continuous series- Median Merits and Demerits	Mean Deviation about Median – Individual series, Mean Deviation about Median – Discrete series, Mean Deviation about Median – Continuous series	Spearman's Rank Correlation Co-efficient, Problems on finding the best pair of judgements- Bivariate Distribution	Testing Procedures Definition of test statistic t and its uses, t-test Small Sample tests, t-test - Test for Single Mean, t-test -Test for two Sample Means
SLO-6	Diagrammatic representation of various types of statistical data : Bar Diagram, Types of Bar diagram	Mode Individual series, Mode Discrete Series	Standard Deviation – Individual and Discrete Series	Regression Analysis:Regression - Definition and Uses, Regression Coefficients	t-test - t Test Statistic, when sample standard deviations are not known, but Population Standard Deviations are known
SLO-7	One dimensional Diagrams, Two dimensional Diagrams	Mode Continuous Series	Standard Deviation - Continuous Series	Regression Equations, Types of Regression Equations	Chi-Square distribution - Definition and its Uses, Chi-Square test - Testing Procedure

SLO-8	Pie chart, Histogram, Frequency Polygon, Frequency Curve	Mode Continuous Series	Coefficient of Variation,	Regression Equation of X on Y and Regression Equation of Y on X	Chi-Square test - Problems
SLO-9	Less than O gives, more than O gives	Mode Merits and Demerits, Empirical Relation	Graphical solution of Dispersion Lorenz curve-	Relationship between Correlation and Regression Coefficients,	F-test - Test Statistic of F-test, Uses and testing Procedures
SLO-10	Less than O gives, more than O gives	Graphical solution of Median	Skewness Bowley's coefficient of Skewness	Relationship between Correlation and Regression Coefficients,	Testing the equality of variance using F distribution- Problems based on F-test
SLO-11	Lorenz Curve	Graphical solution of Mode	Skewness Bowley's coefficient of Skewness	Problems on the Relationship between the Coefficients	Analysis of Variance – Definition and Uses
SLO-12	Lorenz Curve	Graphical solution of Mode	Concept of Kurtosis	Finding the corrected Correlation Coefficient values by correcting the wrongly entered inputs	Analysis of Variance – testing procedure, ANOVA - One Way Classification

Resources

1	Pillai, R.S.N, Bagavathi, V. (2009), Statistics,Theory and Practice,7thEdition,S.ChandLtd,NewDelhi.	3	Gupta, S.P. (2012), Statistical Methods, 4th Edition, Sultan Chand & Sons, New Delhi.
2	Khan and Khanum, (2008), Fundamentals of Bio Statistics, 3rd Edition, Ukaaz Publications, Hyderabad	4	Ken Black, (2013), Business Statistics for Contemporary Decision Making, 7th Edition, John Wiley Publications

Assessment						
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10 %)	(10 %)	(20 %)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
	Total (%)	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. N.Viswanathan, Presidency College, Chennai	1	Dr. M.Vasantha, ICMR,Chennai	1	Dr.S.Parvathi, SRM IST
				2	Dr.S. Poongodisathya, SRM IST

Course Code	UCD24V01T	Course Title	Essentials of Artificial Intelligence	Category	V	Value Added Course	L	T	P	C
							1	0	0	1

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

CLR	The purpose of learning this course is to:
CLR-1	Study the basics of designing intelligent agents that can solve general purpose problems'
CLR-2	Discover appropriate AI methods to solve a given problem
CLR-3	Perform intellectual task as decision making, problem solving, perception, understanding
CLR-4	Formalize a given problem using different AI methods
CLR-5	Provides adaptive learning

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Demonstrate fundamental understanding of the history of artificial intelligence and its foundations	✓	✓	-	-	2	85	75	3	-	-	1	2	1	-	-	-	1
CLO-2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	✓	✓	✓	-	2	85	75	2	-	1	-	2	2	-	1	-	1
CLO-3	Identify systems with Artificial Intelligence. evaluation of different algorithms on a problem formalization	✓	✓	✓	✓	3	85	75	2	2	2	-	2	1	-	1	-	2
CLO-4	Use classical Artificial Intelligence techniques, such as search algorithms	✓	✓	✓	✓	3	85	75	3	-	2	-	2	2	-	2	-	-
CLO-5	Ability to apply Artificial Intelligence techniques for problem solving.	✓	✓	✓	✓	3	85	75	2	2	-	-	2	-	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	Introduction to Artificial Intelligence	**Logical Reasoning and First order logic**	**Unification and State Space Search**	**Planning Graphs**	**Probability Theory and Temporal Models**
	3	**3**	**3**	**3**	**3**
SLO-1	Introduction to Artificial Intelligence, History of Artificial Intelligence- AI models,	Logical Reasoning-Introduction-Knowledge Representation	Unification and Conditions, Unification algorithm	Partial-order planning, planning graphs	Probability Theory, Uncertain Knowledge, Axioms of probability.
SLO-2	Problem Solving with Artificial Intelligence- ProblemSolving Process	Logical Agents, Knowledge basedAgents, Syntax of First order logic, Basic elements of First order logic	Planning: designing programs to search for data or solutions to problem.	Uses of planning graph, Planning and acting in the realworld	Bayes Theorem, Bayes' Rules & uses, Bayesian networks, Types of Bayesian Network
SLO-3	Problem Types, Characteristics and Representation-Agents- Examples of Agents, Types of agents	Forward chaining andBackward Chaining- Properties Examples	State-space search, Problems to solve: Water Jug Problem, State representation: Initial, operator, goal state	Forward march, Backward march and Limited resources	Temporal models, Hidden Markov models, HMM components

Resources			
1	Russel.SandNorvig.P, (2003), "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education	2	S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education

Assessment					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)			
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *
		(20 %)	(20 %)	(40%)	(20%)
		Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10
2	Understand	15	15	10	10
3	Apply	20	25	25	25
4	Analyze	20	25	25	25
5	Evaluate	15	10	15	15
6	Create	15	10	15	15
Total (%)		100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.S.Belina V J Sara, SRMIST KTR Campus

Course Code	UCD24S02L	Course Title	Quantitative Aptitude and Logical Reasoning	Category	S	Skill Enhancement Course	L	T	P	C
							0	0	2	1

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

CLR	The purpose of learning this course is to:
CLR-1	Illustrate the application of different principles in solving mathematical problems
CLR-2	Foster students' curiosity and understanding of concepts related to profit/loss, interest computation, and averages
CLR-3	Analyze fundamental mathematical concepts concerning permutation and combination, as well as time and work, with a critical perspective
CLR-4	Equip students with the abilities essential for generating and comprehending data, focusing on topics such as cubes, dices and blood relations
CLR-5	Empower students to grasp the fundamentals of reasoning

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CLO-1	Grasp, evaluate, and tackle problems involving numbers and percentages	✓	✓	-	-	2	85	75	3	1	3	-	2	2	-	-	-	-
CLO-2	Develop, solve, interpret, and apply fundamental mathematical models relevant to everyday situations	✓	✓	✓	-	2	85	75	3	1	3	-	2	2	-	-	-	-
CLO-3	Realize the principles of permutation and combination, probability, time and work, and adopt simplified and innovative approaches to problem- solving	✓	✓	✓	✓	3	85	75	3	1	3	-	2	2	-	-	-	-
CLO-4	Comprehend the concepts of data interpretation, data sufficiency, coding and decoding	✓	✓	✓	✓	3	85	75		1	3	-	2	2	-	-	-	-
CLO-5	Solve logical puzzles and reasoning challenges	✓	✓	✓	✓	3	85	75		1	3	-	2	2	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO – 3	CLO - 4	CLO - 5
	6	6	6	6	6
SLO-1	Classification of numbers and Test of divisibility	Profit and Loss	Permutation and Combination	Cubes and Dice	Direction Sense
SLO-2	Unit digit and Trailed zeroes	Ratio and Proportions	Problems on Probability	Data Interpretation	Number Series and Word Series
SLO-3	Problems on HCFand LCM	Simple Interest and Compound Interest	Time and work - Men and Work	Data sufficiency	Odd man out Missing Number and Wrong Number

SLO-4	Problems on Partnership	Word problems on Linear and Simultaneous Equations	Time and Work - Pipes and Cisterns	Seating Arrangements – Linear and Circular	Puzzles - Concepts & Problems Syllogisms - Concepts & Problems
SLO-5	Problems on Percentage	Problems on Averages	Time, Speed and Distance - Problems on Trains	Problems on Blood Relations	Problems on Clocks
SLO-6	Percentage - Increasing & Decreasing functions	Mixtures and Alligations	Time, Speed and Distance - Boats & Streams	Coding – Decoding	Problems on Calendars

Resources			
1	Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition	4	Dr. Agarwal. R. S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition
2	Archana Ram, Place Mentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018	5	Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition
3	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

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)			
		CLA – 1 (20 %)	CLA – 2 (20 %)	CLA – 3 (30 %)	CLA – 4 * (30%)
		Practice (%)	Practice (%)	Practice (%)	Practice (%)
1	Remember	20	10	20	10
2	Understand	20	10	20	10
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	20	10	20
6	Create	10	20	10	20
Total (%)		100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089 p.chockalingam1986@gmail.com	1	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu	1	Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST hod.dcgc.ktr@srmist.edu.in
				2	Dr. Aarthi S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST aarthis4@srmist.edu.in

Course Code	UNS24Y01L UNC24Y01L UNO24Y01L UYG24Y01L	Course Title	NSS/NCC/NSO/YOGA	Category	Y	Mandatory Course	L	T	P	C
							0	0	0	0

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

CLR	The purpose of learning this course is to:	Depth					Attainment			Programme Learning Outcomes										
CLR-1	Understand themselves in relation to their community	1	2	3	4		1	2	3		1	2	3	4	5	6	7	8	9	10
CLR-2	Develop among themselves a sense of social and civic responsibility	Conceive	Design	Implement	Operate		Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)		Problem Solving, Critical Thinking, Creativity, Scholarship	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research Aptitude	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO 1	PSO 2
CLR-3	Utilize their knowledge in finding practical solution to individual and community problems																			
CLR-4	Develop competence required for group-living and sharing of responsibilities																			
CLR-5	Acquire leadership qualities and democratic attitude																			
CLO	At the end of this course, learners will be able to:																			
CLO-1	realize themselves in relation to their community	✓	✓	-	-		2	85	75		3	-	-	1		3	3	2		
CLO-2	Develop among themselves a sense of social and civic responsibility	✓	✓	✓	-		2	85	75		3	2	1	2		3	3	1		
CLO-3	find practical solution to individual and community problems	✓	✓	✓	✓		3	85	75		3	1	3	1		3	3	1		
CLO-4	Develop competence required for group-living and sharing of responsibilities	✓	✓	✓	✓		3	85	75		3	3	2	3		3	3	2		
CLO-5	develop leadership qualities and democratic attitude	✓	✓	✓	✓		3	85	75		3	3	2	3		3	3	3		

Assessment is Fully Internal

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

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses		Good Health & Well Being	✓
Presentation Tools		Group Discussion	✓	Quality Education	
Learning Management System		Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming			

***CLA s are evaluated based on (i) participation in awareness programmes, (ii) participation in outreach programme, (iii) Community Services (iv) Camps (National, State, Regional)**

Resources	
1.	NSS Manual (Revised), Govermnment of India

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr Samuel Chellaiya C Regional Director, NSS Government of India	1	State Officer, NSS Tamil Nadu NSS	1	Dr Prakash V, NSS Coordinator, SRMIST, AP, department of Economics, FSH, SRMIST Prakashv2@srmist.edu.in
				2	Dr Yogalakshmi, NSS Programme Officer, FSH, SRMIST.

SEMESTER - III

Course Code	UDS24301J	Course Title	Data Engineering for Enterprises	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
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																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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	75	3	1	1	1	2	-	-	2	2	2
CLO-2	Have a firm understanding of defining the role Big data and IoT plays in building scalable AI Products.	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
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	75	3	1	3	1	3	-	-	1	3	3
CLO-4	Have solid hands-on skills, knowledge and expertise in Collecting data from different enterprise systems and process them efficiently	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Able to reading, process, and write data from Big Data and IIoT platforms using the right tools and techniques involved	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Data Engineering and Data Analytics	**Data types and sources, Big Data**	**Hadoop and Data Identification**	**Data Preparation and Integration, Structured Data**	**Unstructured Data**
	18	**18**	**18**	**18**	**18**
SLO-1	Data Engineering Introduction, What is Data Engineering?,Why Data Engineering is important?	ERD Model, MDM Model, Star Scheme	Big Data Tools, Hadoop, Apache Strom	Data Preparation with Python, What is Data Preparation?, Data Preparation Requirements	Working with Unstructured Data, Data Profiling, Data Profiling Benefits
SLO-2	Data Engineering Driving Factors, Data Engineering Building Blocks, Data Engineering Advancement	Extended Star Schema, Snowflake, Data Types, Structured, Unstructured, Semi-Structured	MongoDB, Cloudera, Introduction to Hadoop	Steps in Data Preparation, Data Discovery, Data Profiling	Group or Individual Project, Information Modeling and Data Virtualization, Business Processes
SLO-3	Data Engineering Skills and Expertise, Data Analytics vs Data Engineering	Machine Data, Sensor Data, Image, Video, Voice	Hadoop Storage, HDFS (Hadoop Distributed File System)	Data Cleansing, Data Transformation	Master Data/Reference Data, Transaction Data/Measures/KPIs
SLO 4-6	**Lab 1 : Setup a Simple Data Engineering Development Infrastructure in My SQL Opensource (Should be able to create table, load data and query data.)**	**Lab 4 : Validate data in the below data loaded tables** **● Customer Table** **● Product Table** **● Sales Order Tables** **✓ Check if the CustomerID, ProductID and Sales OrderID are unique and not null.** **✓ Check if the Data type of Customer Names, Product Names are CHAR**	**Lab 7: Write a Select query with the following conditions using python** **● Use LEFT JOIN to merge above result with the Sales order table on ProductID** **● Use RIGHT JOIN to merge the result of first conditions with the Sales order table on ProductID**	**Lab 10 : Perform Data Transformation with the some logic using python** **● Add the First name and the Last Name as Full Name** **● Change the Customers Full Name with Upper Case to Proper Case**	**Lab 13: Perform data validation with some logic using python** **● Validate for Incorrect Product UOM's** **● Write validation results in a SLO- File in G Drive**
SLO-7	Data Analytics Overview, Data Analysis vs Data Analytics, Data Analytics Advancement	Data Source, Data Target, Datastore	Hadoop Architecture, Hadoop MapReduce, Introduction to Apache Hive and Hbase	Data Enrichment, Data Governance, Data Quality	Data Subsets, Information Modelling, Data Access Path, Virtual Data Provisioning,
SLO-8	Role of Data Engineering in Data Analysis, Data Engineering vs Data Warehousing, Data Warehousing Overview	Data Mapping, Data Conversion, Data Transformation	Big Data Processing with Apache Spark, Data Collection with Python	Data Validation, Data Consistency, Data Completeness	Group or Individual Project, Data Governance and Data Quality Data Sources - Mapping, Integration, Validation, Governance and Quality
SLO-9	Data Warehousing Building Blocks, Data Warehousing Challenges	Data Flow, Data Pipeline	What is Data Identification?, Identifying the Required Data and Data Sources, Data Format	Data Accuracy, Examples of Data Integration	Data Stakeholders, Data Subject Areas

SLO 10-12	**Lab 2 : Create following tables with appropriate columns** **● A Customer Table** **● A Product Table** **● A Sales Order Table (Note: Check DeepSphere.AI GitHub for table structure and sample data)**	**Lab 5 : Validate data in the below data loaded tables** **✓ Check if the Customer Email has a format: name@email.com** **✓ Check if there are any null values** **✓ Check if there are any duplicate values**	**Lab 8: Perform Update operation with the below logic using python** **● Update Unit Price = $40 where Product = 'Coolers'** **● Update Quantity = 5 Customer = 'Alfred'**	**Lab 11: Perform Data Transformation with the some logic using python** **● CHANGE the Sales Order Date Format as DDMMYYYY** **● Sort the product in the higher order of Revenue**	**Lab 14: Using two different files and merge the Files and then load into table using Python In Colab and use appropriate python libraries**
SLO-13	Data Warehousing limitations, Data Warehousing Industry Needs and Market Demand,	Data Frequency, Real-Time Data, Batch Data, and Data Streaming, Data Provisioning, Data Architecture	Data Structure, Data Frequency, What is Data Collection?	Importance of Data Integration, Business Challenges of Data Integration, Key General Tools/Technologies	Data Owners, Data Change Processes, Data Systems
SLO-14	Compare Data Engineering Technologies, Skills, and Expertise with Data Warehousing, Difference between Data Engineering and Data Warehousing, Data Engineering Architecture	ETL (Extract, Transform, and Load), Introduction to Big Data, What is Big Data?	Source and Target Systems, Examples of Data Collection, Business Challenges of Data Collection	Data Cleansing and Data Blending, Understanding different Data Formats, Data Mapping and Data Conversion	Data Validation, Data Quality Standards, Data Acceptance Criteria
SLO-15	Data Engineering Building Blocks, Database and No SQL database, Data Model	Big Data Business Applications, Big Data Architecture	Business Benefits of Data Collection, Key General Tools/Technologies	Data Integration, Working with Structured Data	Data Access Controls, Group or Individual Project
SLO 16-18	**Lab 3: Load Data into the following tables from CSV file, TEXT File and Google G Drive** **● Customer Table** **● Product Table** **● Sales Order Tables**	**Lab 6: Write a Select query with the following conditions using python** **● Use INNER JOIN to merge the Customer table with the Product table on CustomerID**	**Lab 9: Perform Update operation with the below logic using python** **● Calculate Revenue as = Unit Price * Quantity** **● Calculate 10% discount where Product = 'Toothpaste'**	**Lab 12: Perform data validation with some logic using python** **● Validate for Customer Full Name without Double Spaces** **● Validate for Sales Order Data with incorrect date correct (Should be MMYYDD)**	**Lab 15: Using Data from Two different Files merge the Files, remove duplicate rows and replace NULL values with #### and then load into table using Python In Colab and use appropriate python libraries**

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)

Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.K.Sutha, SRMIST, Ramapuram

Course Code	UDS24302J	Course Title	Database Management System	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Understand the fundamentals of Database Management Systems and Its architecture																	
CLR-2	To impart in-depth knowledge of database design process through ER Model and Relational Model																	
CLR-3	Understand the using Structure Query Language (SQL) and PL/SQL																	
CLR-4	Basic knowledge of Improvement of the database design using normalization criteria and optimize queries																	
CLR-5	Basic knowledge of the practical problems of concurrency control and gain knowledge about failures and recover																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Have a thorough Understanding of the Database Systems	✓	✓	-	-	2	85	75	3	1	1	1	2	-	-	-	2	2
CLO-2	Realize the concepts of ER Model and Relational Model	✓	✓	✓	-	2	85	75	3	1	1	1	2	-	-	-	2	2
CLO-3	Create real time applications of SQL and PL/SQL	✓	✓	✓	✓	3	85	75	3	1	1	1	3	-	-	-	3	3
CLO-4	Design and implementation knowledge of a Normalized Database	✓	✓	✓	✓	3	85	75	3	3	1	2	3	-	-	-	3	3
CLO-5	Design and implementation knowledge of Concurrency Control	✓	✓	✓	✓	3	85	75	3	3	1	1	3	-	-	3	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Fundamentals of DBMS	E-R Model	Working With SQL	Basics of PL/SQL	Concurrency and Security
	18	18	18	18	18
SLO-1	What is a DBMS?	Introduction to Entity Relationship	Defining Constraints through SQL	CODD Rules	Recoverability in Transaction
SLO-2	Advantage of DBMS over File Systems	E-R Model Construction	SQL Aggregate Functions Introduction	Normalization: 1Nf, 2Nf, 3Nf	Concurrent Execution
SLO-3	Applications of DBMS	Case Study	Built Functions : In Numeric, Date	BCNF 4Nf and 5Nf	Concurrency Control – Lock Based, Two-Phase Control Commit

SLO 4-6	**Lab1 : Creating a Simple DB**	**Lab 4: Working with Built In SQL Functions**	**Lab 7: Working with Aggregate Functions**	**Lab 10: Normalize a DB**	**Lab 13: Working with Transactions**
SLO-7	DBMS Architecture	Issues in E-R Model	Built Functions: String, Set	Referential Integrity	DB Stored Procedures : PL/SQL
SLO-8	Over View of SQL	Keys, Attributes, Constraints	SQL Joins	Indexing: Primary, Secondary, Multilevel	Multilevel Granularity
SLO-9	SQL : Data Definition- DDL	Mapping Cardinality	Creating Sub Queries	ISAM, B-Trees	Deadlock Prevention
SLO 10-12	**Lab2: Working with DDL**	**Lab 5- Working with Primary and Secondary Key**	**Lab 8: Working With Sub Queries**	**Lab 11: PL/SQL work with Iterative Statements**	**Lab 14: Creating DB Stored Procedures**
SLO-13	SQL : Data Manipulation -DML	Extended ER - Aggregation	Transaction Control Commands : Commit, Roll Back, Save Point	PL/SQL Variables and Control Structures	PL/SQ: Exception Handling, Triggers
SLO-14	Evolution of Data Models	Extended ER – Generalization, Specialization	Relational Algebra : Fundamental Operations	Cursors and Functions in PL/SQL	Need For DB Security
SLO-15	Comparison of Data Models	Conversion of ER to Relational Table	Functional Dependency : Trivial, Non Trivial	Transactions : ACID Property	Mandatory Access control and SLO-2 Multilevel Security
SLO 16-18	**Lab 3: Working with DML**	**Lab 6: Working with Nested Queries**	**Lab 9: Correlated Sub Queries**	**Lab 12: PL/SQL Working with Cursors**	**Lab 15: Implementation of Payroll Processing, Student Mark Report**

Resources

1	Abraham Silberscatz, “Database System Concept”, 6th Edition, McGraw Hill.	3	Hector Garcia-Molina ,Jeffrey Ullman , Jennifer Widom ,Database Systems: The Complete Book Hardcover , Pearson,2001
2	Raghu Ramakrishnan , Johannes Gehrke , Database Management Systems , McGraw-Hill Education (ISE Editions),1999	4	K. Prema , A. Gowri Shankar Reddy ,K. Reddy ,Database Management System Concepts , Notion Press,2020

Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. Sweety Bakyarani. E,,SRMIST, KTR

Course Code	UDS24303J	Course Title	Natural Language Processing	Category	C	Discipline Core Courses	L	T	P	C
							3	0	3	4

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

Rationale (CLR)	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
CLR-1	Understand the working principles and their functions in a business scenario	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	To build intelligent and automated real-world natural language processing applications																	
CLR-3	Understand the various layers of Natural Language processing																	
CLR-4	Identify the implementation framework natural language processing solutions																	
CLR-5	Apply Natural language processing models to business problems																	
Outcomes (CLO)	**At the end of this course, learners will be able to:**	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Understand the Academic and Industry perspectives of NLP.	✓	✓	-	-	2	85	75	3	1	2	1	2	-	-	2	2	2
CLO-2	Gain hands-on solid skills, knowledge and expertise of real-world situations	✓	✓	✓	-	2	85	75	3	1	2	2	2	-	-	1	2	2
CLO-3	Able to understand the basics knowledge and expertise in Data gathering, Data collection	✓	✓	✓	✓	3	85	75	3	1	3	1	3	-	-	1	3	3
CLO-4	Hands-on skills and knowledge to apply all the required processes on texts	✓	✓	✓	✓	3	85	75	3	2	3	3	3	-	-	2	3	3
CLO-5	Gain knowledge and expertise in setting up a data platform for building enterprise.	✓	✓	✓	✓	3	85	75	3	2	3	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Introduction to NLP, NLP in different Sectors	**NLP Framework**	**Modelling and Classification, Natural Language Processing Models**	**Natural Language Processing Data Requirements**	**Model engineering and Optimization**
	18	**18**	**18**	**18**	**18**
SLO-1	Natural Language Processing Defined - Academic and Industry Perspective, What is Natural Language Processing?, Natural Language Processing defined from Academic and Industry perspective,	Natural Language Processing Architecture, Components of machine learning solution, Data Generation	Modelling, Text Classification, Keyword Classification	DeBERTa, Natural Language Processing Data Requirements, How much data is needed	Adding Packages, Natural Language Processing Data Requirements,

SLO-2	Functions of a Natural Language Processing system, Natural Language Processing in business,	Data Collection, Feature Engg pipeline, Training	Lemmatization, Stemming, Part of speech tagging	Is your data good enough?, Data Structure, Data Format	Patient Remittance with discharge summaries, Who is going to get readmitted?, When will they get readmitted
SLO-3	Artificial Intelligence and Natural Language Processing, Natural Language Processing promises and challenges,	Evaluation, Task Orchestration, Prediction	Coreference resolution, What Problem Natural Language Processing Solves, Machine Translation	Data Type, Source System, Target system	Problem statement, Problem type
SLO 4-6	**Lab 1 : Import the nltk package in python and download 'stopwords', 'punkt' packages, tokenize the string using the `transformers` package**	**Lab 4 : Create a monolingual corpus of 200,000 words. Segment it 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)**	**Lab 7: Choose a corpus of at least 20,000 words of online text, 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**	**Lab 10 : Estimate how much storage space is necessary for the index to a 100 billion-page corpus of Web pages. Show the assumptions you made**	**Lab 13: Extract the topics from the any texts of your choice with Latent dirichlet algorithm**
SLO-7	Natural Language Processing Architecture, Libraries, Technologies and Framework, Components of Natural Language Processing	Infrastructure, Authentication, Interaction	Named Entity Recognition, Text/Classification,	Training Data, Validation Data, Test Data	Data engineering, Data pipeline, Model selection
SLO-8	Phases of Natural Language, Natural Language Processing in Real World Applications,	Monitoring, Building your NLP Architecture,	Text Summarization, Modelling,	Natural Language Processing Data Requirements,	Model engineering, Model Outcome
SLO-9	NLP in healthcare, NLP in Retail,	Natural Language Processing Implementation Framework	Keyword Extraction, Information Retrieval	Building a NLP Hardware system, Benefits	, Model Analysis, Model Optimization

SLO 10-12	**Lab2: With your knowledge of the English language, split 10 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 ('), fullstop/period (.), parenthesis, are kept as tokens, tokenize the earlier sentence.**	**Lab 5: Write a program to do segmentation of words without spaces. Given a string, such as the URL "the longest list of the longest stuff at the longest domain name at long last.com," return a list of component words: ["the," "longest," "list," …]. This task is useful for parsing URLs, for spelling correction when words run together, and for languages such as Chinese that do not have spaces between words**	**Lab 8: Create a corpus of spam email and one of non-spam mail. Examine each corpus and decide what features appear to be useful for classification: unigram words? Bigrams? Message length, sender, time of arrival?**	**Lab 11: Write a regular expression or a short program to extract company names. Test it on a corpus of business news articles. Report your recall and precision**	**Lab 14: Extract the topics from the any texts of your choice using Non-negative Matrix Factorization**
SLO-13	NLP in Energy, Automobile, NLP in Oil & Gas, Natural Language Processing Workflow	What is a NLP framework?, Features of a good NLP framework, Popular NLP frameworks	Automatic Image annotation, Natural Language Processing Models,	Challenges, High level decisions, Choosing the hardware components (GPU, TPU)	Model pipeline, Data visualization
SLO-14	Text pre-processing, Exploratory Data Analysis, Text pre-processing, Text pre-processing	NLTK, Gensim, SpaCy, Core NLP, Natural Language Processing - Techniques an Overview	BERT , GPT2, XLNet, Electra, Text to Text Transfer Transformer	Building a NLP Software system, Benefits, Challenges	Introduction to Data visualization, User interface, Data exploration, Visualizing n-grams
SLO-15	Pattern Mining, Evaluation and Deployment	Pattern Recognition, Named Entity Recognition, Text Summarization	RoBERTa, ALBERTA	High level decisions, Choosing the software components, Choosing the OS	Qualitative comparisons, NLP dashboards, NLP: Text Data Visualization
SLO 16-18	**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 answ**	**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 word 2Vec model**

Resources			
1	James A. Natural language Understanding 2e, Pearson Education, 1994	3	Bharati A., Sangal R., Chaitanya V. Natural language processing: a Paninian perspective, PHI, 2000
2	Siddiqui T., Tiwary U. S. Natural language processing and Information retrieval, OUP,2008	4	https://www.nltk.org/book/

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1 2	Dr.Pandian, SRMIST Dr.Siva Kumar, SRMIST

Course Code	UDS24P01L		Internship - I	Category	P	Project Work / Internship	L	T	P	C
							0	0	0	1

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

CLR	The purpose of learning this course is to:
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

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Program Learning Outcomes									
		1 Conceive	2 Design	3 Implement	4 Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CLO-1	To get an insight of an industry and organization/company	✓	✓	-	-	2	85	75	3	2	2	2	2	2	2	2	2	2
CLO-2	To gain valuable skills and knowledge	✓	✓	✓	-	2	85	75	3	2	3	3	3	2	2	1	2	2
CLO-3	To make professional connections and enhance networking	✓	✓	✓	✓	3	85	75	3	2	3	3	3	3	2	1	3	3
CLO-4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	3	2	2	3	3	2	2	2	3	3
CLO-5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	2	2	3	3

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.

Assessment Component	Expected outcome	Type	Evaluators	Criteria or basis	Marks
Review-1	Internship letter Submission Internship title to be described.	Internal	Supervisor / Guide & Internship Coordinator	Feasibility Study of the Internship	20
Review-2	A short presentation about the internship work	Internal	Supervisor / Guide & Project Coordinator	Clarity of the idea, Preliminary work done.	30
Internship Report	Evaluation of internship Report	External	Examiner(s)/ Reviewer(s)	Presentation, Handling Q&A	30
Viva-Voce	Final Presentation				20

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

*Student has to be present for the viva voce for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'

SEMESTER - IV

Course Code	UDS24401J	Course Title	Deep Learning	Category	C	Discipline Core Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes										
CLR-1	Demonstrate various principles involved in solving mathematical concepts related to permutation and combination and probability and interpret data	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	Learn the basic mechanics of grammar and develop resume-building practice and presentation skills in students	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLR-3	Understand the object oriented features																	
CLR-4	Prepare students for job interviews																	
CLR-5	Instill confidence in students and develop the necessary skills to face interview																	
CLO	At the end of this course, learners will be able to:																	
CLO-1	Understand the concepts of permutation and combinations, probability and approach questions in a simpler and innovative method	✓	✓	-	-	2	85	75	3	1	2	1	2	-	-	2	2	2
CLO-2	Understand the different parts of speech and use them in sentences appropriately and also the importance of resume preparation	✓	✓	✓	-	2	85	75	3	2	2	2	3	-	-	1	3	2
CLO-3	Understand the importance of object oriented features	✓	✓	✓	✓	3	85	75	3	2	3	2	2	-	-	1	3	3
CLO-4	Face interviews confidently	✓	✓	✓	✓	3	85	75	3	1	3	3	3	-	-	2	3	3
CLO-5	Develop their domain skills	✓	✓	✓	✓	3	85	75	3	1	3	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Deep Learning Basics	Deep Learning Workflow	Deep Learning Models Prediction and frameworks	Convolutional Neural networks	Hardware support for Deep learning
	18	18	18	18	18
SLO-1	Deep Learning Basics, What is Deep Learning? Deep Learning defined from Academic perspective	Deep Learning Workflow, Adding Another input, Adding more layers, Error measurement in neural networks	Deep Learning Models Prediction and frameworks, Model Accuracy, Tune, Hyper parameters	Motivation for Neural Networks, Biological Neural Networks, Neurons	hardware support for Deep learning, Challenges, High level decisions,

SLO-2	Deep Learning defined from Industry perspective, Deep learning and machine learning, Deep Learning vs Data Science	Gradient descent, Loss functions, Learning rates	Deploy Model, Monitor Predictions, Manage your models,	Connections and weights, Propagation functions, Different layers of CNN	Choosing the hardware components(GPU,TPU), Building a Deep learning Hardware system
SLO-3	How a business uses deep learning, How deep learning works?	Advanced deep learning concepts, Steps in Deep learning in Implementation	Components of a deeplearning solution, Data Generation	Max pooing, Average Pooling	Benefits, Challenges, High level decisions
SLO 4-6	**Lab1: Build a simple artificial Neural Networks with 1layer, 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**	**Lab4: Build a network with atleast 3 hiddenlayers 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**	**Lab7: Build a network for classification using the built-in MNIST dataset and Use the sigmoid activation functionUse the categorical cross entropy loss function.**	**Lab10: Build a Recommendation system using Deep Learning techniques**	**Lab13: Using Generative Adversarial networks perform Imagegeneration**
SLO-7	What are deep learning promises and challenges?, Deep Learning Architecture, Deep Learning Libraries	Data Collection, Public Datasets, Existing Databases	Data Collection, Training, Evaluation	Hidden layers, Dropouts, Fully connected layer	Choosing the software components, Choosing the OS,
SLO-8	Deep Learning Technologies, Deep Learning Implementation Framework	Web Scraping, Crowd source labelling, DataPreparation	Task Orchestration, Prediction	Final softmax layer, Different CNN architectures	Adding Packages, Deep Learning Hands On Lab Work - Build, Test and Deploy ML Models (Consumer1)
SLO-9	The core of Deep Learning: ANN, Role of deep neural networks	Cleaning Data, Feature Scaling	Infrastructure, Authentication, Interaction	Lenet, Alexnet, VGG-16	Customer Churn, Who is going to churn?, When the churn will occur, Why(reason)is the churn occurring
SLO 10-12	**Lab2: Using Tensorflow Build a network with a single hidden layer**	**Lab 5: Build a network for classification using the builtin MNIST dataset**	**Lab 8: Working Data Collection, Evaluation**	**Lab11:Working on Deep Learning DataStructures**	**Lab 14: Deep Learning HandsOn Lab Work - Build, Test andDeployMLModels**
SLO-13	What is ANN?, Perceptron, Single Layer Perceptron-1,	Handling categorical data & text, ModelEngineering, TestTrainSplit	Monitoring, Building your deep learning Architecture	VGG-19, Inception -V3,	Problem statement, Problem type, Dataengineering
SLO-14	Single Layer Perceptron-2, Multi Layer Perceptron-1	Handling Imbalanced Data, Model Training	What is a deep learning Frame work?, Features of a good deep learning framework	Building a own architecture, Image datasets	Data pipeline, Model selection, Model engineering
SLO-15	Multi Layer Perceptron-2, Activation Functions-1, Activation Functions-2	Model Validation, Model Test, Model Outcome	Popular deep learning frame works, Tensorflow, Keras, Pytorch	Preprocessing, Data augmentation, Image data generator	Mode loutcome, analysis,and optimization, Model pipeline, Data Visuzlization and User Interface

SLO 16-18	**Lab3: Using Tensor flow build 3 networks, each with atleast 10 hidden layers**	**Lab6: Build a network for classification using the builtin MNIST dataset and Use the sigmoid activation function**	**Lab9: Conduct an experiment onObject detection using Convolution Neural Network**	**Lab12: Customize a CNN model for Bird classification**	**Lab15: Implement Transfer learning to retrain models that have been trained on the Image Net dataset in order to perform classification on the CIFAR dataset**

Resources			
1	Deep Learning from Scratch, by Seth Weidman, Released on September 2019, Pu blisher(s): O'Reilly Media, Inc.	2	Deep Learning: A Practical Approach, PB Paperback – 1 January 2018 by Rajiv Chopra Introduction to DeepLearning, Book by Eugene Charniak

Assessment

Bloom's Level of Thinking		**Continuous Learning Assessment (CLA) (50% weightage)**								**Final Assessment (50 % weightage)**	
		CLA – 1		**CLA – 2**		**CLA – 3**		**CLA – 4 ***			
		(10 %)		**(10 %)**		**(20 %)**		**(10 %)**			
		Theory (%)	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**
1	**Remember**	15	15	15	15	10	10	10	10	15	15
2	**Understand**	15	15	15	15	10	10	10	10	15	15
3	**Apply**	20	25	25	20	25	25	25	25	25	25
4	**Analyze**	20	25	25	20	25	25	25	25	25	25
5	**Evaluate**	15	10	10	15	15	15	15	15	10	10
6	**Create**	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.Usha.S, SRMIST,KTR Campus

Course Code	UDS24D01J	Course Title	Advanced Computing with Python	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

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

CLR	The purpose of learning this course is to:
CLR-1	Demonstrate various principles involved in solving mathematical concepts related to permutation and combination and probability and interpret data
CLR-2	Learn the basic mechanics of grammar and develop resume-building practice and presentation skills in student
CLR-3	Understand the object oriented features
CLR-4	Prepare students for job interviews
CLR-5	Instill confidence in students and develop the necessary skills to face interview

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Understand the concepts of permutation and combinations, probability and approach questions in a simpler and innovative method	✓	✓	-	-	2	85	75	3	1	1	1	2	-	-	2	2	3
CLO-2	Understand the different parts of speech and use them in sentences appropriately and also the importance of resume preparation	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	3
CLO-3	Understand the importance of object oriented features	✓	✓	✓	✓	3	85	75	3	1	3	1	3	-	-	1	1	2
CLO-4	Face interviews confidently	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Develop their domain skills	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Working and Architecture of Cluster Computing Grid Computing And Cloud Computing	**Cloud Computing Building Blocks, High Performance Computers**	**Real Time Computing, Open MP programming**	**Parallel Meshing and Remeshing, Google Cloud Platform Core Infrastructure And Services**	**Google Cloud Platform Compute, Kubernetes, AppEngine**
	15	**15**	**15**	**15**	**15**
SLO-1	Working and Architecture of Cluster Computing Grid Computing And Cloud Computing, Cluster computing overview, Cluster Load Balancing, High Availability Clusters, High Performance Clusters	Cloud Computing Building Blocks, Software Building Blocks Application Workloads, VirtualWorkloads, PaaS, Identity Management, Virtualization	Examples of In-memory Computing, Real Time Computing Overview, Business Benefits Real Time Computing Overview	Working of Dynamic Load Balancing, Applications of Dynamic Load Balancing, Parallel Meshing and Remeshing, Meshing Overview, Mesh Topology and Parallel Meshing Overview,	Projects, networks, and subnet works, Routes and fire wall rules, VPC Networking
SLO-2	Working and Architecture of Cluster Computing, Grid computing overview, Computational Grid Computing, Data Grid Computing,	Hardware Building Blocks Compute Servers, Storage Servers, Hyper Converged Servers. Physical networks, High Performance Computing	Working of Real Time Computing, Examples of Real Time Computing Computing	Business Benefits, Challenges & Applications of Parallel Meshing, Partitioning and parallel meshing technique, Remeshing Overview, Business Benefits,	Common network designs, Virtual Machines, Google Cloud Platform Compute, Kubernetes, AppEngine, GCP Compute Engine overview
SLO-3	Collaborative Grid Computing, Manuscript Grid Computing, Working and Architecture of Grid computing, Cloud computing overview	High Performance Computers, High Performance Components, Compute, Network, Storage, Importance of High Performance Computers	Open MP programming, OpenMP programming Overview	Business Challenges, Applications of Remeshing, Partitioning and parallel meshing technique, Remeshing Overview, Business Benefits, Business Challenges, Applications of Remeshing, Networking and Storage Options for Advanced Computing	Advantages, Business Benefits, Applications of Compute Engine, Google Compute Engine features Machine Types, Persistent Disks, Local SSD
SLO 4&5	**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**	**Lab7: Set up and write simple programs on Apache Spark and Jupyter Notebooks on Cloud Data**	**Lab10: Calculate multiplicative inverse of five symmetric matrices ofsize 2000x2000.**	**Lab13: 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.**

SLO-6	Private Cloud, Public Cloud, Hybrid Cloud and Multi cloud, Working of Cloud Computing,	Business Benefits of High Performance Computing, Business Challenges of High Performance Computing	Business Challenges of OpenMP Programming, Parallel programming overview, OpenMP parallel region,Worksharing	Networking Options for Advanced Computing Overview, Business Benefits, Business Challenges of Networking, Storage Options for Advanced Computing Overview	Introduction to Containers and Kubernetes, Containers and ContainerImages, Introduction to Kubernetes, Introduction to Google Kubernetes Engine
SLO-7	Architecture of Cloud computing, Difference between Cluster vs Grid computing, Cluster vs Cloud computing and Grid vs Cloud computing, Role of Cloud Computing in An AI Implementation	What can you do with High Performance Computing?, High Performance Computing in the cloud, High Performance Computing Building Blocks	OpenMP data environment, tasking, Creating Parallelism, Message Passing interface (MPI) parallel programming	Business Benefits Business Challenges for Advanced Computing, Google Cloud Platform Core Infrastructure And Services, Google Cloud Platform Core Infrastructure and Services	Kubernetes Architecture, Google Cloud App Engine environments
SLO-8	Merging AI and cloud computing, Machine learning cloud services, IoTcloud	High Performance Computing Building Blocks Overview, Why Is High-Performance Computing Important?, Business Benefits of High Performance Computing	Message Passing interface(MPI) parallel programming, Business Benefits of MPI Programming	Introduction to Google Cloud, Getting Started with Google Cloud, The Google Cloud resource hierarchy, Identity and Access Management (IAM)	Handson Python Lab on GCP, HelloWorld, Add Two Numbers
SLO 9&10	**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 hostedon Google Cloud Platform via the web**	**Lab11: Create Kubernetes Cluster in Google Cloud Kubernetes engine**	**Lab 14: Perform basic networking tasks on Google Cloud, including Compute Engine in stances**
SLO-11	Business Intelligence, AIasa Service on cloud, Infrastructure as a Service and AI, Platform as a Service and AI	Components of High-Performance Computing Solutions, Compute, Network, Storage, In memory and Real Time Computing	Business Challenges of MPI Programming, Types of Parallel Computing Models, Error Handling	Interacting with Google Cloud,Virtual Machines in the Cloud, Storage, Containers, Applications in the Cloud, Advanced Computing in Google Cloud Platform	Square Root of a Number, Area of a Circle, Quadratic Equation,
SLO-12	Software as a Service and AI, Cloud technologies for AI applications,	Inmemory Computing Overview, Business Benefits In-memory Computing Overview	Running MPI Programs, Dynamic Load Balancing, Dynamic Load Balancing Overview	Interacting with Google Cloud, Using the Google Cloud,	Swap Two Variables, Mutiply Two Numbers, Divide Two Numbers
SLO-13	Containers, Kubernetes	Business Challenges In-memory Computing Overview, Working of In-memory Computing, Business Benefits of Open MP Programming	Business Benefits of Dynamic Load Balancing, Business Challenges of Dynamic Load Balancing	Working with GCP Cloud Console and Cloud Shell, Virtual Networks, Virtual Private Cloud	Generate random numbers between 0 and 100, Convert Kms to metre

SLO 14 & 15	**Lab 3: Create Our First VPC in Google Cloud**	**Lab 6: Analyze production performance with Cloud Profiler**	**Lab9: Build a Fraud Detection modelon Cloud AI Platform with TensorFlow Enterprise and BigQuery**	**Lab12: Creating a Network Storage Solution Using Google Cloud File store**	**Lab15: Createas to rage bucket and then use it to store some files, retrieve files, and implement version control**

Resources

1	Google Cloud Platform for Developers: Build Highly ScalableCloud Solutions with the Power of Google Cloud Platform, BookbySteven Porterand TedHunter	3	Introduction to Computation and Programming Using Python,Bookby John Guttag
2	Python for Google App Engine, by Massimiliano Pippi	4	Python Programming: Using Problem Solving Approach, Book by Reema Thareja

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.R.Jayashree,SRMIST
				2	Mrs.S.Chandrakala,SRMIST

Course Code	UDS24D02J	Course Title	Machine Learning	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

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

CLR	The purpose of learning this course is to:
CLR-1	Understand the basic theory underlying Machine Learning
CLR-2	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CLR-3	Understand the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning
CLR-4	Understand a range of machine learning algorithms along with their strengths and weaknesses
CLR-5	Learn the basics of Demystifying Artificial Intelligent and machine learning

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcome										
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To understand various key paradigms for machine learning approaches	✓	✓	-	-	2	85	75	3	1	1	1	2	-	-	2	2	2
CLO-2	Implement and analyze existing learning algorithms, including well-studied methods for classification, regression, structured prediction, clustering, and representation learning	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
CLO-3	Understand a very broad collection of Machine Learning algorithms and problems	✓	✓	✓	✓	3	85	75	3	1	3	1	3	-	-	1	3	3
CLO-4	Grasp the ML implementation framework	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Develop skills of using recent machine learning software for solving practical problems.	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Introduction to Machine Learning	Data and It's Processing	Supervised Learning	Unsupervised Learning	Artificial Intelligence, Machine Learning, Deep Learning and beyond
	15	15	15	15	15
SLO-1	Introduction to Machine Learning - What is Machine Learning?	Introduction to Data in Machine Learning - How to get datasets for Machine Learning	How Supervised Learning Works? - Steps Involved in Supervised Learning	Supervised vs. Unsupervised Machine Learning - Advantages & Disadvantages of Unsupervised Learning	Machine Learning and Deep Learning are Subfields of AI - Difference Between Machine Learning and Deep Learning
SLO-2	How does Machine Learning work? - Features of Machine Learning	Types of data in datasets- Need of Dataset	Types of supervised Machine Learning Algorithm – Advantages & Disadvantages of Supervised Learning	Clustering in Machine Learning - Clustering Method	Capabilities of AI and Machine Learning - Machine Learning Tools

SLO-3	Need for Machine Learning- Classification of Machine Learning	Popular sources for Machine Learning datasets- How do we split data in Machine Learning?	Getting started with Classification - Types of Classification	Applications of Clustering in different fields - Types of Clustering Methods	Tensorflow - PyTorch - Amazon Machine Learning (AML)
SLO 4-5	**Lab 1: Predicting the price of a house based on its size.**	**Lab 4: Classifying emails as spam or not spam based on their content**	**Lab 7: Grouping customers into segments based on their purchasing behavior**	**Lab 10: Classifying handwritten digits from the MNIST dataset.**	**Lab 13:Text classification of news articles into different categories**
SLO-6	History of Machine Learning- Types of Machine Learning	Advantages & Disadvantages of using data in Machine Learning	Classification model Evaluations - Applications of Classification Algorithm	K means Clustering - Mean-shift Algorithm	Apache Spark MLlib- Google ML kit for Mobilex
SLO-7	Machine Learning Techniques- Applications of Machine Learning	Understanding Data Processing- Why do we need Data Preprocessing?	Process of building a Classification Mode - Logistic Regression in Machine Learning	DBSCAN Algorithm - Agglomerative Hierarchical Algorithm	Oryx2 - Shogun
SLO-8	Business Challenges & Benefits of Machine Learning	Different data Pre-processing techniques for machine learning - Advantages of Data Processing in Machine Learning	K-Nearest Neighbour (KNN) Algorithm - Support Vector Machine Algorithm	Association Rule Learning - Types of Association Rule Learning	How Companies Use AI and Machine Learning? - How Machine Learning Will Transform Your Industry
SLO 9-10	**Lab 2: Predicting the price of a house based on its size.**	**Lab 5: Classifying emails as spam or not spam based on their conten**	**Lab 8: Grouping customers into segments based on their purchasing behavior**	**Lab 11: Classifying handwritten digits from the MNIST dataset.**	**Lab 14: Text classification of news articles into different categories**
SLO-11	Machine learning Life Cycle- Difference between Artificial intelligence and Machine learning	Overview of Data Cleaning- Steps involved in Data Cleaning	Naïve Bayes Classifier Algorithm - What is Regression Analysis?	Apriori Algorithm - F-P Growth Algorithm	Top Machine Learning Applications by Industry - Retail or eCommerce Machine Learning Use Cases
SLO-12	Demystifying Machine Learning- How Machine Learning and Artificial Intelligence Will Impact Global Industries	Advantages & Disadvantages of Data Cleaning in Machine Learning:	Types of Regression Techniques - Classification vs Reg	Applications of Association Rule Learning - Overfitting and Underfitting in Machine Learning	Cybersecurity Machine Learning Use Cases - Real-world machine learning use cases
SLO-13	Difference Between Business Intelligence and Machine Learning - How Artificial Intelligence (AI) and Machine Learning (ML) Transforming Endpoint Security?	Data Cleansing tools- Data Cleansing tools- Handling Imbalanced Data in Machine Learning	Comparison between Classification and Regression	Reinforcement learning - Difference between Reinforcement learning and Supervised learning	Machine Learning in Image Recognition - Machine learning in the future

SLO 14-15	**Lab 3: Predicting whether a student will pass or fail an exam based on study hours and previous grades.**	**Lab 6: Predicting whether a loan application will be approved or not based on applicant attributes.**	**Lab 9: Analyzing market basket data to find frequently co-occurring items in transactions.**	**Lab 12: Implementing Q-learning to train an agent to navigate a grid-world environment and reach a goal state while avoiding obstacles.**	**Lab 15: Community detection in social networks using network library.**

Resources			
1	Machine Learning for Absolute Beginners: A Plain English Introduction (Third Edition).Oliver Theobald, Scatterplot Press 2017	4	Machine Learning, Tom Mitchell, McGraw Hill, 1997
2	Essential Machine Learning and Pragmatic AI, By Noah Gift, December 2018	5	Machine Learning Yearning by Andrew Ng, deeplearning.ai, 2018
3	https://www.geeksforgeeks.org/difference-between-machine-learning-and-deep-learning/		

Assessment

Bloom's Level of Thinking		**Continuous Learning Assessment (CLA) (50% weightage)**								**Final Assessment (50 % weightage)**	
		CLA – 1		**CLA – 2**		**CLA – 3**		**CLA – 4 ***			
		(10 %)		**(10 %)**		**(20 %)**		**(10 %)**			
		Theory (%)	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**
1	**Remember**	15	15	15	15	10	10	10	10	15	15
2	**Understand**	15	15	15	15	10	10	10	10	15	15
3	**Apply**	20	25	25	20	25	25	25	25	25	25
4	**Analyze**	20	25	25	20	25	25	25	25	25	25
5	**Evaluate**	15	10	10	15	15	15	15	15	10	10
6	**Create**	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.R.Renuga Devi, Associate Professor, SRM IST, Ramapuram

Course Code	UEN24S01L	Course Title	Communication Skills	Category	S	Skill Enhancement Courses	L	T	P	C
							0	0	4	2

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

CLR	*The purpose of learning this course is to:*	Depth				Attainment			Program Learning Outcomes											
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning,	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLR-1	Bridge the theoretical language knowledge with practical communication skills, essential for academic and professional contexts.																	
CLR-2	Focus on enhancing listening, speaking, reading, and writing skills, crucial for effective interaction and teamwork.																	
CLR-3	Prepare students for employability by building competence in interviews, group discussions, and professional communication.																	
CLR-4	Promote understanding and sensitivity towards linguistic and cultural diversity, key to thriving in a globalized world.																	
CLR-5	Articulate ideas and emotions clearly, overcoming language barriers.																	
CLO	**At the end of this course, learners will be able to:**																	
CLO-1	Acquire basic proficiency in listening, speaking, reading, and writing, enabling effective interaction in everyday and academic scenarios.	✓	✓	-	-	2	85	75	3	-	-	1	3	3	-	2	2	1
CLO-2	Express ideas clearly using appropriate verbal cues and non-verbal signals in social, academic, and professional contexts.	✓	✓	✓	-	2	85	75	3	-	1	2	3	3	-	1	2	1
CLO-3	Enhance their ability to comprehend, evaluate, and respond to diverse forms of written and spoken communication critically.	✓	✓	✓	✓	3	85	75	3	-	3	1	3	3	-	1	1	2
CLO-4	Produce well-organized written documents and oral presentations, showcasing logical thinking and clarity of expression.	✓	✓	✓	✓	3	85	75	3	-	2	3	2	3	-	2	3	3
CLO-5	Demonstrate awareness and sensitivity towards linguistic and cultural diversity, effectively navigating multicultural interactions.	✓	✓	✓	✓	3	85	75	3	3	2	3	2	3	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	Introduction to Communication. Types of Communication- verbal and non-verbal communication Barriers of Communication dynamics of interpersonal communication, Interpret Cross-Cultural Differences in Non-Verbal Communication Develop and Demonstrate Effective Non-Verbal Communication Skills	Introduction to Reading Skills. Discussion of techniques of Reading Skill Reading Skills.(Barriers of reading skills and strategies of effective communication through reading) Identifying common reading problems in students after making them read a few passages.	Introduction to Speaking Skills. Explaining the importance of phonetics and vocabulary Speaking Skills.(Barriers of speaking skills and strategies of effective communication through speaking) Explaining the usage of the Oxford Learner's Dictionary to learn phonetics of the words at the fundamental level.	Introduction to Writing Skills Importance of writing skills Writing Skills.(Barriers of writing skills and strategies of effective communication through writing) Explaining various forms of writing with examples:.	Introduction to appreciation of texts. Encouraging the students to share a few of their favourite lines from any sources they have read or sharing a few lines from paditthadhil piditthadhu.
SLO-2	Introduction to Digital language lab/ usage of mobile applications Equipping the listening skill of the learners Listening Skills.(Barriers of listening skills and strategies of effective communication through listening) Exploring Effective Ways of Listening.	Learners are enabled to record their speech and listen to it in order to correct their problematic areas, repetitive practices of reading select paragraphs from web resources, their standard will be measured.	The right enunciation of certain words to be taught through phonetic representation and decoding the phonetic symbols by learning to use the dictionary.. Observe and repeat and learn the phonetic pronunciation of words by practicing continuously.	Introduction to letter writing. Types of letters- Formal and Informal letters with examples. Learning E-mail etiquette. Class Assignment - write a formal letter and informal letter and check for e-mail etiquettes in writing.	Explaining why appreciating texts creates a good reader. Enabling the students to reflect in the classroom about any of their favourite books/ articles or magazines.
SLO-3	Introducing google podcasts.	The speed, fluency, pronunciation, comprehension of the words in the paragraph	Teaching the usage of Thesaurus to understand and develop various words and improve vocabulary.	Enabling the students to unleash their potentials in creative writing through writing transcripts for advertisements of any product.	Introducing the text of Letters by Mathrubootham published in the Hindu.

SLO-4	Task to write down the words from the audio they have listened to. This activity should be done in two steps. 1. Jotting down the words simultaneously as they listen to the speaker. 2. Writing the transcript of the audio through repetitive play and pause.	hints and tricks to follow where the pauses are to be followed.	Identifying common errors in concord, preposition, direct speech and indirect speech.	write a review of any book or a movie or an interview or a debate.	Reading and recitation of the text of the first letter-Enjoy within limits, says Mr. Mathrubootham Understanding characters by analyzing the usage of their style of language
SLO-5	Imitating the speakers by listening to them and attempting to learn the pronunciation of the words uttered in the audio. Repetitive listening to enhance pronunciation skills	Students group 1- reads – group 2 identifies the flaws in reading. The roles have to be exchanged between the two groups and the activity should be practiced.	Identifying common errors in tenses, punctuation, and syntactical errors. Rectifying the common errors and instructing the learners about the right usage in order to avoid common errors.	Mechanics of writing like capitalization, punctuation, spelling, correct pronoun, preposition, concord usage can be taught. meachnaics of writing - assessed and evaluated.	Reading of the second letter- Nobel? What Nobel, asks Mr. Mathrubootham. Mathrubootham's humour and the language of code switching from Tamil to English and vice –versa.
SLO-6	Introducing to the audios of TED TALK American Speakers. Listening to the native speakers of English Language through TED TALKS. Introducing to the audios of TED TALK British Speakers. Listening to the native speakers of English Language through TED TALKS.	Identify the key arguments in a passage -introductory point, lead point, supportive argument statement, concluding point and the common connecting word between all the key words in the passage. encouraged to identify the key arguments in other passages on their own.	Practicing how to avoid common errors. The learners are introduced to collocations for quick choice of learning how to speak in short time and how to speak effectively.	Teaching effective writing by learning to avoid common errors in concord, preposition, conjunction, relative pronouns, question tags. Practicing effective writing by learning to avoid common errors in concord, preposition, conjunction, relative pronouns, question tags.	Reading of the third letter -Mr. Mathrubootham is fully supporting all new technologies, Mathrubootham's frustration over the failure of technologies and the language that he positively uses to denote hopelessness over technologies.
SLO-7	American and British styles can be differentiated.	Guiding the act of reading through scanning and skimming by model reading of the passages by the instructor.	Practice collocations	common errors in tenses, direct and indirect speech and syntax structure.	Reading of the fourth letter in the classroom and discussion Pizza maavu: Welcome to Mr. Mathrubootham food recipe website,
SLO-8	The recognition of different accents should be practiced by speaking after listening.	scanning and skimming activities	Idioms and phrases	Practicing effective writing by learning to avoid common errors in tenses, direct and indirect speech and syntax structure.	Mathrubootham's love for food and the miscommunication about food.

SLO-9	Learning advanced pronunciation and vocabulary through various computer applications like Woodpecker. Imitate the different sounds and accents - repeat it after listening to any of the videos from the library based on individual interest.	Loud reading and slow mind reading Pauses, pronunciation, comprehension and fluency can be checked for Improvement at this stage through repetitive practices.	A speaking task to learn-collocations, idioms and phrases, vocabulary and phonetic pronunciation Their speaking activity is to be recorded and played again to rectify the errors and highlight the problematic areas in speaking.	Teaching how to write statement of purpose for admission to higher educations, and practicing the same. Teaching how to write a story by looking at a picture. Developing the writing skill through word ladders.	Analyisng the text for regional relevance and National significance. Appreciating the aesthetics of the comic element and the embodiment of humour in the narrative in the letter
SLO-10	Repeat listening to the same time frames and move from 02.01 to 03.00 Choosing any particular time frame and practicing it.	Students -groups -checking the comprehension skills. Analyse the text of a passage. Brainstorming the comprehension Skills-questioning the key points in the passage.	Automating vocabulary through engaging the students in various activity games like solving crossword puzzle and Playing scattergories. Engaging the students to play the games in order to learn the vocabulary.	Introduction to blog writing and steps to become an effective blog writer. Encourage the readers to create their own blogs and post articles on a regular basis.	importance of bringing in the Indianized way of speaking the English Language in order to depict the character called Mathrubootham. Relatable characters of both formal and informal everyday life experiences.
SLO-11	Interested students can complete listening and reflecting the complete audio listening practice and speaking.	Cross check with misunderstanding if any and rectify- match the question and answers.	Spur of the moment speech.	Selecting any news article and learning the writing style in it.	Talk about their favourite letter from the letters of Mathrubootham by recollecting the appreciation of the text according to their perception and understanding.
SLO-12	Group activities and games can be conducted to test the listening skills by responding to the speech given by other students	Passages for reading comprehension are to be given for practice that tests their reading skills.	Prepared speech : Giving a speaking task to the students to speak on their own choice	Students are given chances to write reports on various topics.	Enabling the students to share their Appreciation of any of their favourite lines form the books they have read.

Resources			
1	Horizon- English Text Book – Compiled and Edited by the Faculty of English Departement, FSH, SRMIST, 2023	5	The Art of Public Speaking by Stephen E. Lucas- 2019
2	The Creative Writing Coursebook: Forty Authors Share Advice and Exercises for Fiction and Poetry by Julia Bell and Paul Magrs- 2001	6	Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds by Carmine Gallo – 2014
3	On Writing: A Memoir of the Craft by Stephen King 2000	7	The Anatomy of a Book Review: A Guide for College Students by Ronald J. Weber 1994
4	The Writing Life: Writers on How They Think and Work edited by Marie Arana -2003	8	How to Write a Simple Book Review: It's easier than you think! by Allyson R. Abbott 2013

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assesment (50 % Weightage)
		CLA-1 (10%)	CLA-2 (10%)	CLA-3 (20%)	CLA-4* (10%)	
		Practice (%)	Practice (%)	Practice (%)	Practice (%)	Practice (%)
1	Remember	20	20	15	20	20
2	Understand	20	20	15	20	20
3	Apply	20	20	20	20	20
4	Analyze	20	20	20	20	20
5	Evaluate	10	10	15	10	10
6	Create	10	10	15	10	10
	Total (%)	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Krishna Raj, Sutherland Krishna.Raj1@sutherlandglobal.com-	1	Dr. J Mangayarkarasi, Associate Professor and Head, Dept. of English Ethiraj College for Women, Chennai, jmbwilson97@gmail.com	1	Dr. Pushpanjali Sampathkumar, Assistant Professor, Department of English, FSH, SRMIST
		2	Dr. K S Antonysamy, Associate Professor and Head, Dept. of English Loyola College, Chennai, antonysamyks@loyolacollege.edu	2	Dr. Shanthichitra, Professor, & Head, Department of English, FSH,SRMIST

Course Code	UCD24S03J	Course Title	Industry Oriented Employability and Leadership Skills	Category	S	Skill Enhancement Course	L	T	P	C
							1	0	2	2

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

CLR	*The purpose of learning this course is to:*	Depth				Attainment			Program Learning Outcomes										
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning,	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community	Entrepreneurial Risk Taking	PSO-1	PSO-2
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																	
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	✓	✓	-	-	*2*	*85*	*80*	3	2	3	2	-	-	2	3	-	-
CLO-2	Learn and master a set of practical skills such as time management, self-management, handling conflicts, team leadership	✓	✓	✓	-	*3*	*85*	*80*	2	2	1	2	2	1	2	3	-	-
CLO-3	Understand the basics of entrepreneurship and develop business plan	✓	✓	✓	✓	*3*	*85*	*80*	2	3	3	3	-	3	2	3	-	-
CLO-4	Apply the design thinking approach for leadership	✓	✓	✓	✓	*3*	*85*	*80*	-	3	2	-	2	2	1	1	-	-
CLO-5	Appreciate the importance of ethics and moral values for making of a balanced personality & be an integral human being	✓	✓	✓	✓	*3*	*85*	*80*	3	3	2	2	2	2	2	3	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	9	9	9	9	9
SLO-1	Leadership - definition & Qualities	Team building & dynamics	Management – definition & Manager traits	Innovative leadership – Concept of emotional and social intelligence	Entrepreneurship
SLO-2	Leadership – styles	Work delegation with activity	Work schedule with activity	Synthesis of human and Artificial intelligence	Successful Indian entrepreneurs – case study
SLO-3	Difference between leader and boss	Decision making with activity	Strategic planning	Design thinking	Ethics – definition & Corporate ethics
SLO-4	Case study (based on leadership styles)	Motivation & Motivation for results	Conflict management	Measuring and Sustaining innovation	Importance of ethics
SLO-5	Leadership in diverse organizational hierarchy , cultures and communications	Argumentation, Persuasion, Negotiation, Networking	Energy Management & Novel Ways to manage energy in work place – activity	Case study: Organizations with sustained innovation.	Essential elements of business ethics
SLO-6	Leading the organisation through stability and turbulence	Interpersonal communication	Workforce management	Key elements of design thinking	Creating a harmonious life with work-life balance
SLO-7	Understanding Leadership and its importance.	Budget planning	Time Management	How to transform challenges into opportunities	Ethics and Conduct : Ethical decision-making
SLO-8	Models of Leadership	Workflow optimization	Recruiting and Retaining Talent	How to develop human-centric solutions for creating socially good humans	Importance of ethical principles in professional and social contexts.
SLO-9	Basic Leadership Skills	Critical thinking and Multitasking	Conflict & Stress Management	Emerging trends in design thinking	Building ethical culture: promoting ethical behavior in organization.

Resources

1	Craig E Johnson, Meeting the ethical challenges of leadership, Sage publications, 2018	4	Alexander Osterwalder, Business Model Generation, Wiley, 2013
2	T V Rao, Managers who make a difference: Sharpening your management skill, Random House India, 2016	5	Deborah Tannen, Talking from nine to five: Women and men in the workplace, Harper Collins Publishers, 2010
3	Allan R Cohen, David L Bradford, Influence without authority, Wiley, 2018	6	Dr Carrie Picardi Leadership Essentials you always wanted to know Vibrant Publishers,2021

Assessment									
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)							
		CLA – 1 (20 %)		CLA – 2 (20 %)		CLA – 3 (30 %)		CLA – 4* (30%)	
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	5	5	5	5	15	15	10	10
2	Understand	5	5	5	5	15	15	10	10
3	Apply	25	25	25	25	20	20	20	20
4	Analyze	25	25	25	25	20	20	20	20
5	Evaluate	20	20	20	20	15	15	20	20
6	Create	20	20	20	20	15	15	20	20
Total (%)		100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089 p.chockalingam1986@gmail.com -	1	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu -	1	Mrs.Deepalakshmi S, HOD, Department of Career Guidance, FSH, SRMIST hod.dcgc.ktr@srmist.edu.in
				2	Dr. Elamathiyan E, Assistant Professor, Department of Career Guidance, FSH, SRMIST, elamathe1@srmist.edu.in

Course Code	UMI24Y01L	Course Title	My India Project	Category	Y	Mandatory Course	L	T	P	C
							0	0	0	0

Course Offering Department	Computer Applications	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	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

SEMESTER - V

Course Code	UDS24D03J	Course Title	Deep Learning with Keras and Tensorflow	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
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, and 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.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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	75	3	1	1	-	1	-	-	2	2	2
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.	✓	✓	✓	-	2	85	75	3	1	1	-	2	-	-	1	3	2
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	75	3	1	3	1	2	-	-	1	3	3
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	75	3	2	2	-	3	-	1	-	3	3
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	75	3	2	-	2	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Basics of Deep Learning	**Deep Learning Approaches**	**Neural Networks**	**DNN and Auto encoders**	**Tensor Flow and Keras**
	18	**18**	**18**	**18**	**18**
SLO-1	Deep Learning, Deep Dive, Optimization for Deep Learning	Back propagation, Gradient Descent	Cost Function, Gradient Descent	Improving Activation Maximization with an expert, Performing Activation Maximization in a code space	Getting started with Deep Learning with Tensor Flow and Keras
SLO-2	Aggregated Residual Transformations or Deep Neural Networks, Spatial Transformer Networks	Deep Learning in Real World Applications, Deep learning in Healthcare	Stochastic Gradient Descent, Learning Rate	Explaining DNN Decisions, Backward Propagation Techniques	Getting started with Tensor Flow, Getting started with Keras
SLO-3	End-to-end Optimized Image Compression, Generative Adversarial Nets, Improved Techniques for Training GANs	Deep learning in Retail, Deep learning in Energy	Batches, Epochs and Iteration, Deep Neural Networks and Tools	Deep Neural Net optimization, Tuning, Optimizers overview, Gradient Descent, Stochastic Gradient Descent (SGD)	Deep Learning Framework
SLO 4-6	**Lab 1: Learning XOR Problem**	**Lab 4 : Data Augmentation lab**	**Lab 7: Generative Adversarial Networks**	**Lab 10 : Bidirectional LSTM**	**Lab 13: Install, Import Tensor flow and Keras. Create a Basic Neural Network with few layers.**
SLO-7	Learning Algorithms: Supervised Learning and unsupervised Learning	Deep Learning Approaches, Challenges of Deep Learning	Deep learning in Automobile	Difference between neural network and deep neural network	Tuning the layers, Hyper parameter Tuning
SLO-8	Deep Learning Workflow and applications, Deep Learning Techniques,	Data Issues, Over fitting in neural networks, Hyper parameter optimization, High Performance Hardware,	Deep Learning Neural Network overview, Deep Convolutional Neural Network overview	learning rate, Momentum β, for RMSprop, etc, Mini-batch size, Number of hidden layers, learning rate decay, Regularization λ	Deep Learning Workflow-Model Features-Performance
SLO-9	Classic Neural Networks, Convolutional Neural Networks	Neural network is a Black Box, Lack of Flexibility, Multitasking Deep Learning Security, Artificial Neural Networks	Improving accuracy of the neural networks, Interpretability of Neural Networks, Feature Visualization through Optimization	Convolution , ReLU layer, Pooling, Padding, Flattening, Long Short-Term Memory, Applications of Recurrent Neural Networks	Simple Deep Learning Implementation with the Iris Dataset, Available Modules IN Keras

SLO 10-12	**Lab 2 : Image Classification using CNN**	**Lab 5 : Implementation of RNN**	**Lab 8: variational autoencoder**	**Lab 11: Data Augmentation lab I**	**Lab : 14 Install, Import Tensor flow and Keras. Create a Basic Neural Network with few layers.**
SLO-13	Recurrent Neural Networks (RNNs), Generative Adversarial Networks	Neuron, Weight	Connection to Adversarial Examples, Network Dissection Algorithm	Types of Auto encoders, Applications of Auto encoders	backend module
SLO-14	Self-Organizing Maps, Boltzmann Machines	Bias, Activation Function	Experiments, Advantages of Feature visualization	Dimensionality Reduction with PCA, The Curse of Dimensionality	backend module
SLO-15	Deep Reinforcement Learning, Auto encoders	Forward Propagation, Backward Propagation	Disadvantages of Feature, visualization, Activation Maximization	Principal component analysis, Eigen Value Decomposition	Keras - Applications
SLO 16-18	**Lab 3: Building a deep learning model**	**Lab 6: Restricted Boltzmann machine**	**Lab 9: LSTM**	**Lab 12: Data Augmentation lab II**	**Lab 15: Neural Networks using Keras**

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

Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr. S. Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. Indumathi, SRMIST, Ramapuram.

Course Code	UDS24D04J	Course Title	Big Data Analytics with Applications	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Gain knowledge about the various tools and techniques used in big data analytics																	
CLR-2	Learn the fundamentals of Hadoop and the related technologies																	
CLR-3	Understand the basics of development of applications using MapReduce, HDFS, YARN, Pig, Hive and Sqoop																	
CLR-4	Learn the basics of Apache Spark, Flink and understand the importance of NoSQL databases																	
CLR-5	Learn about Enterprise Data Science and data visualization tools																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Use the various tools and techniques in big data analytics	✓	✓	-	-	2	85	75	3	1	1	1	2	-	-	2	2	2
CLO-2	Apply Hadoop and related technologies to big data analytics	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	3	2
CLO-3	Apply MapReduce, HDFS and YARN develop big data applications	✓	✓	✓	✓	3	85	75	3	-	3	-	3	-	-	1	3	3
CLO-4	Develop applications using Pig, Hive and Sqoop	✓	✓	✓	✓	3	85	75	3	2	2	-	3	-	-	2	3	3
CLO-5	Apply Apache Spark and Flink to applications and understand the importance of NoSQL databases	✓	✓	✓	✓	3	85	75	3	2	-	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Introduction to Apache and Mapreduce	YARN and Hadoop File System	Zookeeper and Sqoop	Flink and NoSql	Data Visualization Tools and Spark
	18	18	18	18	18
SLO-1	Overview and Introduction of Big Data Analytics	MapReduce, Analyzing data with Unix tools and Hadoop	Setting up a Hadoop cluster, Cluster specification and setup	Introducing Oozie, Apache Spark	Enterprise Data Science Overview

SLO-2	Big data mining, Technical elements of the Big Data platform	Scaling Out – Data Flow Combiner Functions	Hadoop configuration, YARN configuration	Limitations of Hadoop and overcoming the limitations	Data Science Solutions in the enterprise
SLO-3	Analytics Toolkit, Components of the analytics toolkit	Hadoop Streaming	Introduction, Installing and Running pig, Basics of Pig Latin,	Core components and architecture of Spark	Enterprise data science – Machine Learning and AI- Enterprise Infrastructure solutions
SLO 4-6	**Lab 1: Install Apache Hadoop**	**Lab 4: Develop a MapReduce program to find the grades of student's.**	**Lab 7: Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day.**	**Lab 10: XYZ.com is an online music website where users listen to various tracks, the data gets collected which is given**	**Lab 13: Develop a MapReduce program to analyze Uber data set to find the days on which each basement has more trips using the given dataset.**
SLO-7	Cloud computing and Big Data	HDFS, Java Interface to Hadoop	Introduction , Installing and running Hive, Introduction to HiveQL	Introduction, Installing Flink to Apache Flink.	Visualizing Big Data, Using Python and R for visualization
SLO-8	In-Memory Computing Technology for Big Data	YARN, Job Scheduling	Introduction to Zookeeper	Batch analytics using Flink	Big Data Visualization Tools, Data Visualization with Tableau
SLO-9	Data Product, Building Data Products	Hadoop I/O, Data Integrity, Compression, Serialization	Installing and running Zookeeper	Big Data Mining with NoSQL	Case Studies: Hadoop and Spark
SLO 10-12	**Lab 2: Develop a MapReduce program to calculate the frequency of a given word in a given file.**	**Lab 5: Develop a MapReduce program to implement Matrix Multiplication.**	**Lab 8: Develop a MapReduce program to find the number of products sold in each country by considering sales data containing fields**	**Lab 11: Develop a MapReduce program to find the frequency of books published each year and find in which year maximum number of books were published using the given data.**	**Lab 14:Develop a program to calculate the maximum recorded temperature by yearwise for the weather dataset in Pig Latin**
SLO-13	Leveraging large datasets, Bigdata workflows	File based Data Structures	The Zookeeper Service	Uses of NoSQL	Machine Learning, Scalable machine learning with Spark
SLO-14	The core modules of Hadoop, Fundamentals of Hadoop, Hadoop Ecosystem	Developing a MapReduce Application	Flume Architecture	Why NoSQL?, Introduction to HBase	Collaborative Filtering
SLO-15	Introduction to Hadoop MapReduce, Hadoop YARN	Working with a Distributed file system	Introduction to Sqoop	Introduction to MongoDB, Cassandra	Classification, Clustering
SLO 16-18	**Lab 3: Develop a MapReduce program to find the maximum temperature in each year.**	**Lab 6: Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.**	**Lab 9: Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.**	**Lab 12: Develop a MapReduce program to analyze Titanic ship data and to find the average age of the people (both male and female) who died in the tragedy. How many persons are survived in each class.**	**Lab 15: Write queries to sort and aggregate the data in a table using HiveQL.**

Resources			
1	Raj Kamal; Preeti Saxena, BIG DATA ANALYTICS: Introduction to Hadoop, Spark, and Machine-Learning, McGraw-Hill Education, 2019.	3	TomWhite, Hadoop: The Definitive Guide,3rd Edition,O'Reilly, 2012.
2	Sridhar Alla,Big Data Analytics with Hadoop3,Packt,2018.	4	Nataraj Dasgupta, Practical Big Data Analytics, Packt, 2 018

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. R. Ramyadevi, SRMIST, Ramapuram.

Course Code	UDS24D05J	Course Title	Intelligent Automation	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
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.
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.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Program Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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	75	3	1	2	-	2	-	-	-	2	2
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.	✓	-	✓	-	2	85	75	3	-	-	2	2	-	-	1	3	3
CLO-3	Have a firm understanding of how Intelligent automation involves people, organizations and also	✓	✓	✓	✓	3	85	75	3	1	3	-	3	-	-	1	2	2
CLO-4	Technologies involving machine learning.	✓	✓	✓	✓	3	85	75	3	2	2	-	3	-	-	2	3	2
CLO-5	Have a firm understanding of the barriers Intelligent Automation poses within an existing IT landscape	✓	-	✓	✓	3	85	75	3	2	2	-	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Overview of Intelligent Automation	**Intelligent Automation in Business**	**Design for Automation**	**Optimizing and Monitoring the process**	**Problem Solving in Intelligent Automation**
	18	**18**	**18**	**18**	**18**
SLO-1	Intelligent Automation Defined-Overview and Benefits.	Greater processing efficiency and ease of use, Workforce agility, Scalable infrastructure	Low Highly scaled automation deployments	Agile implementation, The value of intelligent automation	Public-private partnerships, Private-sector initiatives
SLO-2	Intelligent Automation Defined from academic and industry perspective	Exploring Possibilities and Identifying Opportunities for Intelligent Automation	Adoption and Barriers to Intelligent Automation Adoption and Overview	Increasing process efficiency, Improving customer experience	Structural and workforce change, Building a future workforce
SLO-3	Business Benefits & challenges of Intelligent Automation	Start with a Proof of Concept, Involving the Business and the IT	Gaining Organizational Engagement, Internal Stakeholder and Governance Processes	Optimizing back-office operations, Optimizing the work force productivity	Components of Intelligent Automation Framework, Business Objectives
SLO 4-6	**Lab 1: Introduction to RPA Tools**	**Lab 4: Building a Robotic Process Automation Workflow**	**Lab 7: Exploring with python libraries**	**Lab 10: Web scraping and automation**	**Lab 13 : Build an Industry- Specific Automation Solution-1**
SLO-7	RPA Overview, RPA vs Intelligent Automation,	How Intelligent automation addresses societal and business challenges?	Lack of Strategy, Lack of Skill and Talent	Early adopters and positive returns, Define your business outcomes first	Develop Automated Processes, Intelligent Operations
SLO-8	Intelligent Automation Overview	Rethinking Industries for Intelligent Automation,	Change Management and Culture Readiness	Process Analysis, Prioritization & Excellence, Process Mapping	Hands On Lab Use case Implementation (Consumer-3), Self-Driving Cars
SLO-9	Business Benefits and drivers of Intelligent Automation	Intelligent Automation to be More Innovative	Building a winning intelligent automation strategy	Data Management & Governance, The Human Factor	Problem statement, Problem type-Data engineering
SLO 10-12	**Lab 2: Installation of RPA Blue Prism**	**Lab 5: Data Cleansing and Preprocessing for Automation**	**Lab 8: Process Automation with Python**	**Lab 11: Exploring cognitive automation**	**Lab 14: Build an Industry- Specific Automation Solution-2**
SLO-13	Why is Intelligent Automation important?	Moving Forward with Intelligent Automation,	Defining your vision, Organizational Design	Monitoring Intelligent Automation, Skill oriented education	Model selection, Model engineering,
SLO-14	Working of Intelligent Automation	Implementation challenges of Intelligent Automation	Architecture of technology components, Factors for intelligent automation success Tuning	Engaging with the workforce	Mode outcome, Mode Analysis
SLO-15	Best practices of AI in Intelligent Automation	What Businesses Does Intelligent Automation Work For? How Intelligent Automation Is The Best For Business?	Designating automation as a strategic priority, Automation guidelines	Lifelong learning programmes and incentives	Model optimization, Model pipeline

SLO 16-18	Lab 3: Automation Implementation Strategies	Lab 6: Building a Predictive Model for Automation Tasks	Lab 9: Introduction to Web Scraping and Automation	Lab 12: Exploring AI Integration	Lab 15: Build an Industry- Specific Automation Solution-3

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

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.J Dhilipan,SRMIST,Rampuram
				2	Mrs. PM Kavitha, SRMIST,Ramapuram

Course Code	UDS24D06J	Course Title	Computer Vision	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Understand the basics of Computer Vision																	
CLR-2	Learning the fundamentals of Image Processing Techniques																	
CLR-3	Learn image smoothing techniques																	
CLR-4	Understanding the feature matching algorithm																	
CLR-5	Understanding the Deep Learning algorithm for computer vision																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Implement image processing techniques for computer vision	✓	✓	-	-	2	85	75	3	1	1	1	1	-	-	2	2	2
CLO-2	Gain knowledge to work with image processing techniques	✓	✓	-	-	2	85	75	3	-	1	2	2	-	-	1	2	2
CLO-3	Apply Hough Transformation & Recognition Methodology	✓	✓	✓	✓	3	85	75	3	-	3	-	2	-	-	1	3	3
CLO-4	Explore feature matching techniques.	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Develop applications using Deep Learning algorithm.	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Computer Vision and OpenCV	Image Enhancement and Filtering	Image Gradients	Image segmentation	Image Classification Models & Tensorflow
	18	18	18	18	18
SLO-1	Introduction to Computer Vision, Definition and scope of computer vision	Overview of Binary Image Processing, Thresholding in Opencv	Image Smoothing Techniques, Box Blur, Gaussian Blur, Median Blur, Bilateral Filtering Comparison: Median VS Bilateral	Feature Matching, Different Feature Matching Algorithms in OpenCV, RANSAC	Image Classification Models, Object Detection Techniques

SLO-2	Evolution of computer vision, Task of Computer Vision	Erosion and Dilation in OpenCV, Connected Component Analysis Technioques	Introduction to Image Gradients, First Order Derivative Filters Second Order Derivative Filters	Application: Image Alignment, Creating Panorama, Finding Known Objects using OpenCV	Pedestrian Detection in OpenCV, Face Detection using HAAR Cascade
SLO-3	Applications of computer vision in various fields, Virtual Reality & Augmented Reality	Connected Component Analysis in OpenCv, Contour Analysis in OpenCV	Application: Sharpening Filter, Canny Edge Detection in OpenCV	Image segmentation using GrabCut, Grabcut Theory Grabcut in OpenCV	Face Detection in OpenCV, Deep Learning with OpenCV: Image Classification
SLO 4-6	**Lab 1 : Read,Displaying, Write images using OpenCV**	**Lab 4: Implement different Morphological Operations**	**Lab7: Implement Canny Edge Detection**	**Lab 10 : Image segmentation using GrabCut in openCV**	**Lab13 :Face Detection using OpenCV**
SLO-7	Techniques in Computer Vision, Challenge in computer vision	Blob Detection in OpenCV, Mouse and Trackbar using OpenCv	Hough Transforms, HoughLine: To detect a line in an image HoughCircle: To detect a circle in an image	Image Classification, Histogram of Oriented Gradients(HOG)	Image Classification using Caffe and Tensorflow, Object Detection : Single Shot Multibox Detector(SSD) You Only Look Once Detector(YOLO)
SLO-8	Image formation, Digital Image, Image as Matrix, Manipulating Pixels, Working with Color & Gray Scale images	Image Enhancement and Filtering, Color Spaces : RGB, HSV and Other Color Spaces	High Dynamic Range Imaging in OpenCV, Image Impainting	Eyeglass Classifier in OpenCV, Object Detections	Face Detection: SSD based Face Detector, Neural Networks Models for Image Classifications
SLO-9	Image Operations: Creating Image, Cropping images, Coping a region to another image, Resizing images creating Image mask	Applications: Finding Dominant Color in an image, Desaturation Filter	Seamless Cloning, Seamless Cloning in OpenCV	Motion Estimation using Optical Flow, Lucas-Kanade Optical Flow	Image Filtering Using Convolution in OpenCV, CNN architectures: region-based CNNs, Faster R-CNN
SLO 10-12	**Lab 2:Working Basic Image operating using OpenCV**	**Lab 5 : Working with Contour Analysis**	**Lab 8 : Face Blending**	**Lab 11: Motion Detection in OpenCV**	**Lab 14 : Work with a YOLO/single shot object detection system.**
SLO-13	Mathematical Operations on Images: Data Type Conversion, Contrast Enhancement, Brightness Enhancement	Color Transform, Histogram Equalization	Image In painting, Geometric Transforms: Affine Transform Homography	Object Trackers in OpenCV, Comparison of different trackers	Implementing a CNN in TensorFlow & Keras, Image Classification using Pre-Trained ImageNet Models in TensorFlow & Keras

SLO-14	Image Channels, Splitting & Merging Channels, Manipulating Color Pixels, Images with Alpha Channels	Advanced Histogram Equalization (CLAHE), Color Adjustment using Curves	Geometric Transforms in OpenCV, Image Features: Image Feature: ORB	Multiple Object Tracking using OpenCV, Kalman Filter Tracker	Implementing an MLP in TensorFlow & Keras, Video Analysis: Motion Estimation using Optical Flow
SLO-15	Image Annotation: line over an image, Circle over an image, Rectangle over an image, Ellipse over an image text over an image	Image Filtering Techniques, Image filtering using Convolution in OpenCv	ORB Feature in OpenCV, Application: Image Alignment, Creating Panorama	Tracking using MeanShift, Tracking using CamShift	Object Trackers in OpenCV, Multiple Object Tracking using OpenCV
SLO 16-18	**Lab 3: Working with Image Annotation using OpenCV**	**Lab 6 : Convert the images into different color spaces**	**Lab 9 : Implement Geometric Transforms in OpenCV**	**Lab 12: Tracking using MeanShift and CamShift**	**Lab 15: Image Classification using OpenCV**

Resources			
1	Wesley E. Snyder, Fundamentals of Computer Vision , Cambridge University Press; 1st edition, 2017.	3	Computer Vision: Algorithms and Applications by Richard Szeliski. Available for free online.
2	Computer Vision: A Modern Approach (Second Edition) by David Forsyth and Jean Ponce. Available for free online.		

Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.Helen, SRMIST, Kattankulathur

Course Code	UES24V01T	Course Title	Environmental Studies	Category	V	Value Added Course	L	T	P	C
							2	0	0	2

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

CLR	The purpose of learning this course is to:
CLR-1	To create awareness on environment and renewable and non-renewable resources
CLR-2	To understand about ecosystem and biodiversity
CLR-3	To understand the natural and anthropogenic impact of the environmental pollution
CLR-4	To create awareness on different environmental problems
CLR-5	To create awareness on various environment protection acts and the impact of human population on environment

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLO-1	Applying knowledge on renewable and non-renewable resources	✓	✓	-	-	1	75	70		-	1	-	-	2	1	-	-	-	
CLO-2	Understanding about ecosystem and biodiversity	✓	✓	-	-	1	80	75	3	2	-	1	-	-	2	-	-	-	
CLO-3	Gathering knowledge on impact of environmental pollution	-	✓	✓	-	2	80	75	-	3	2	-	3	-	3	-	-	-	
CLO-4	Understanding of different environmental problems	✓	-	✓	-	3	80	75	-	2	3	-	-	3	2	-	-	-	
CLO-5	Having knowledge on various environment protection acts and the impact of human population on environment problems	✓	-	✓	✓	3	80	75	-	-	3	-	3	2	1	-	-	-	

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	6	6	6	6	6
SLO - 1	Multidisciplinary nature of environmental studies, definition, scope and importance of environmental studies	Energy flow in the ecosystem, energy flow in the ecosystem, ecological succession	Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity	Disaster management- floods, earthquakes, cyclones, landslides	Air, water, wildlife - environment protection act
SLO - 2	Need for public awareness. institutions in environment, people in environment	Food chains, food webs and ecological pyramids	Environmental pollution- definition, causes, effects and control measures of air, water, and soil pollution	Social issues and the environment: From unsustainable to sustainable development	Forest conservation act; issues involved in enforcement of environmental legislation, public awareness
SLO - 3	Introduction to natural resources- renewable and nonrenewable resources - associated problems	Ecosystem, introduction, types, characteristic features, structure and functions: forest, grassland and desert ecosystems	Causes, effects and control measures of marine, and noise	Urban problems related to energy, water conservation, rain water harvesting, watershed	Human population and the environment: population growth, variation among nations

SLO - 4	Forest, water, mineral, food resources	Aquatic ecosystems; biodiversity and its conservation- genetic, species and ecosystem diversity	Causes, effects and control measures of thermal pollution and nuclear hazards	Environmental ethics: issues and possible solutions, climate change & global warming	Population explosion – family welfare programme, human rights, value education
SLO - 5	Energy and land resources; role of an individual in conservation of natural resources; equitable use of resources for sustainable lifestyles	Biogeographical classification of India, value of biodiversity, biodiversity at global, national and local levels	Role of individuals in pollution prevention	Acid rain & ozone layer depletion	HIV/AIDS, women and child welfare
SLO - 6	Concept of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers	India as a mega diversity nation, hot-spots of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife man-wildlife conflicts, endangered and endemic species of India	Solid waste management Causes, effects and control measures of urban and industrial waste	Nuclear accidents and nuclear holocaust; wasteland reclamation	Role of information technology in environment and human health

Resources

1	Bharucha, E (2013). *Textbook of environmental studies for undergraduate courses* (2nd ed.). Orient BlackSwan.	3	Jeyalakshmi, R. (2014). Text book of environmental studies, Devi publications
2	Basu, M., & Savarimuthu, X., (2017), *SJ Fundamentals of environmental studies*. Cambridge University Press, Cambridge, United Kingdom	4	Bharucha, E (2002). *The Biodiversity of India*, Mapin Publishing Pvt. Ltd.

Assessment							Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)	Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1 (10%)	CLA – 2 (10%)	CLA– 3 (20%)	CLA– 4 * (10%)		Presentation Tools	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
							Learning Management System	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20			Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20			Interactive Lecture	✓	Clean Water and Sanitation	✓
3	Apply	20	20	20	20	20			Brainstorming	✓	Affordable and clean energy	✓
4	Analyze	20	20	20	20	20						
5	Evaluate	20	-	20	20	20						
6	Create	-	20	-	-	-						
	Total (%)	100	100	100	100	100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. P. Parthipan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD24S04J	Course Title	Career Readiness and Professional Skills	Category	S	Skill Enhancement Course	L	T	P	C
							1	0	2	2

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

CLR	*The purpose of learning this course is to:*	Depth				Attainment			Program Learning Outcomes										
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking,	Communication Skills, Collaborating	Independent Thinking, Analytical	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural	Environmental Action, Community	Entrepreneurial Risk Taking	PLO-9	PLO-10
CLR-1	Develop resume building practice																	
CLR-2	Prepare for interviews and group discussion																	
CLR-3	Understand the significance of team skills																	
CLR-4	Help students improve their speaking and presenting abilities																	
CLR-5	Acquire career planning skills and fully pursue a successful career path																	
CLO	***At the end of this course, learners will be able to:***																	
CLO-1	Understand the importance of resume preparation and face interview confidently	✓	✓	-	-	*2*	*85*	*80*	2	3	2	3	-	-	-	-	-	-
CLO-2	Perform appropriately and effectively in group discussions	✓	✓	✓	-	*3*	*85*	*80*	2	3	2	3	-	1	2	3	-	-
CLO-3	Empathize with and trust colleagues for improving interpersonal skills	✓	✓	✓	✓	*3*	*85*	*80*	3	3	3	3	1	-	3	2	-	-
CLO-4	Prepare effective presentations considering the important strategies	✓	✓	✓	✓	*3*	*85*	*80*	1	3	2	3	-	2	2	-	-	-
CLO-5	Explore sources of (online/offline) opportunities	✓	✓	✓	✓	*3*	*85*	*80*	-	3	2	3	-	1	2	2	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	9	9	9	9	9
SLO-1	Introduction of resume and its Importance - Difference between a CV, Resume and Bio Data	Mock interview – face to face	Listening as a Team Skill	Types of Presentation - Informative, Instructional, Arousing, Persuasive, Decision-making - Structure of a presentation – Introduction of the event, Introducing the speaker, vote of thanks	Process of Career Exploration - Knowing Yourself - Personal Characteristics
SLO-2	Essential components of a good resume, common errors people make while preparing a resume	Mock interview- Feedback	Trust and Collaboration - Importance of Collaboration in Organization	Improvisation and unprepared presentations, man-woman view, feedback – appreciation and critique - Dos and Don'ts	Knowledge about the World of Work - Requirements of Jobs including Self-employment
SLO-3	Resume building format -Video resume – Tips and tricks – Do's and Don'ts	Meaning and Importance of Group Discussion - types of Group Discussion	The Secret to be a high performing Team	PowerPoint presentation–body language and stage etiquette – practice session	Sources of Career Information - Career Opportunities
SLO-4	Meaning and types of interview (face to face, telephonic, video) - Dress code, background research	Procedure of Group Discussion - Ground rules - Evaluation of Group Discussion	Creativity - Meaning - Strategies to increase Creativity - creativity skills at the Workplace	PowerPoint presentation–practice session	Critical Thinking Skills - Problem Solving Skills - Ability to Learn
SLO-5	STAR Technique (situation, task, approach and response) for facing an interview	Group Discussion - Common Errors Group Discussion Rubric	Methods and Process of Creativity Skills	PowerPoint presentation–practice session	Non- Cognitive Skills - Types of non-cognitive Skills and Strategies
SLO-6	Interview procedure (opening, listening skills, closure, asking questions)	Group discussion – Types and Tips to follow	Social Skills - Peer Pressure	Presentation for Internal and External Communication - online & offline Meetings	Non-Cognitive Skills and Gaps I Socio Economic Status
SLO-7	Keys to attain success in an interview	Group Discussion Practice	Stress and Stress Management - Meaning Stress Management Techniques	Visual elements in Presentation	Brainstorming
SLO-8	Rules and Elements of an Interview	Email Drafting – formal and informal	Social and Cultural Etiquette	Oral Skills and Public Speaking Skills	Logic and Rationality of Critical Thinking
SLO-9	Preparation and Practice	Writing Email – Practice	Characteristics and Enhancing Social Skills	Speaking Skills – Practice	Habits and Traits of the Mind

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

Assessment

Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (100% weightage)							
	CLA – 1		CLA – 2		CLA – 3		CLA – 4	
	(20 %)		(20 %)		(30 %)		(30%)	
	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1 Remember	5	5	5	5	15	15	10	10
2 Understand	5	5	5	5	15	15	10	10
3 Apply	25	25	25	25	20	20	20	20
4 Analyze	25	25	25	25	20	20	20	20
5 Evaluate	20	20	20	20	15	15	20	20
6 Create	20	20	20	20	15	15	20	20
Total (%)	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

Designers

Professional Experts	Higher Institution Experts	Internal Experts
1 Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089 p.chockalingam1986@gmail.com -	1 Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu -	1 Mrs.Deepalakshmi S, HOD, Department of Career Guidance, FSH, SRMIST hod.dcgc.ktr@srmist.edu.in 2 Dr. Muthu Deepa, Assistant Professor, Department of Career Guidance, FSH, SRMIST, muthudem@srmist.edu.in

Course Code	UDS24P02L	Course Title	Internship - II	Category	P	Project Work / Internship	L	T	P	C
							0	0	0	1

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
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 knowledge learnt.																	
CLR-5	Applying the skills in problem solving																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learng, Research Skills	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To get an insight of an industry and organization/company	✓	✓	✓	✓	2	85	75	3	2	2	2	2	2	2	2	2	2
CLO-2	To gain valuable skills and knowledge	✓	✓	✓	✓	2	85	75	3	2	3	3	3	2	2	1	2	2
CLO-3	To make professional connections and enhance networking.	✓	✓	✓	✓	3	85	75	3	2	3	3	3	3	2	1	3	3
CLO-4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	3	2	2	3	3	2	2	2	3	3
CLO-5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	2	2	3	3

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.

Assessment Component	Expected outcome	Type	Evaluators	Criteria or basis	Marks
Review-1	Internship letter Submission Internship title to be described.	Internal	Supervisor / Guide & Internship Coordinator	Feasibility Study of the Internship	20
Review-2	A short presentation about the internship work	Internal	Supervisor / Guide & Project Coordinator	Clarity of the idea, Preliminary work done.	30
Internship Report	Evaluation of internship Report	External	Examiner(s)/ Reviewer(s)	Presentation, Handling Q&A	30
Viva-Voce	Final Presentation				20

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 %

*Student has to be present for the viva voce for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as ‘Ab’

SEMESTER-VI

Course Code	UDS24D07J	Course Title	Advanced Analytics and Data Visualization	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
CLR-1	To understand advanced analytics
CLR-2	To advance in Analytics and data visualization
CLR-3	To Get a strong hands on skill, knowledge and expertise in creating beautiful stories using Analytical applications that are an integral part of SAP analytics
CLR-4	To apply hybrid solutions
CLR-5	To use a hybrid solutions

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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	75	3	1	-	1	1	-	-	2	2	2
CLO-2	Get a strong hands-on skill, knowledge and expertise in creating beautiful stories that are an integral part of SAP analytics	✓	✓	✓	✓	2	85	75	3	1	-	2	2	-	-	1	2	2
CLO-3	Get a strong hands-on skill, knowledge and expertise in creating beautiful stories using analytical applications that area in integral part of SAP analytics	✓	✓	✓	✓	3	85	75	3	1	3	1	2	-	-	1	3	3
CLO-4	Be introduced to the scripting world in SAP analytics for cloud for creating analytical applications	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Use a hybrid solution where SAC serves as a front-end on top of your BPC back bone called Financial Planning in SAP SAC.	✓	✓	✓	✓	3	85	75	3	2	-	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Foundations of Data Visualization	**Charts**	**Data Modelling and Stories**	**Scripting in SAPSAC**	**Planning**
	18	**18**	**18**	**18**	**18**
SLO-1	Foundations of Data Visualization, Data Visualization Overview	Bar Chart, Column Chart, Pie Chart	Data Modelling in SAP SAC, Data Visualization SAP SAC, Predictive modelling in SAP SAC	Creating Analytic Applications in SAP Data Warehouse Cloud. Defining Busy Indicator, Using Popups	Pall The Right Information On The Page, Select The Right Type of dashboard
SLO-2	Business Benefits of Data Visualization, Business Challenges of Data Visualization	Scatter Plot Entitle A Specific Audience And mark their needs	Creating Stories in SAP SAC Stories SAP SAC Overview	Scripting in SAPSAC Analytic Applications Scripting in SAP, SAP overview	Financial Planning in Analytics Designer and Financial Planning in Analytics Designer overview
SLO-3	When to use Data Visualization, Types of Data Visualization, Data Visualization tools and techniques, Why Would a Company Want to Visualize Data?	Choose The Right Visual, Apply Text Carefully and Intentionally, Use The Predictable Pattern For Layouts	Business Benefits of APSAC Stories, Steps to Create stories in SAP SAC, Save the Story	Create a new Scrip to object, Create A Function, Edit The Script Function	Business Benefits of Financial Planning SAPSAC, Cost center Planning ,Product Cost Planning, Sales and Profitability Planning
SLO 4-6	**Lab 1: Data Visualization Tools**	**Lab 4: Working with comment widgets and scripting objects**	**Lab 7: Business Benefits of APSAC Stories**	**Lab 10: Placing the Right information on the page**	**Lab 13: Model Creation**
SLO-7	Solving Data Inefficiencies And Data Visuals, Speed of Decision Making	Select the right data visualization tool, Use Attractive Colors For Telling Data Stories	Typical Work flow in creating an Analytic Application?, Analytic Application , SAP SAC Overview, Place the widget in the canvas	Create A New Argument For The Function, Save the Analytic application	Project Planning, Internal Order Planning, Capital Expense Planning
SLO-8	Identify Data Inaccuracies, Access Real-time information	Types of Data Visualization, Types of Data Visualization	Choose the Data Visualization Component, Add More Widgets, Add Scripts to your widgets	Scripting in SAPSAC Analytic Applications, Widgets SAPSAC overview	Financial Statement Planning, Predictive Modelling in SAPSAC
SLO-9	Promote Storytelling, Exploring business Insights, Discover latest Trends, Tailor Made Reports	Business Benefits of Data Visualization, Charts, Tables, Graphs	Save the Analytic application, Creating Stories using Analytic Application in SAP SAC	Uses of Widgets in SAPSAC, Create a New Widget, Adding a Custom Widget, Modifying the Custom Widget	Predictive Modelling in SAPSAC Overview, Business Benefits of Predictive Analytics in SAPSAC
SLO 10-12	**Lab 2: Visualizing location based data for business insights**	**Lab 5: Applying Color theory in Data Visualization**	**Lab 8: Data Modeling in SAPSAC**	**Lab 11: Scripting in SAPSAC Analytic Applications**	**Lab 14: Predictive Modeling in SAPSAC**

SLO-13	What Does the Future Hold for Visualizing Data, Future of Data Visualizations	Maps, Infographics, Dashboards	Analytic Application SAPSAC Overview, Create New Analytic Application, Changing the Name of Widgets, Adding Comments to Widgets and Table Cells,	Scripting in SAPSAC Analytic Applications, SAPSAC Best Practices,	Steps to implement Predictive modelling in SAPSAC, Identify the ML Scenario,
SLO-14	Location Based Analysis, Storytelling Will Become Crucial, Interactive Dashboards, Data Visualization for everyone	Types of Data Visualization, SAP Analytics for Cloud Overview	Working with the Comment Widget in an Analytic Application, Copying and Pasting Widgets and Scripting Objects, Features of APSAC	Determine Your Goals, Choose relevant KPIs,	Data Acquisition, Data Discovery, Data Processing
SLO-15	Techniques and Best Practices Techniques, Data Visualization techniques Overview	Features of APSAC, Business Benefits of APSAC, Key Capabilities of APSAC	Copying and Pasting Widgets from Story to Analytic Application Restoring Deleted Widgets or Scripting Objects	Tell a story With Your Data, Provide context, Pall the right information on the page	Model Creation, Generating Predictions
SLO 16-18	**Lab3: Techniques and Best Practices Techniques**	**Lab6: Types of Data Visualization**	**Lab 9: Analytic Application SAPSAC**	**Lab12: Scripting in SAPSAC Analytic Applic ations**	**Lab15: Model Creation**

Resources			
1	Data Visualization :a successful design process by Andy Kirk Publisher(s): Packt Publish inglink:https://www.oreilly.com/library/view/data-visualization-a/9781849693462/	2	SAPAnalyticsCloudbyAbassinSidiqpublisher:SAPpresswithRheinwerkpublisher

Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr.R.Thilagavathy, SRMIST, KTR

Course Code	UDS24D08J	Course Title	Data Science for Business Analytics	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
CLR-1	Understand the fundamental concepts and techniques of Data Science.
CLR-2	Gain Proficiency in Statistical Analysis and Exploratory data analysis.
CLR-3	Develop Skills in applying machine learning algorithms for Business Analytics
CLR-4	Learn to visualize and communicate data insights effectively.
CLR-5	Apply data science techniques to solve real-world business problems

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Explore and summarize data effectively	✓	✓	✓	✓	2	85	75	3	1	1	1	1	-	-	2	2	2
CLO-2	Handle and analyze large-scale datasets	✓	✓	✓	-	2	85	75	3	-	1	2	2	-	-	1	2	2
CLO-3	Evaluate and interpret the performance of machine learning models	✓	✓	✓	✓	3	85	75	3	-	3	-	2	-	-	1	3	3
CLO-4	Apply various predictive analytics techniques	✓	✓	✓	✓	3	85	75	3	2	2	-	3	-	-	2	3	3
CLO-5	Analyze real-world business problems and develop data-driven solutions	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Data Analysis and Data Visualization Techniques	**Linear Regression ad Clustering Techniques**	**Time Series and Big data Analytics**	**Model Evaluation and Forecasting**	**Decision Making and Predictive Analysis**
	18	**18**	**18**	**18**	**18**
SLO-1	Introduction to Data Science and Business Analytics, Overview of data science and its role in business analytics	Linear regression for predicting continuous variables, Logistic regression for classification problems	Time Series Analysis and Forecasting, Understanding time series data and its characteristics	Model Evaluation and Selection, Performance metrics for regression and classification models	Business Analytics and Decision Making, Application of data science techniques in business decision- making.
SLO-2	Understanding the data science lifecycle and its stages, Ethical considerations in data science and responsible data usage	Decision trees and random forests for classification and regression, Support Vector Machines (SVM) for classification	Time series decomposition and trend analysis, Forecasting methods (moving averages, exponential smoothing, ARIMA)	Overfitting and underfitting in machine learning models, Model selection techniques: cross- validation, regularization, and feature selection	Optimization models and techniques, A/B testing and experimental design
SLO-3	Data Acquisition and Data Preprocessing, Data collection methods and sources	Evaluation metrics for regression, Classification models	Evaluation metrics for time series forecasting models, Mean Absolute Error (MAE), Root Mean Squared Error (RMSE)	Data Visualization and Communication, Principles of effective data visualization	Social Network Analysis-Introduces social network analysis and its applications in understanding relationships and influence Covers network metrics, community detection, and link prediction
SLO 4-6	**Lab 1: Loading Data: Demonstrate how to load data from different sources (e.g., CSV, Excel) using Pandas' read functions.**	**Lab 4: Removing missing values and outliers from a dataset**	**Lab 7: Applying PCA for feature extraction and data visualization.**	**Lab 10: Evaluating recommender system performance using metrics like precision and recall**	**Lab 13: Collecting data from APIs and integrating it into data analysis tasks**
SLO-7	Data cleaning techniques and handling missing values, Data transformation and feature scaling	Clustering Techniques, Introduction to clustering and its applications	Data Visualization and Communication, Principles of effective data visualization and storytelling	Data Science Tools and Resources, Introduction to popular data science tools (e.g., Python, R)	Data summarization and feature engineering, Hypothesis testing and statistical inference

SLO-8	Handling categorical data and feature encoding, Feature engineering and dimensionality reduction techniques	K-means clustering algorithm, Hierarchical clustering algorithms (agglomerative and divisive)	Using visualization libraries (e.g., Matplotlib, Seaborn) to create insightful plots, Interactive visualization tools (e.g., Tableau, Power BI)	Introduction to libraries and frameworks (e.g., Pandas, NumPy, Scikit-learn), Accessing and manipulating data using SQL Introduction to cloud-based data platforms (e.g., AWS, Azure)	Predictive Analytics using Statistical Techniques, Machine Learning Algorithms for Business Analytics
SLO-9	Exploratory Data Analysis, Descriptive statistics and data summaries	Evaluation metrics for clustering algorithms, Confusion Matix - example	Dashboard design, Storytelling with data and communicating analytical insights	Case Studies and Real-World Applications, Analyzing customer behavior and segmentation	Anomaly Detection- Discusses techniques for detecting unusual patterns and anomalies in data, Covers statistical methods, clustering-based approaches, and outlier detection algorithms
SLO 10-12	**Lab 2: Generating descriptive statistics and visualizations for a dataset**	**Lab 5: Evaluating forecast accuracy and selecting appropriate models for time series forecasting**	**Lab 8: Applying association rule mining for market basket analysis**	**Lab 11: Data Manipulation with Pandas: Loading, cleaning, and transforming data using the Pandas library.**	**Lab 14: Applying named entity recognition and sentiment analysis to analyze text data**
SLO-13	Data visualization techniques using libraries such as Matplotlib and Seaborn, Correlation and covariance analysis	Text Mining and Sentiment Analysis, Introduction to text mining and natural language processing (NLP)	Big Data Analytics, Introduction to big data concepts and cha llenges	Forecasting sales and demand, Fraud detection and anomaly detection	Case Studies: Applying data science techniques to real-world business problems, Identifying and formulating a business problem
SLO-14	Outlier detection and treatment strategies, Hypothesis testing and statistical inference	Text preprocessing techniques (tokenization, stemming, stop word removal), Sentiment analysis using machine learning approaches	Distributed computing frameworks (e.g., Hadoop, Spark), Processing and analyzing big data using distributed systems	Sentiment analysis and text mining, Recommendation systems	Data collection, preprocessing, and analysis, Model development, evaluation, and interpretation
SLO-15	Predictive Modeling Techniques, Introduction to supervised and unsupervised learning	Topic modeling, Document classification	Introduction to NoSQL databases, MongoDB, Cassandra	Tools and libraries for data visualization (e.g., Tableau, Matplotlib, ggplot), Storytelling with data: conveying insights to non-technical stakeholders	Presenting project findings and recommendations
SLO 16-18	**Lab 3: Creating interactive visualizations using libraries like Matplotlib and Seaborn**	**Lab 6: Applying k-means clustering to group similar data points**	**Lab 9: Pre-processing text data by removing stop words, tokenizing, and stemming**	**Lab 12: Creating interactive dashboards and visualizations using Tableau's drag-and-drop interface**	**Lab 15: Understanding privacy regulations and implementing data anonymization techniques**

Resources			
1	"Data Science for Business" by Foster Provost and Tom Fawcett. Published by O'Reilly Media, 2013.	2	"Python for Data Analysis" by Wes McKinney. Published by O'Reilly Media, 2017.
3	"Applied Predictive Modeling" by Max Kuhn and Kjell Johnson. Published by Springer, 2013.	4	"Data Science from Scratch" by Joel Grus. Published by O'Reilly Media, 2019.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S. Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. T. Papitha Christobel, SRM IST, Ramapuram

Course Code	UDS24D09J	Course Title	Artificial Intelligence and Automation for Enterprises	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
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.																	
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 human to pleasant one by automating repetitive, monotonous and often tedious tasks																	
CLR-4	To provide the participants with 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 ITl and scape of the enterprise and defining an end-to end solution and then leveraging the appropriate enabling technologies against it.																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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	75	3	1	1	1	1	-	-	2	2	2
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.	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
CLO-3	Have a firm understanding of how Intelligent automation involves people, organizations and also technologies involving machine learning.	✓	✓	✓	✓	3	85	75	3	1	3	1	2	-	-	1	3	3
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	75	3	2	2	3	3	-	-	2	3	3
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	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Intelligent Automation Framework	**Opportunities for Intelligent Automation**	**Intelligent Automation**	**Agile implementation**	**Intelligent Automation Framework**
	18	**18**	**18**	**18**	**18**
SLO-1	Intelligent Automation Defined, Intelligent Automation Overview	Greater processing efficiency, Ease of use	Low Highly scaled automation deployments, Adoption and Barriers to Intelligent Automation Adoption	Agile implementation, Democratization of app development	Public-private partnerships, Private-sector initiatives
SLO-2	Intelligent Automation Defined from academic, Intelligent Automation Defined industry perspective	Workforce agility, Scalable Infrastructure, Exploring the Possibilities of Intelligent Automation	Barriers of Intelligent Automation Adoption Overview, Gaining Organizational Engagement	CIO leadership, The value of intelligent automation	Structural change, Workforce change
SLO-3	Business Benefits and Challenges of Intelligent Automation	Identifying Opportunities for Intelligent Automation	Internal Stakeholder and Governance Processes, Making the Business Case Stack	Increasing process efficiency, Improving customer experience	Building a future workforce, Components of Intelligent Automation Framework
SLO 4-6	**Lab 1 : Intelligent Automation Tools and Techniques**	**Lab 4 : Customer relationship management – Intelligent Automation**	**Lab 7: Adoption and Barriers**	**Lab 10: Optimizing the work force productivity**	**Lab 13: Business Process Analysis**
SLO-7	Intelligent Automation Framework, RPA vs Intelligent Automation	Involving the Business and the IT, How Intelligent Automation differs from IT Automation?	Lack of Skill and Talent, Change Management and Culture Readiness	More effective monitoring and fraud detection, Product and service innovation	Develop Automated Processes, Intelligent Operations
SLO-8	RPA Overview, Business Benefits of RPA	How Automation is powered by artificial intelligence, How Intelligent automation addresses societal and business challenges	Building a winning intelligent automation strategy, Defining your vision	Early adopters and positive returns, Define your business outcomes first	Hands On Lab Use case Implementation (Consumer-3), Self-Driving Cars
SLO-9	Business Drivers of RPA, Intelligent Automation Overview	Rethinking Industries for Intelligent Automation, Intelligent Automation to Be More Innovative	Organizational Design, Governance and Pipeline	Process Analysis, Prioritization	Problem statement, Problem type
SLO 10-12	**Lab 2 : Develop simple application (Intelligent Automation)**	**Lab 5 : RPA top 5 tools**	**Lab 8: intelligent automation strategy**	**Lab 11: Process Analysis**	**Lab 14: Hands On Lab Use case Implementation (Consumer-3)**

SLO-13	Working of Intelligent Automation, Why is Intelligent Automation important	Moving Forward With Intelligent Automation, Implementation challenges of Intelligent Automation	Factors for intelligent automation success Tuning, Designating automation as a strategic priority	Data Management & Governance, The Human Factor	Mode outcome, Mode Analysis
SLO-14	Best Intelligent Automation, Accuracy, Speed, Service Continuity	How Intelligent Automation is Coming of the age? More process work is pivoting to machines	Modularity and packaged business Capabilities, Automation guidelines	Engaging with the workforce, Lifelong learning programs and incentives	Data visualization, User interface
SLO-15	How to adopt Intelligent Automation, Best practices of AI in Intelligent Automation	What Businesses Does Intelligent Automation Work For?, How Intelligent Automation Is The Best For Business	Pursuing people-focused initiatives, Developing an operating model that enables scaling	Monitoring Intelligent Automation, Skill oriented education	Model optimization, Model pipeline
SLO 16-18	**Lab 3: Top 5 open- source RPA frameworks**	**Lab 6: Explore Taskt tool**	**Lab 9: intelligent automation success Tuning**	**Lab 12: Data Management**	**Lab 15: Design User interface**

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

Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. L. Selvam SRMIST, Kattankulathur

Course Code	UDS24D10J	Course Title	Data Wrangling	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
CLR-1	Clean and format data to eliminate duplicates and errors in your datasets
CLR-2	Learn when to standardize data and when to test and script data cleanup
CLR-3	Scrape websites and APIs to find a bounty of useful information
CLR-4	Explore and analyze datasets with new Python libraries and techniques
CLR-5	Use Python solutions to automate your entire data-wrangling process

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Acquire the Fundamentals of Data Wrangling using Python Data Structures and Libraries	✓	✓	-	-	2	85	75	3	1	1	1	1	-	-	2	2	2
CLO-2	Acquire data and demonstrate the knowledge of Web Scraping	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
CLO-3	Clean data, impute missing values and detect Outliers	✓	✓	✓	✓	3	85	75	3	1	3	1	2	-	-	1	3	3
CLO-4	Perform Data Wrangling and Visualization	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Perform Aggregation and Groupby operation	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Introduction to Data Wrangling and Python libraries	No Relational Database & Read and write XML	Data Cleaning & String Manipulation	Pandas & Types of Plots	Grouping & Data Aggregation
	18	18	18	18	18
SLO-1	Introduction to Data Wrangling, What is the role of data wrangling?	Acquiring & Storing Data, Readability, Cleanliness, and Longevity of the Data	What is Data Cleaning?, Data Cleaning Process	Data Wrangling – Join, Hierarchical Indexing	What is Grouping?, Mechanics of Group By Operation

SLO-2	Why data wrangling?, Data Wrangling Challenges, Tools for Data Wrangling, Data Wrangling Tasks	Where to find Data?, Data Investigation-Case Studies, Relational Databases-MySQL and PostgreSQL	Benefits of Data Cleaning, Example Use Case for Data Cleaning, Components of Quality Data, Subsetting the DataFrame	Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns, Data Wrangling - Combining	Iterating Over Groups, Selecting a Column or Subset of Columns, Grouping with Dicts and Series, Grouping with Functions
SLO-3	**Lab1: Install python, Setting up Ipython and Jupyter Notebook**	**Lab 4: Download a dataset and perform visual exploration of data**	**Lab 7: Explore different data cleaning Tools**	**Lab 10: Implement Combine and merge of data in Pandas Object**	**Lab 13: Perform Groupby Operations using Pandas**
SLO 4-6	Data Sources - EMR, PO, File formats: JSON, XML, EXCEL, CSV, HTML, audio files.	Non-Relational Databases NoSQL, Reading data from different sources	The unique function, Conditional Selection and Boolean Filtering	Combining and Merging Datasets, Database-Style DataFrame Joins	Ex: sum(), min(),Grouping by Index Levels
SLO-7	Handle machine-readable data formats with Python, Working with Excel Files	Data Loading into Pandas , DataFrame, Fundamentals of Regular Expressions RegEx	Handling Missing Data, Filtering Out Missing Data	Merging on Index, Concatenating Along an Axis	What is Data Aggregation?, Column-Wise and Multiple Function Application
SLO-8	Parsing Excel Files, Python Data Structures – Sets, Tuples and Strings, Iterators, Lambda Expressions	Reading and Writing data in text format, Reading text files in pieces, Writing data to text format, Working with delimited format	Filling in missing data, Data Transformation, Removing Duplicates, Transforming Data using a function or mapping	Pandas concat function with arguments, Combining Data with Overlap, Pandas Merge Functions with Arguments, Data Wrangling-Reshaping and Pivoting	Returning Aggregated Data Without Row Indexes, Apply: General split-apply- combine, Suppressing the Group Keys, Quantile and Bucket Analysis
SLO-9	Introduction to Numpy. Pandas, Matplotlib, Numpy Basics, Pandas DataFrames	JSON data, XML and HTML : Web scraping, Introduction to Beautiful Soup library	Replacing values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers	Reshaping with Hierarchical Indexing, stack and unstack, Plotting and Visualization, matplotlib API Primer	Example: Filling Missing Values with Group-Specific Values, Random Sampling and Permutation, Group Weighted Average and Correlation, Group-Wise Linear Regression
SLO 10-12	**Lab 2: Using Python libraries to parse excel file.**	**Lab 5: Use RegEx for text format files**	**Lab 8: Outlier Detection Using a Simple Statistical Test**	**Lab 11: Implement Reshaping and Pivoting using Pandas Object**	**Lab 14: Perform Aggregation Operation on dataframe**
SLO-13	Statistics and Visualization with NumPy and Pandas, Descriptive Statistics using Numpy and Pandas	Scrape HTML content from a Page, Parse HTML Code with Beautiful Soup	Permutation and Random Sampling, Computing Indicator/Dummy Variables	Figures and Subplots, Colors, Markers, and Line Styles	What is Pivot Tables?, Summary of pivot table methods in Python
SLO-14	Random Variables, Probability Distribution	Reading data from XML, Reading data from an API	String Manipulation, String methods, Regular Expressions	Saving Plots to File, Plotting with pandas and seaborn	What is Cross Tabulation? CrossTab function in python
SLO-15	Discrete and Continuous Distribution, Introduction to Matplotlib Through a Scatter Plot	Reading microsoft excel files, Interacting with Web API's	Vectorized Strings, Concat, merge, join data tables	Types of Plots in matplotlib, Facet Grids and Categorical Data	Handling Categorical data in Python, Techniques for Method Chaining

SLO 16-18	**Lab 3: Using NumPy & Pandas to Calculate Basic Descriptive Statistics on the DataFrame**	**Lab 6: Build a Web Scrapper using Python**	**Lab 9: Read any tabular dataset and perform data cleaning**	**Lab 12: Use matplotlib to perform data visualization**	**Lab 15: Perform Cross Tab analysis in Python**

Resources	
1	Data Wrangling with Python, by Kazil and Jarmul (ISBN: 1491948817)

Assessment

Bloom's Level of Thinking		**Continuous Learning Assessment (CLA) (50% weightage)**								**Final Assessment (50 % weightage)**	
		CLA – 1		**CLA – 2**		**CLA – 3**		**CLA – 4 ***			
		(10 %)		**(10 %)**		**(20 %)**		**(10 %)**			
		Theory (%)	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**	**Theory (%)**	**Practice (%)**
1	**Remember**	15	15	15	15	10	10	10	10	15	15
2	**Understand**	15	15	15	15	10	10	10	10	15	15
3	**Apply**	20	25	25	20	25	25	25	25	25	25
4	**Analyze**	20	25	25	20	25	25	25	25	25	25
5	**Evaluate**	15	10	10	15	15	15	15	15	10	10
6	**Create**	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Mrs.M.Ramla, Assistant Profesor, SRM IST, KATTANKULATHUR

Course Code	UDS24P03L	Course Title	Project Work	Category	P	Project Work / Internship	L	T	P	C
							0	0	4	2

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes										
CLR-1	Demonstrate skills learnt in the real time environment	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
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 knowledge learnt.																	
CLR-5	Applying the skills in problem solving																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities,Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To get an insight of an industry and organization/company	✓	✓	✓	✓	2	85	75	3	2	2	1	3	2	1	2	1	2
CLO-2	To gain valuable skills and knowledge	✓	✓	✓	✓	2	85	75	3	3	3	2	3	2	2	1	1	2
CLO-3	To make professional connections and enhance networking.	✓	✓	✓	✓	3	85	75	3	3	3	2	2	3	2	1	2	3
CLO-4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	3	3	3	3	2	2	2	2	2	3
CLO-5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	3	2	2	3	3	2	1	2	2	3

1

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.

Assessment Component	Expected outcome	Type	Evaluators	Criteria or basis	Marks
Review – 0 Internship	Internship letter Submission Proposed Project title to be described. Abstract of the project.	Internal	Supervisor / Guide & Project Coordinator	Feasibility Study of the project	5
Review – I Project Proposal	A short presentation about the Problem statement Literature Survey System architecture Design Specifications	Internal	Supervisor/Guide	Clarity of the idea, Preliminary work done	10
Review – II	Presentation on Techniques, Model/ Algorithm, Modules, coding Prototype of the project	Internal	Supervisor/Guide	Clarity of idea, Presentation	10
Review – III	Final presentation, Demonstration of Project.	Internal	Supervisor/Guide	Technical demonstration, Presentation	10
Report Submission	Submission of final project report	Internal	Supervisor/Guide/Project Coordinator	Regularity, Originality, Systematic progress	15
Project Report	Evaluation of Project Report	External	Examiner(s)/ Reviewer(s)	Presentation, Handling Q&A	30
Viva – Voce	Final Presentation	External	Examiner(s)/ Reviewer(s)	Presentation, Handling Q&A	20

The assessment method for the project work consists of in-semester and end semester evaluations as detailed below:

Assessment							
	Continuous Learning Assessment(CLA) (50% weightage)					**Final Evaluation (50% weightage)**	
	Review-0	**Review-1**	**Review-2**	**Review-3**	**Report Submission**	**Project Report**	**Viva-Voce***
Project Work	5%	10%	10%	10%	15%	30 %	20 %

*Student has to be present for the viva voce for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'

Course Code	UCD24V02T	Course Title	Universal Human Values	Category	V	Value Added Course	L	T	P	C
							2	0	0	2

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes										
CLR-1	Help the students to understand need of value education, appreciate the essential complimentarily between 'values' and 'skills' and to ensure sustained happiness and prosperity which are the core aspirations of all human beings,	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	Help students initiate a process of dialog within themselves to know what they really want to be' in their life and profession.																	
CLR-3	Help students to understand the meaning of happiness and prosperity for a human being. understanding holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.																	
CLR-4	Help students on right understanding of the Human reality and the rest of existence, harmony at all the levels of human living, and live accordingly.																	
CLR-5	Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Evaluate the significance of value inputs in formal education and start applying them in their life and profession	✓	✓	-	-	2	85	75	-	1	1	2	-	3	2	-	-	-
CLO-2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	✓	✓	✓	-	2	85	75	-	-	1	2	-	3	2	-	-	-
CLO-3	Analyze the value of harmonious relationship based on trust and respect in their life and profession	✓	✓	✓	✓	3	85	75	-	1	1	2	-	3	2	-	-	-
CLO-4	Examine the role of a human being in ensuring harmony in society and nature.	✓	✓	✓	✓	3	85	75	-	-	1	2	-	3	2	-	-	-
CLO-5	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	✓	✓	✓	✓	3	85	75	-	-	1	2	-	3	2	-	-	-

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	6	6	6	6	6
SLO-1	Right Understanding, Relationship and Physical Facility	Understanding Human being as the Co-existence of the Self and the Body	Harmony in the Family – the Basic Unit of Human Interaction	Understanding Harmony in the Nature	Natural Acceptance of Human Values
SLO-2	Understanding Value Education	Distinguishing between the Needs of the Self and the Body	Trust – the Foundational Value in Relationship	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	Definitiveness of (Ethical) Human Conduct
SLO-3	Self-exploration as the Process for Value Education	The Body as an Instrument of the Self	Respect – as the Right Evaluation	Exploring the Four Orders of Nature	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
SLO 4	Continuous Happiness and Prosperity – the Basic Human Aspirations	Understanding Harmony in the Self	Other Feelings, Justice in Human-to-Human Relationship	Realizing Existence as Co-existence at All Levels	Competence in Professional Ethics
SLO-5	Happiness and Prosperity – Current Scenario	Harmony of the Self with the Body	Understanding Harmony in the Society	The Holistic Perception of Harmony in Existence	Holistic Technologies, Production Systems and Management Models-Typical Case Studies
SLO-6	Method to Fulfill the Basic Human Aspirations	Programme to ensure self-regulation and Health	Vision for the Universal Human Order	Exploring Co-existence in Existence	Strategies for Transition towards Value-based Life and Profession

Resources

1	Gaur R.R., Sangal R., Bagaria G.P., 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi.	3	A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
2	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.	4	A N Tripathy, 2003, Human Values, New Age International Publishers.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)			
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *
		(20 %)	(20 %)	(30 %)	(30 %)
		Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10
2	Understand	15	15	10	10
3	Apply	20	25	25	25
4	Analyze	20	25	25	25
5	Evaluate	15	10	15	15
6	Create	15	10	15	15
Total (%)		100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Prof. Rajiv Kumar, Member Secretary, NCC-IP as member at AICTE	1	Mrs. V Sumathi, Associate Professor, Sri Sairam Engineering College, Chennai, Tamil Nadu	1	Dr. Supraja P, UHV University Coordinator, SRMIST
				2	Dr. Deepalakshmi S, HoD, Department of Career Guidance Cell, FSH, SRMIST
				3	Dr. Sweety Bakyarani E, Department of Computer Science, FSH, SRMIST

SEMESTER - VII

Course Code	UDS24D11T	Course Title	Research Methodology in Data Science	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

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

CLR	The purpose of learning this course is to:
CLR-1	Understand Research principles while developing software
CLR-2	Gain extensive knowledge about the Research concepts, methods and the process models
CLR-3	Obtain adequate knowledge about Research process models and software
CLR-4	Identify the research methods involved in various area
CLR-5	Gain insight on the Analytical Statistics performed in Research

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To understand the Research and Evaluation techniques	✓	✓	-	-	2	85	75	3	2	-	1	1	-	-	2	1	2
CLO-2	To plan and manage hypothesis value at each stage of the Research	✓	✓	✓	-	2	85	75	3	-	-	2	2	-	-	1	1	3
CLO-3	To learn about the Research Type and find the correct methods	✓	✓	✓	✓	3	85	75	3	1	3	1	2	-	-	1	1	2
CLO-4	To develop Research skill	✓	✓	✓	✓	3	85	75	3	2	-	3	3	-	-	2	1	3
CLO-5	To perform various analytical techniques in research	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	1	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Foundations Of Research	Data Preparation	Research Design	Data Sampling	Data Analysis
	12	12	12	12	12
SLO-1	Introduction to Research Methods	Introduction to literature review	Introduction to research design	Introduction to Design of Sample Survey	Univariate Analysis – Frequency table, Bar chart and Pie chart
SLO-2	Definition of Research	Methods to collect the meaningful data	Identify the research problem	Introduction to Census	Bivariate Analysis – Cross tabulation and Chi square test
SLO-3	Role of Research	Data Cleaning	Select a research problem	Introduction to Sample enumerations	Introduction to Correlation

SLO-4	Objectives of Research	Reviewing the data	Defining a research problem	Difference between Census V/s Sample enumerations	Simple, Partial and Multiple Correlation
SLO-5	Applications of research	Process the data	Introduction to need of research problem design	Introduction to objectives in Research sampling	Pearson's Coefficient of Correlation
SLO-6	Research in Computer Science & Applications	Analysis the Data	Apply the research design with the simple data set	Introduction to principles of sampling	Rank Correlation
SLO-7	Steps involved in research	Conceptualization of a research problem	Introduction to good design	Introduction to Types of Sampling in Research methods	Factor Analysis
SLO-8	Aim and Scope of research in Computer filed	Formulation of a research problem	Feature of good research design	Sampling Errors	Regression
SLO-9	Types of Research	Identifying the variables	Introductions to different research design	Non-sampling errors	Simple and multiple regression
SLO-10	Research Process in the Computer Field	Assigning the initial value to the variables	Different research designs - Exploratory	Determination of the sample size	Discriminant analysis
SLO-11	Introduce the basic software to develop a Research	Constructing hypothesis	Different research designs - Descriptive	Designing Questionnaires	Time Series Analysis
SLO-12	Research Process	Types of hypotheses	Different research designs - Experimental	Design the interview	Methods of Estimating Trend and Seasonal Variations

Resources			
1	Krishna Swamy K.N., Siva Kumar A.I., Mathirajan M., "Management Research Methodology (2006), Pearson Education, New Delhi.	2	Kothari C.R., "Research Methodology, Methods and Techniques, Second edition, (2008), New Age International Publication.

Assessment						
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10%)	(10%)	(20%)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
Total (%)		100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
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				2	Dr.Harshini Manoharan,SRMIST, Ramapuram

Course Code	UDS24D12T	Course Title	Data Analytics for Project Management	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

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

CLR	The purpose of learning this course is to:
CLR-1	Create an understanding why do we use data analytics in project management
CLR-2	Give exposure to know the risk in data analytics
CLR-3	Teach the analytical challenges of modern PMO
CLR-4	Create a knowledge about portfolio management
CLR-5	Impart the knowledge on Big data issues in Project Management

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn	4 Leadership Qualities, Professionalism, Autonomy,	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CLO-1	Understand the role of data analytics in project management	✓	✓	-	-	2	85	75	3	-	-	1	-	3	-	2	-	2
CLO-2	Apply the Exploratory vs Confirmatory vs Predictive analytics	✓	✓	✓	-	2	85	75	3	2	1	2	2	3	-	1	-	-
2CLO-3	Understand and apply the concepts of modern PMO challenges	✓	✓	✓	✓	3	85	75	3	-	3	1	3	3	-	1	-	2
CLO-4	Recognize data analytics and Project Portfolio performance	✓	✓	✓	✓	3	85	75	3	3	-	3	3	3	-	2	3	3
CLO-5	Gain Knowledge in the concepts of Big data issues in Project Management	✓	✓	✓	✓	3	85	75	3	3	-	3	3	-	-	3	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Data Analytics in Project Management	Data Analytics Risk	Analytical Challenges of Modern PMO	Project Portfolio management	Big data issues in project environment
	12	12	12	12	12
SLO-1	Introduction to Data Analytics in Project Management	The Risk management process	Toward an analytically matured PMO	Main role in data analytics	Determining where to start
SLO-2	Overview of Data Analytics and its Role in Project Management	Establishing Tolerance	Method and tools	data analytics and Project Portfolio performance	Pairing data with an analytical method
SLO-3	The Evolution of Project Management	Risk and data analytics language	Human Resources	Introduction to Earned value method	Big data technologies

SLO-4	Why data analytics in Project management	Data collection risk	Project Environment	EVM methods	Driving organizational Maturity and process Discipline
SLO-5	Taking Root	Risk collection	Project Knowledge Management	Earned value graphs	Gaining Stack-holder Buy-in
SLO-6	The View from 10,000	Exploratory vs Confirmatory vs Predictive	The PMO as the multilevel data analysis center	Interrupting earned value results	Communicating the value statement
SLO-7	Data Warehousing	Exploratory risk in data analytics	Project, portfolio and organization	Setting up for EVM	Assigning responsibility
SLO-8	Project Manager	Predictive risk in data analytics	Operation tactics and strategy	Units Completed, Incremental milestones, start/Finish methods	Overcoming data related challenges
SLO-9	Project Office	Predictive analysis and consequences	Introduction to Project Portfolio management	Supervisor/Resource Estimate, Cast ration, Weight or equivalent units	IT Solutions of Data Analytics as applied to Project Management, Setting the Stage
SLO-10	Chief Operating Officer, Executive Committee	Risk in communicating results	Project Portfolio management and Data analytics	EV Pitfalls	Early Warnings of Project Failure, Data Driven Governance
SLO-11	Descriptive, Predictive data analytics	Solving and resolving our data analytics risks	PPM and Decision Making	Preparing for data deluge	Analytical Tool solutions
SLO-12	Data analytics 3.0	Success	Project Portfolio management as a Rational Decision making Process, Practice and Context	Big data challenges at the project level	Project Risk mitigation through data analytics

Resources			
1	Data Analytics in Project Management edited by Seweryn Spalek, CRC Press(Taylor and Francis group)		

Assessment						
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50% Weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10%)	(10%)	(20%)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
Total (%)		100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr N Aswini , SRMIST, Ramapuram

Course Code	UDS24D13J	Course Title	Data Warehousing and Data Mining	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Learn in-depth concepts ,methods and applications of data mining																	
CLR-2	Learn how to start looking at data from the perspective of the data scientist																	
CLR-3	Experimenting with different data mining techniques for knowledge discovery																	
CLR-4	Use R software for data import and export, data exploration and visualization, and for data analysis tasks																	
CLR-5	Demonstrationonhowtoperformclassificationandclusteringdataminingtasksonreal time datasets																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	To understand data mining process and the resulting patterns, types of data, attributes and knowledge discovery process	✓	✓	-	-	2	85	75	3	1	-	1	1	-	-	2	2	1
CLO-2	To study the different data preprocessing techniques before applying the data mining process	✓	✓	✓	-	2	85	75	3	1	-	2	2	-	-	1	2	3
CLO-3	To characterize the kinds of patterns that can be discovered by association rule mining	✓	✓	✓	✓	3	85	75	3	1	3	1	2	-	-	1	3	3
CLO-4	To learn the different prediction, classification and clustering algorithms	✓	✓	✓	✓	3	85	75	3	2	-	3	3	-	-	2	3	3
CLO-5	To categorize and carefully differentiate between situations for applying different data mining techniques for different applications	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Data Mining Tools	Data Integration and Transformation	Data Generalization and Apriori Algorithm	Classification and Prediction	Cluster Analysis and Partitioning
	18	18	18	18	18
SLO-1	Data Warehousing and Business Analysis, Data warehousing Components	What kind of data can be mined? Data Mining Techniques, What kind of patterns can be mined? Are all pattern interesting?	Data Generalization, Data Summarization	Classification and Prediction, What is Prediction?	What is Cluster Analysis?, Overview of Clustering Approaches

SLO-2	Building a Data warehouse, Data Warehouse Architecture	Data Objects and Attribute Types, Nominal, Binary, Ordinal, Numeric, Discrete data types	Analysis of attribute relevance, Mining Class Comparisons	Preparing the data for classification and prediction, Comparing Classification and Prediction methods	Requirements for Cluster Analysis
SLO-3	DBMS Schemas for Decision Support, Data Extraction, Cleanup, and Transformation Tools	Data Mining Functionalities, What technologies are used?	Different Dispersion?, Frequent item-set mining	Basic Concepts-What is Classification, General Approach to Classification	Similarity and Distance Metrics, Characteristics of Clustering Algorithms
SLO 4-6	**Lab 1: : Installation of WEKA Tool - Investigation the Application interfaces of the Weka tool**	**Lab 4: Pre-process a given dataset based on Attribute selection**	**Lab 7: Generate Association Rules using the Apriori Algorithm**	**Lab 10: Naïve bayes classification on a given data set**	**Lab 13: Applying k-means clustering on a given data set**
SLO-7	Metadata, Reporting	Data Pre-processing- Introduction to Data Pre-processing, Data Cleaning, Missing Values, Inconsistent Data	Frequent pattern mining, What is Association rule mining?	Decision Tree Induction, Attribute Selection Methods	Partitioning Algorithms, k-Means Clustering- Centroid Based Technique
SLO-8	Query tools and Applications, Online Analytical Processing (OLAP)	Data Integration and Transformation, Entity Identification Problem.	Methods to discover Association Rules, Market Basket Analysis: A motivational Example	Decision Tree Classifier- Using Entropy, Decision Tree Classifier- Using Gini Index	Partitioning Method: k-Means Clustering-Example, k-Medoids Algorithms
SLO-9	OLAP and Multidimensional Data Analysis, Introduction to Data Mining	Redundancy and Correlation Analysis, Tuple Duplication, Data Reduction	Basic Concepts: Frequent Item Sets, Closed Item Sets, Frequent Item Set Mining- Apriori Algorithm	Tree Pruning Techniques, Rule Based Classifier	Example: k-Medoids, Hierarchical Methods
SLO 10-12	**Lab 2: Overview -Working in the Console**	**Lab 5: Pre-process a given dataset based on Handling**	**Lab 8: Generate Association Rules using the Apriori**	**Lab 11: Finding Association Rules for Employee data.**	**Lab14:Distance Measures in Algorithmic Methods**
SLO-13	Why Data Mining? Evolution of Information Technology, Data mining Foundations Stages of the Data Mining Process	Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Numerosity Reduction	Candidate Generation, Generating Frequent Item Sets- Example	Using IF-THEN rules for Classification, Rule Extraction from Decision Tree	Agglomerative and Divisive Methods, Distance Measures in Algorithmic Methods
SLO-14	Different Types of Data in Data Mining, Data Mining Functionalities, The Architecture of Data Mining	Bar Graphs and Histograms, Under Sampling and Over Sampling	Apriori Algorithm-Examples, Improving the Efficiency of Apriori	Bayes Classification Methods, Bayes Theorem	Dendogram, Density Based Methods: DBSCAN

SLO-15	Data Mining Tools, Knowledge Discovery in Databases or KDD process, KDD Vs Data Mining, Steps in KDD Process	Data Cube Aggregation, Data Discretization	A Pattern Growth Approach for Mining Frequent Item Sets, FP-Growth Algorithm – Basic Idea	Naïve Bayes Classifier, Naïve Bayes –Example	DBScan Algorithm, Evaluation of Clustering
SLO 16-18	**Lab 3: Getting Help in weka tool and Quitting WEKA**	**Lab 6: Create a Weather Table with the help of Data Mining Tool WEKA.**	**Lab 9:Build a Decision Tree by using J48 algorithm**	**Lab 12: To Construct Decision Tree for Weather data and classify it..**	**Lab 15: Write a procedure for Employee data using Make Density Based Cluster Algorithm**

Resources

1	Arun K Pujari, Data Mining Techniques, Univeristy Press Pang-Ning Tan, Michael Steinbach and Vipin Kumar, 2007, “Introduction to Data Mining”,Pearson .	3	J Han and M Kamber , Data Mining : Concepts and Techniques, Third Edition, Morgan Kaufmann Publishers
2	G. K. Gupta, 2006, “Introduction to Data Mining with Case Studies		

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

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Professional Experts		**Higher Institution Experts**		**Internal Experts**	
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Course Code	UDS24D14J	Course Title	Cloud and Grid Computing	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
CLR-1	To develop an awareness on Cloud Computing
CLR-2	To Understand How Grid computing helps in solving large scale scientific problems.
CLR-3	To Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
CLR-4	To Learn how to program the grid and the cloud.
CLR-5	To Understand the security issues in the grid and the cloud environment.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes										
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CLO-1	Differentiate between various software process models.	✓	✓	-	-	2	85	75	3	2	-	1	1	-	-	2	2	2
CLO-2	Prepare project planning documents.	✓	✓	✓	-	2	85	75	3	-	1	2	2	-	-	1	2	3
CLO-3	Apply grid computing techniques to solve large scale scientific problems.	✓	✓	✓	✓	3	85	75	3	-	3	1	2	-	-	1	3	2
CLO-4	Apply the concept of virtualization.	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Use the grid and cloud tool kits.	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Introduction to Cloud Computing	Concepts of Virtualization	Security in Cloud and Data	Open Grid Services	Hadoop Framework
	18	18	18	18	18
SLO-1	Introduction to Cloud Computing	Introduction to Web Service and Service Oriented Architecture	Cloud Management Products	Introduction to Open Grid Service Architecture (OGSA)	Introduction to Hadoop Framework
SLO-2	Evolution of Cloud Computing	SOAP – REST – Basics of Virtualization	Cloud Storage – Provisioning Cloud Storage	Motivation	Input splitting
SLO-3	Cloud Characteristics- Elasticity in Cloud	Full and Para Virtualization	Cloud Security Overview and Challenges	Functionality Requirements	Map and reduce functions

SLO 4-6	**Lab 1: Use Google collaboration tools: Create Google Docs, Sheets and Slides and share it with other users.**	**Lab 4: Create a simple web service using Python Flask/Java/any language [Web Service: Client-server model should be implemented using socket/http]**	**Lab 7: Use security tools like ACUNETIX, ETTERCAP to scan web applications on the cloud.**	**Lab 10: Practical - Implement RPC and Bankers algorithm.**	**Lab 13: Install Apache Hadoop**
SLO-7	On-demand Provisioning	Implementation Levels of Virtualization	Architecture Design – Virtual Machine Security	Practical & Detailed view of OGSA/OGSI	Specifying input and output parameters,
SLO-8	NIST Cloud Computing Reference Architecture	Tools and Mechanisms	Security – Application Security	Data intensive grid service models	Design of Hadoop file system
SLO-9	Architectural Design Challenges	Virtualization of CPU	Data Security	OGSA services.	Dataflow of File read & File write.
SLO 10-12	**Lab 2: Explore public cloud services like Amazon, Google, Sales Force, Digital Ocean etc.**	**Lab 5:Install Oracle Virtual Box/VMware Workstation and create a chat application [Note: Launch two virtual machines for chat application]**	**Lab 8: Cloud networks for finding vulnerabilities, verifying leakage of information to an unauthorized third party**	**Lab 11: Create and distribute a Torrent file to share a file in LAN Environment.**	**Lab 14: Map reduce program to calculate the frequency of a word**
SLO-13	Deployment Models: Public, Private and Hybrid Clouds	Memory – I/O Devices	Amazon EC2	Open source grid middleware packages	Trust models for Grid security environment
SLO-14	Service Models: IaaS- PaaS – SaaS	Desktop Virtualization	AWS, Microsoft Azure	Globus Toolkit (GT4) Architecture	Authentication and Authorization methods
SLO-15	Benefits of Cloud Computing.	Server Virtualization.	Google Compute Engine	Usage of Globus	Grid security infrastructure
SLO 16-18	**Lab 3: Quizzes on different service models and deployment models. Report submission - Comparison of various services provided by different Cloud Service Providers (configuration of VM, cost, network bandwidth etc.).**	**Lab 6: Review web services implementation - Proper Connection should be established between the client and server to make use of the service offered by the Server. Review the working of application in virtual environment.**	**Lab 9: Launch VMs in OpenStack through dashboard.**	**Lab 12: Demonstration and assessment of the implemented algorithms.**	**Lab 15: Map reduce program to calculate the grades of the students**

Resources			
1	Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems - Principles and Paradigm, Second Edition, Pearson, 2006.	4	Bart Jacob, Michael Brown, Kentaro Fukui, Nihar Trivedi,Introduction to Grid Computing, Copyright International Business Machines Corporation, 2005
2	Buyya R., Broberg J., Goscinski A., Cloud Computing: Principles and Paradigm, John Wiley& Sons, 2011	5	Mukesh Singhal, Advanced Concepts In Operating Systems, McGraw Hill Series in Computer Science, 1994.
3	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.	6	John W.Rittinghouse, James F.Ransome, "Cloud Computing: Implementation "Management, and Security", CRC Press, 2010.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	**Remember**	15	15	15	15	10	10	10	10	15	15
2	**Understand**	15	15	15	15	10	10	10	10	15	15
3	**Apply**	20	25	25	20	25	25	25	25	25	25
4	**Analyze**	20	25	25	20	25	25	25	25	25	25
5	**Evaluate**	15	10	10	15	15	15	15	15	10	10
6	**Create**	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

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Course Code	UDS24D15J	Course Title	Machine Learning for Enterprises	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:
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

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Have skills and expertise to train, validate, test, and deploy the models in the production for the consumption of users.	✓	✓	-	-	2	85	75	3	1	1	1	1	-	-	2	2	2
CLO-2	Have a firm understanding of the importance and challenges of learning agents that make decisions is of vital importance today	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
CLO-3	Hands-on skills and knowledge to develop an ensemble based learning system by combining diverse machine learning models together	✓	✓	✓	✓	3	85	75	3	1	2	1	3	-	-	1	3	3
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	75	3	-	-	3	3	-	-	2	3	3
CLO-5	Have a hands-on skills, expertise and knowledge to use and design automated approaches for determining Machine Learning pipelines efficiently	✓	✓	✓	✓	3	85	75	3	-	-	3	3	-	-	2	3	3

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.

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Machine Learning – Deep Dive	**Classification & Feature Engineering**	**Supervised Machine Learning**	**Reinforcement Learning Models**	**Recommendation engine**
	18	**18**	**18**	**18**	**18**
SLO-1	Machine Learning – Deep Dive, Machine learning advanced Concepts, Bias and Variance trade off, Testing and Validation, Cross validation	✓ Classification ✓ Binary Class Classification ✓ Multiclass Classification ✓ Clustering ✓ Density- based methods ✓ Hierarchical methods ✓ Partitioning methods ✓ Grid-based method	Supervised Machine Learning-Classification Type Problems, Decision Tree Classification	Value Based Learning, Policy Based Learning, Model Based Learning, Markov Decision Processes ,Bellman Equations,	How does are recommendation engine work? ✓ Data Collection ✓ Data Storage ✓ Filtering the Data Why Recommendation systems are needed, What can be Recommended, User and Item matching, Types of Recommendation systems
SLO-2	Classification Metric: The confusion matrix in ML, Accuracy, Precision, Recall, F1-Score	Neural networks, Perceptron learning -single and multilayer perceptron, Machine Learning in Real World Applications, ✓Machine learning in Healthcare ✓ Machine learning in Automobile ✓ ML in Product Recommendation ✓ ML in Banking sector ✓ ML in NLP- Sentiment analysis ✓ ML in Computer Vision	Random Forest Classification, Linear Support Vector Machines, Non-Linear Support Vector machines	Reinforcement Learning Models, Monte-Carlo Methods, Temporal-Difference Learning, SARSA: On-Policy TD control,	Content based Recommendation systems, Collaborative filtering, Auto Machine Learning (Auto ML) Auto ML overview, Types of Auto ML

SLO-3	Regression Metric: Mean Squared Error (MSE), Root Mean Squared Error (RMSE). Mean Absolute Error (MAE)	Data Preprocessing for Machine Learning Models, Data Pre-processing overview, Why is Data Pre-processing Important, Data Pre-processing Best Practices	Logistic Regression, Gaussian Naïve Bayes, Bagging and Boosting	Q-Learning: Off-policy TD control, Deep Q-Network, Unit 15: Reinforcement Learning Real World Example –Self Driving Cars	Working of Auto ML ,Auto ML in Google Cloud, Auto ML in Microsoft Azure, When to use Auto ML, Business Benefits, Business Challenges Of Auto Machine Learning, Auto ML Regression, Auto ML Classification, Auto ML Time Series Forecasting, Auto ML Computer Vision
SLO 4-6	**Lab1:Machine Learning Approaches**	**Lab4: Demonstrate Markov Decision Processes**	**Lab 7: Gaussian Naïve bayes**	**Lab10: application of Reinforcement Learning Real World Example**	**Lab13: demonstration of Auto ML Classification**
SLO-7	Iris classification and house price prediction using simple regression and classification algorithm with its metrics, Role of loss function and optimization	Steps in Data Pre-processing for machine learning models ✓ Data Collection ✓ Data Integration ✓ Data Preparation ✓ Data Provisioning	Supervised Machine Learning- Classification Type Problems, Unsupervised Algorithm: K-Means Clustering	Self-Driving Cars Overview, Components of Self Driving Cars System ✓ Cameras ✓ LIDAR ✓ RADAR ✓ Ultrasonics	Machine LearningHandsOnLabWork2- Build, Test and Deploy ML Models(Consumer2), Customer Segmentation
SLO-8	Gradient descent weigh Optimization, Machine Learning Approaches	Feature Engineering, Features overview, Why are Features Important, Feature Engineering overview, Why is Feature Engineering Important, Problem Feature Engineering Solves, Importance of Feature Engineering,	Density Based Clustering, Dimensionality Reduction, Collaborative Filtering	Scene Understanding, Localization and Mapping, Planning and Driving policy, Control, Planning and Driving policy, Control	Problem statement, Problem type, Data engineering

SLO-9	Learning Algorithms, Supervised Learning, Unsupervised Learning, Semi-Supervised Learning	Feature Engineering Best Practices, Feature Extraction, Feature Selection, Feature Construction, Feature Learning, Iterative process of feature engineering	Association Rule Learning, Apriori-Association Measures ✓ Support ✓ Confidence ✓ Lift Unsupervised Machine Learning-Clustering Problems	Action Space Representation, Reward Function, Discrete Q-Learning Agent	Data pipeline, Model selection, Model engineering
SLO 10-12	**Lab2: Python Code for Binary Class classification**	**Lab5: Steps involved in Data Preprocessing**	**Lab8: Demonstrate Clustering Problems**	**Lab11: Demonstrate Learning Agent**	**Lab14: Data Pipeline**
SLO-13	Reinforcement Learning, Similarity Algorithms,	Model Engineering(Model Selection, Model Train, Test, Validate, Analyze, Deploy) Model Selection Model Training Model Validation Model Testing Model Outcome Model Analysis Model Deployment Model R e-training Model Re-testing	K-Means Clustering Density Based Clustering Hierarchical Clustering,	Deep Q-Network Agent, Deep Q-Training,	Model outcome, Model analysis,
SLO-14	How to select a Machine Learning Algorithm	Supervised Machine Learning, Continuous Target Variable, Discrete Target Variable Perceptron Classifier Support Vector Machines(SVM)	UnsupervisedMachine Learning –Association , KNN,	MachineLearning Ensemble Learning Techniques Including Bagging, Boosting, Ensembling Techniques Overview	Model optimization,

SLO-15	Machine Learning Workflow and applications, Challenges and Vision for the Future, Analysis of machine learning applications	Decision tree classifier K-nearest classifier Naïve Bayes classifier	PCA Dimensionality reduction, Agent, Action, Environment	Basis Ensembling Techniques in machine learning Advanced Ensembling Techniques in machine learning Bagging and Bosting	Model pipeline, Data visualization
SLO 16-18	**Lab3:Perform K-Means Clustering algorithm**	**Lab 6: Decision Tree Regression**	**Lab9: Reinforcement Learning**	**Lab12: Bagging and Boosting Algorithms**	**Lab15: Datavisualization**

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

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	**Remember**	15	15	15	15	10	10	10	10	15	15
2	**Understand**	15	15	15	15	10	10	10	10	15	15
3	**Apply**	20	25	25	20	25	25	25	25	25	25
4	**Analyze**	20	25	25	20	25	25	25	25	25	25
5	**Evaluate**	15	10	10	15	15	15	15	15	10	10
6	**Create**	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. S. Albert Antony Raj, SRMIST, KTR
				2	Dr. M. Pandiyan, SRMIST, KTR

Course Code	UDS24D16J	Course Title	Real World Computer Vision Applications	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	3	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
CLR-1	Inculcate the participants with the fundamentals of computer vision, their working principles and their functions in a business scenario.	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
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, and 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																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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	75	3	1	1	1	1	-	-	2	2	2
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	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	3	2
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	75	3	1	2	1	2	-	-	1	3	3
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	75	3	2	2	3	3	-	-	2	3	3
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	75	3	2	2	3	3	-	-	2	3	3

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.

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Computer Vision – Introduction	**Computer Vision Workflow Steps and Computer vision architecture**	**Computer Vision Techniques**	**Image Classification Models**	**Computer Vision in Real World Applications**
	18	**18**	**18**	**18**	**18**
SLO-1	Computer Vision – Introduction, Computer Vision Overview, Computer Vision defined from academic perspective	Computer Vision Workflow Steps, Business Problem Identification, Success Criteria Definition	Computer Vision Techniques an Overview, Image Processing, Image Processing Techniques	Image Classification Models, ImageNet, CIFAR	Computer Vision in Real World Applications, Computer Vision in Healthcare
SLO-2	Computer Vision defined from Industry perspective, Signal Processing for Computer Vision,	Right Computer Vision Techniques, Collect Training Data, Label Train and Test Datasets	Image Restoration, Linear Filtering , Independent Component Analysis , Pixelation, Template Matching, Image Generation Technique, Filtering Techniques in Image Processing	MNIST, Object Detection Models, Fast R-CNN	Computer Vision in Retail, Computer Vision in Energy, Computer Vision in Oil & Gas,
SLO-3	Pattern recognition of Computer Vision, Challenges of Computer Vision, Computer Vision Data Requirements	Train the computer vision model, Evaluate the computer vision model	Linear Filter, Non Linear Filter, Box Filter, Gaussian Filter, Median Filter, Feature detection and matching	Faster R-CNN, Computer Vision Hands On Lab Work - Build,Test and Deploy ML Models (Consumer 1)	Computer Vision in Automobile, Computer Vision in day to day life, Computer vision in security systems
SLO 4-6	**Lab 1-Install OpenCV Displaying images OpenCV**	**Lab 4:Text in Images**	**Lab 7:Image Edge Detection OpenCV**	**Lab 10:Image Filtering Blurring OpenCV,Image Filtering Blurring Gaussian Blur OpenCV**	**Lab 13:Image Filtering bilateral OpenCV**
SLO-7	How much data is needed, s your data good enough?,	**Test the model, Deploy the model**	Harris Corner Detector, SIFT (scale invariant feature transform), SURF (speeded-up robust features), FAST (features from accelerated segment test, BRIEF (Binary Robust Independent Elementary eatures),Harris Corner Detector,SIFT (scale invariant feature transform),SURF (speeded-up robust features),FAST (features from accelerated segment test)	Challenges, High level decisions, Choosing the hardware components (GPU, TPU),	Surveillance, Fingerprint recognition and biometrics, Medical Imaging

SLO-8	Data Structure, Data Format, Data Type,	Iterate the steps process, Computer vision architecture Data Ingestion, Data Pre-processing,	Problems that Computer Vision can Solve, Text Classification, Image Detection	Benefits, Challenges,	Object Recognition, Medical Image Analysis, Content-Based Image Retrieval
SLO-9	Training Data, Validation Data, Test Data	Multiprocessing, Transfer Learning/Model Processing	Image Segmentation, Image Classification, Object Detection	High level decisions, Customer Image Segmentation	Video Data Processing, Virtual Reality and Augmented Reality
SLO 10-12	**Lab2: Reading &Writing images OpenCV**	**Lab 5- Color Space OpenCV Thresholding OpenCV**	**Lab 8: Image Scaling & Rotation using OpenCV**	**Lab 11: Image Filtering Blurring Median Blur OpenCV Morphological Operations Erosion OpenCV**	**Lab 14: Morphological Operations Opening OpenCV**
SLO-13	Image Processing Techniques Image Restoration, Linear Filtering,Independent Component Analysis, Pixelation, Template Matching, Image Generation Technique (GAN), Filtering Techniques in Image Processing Linear Filter, Non-Linear Filter	Data Transformation, Parallel Processing, User Interface and Advanced Analytics	Object Recognition, Object Classification, Computer Vision Models	Problem statement Problem type, Data engineering	Computer vision applications in Construction, Computer Vision applications in Agriculture
SLO-14	Computer Vision Development Hardware and Software Requirements, Building a Computer Vision Hardware system	Computer Vision Implementation Framework, What is a Computer Vision framework?, Features of a good Computer Vision framework	Computer Vision Models overview, Image Processing Models An overview, Hough Transformers	Data pipeline, Model selection, Model engineering Model outcome	Computer Vision applications in Pedestrian detection, Computer vision applications in Parking Occupancy, Computer Vision application in road Conditions Monitoring,
SLO-15	Benefits, Choosing the software Components, Choosing the OS, Adding Packages	Popular Computer Vision frameworks OpenCV, TensorFlow, Matlab,CUDA, YOLO	SURF, Canny Edge Detectors	Model analysis, Model optimization Model pipeline, Data visualization, User interface	Computer Vsion applications in Traffic flow analysis, CV in Manufacturing, Case Study: Self driving cars using Computer vision technology
SLO 16-18	**Lab 3-Draw a Rectangle Draw a Circle**	**Lab 6: Finding Contours**	**Lab 9: Image Translation OpenCV Image Filtering OpenCV**	**Lab 12: Morphological Operations Dilation OpenCV**	**Lab 15: Morphological Operations Closing OpenCV**

Resources			
1	R. Jain, R. Kasturi, and B. G. Schunck, Machine Vision, McGraw-Hill, Inc. 1995.	4	Digital Image Processing and Analysis: Application with MATLAB and CVIPtools, 3rd Edition, SE Umbaugh, Taylor&Francis/CRC Press, 2018
2	Computer Vision: Algorithms and Applications by Richard Szeliski. Available for free online.	5	Computer Vision: A Modern Approach (Second Edition) by David Forsyth and Jean Ponce. Available for free online.
3	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).

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
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				2	Dr.T.Papitha Christobel, SRM IST, RMP

Semester-VIII

Course Code	UDS24D17J	Course Title	Technology Leadership and Innovation Management	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Teach the students 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 students understand, embrace, and deploy the appropriate innovations at scalefor business Organizations to not only survive but thrive.																	
CLR-4	earn 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																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Walk away with concepts of how digital transformation offers a technology-based solution to a business problem that you face in your organization	✓	✓	-	-	2	85	75	3	1	1	1	1	-	-	2	2	2
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	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
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	75	3	1	3	1	2	-	-	1	3	3
CLO-4	Understand the various applications of AI in business and the opportunities being created by advances in AI	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
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	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Principles of Management	**Projects, Programs, and Portfolios**	**Technology Adoption and Diffusion**	**Automation and business cases**	**Technology Assessment**
	15	**15**	**15**	**15**	**15**
SLO-1	Management - General vs. Business, Management Overview, Principles of Management, Financial Management	Issues in Technology Innovation Management, Research Methods in Technology Innovation Management, Customer Value Creation in Technology Firms	Performance Measurement, Performance Management, and Improvements, Need of Technology Forecasting, Technology Lifecycle, Technological Roadmaps and Forecasting	Steps of technology implementation ✓ Plan ✓ Design ✓ Implement Support Automation overview,	Technology Assessment: Technology Choice, Technology Assessment Process, Technology Assessment overview, Importance of technology assessment
SLO-2	Business Environment, Human Resource Management, Marketing Research	Management of Software Engineering Projects, Integrated Product Development, Designing Innovation Communities	Technology Adoption and Diffusion, Technology Adoption and Diffusion Overview, Technology Adoption Lifecycle, Stages of Technology Adoption Lifecycle	Automation and business cases, Business case for automation	Business Benefits and challenges of technology assessment, Various elements in technology assessment, Steps to conduct technology assessment
SLO-3	Communication skills, Leadership skills, Business laws, Customer Relations Management	Program, Project, People, and Product Management, Program Management overview, Foundations of Program Management, Program Management Life Cycle and Methodologies, Program Management Skills	How a Business leverages from Technology Adoption Lifecycle, Why Companies need to focus on Technology Adoption Lifecycle, How Technology Adoption works, Business Benefits of Improving Adoption rates	Technological Change and Impact of Technological Change, Technology change Overview, Process of Technology Changes, Importance of Technology Changes, Characteristics of Technology Changes	Evaluating and Choosing Technologies, Evaluating Criteria, Technology and Innovation Business Case Development
SLO 4-5	**Lab1:Analyse different tools to perform financial management**	**Lab4:Analyze different Project management tools**	**Lab7:Using the performance metrices of various technologies given, analysis and provide the case study about which is the best performing tech**	**Lab 10:Plan, Design and Implement a new technology (I.E. AI, chat bot)**	**Lab 13:Building a business case for introducing new technologies**

SLO-6	Computer Applications, Operations Management, Organizational Behavior	Projects, Programs, and Portfolios, Role and Responsibilities of a Program Manager, Leading a Program, Leading a Program vs Leading a project, Project Management overview, Foundations of Project Management, Project Management Life Cycle and Methodologies, Project Management Skills, Role of a Project Manager	Technology Adoption Challenges, Diffusion of Innovation	Example of Technology Changes, Impacts of Technology Changes, Emerging Technologies, Impact on the workforce	Business cases overview, Data and Assumptions, Business cases – organizational context, Business case opportunity identification
SLO-7	Economics, Business Fundamentals	Organizational structure and culture, People Management overview, Foundations of People Management, People Management Life Cycle and Methodologies, People Management Skills, Getting Work Done Through Others, Assessment and Evaluation, Building Peer Networks, Essentials of communication	Companies and Technological Diffusion, Pattern of Technological Diffusion	Implications for public policy, Corporate Learning, Research, and Innovation	Business case considerations, Effective Decision-making structures, Business case Opportunities., Building a business case for introducing new technologies, Evaluating Industry Trend, Market Demand, and Business Needs, Market Research and competitive analysis
SLO-8	Retail Management, Understanding Industry and Markets	Managing Self, Product Management overview, Foundations of Product Management, Product Management Life Cycle and Methodologies, Product Management Skills, Managing Innovative Product Teams	Product Diffusion, Characteristics of Technology Diffusion	Organizational learning, Obstacles to organizational learning	Use market research to find customers, Find a Market advantage, Five Force analysis, Rivalry among competitors in an Industry, Threat of potential new entrants, Threat of Substitutes for an Industry's Offerings, Power of Suppliers to an Industry, Power of an Industry's Buyers
SLO 9-10	**Lab2:Case Studies- Retail management application using salesforce**	**Lab5: Case study on how to use different tools and equipment for Designing Innovation Communities**	**Lab 8:Technology forcast using data tool**	**Lab 11: Select a process that we do day by day, automate it using any programming language**	**Lab 14: Case study: Study the inventory system of any factory and present it**

SLO-11	Digital Marketing, Leadership and Ethics	Roles and Responsibilities of the Product Manager, Marketing Challenges and Guiding Principles, Customer Development and Crossing the Chasm, Technology Acquisition and Forecasting	Implementation of New Technology, Automation, and Business Case Development, Implementing New Technologies overview	Building a learning organization, Implementing an Effective Corporate Learning Strategy	Limitations of Five Forces Analysis, Market Demand Analysis ✓ Market identification ✓ Business cycle ✓ Product niche Evaluate competition, Evaluating Industry Trend, Market Demand, and Business Needs
SLO-12	Strategic Management, Technology and Innovation Management	Acquisition Laws, Regulations, and Policies, Business Planning, Need and Establishing the Acquisition Team	Marketing Perspective, Framework for implementation	Corporate research overview, importance of Corporate research	Technology Leader overview, Technology steward overview, Aspects of Technology Leadership, Assessment and forecasting Technology assessment Technology forecasting
SLO-13	Principles of Technology Innovation Management, Technology Entrepreneurship	Planning for IT Acquisitions, Acquisition Strategy, Plan, and Implementation	Multiple internal markets, Promotion vs hype	Business Benefits of Corporate Research, Why is corporate innovation needed, Getting started with corporate innovation	Technology management and transfer, Technology assessment techniques, Adopting Project management methodologies from different industries, Build in time to experiment and fail, Taking the management out of project management
SLO 14-15	**Lab3:perform SWOT analysis of any website using tool**	**Lab 6: Program management using tool**	**Lab 9: Market analysis (Analysis the market and produce a case study about the current market needs)**	**Lab 12: Case study: Implementing an Effective Corporate Learning Strategy**	**Lab 15:Case studies with top leaders like Rata Tata, Narayana Murthy, Laxmi Mittal etc**

Resources			
1	V. K. Narayanan, Gina Colarelli O'Connor, (2010), "Encyclopedia of Technology and Innovation", John Wiley & SonsLtdScott Shane, (2008), "The Handbook of Technology and Innovation Management", John Wiley & Sons Ltd	2	Robert S. Friedman, Desiree M. Roberts, Jonathan D. Linton, (2008),"Principle Concepts of Technology and Innovation Management: Critical Research models", Information science reference

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
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3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

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Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Mrs. K. Kanmani, SRMIST, KTR

Course Code	UDS24D18J	Course Title	Social Media and Text Analytics	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
CLR-1	To leverage the power of the R eco-system to extract, process, analyze, visualize and model social media data	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
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																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Understand the basics of social media analytics and R language	✓	✓	-	-	2	85	75	3	1	1	1	1	-	-	2	2	2
CLO-2	Analyze data from major social media channels such as Twitter & Flickr	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	2	2
CLO-3	Acquire knowledge on fundamentals of text mining	✓	✓	✓	✓	3	85	75	3	1	3	1	2	-	-	1	3	3
CLO-4	Perform prediction from text and evaluate it	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3
CLO-5	Perform document matching	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	3	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Social Media Analytics	Sentiment analysis	Text Mining	Document Classification	Mining social media
	15	15	15	15	15
SLO-1	Getting Started with R and Social Media Analytics, Understanding social media	Visualizing data, Managing packages	Overview of Text Mining, What's Special About Text Mining?	Using Text for Prediction, Recognizing that Documents Fit a Pattern	Finding Structure in a Document Collection

SLO-2	Advantages and Significance of social Media, Disadvantages and Pitfalls of social media	Data analytics - Analytics workflow, Machine learning techniques	Structured or Unstructured Data, Is Text Different from Numbers?	How Many Documents Are Enough?, Document Classification	Clustering Documents by Similarity, Similarity of Composite Documents
SLO-3	Social media analytics, A typical social media analytics workflow	Supervised learning, Unsupervised Learning, Text analytics	What Types of Problems Can Be Solved?, Document Classification	Learning to Predict from Text, Similarity and Nearest-Neighbor Methods	k-Means Clustering
SLO 4-5	**Lab 1: Simple Text Analytics**	**Lab 4: Text Analytics**	**Lab 7: Working with Classification**	**Lab 10: Working with Document Classification**	**Lab 13: implementing clustering algorithm**
SLO-6	Opportunities and Challenges,	Registering an application,	Clustering and Organizing Documents	Decision Rules,	The EM Algorithm
SLO-7	Data Science vs. Artificial Intelligence, Types of Analysis	Connecting to Twitter using R, Extracting sample Tweets	Information Extraction, Prediction and Evaluation	Decision Trees, Scoring by Probabilities	The EM Algorithm
SLO-8	Similarities Between Data Science and Business Intelligence, Data Science alignment With Business Intelligence	Trend analysis	From Textual Information to Numerical Vectors, Collecting Documents	Linear Scoring Methods, Evaluation of Performance - Estimating Current and Future Performance	What Do a Cluster's Labels Mean?, Applications, Evaluation of Performance
SLO 9-10	**Lab 2: Working with Data structures**	**Lab 5: Working with Twitter data**	**Lab 8: Information Extraction**	**Lab 11: Decision Trees**	**Lab 14: EM Algorithm**
SLO-11	Data Science Reinforcement with Business Intelligence, Data Science and Business Intelligence Together: Future	Sentiment analysis, Key concepts of sentiment analysis – Subjectivity, Sentiment polarity	Document Standardization, Tokenization	Getting the Most from a Learning Method, Errors and Pitfalls in Big Data Evaluation	Case Study: Market Intelligence from the Web
SLO-12	Three Features for Data Science and Business Intelligence, Getting Started with Data Science, Business Intelligence and AI Journey	Opinion summarization, Features	Lemmatization-Inflectional Stemming, Stemming to a Root	Information Retrieval and Text Mining, Is Information Retrieval a Form of Text Mining?	Case Study: Lightweight Document Matching for Digital Libraries
SLO-13	Functions - Built-in functions User-defined functions, Controlling code flow - Looping constructs, Conditional constructs	Sentiment analysis in R, Follower graph analysis, Flickr Data Analysis	Vector Generation for Prediction Multiword Features, Labels for the Right Answers, Feature Selection by Attribute Ranking, Sentence Boundary Determination	Key Word Search Nearest-Neighbor Methods, Measuring Similarity - Shared Word Count, Word Count and Bonus, Cosine Similarity	Mining social media, E-mail Filtering
SLO 14-15	**Lab 3: Working with Looping and functions**	**Lab 6: Working with Flickr Data Analysis**	**Lab 9: Phrase Recognition**	**Lab 12: Nearest-Neighbor Methods**	**Lab 15: Developing social media Listening Program**

Resources			
1	Raghav Bali, Dipanjan Sarkar, Tushar Sharma, (2017)," Learning Social Media Analytics with R", Packt Publishing.	4	Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, (2015), "Fundamentals of Predictive Text Mining", Second Edition, Springer London
2	Matthew A.Russell, "Mining the social web", 2nd edition- O'Reilly Media, 2013	5	Mining the Social Web_ Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites, Matthew A Russell, O'Reilly, Media.,2013
3	Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan,(ISBN-10: 1507823207)	6	Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 2011

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Mrs. K. Kanmani, SRMIST, KTR

Course Code	UDS24D19T	Course Title	Statistical Analysis and Business Applications	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Create an understanding on the use of Statistical concepts applied in Business Applications																	
CLR-2	Give overview to Applications of Differential/Inferential Statistics in Business Applications																	
CLR-3	Clarify the concepts of Exploratory Data Analysis, Types of Distributions, Anova, Regression, Bagging and Boosting.																	
CLR-4	Learn about the Statistical Machine Learning																	
CLR-5	Apply Statistical analysis in data science for Business Applications																	
CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Learning the importance of Exploratory Data Analysis and Correlation	✓	✓	-	-	2	85	75	3	1	1	1	1	-	-	2	1	2
CLO-2	Applying Statistics in data science and learning about Hypothesis Tests and Distributions	✓	✓	✓	-	2	85	75	3	1	1	2	2	-	-	1	1	2
CLO-3	Understand about Anova, Multiple Linear Regression and classification	✓	✓	✓	✓	3	85	75	3	1	1	1	2	-	-	1	1	3
CLO-4	Interpretation of hypothesis testing, ROC curve, One Hot Encoder and sampling methods	✓	✓	✓	✓	3	85	75	3	2	1	3	3	-	-	2	1	3
CLO-5	Knowledge of Bagging and Boosting	✓	✓	✓	✓	3	85	75	3	2	2	3	3	-	-	2	1	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Exploratory Data Analysis	Binomial Distribution	Simple Linear Regression	Statistical Machine Learning	Random Forest & Bagging
	12	12	12	12	12
SLO-1	Exploratory Data Analysis, Types of data	Confidence Intervals, Normal Distribution	Degrees of Freedom, Anova, two-way Anova	Predicted Values from Logistic Regression, Linear and Logistic Regression: Similarities and Differences	Impurity, pruning
SLO-2	Rectangular and non-Rectangular data, Estimates of Location Mean, Median, mode, robust. outlier	Long-Tailed Distributions, Student's t-Distribution	Chi-Square Test, Regression and Prediction	Fitting the model, Evaluating Classification Models	Measuring Homogeneity or Impurity, Stopping the Tree from Growing

SLO-3	Deviations, Variance, Standard deviation, Mean absolute deviation, Median absolute deviation from the median, range, percentile, inter quartile range,	Binomial Distribution, Chi-Square Distribution	Simple Linear Regression, Fitted Values and Residuals	Accuracy, Confusion matrix	Bagging and the Random Forest, Bagging
SLO-4	Exploring the Data Distribution, Estimates of Variability	F-Distribution, Poisson and Related Distributions	Least Squares, Multiple Linear Regression	Sensitivity, Specificity, Precision, ROC curve	Random Forest, Variable Importance
SLO-5	Percentiles and Boxplots, Density Plots and Estimates	Exponential Distribution, Statistical Experiments and Significance Testing	Cross-Validation, Factor Variables in Regression	Lift, AUC	Hyperparameters, Boosting
SLO-6	Frequency Tables and Histograms, Exploring Binary and Categorical Data	A/B Testing, Control Group	Dummy Variables Representation, Multicollinearity	Strategies for Imbalanced Data, Undersampling	The Boosting Algorithm, XGBoost
SLO-7	Correlation, Scatterplot	Hypothesis Tests, Null hypothesis	Multicollinearity, Heteroskedasticity error	Down sampling, Data Generation	Regularization: Avoiding Over fitting, Hyper parameters and Cross1Validation
SLO-8	Plot for Exploring Two or More Variables, Hexagonal Binning and violin, Contours plot	The Null Hypothesis, Alternative Hypothesis	Non-Normality errors, Non-Normality errors	Statistical Machine Learning, K-Nearest Neighbors	Unsupervised Learning, Principal Components Analysis
SLO-9	Categorical and Numeric Data, Data and Sampling Distributions, Random Sampling and Sample Bias	One-Way Versus Two-Way Hypothesis Tests, Resampling	Classification, Related terms in classification	Distance Metrics, One Hot Encoder	A Simple Example, Computing the Principal Components
SLO-10	Sampling types, Size Versus Quality	Permutation test, Statistical Significance and p-Values	Naive Bayes, Conditional probability	Standardization, Choosing K	Interpreting Principal Components, K-Means Clustering
SLO-11	Sampling Distribution of a Statistic, Central limit theorem	p-value, Alpha, Type 1 and Type 2 Errors	Posterior probability, Discriminant Analysis	KNN as a Feature Engine, Tree Models	A Simple Example, Steps for K-Means Algorithm
SLO-12	Standard Error, Resampling Versus Bootstrapping	Test statistic, t-statistic, t-distribution	Covariance Matrix, Logistic Regression	Key terms for tree model, Loss	Interpreting the Clusters, Selecting the Number of Clusters

Resources			
1	Text Book: Practical Statistics for Data Scientists, Author: Peter Bruce & Andrew Bruce, Publisher(s): O'Reilly Media, Inc	2	Reference: R FOR STATISTICS, Authors: Pierre-Andre Cornillon, Arnaud Guyader, Francois Husson, publisher: CRC Press

Assessment						
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10%)	(10%)	(20%)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
Total (%)		100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Mrs. K. Kanmani, SRMIST, KTR

Course Code	UDS24D20T	Course Title	Applications of Edge IoT and Machine Learning	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

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

CLR	The purpose of learning this course is to:
CLR-1	Understand the basic concepts of IoT and its possible application areas
CLR-2	Understand the various IoT architectures along with compute and management stack across layers
CLR-3	Understand the architecture dissected at physical, Communication and Access levels
CLR-4	Be able to understand and manage the knowledge of models and principles and key techniques for IOT data analytics.
CLR-5	Understand the various enabling technologies for IOT including Big data analytics, Machine learning, Cloud and Streaming analytics

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CLO-1	Appreciate the omnipotent presence of IOT in all fields across globe	✓	✓	-	-	2	85	75	2	1	1	1	1	-	-	2	1	2
CLO-2	Compare and contrast various architectures and be able to justify the right choice for adoption	✓	✓	✓	-	2	85	75	2	1	1	2	2	-	-	1	1	2
CLO-3	Choose appropriate protocols for various levels/layers based on the requirement in hand	✓	✓	✓	✓	3	85	75	2	1	2	1	2	-	-	1	1	3
CLO-4	Implement using the available resources and demonstrate quick to deployment skills wherever applicable	✓	✓	✓	✓	3	85	75	2	2	2	3	3	-	-	2	1	3
CLO-5	Be able to identify and implement practical IOT applications with data analytics techniques	✓	✓	✓	✓	3	85	75	2	2	2	3	3	-	-	2	1	3

Sessions	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
	Introduction to IoT	**IoT Network Architecture and Design**	**Smart Objects**	**Microsoft Azure**	**Machine Learning**
	12	**12**	**12**	**12**	**12**
SLO-1	Introduction to IoT, Genesis of IoT	IoT Network Architecture and Design, Drivers Behind New Network Architectures	Smart Objects: The "Things" in IoT, Sensors, Actuators, Micro-Electro-Mechanical Systems	Introducing IoT Analytics, IoT Analytics for the Cloud	Apache Spark for data processing, Spark and big data analytics
SLO-2	IoT and Digitization, IoT Impact	Scale, Security	Smart Objects: A Definition, Trends in Smart Objects	Building elastic analytics, Designing for scale	Using Spark for IoT data Processing, Lambda architectures
SLO-3	Convergence of IT and IoT, IoT Challenges	Constrained Devices and Networks	Sensor Networks, Connecting Smart Objects	Cloud security and analytics Public/private keys, Public versus private subnets, Access restrictions, Securing customer data	Getting to Know Your Data - Exploring IoT Data, Exploring and visualizing data, The Tableau overview
SLO 4	Introduction, IoT Data and Big Data, IoT Conceptual Framework	Comparing IoT Architectures, The oneM2M IoT Standardized Architecture	Communications Criteria, IoT Access Technologies – Introduction	The AWS overview: AWS key concepts, AWS key core services, AWS key services for IoT analytics	Techniques to understand data Quality, Data completeness
SLO-5	Data Flow of IoT, IoT Architectural View	The IoT World Forum (IoTWF) Standardized Architecture, Layer 1: Physical Devices and Controllers Layer	IoT Access Technologies-Definitions, IP as the IoT Network Layer	Microsoft Azure overview: Azure Data Lake Store, Azure Analysis Services, The ThingWorx overview	Data validity, Basic time series analysis
SLO-6	Technology Behind IoT, Sources of IoT	Layer 2: Connectivity Layer, Layer 3: Edge Computing Layer	The Business Case for IP, The Need for Optimization	Creating an AWS Cloud Analytics Environment: The AWS Virtual Private Cloud (VPC) setup walk-through	Machine Learning, Machine Learning Overview
SLO-7	M2M Communication, Examples of IoT	Upper Layers: Layers 4-7, A Simplified IoT Architecture	Optimizing IP for IoT, Profiles and Compliances	Creating a key pair for the NAT and bastion instances, Creating an S3 bucket to store data	Supervised Learning, Unsupervised Learning
SLO- 8	Design Principles for Connected Device, IoT/M2M Systems, Layers and Designs Standardization	The Core IoT Functional Stack, Layer 1: Things: Sensors and Actuators Layer	Internet Protocol for Smart Objects (IPSO) Alliance, Wi-SUN Alliance	Creating a VPC for IoT Analytics, How to terminate and clean up the environment	Machine Learning and Getting Intelligence from Big Data, Predictive Analytics
SLO-9	Modified OSI Model for the IoT/M2M Systems, ITU-T Reference Model	Layer 2: Communications Network Layer, Layer 3: Applications and Analytics Layer	IPv6 Ready Logo, IoT Application transport methods- Definitions	ThingSpeak an Overview, Setup and Configuring ThingSpeak	Edge Streaming Analytics, Comparing Big Data and Edge Analytics

SLO-10	ETSI M2M Domains and High-level Capabilities, Communication Technologies	Analytics Versus Control Applications, Data Analytics Versus Business Benefits	Application Layer Protocol Not Present SCADA, A Little Background on SCADA	Collecting All That Data - Strategies and Techniques: Designing data processing for analytics	Edge Analytics Core Functions, Distributed Analytics Systems
SLO-11	Wired Communication Technology, Communication Technologies—A Comparison	IoT Data Management and Compute Stack, Fog Computing	Adapting SCADA for IP, SCADA Protocol Translation	Applying big data technology to storage: Hadoop, Hadoop cluster architectures	Network Analytics, Flexible NetFlow Architecture
SLO -12	Data enrichment, data Consolidation and device Management at gateway, Device-management Gateway	Edge Computing, The Hierarchy of Edge, Fog, and Cloud	IoT Application Layer Protocols, Message Queuing Telemetry Transport (MQTT)	Hadoop Distributed File System, Parquet, Avro, Hive,SerDe, YARN	FNF Components, Flexible NetFlow in Multiservice IoT Networks

Resources			
1	Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill Education (India) Private Limited, ISBN-13: 978-93-5260-522-4	2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by Rob Barton, Gonzalo Salgueiro, David Hanes, Publisher: Cisco Press, Release Date: June 2017, ISBN: 9780134307091 (https://www.oreilly.com/library/view/iot-fundamentals-networking/9780134307091/)

Assessment						
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10%)	(10%)	(20%)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
Total (%)		100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
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1	Mr.Jothi Periaswamy, Founder/Chief Data Scientist, DeepSphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr.S.Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. L. Selvam, SRMIST, KTR

Course Code	UDS24P04L	Course Title	Research Project and Dissertation	Category	P	Project Work / Internship	L	T	P	C
							0	0	24	12

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

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes									
CLR-1	Demonstrate skills learnt in the real time environment	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	Explore the different industries that are using IT	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
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																	
CLO	At the end of this course, learners will be able to:																	
CLO-1	To get an inside view of an industry and organization/company	✓	✓	-	-	2	85	75	3	2	2	1	2	1	1	2	1	2
CLO-2	To gain valuable skills and knowledge	✓	✓	✓	-	2	85	75	3	3	2	2	2	2	1	1	1	2
CLO-3	To make professional connections and enhance networking	✓	✓	✓	✓	3	85	75	3	3	3	1	3	2	2	1	2	3
CLO-4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	3	3	3	3	3	1	2	2	2	3
CLO-5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	3	2	3	3	3	2	2	2	2	3

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.

Assessment Component	Expected outcome	Type	Evaluators	Criteria or basis	Marks
Review – 0 Internship	Internship letter Submission Proposed Project title to be described. Abstract of the project.	Internal	Supervisor / Guide & Project Coordinator	Feasibility Study of the project	5
Review – I Project Proposal	A short presentation about the Problem statement Literature Survey System architecture Design Specifications	Internal	Supervisor/Guide	Clarity of the idea, Preliminary work done	10
Review – II	Presentation on Techniques, Model/ Algorithm, Modules, coding Prototype of the project	Internal	Supervisor/Guide	Clarity of idea, Presentation	10
Review – III	Final presentation, Demonstration of Project.	Internal	Supervisor/Guide	Technical demonstration, Presentation	10
Report Submission	Submission of final project report	Internal	Supervisor/Guide/Project Coordinator	Regularity, Originality, Systematic progress	15
Project Report	Evaluation of Project Report	External	Examiner(s)/ Reviewer(s)	Presentation, Handling Q&A	30
Viva – Voce	Final Presentation				20

The assessment method for the project work consists of in-semester and end semester evaluations as detailed below:

Assessment							
	Continuous Learning Assessment(CLA) (50% weightage)					**Final Evaluation (50% weightage)**	
	Review-0	**Review-1**	**Review-2**	**Review-3**	**Report Submission**	**Project Report**	**Viva-Voce***
Project Work	5%	10%	10%	10%	15%	30 %	20 %

*Student has to be present for the viva voce for assessment. Otherwise, it will be treated as non-appearance for the examination with final grade as 'Ab'

Course Code	UDS24P05L	Course Title	Professional Internship	Category	P	Project Work / Internship	L	T	P	C
							0	0	24	12

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

CLR	The purpose of learning this course is to:
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

CLO	At the end of this course, learners will be able to:	Depth				Attainment			Programme Learning Outcomes									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CLO-1	To get an insight of an industry and organization/company	✓	✓	-	-	2	85	75	3	2	2	2	2	2	2	2	2	2
CLO-2	To gain valuable skills and knowledge	✓	✓	✓	-	2	85	75	3	2	3	3	3	2	2	1	2	2
CLO-3	To make professional connections and enhance networking	✓	✓	✓	✓	3	85	75	3	2	3	3	3	3	2	1	3	3
CLO-4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	3	2	2	3	3	2	2	2	3	3
CLO-5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	2	2	3	3

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. 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.

Assessment Component	Expected outcome	Type	Evaluators	Criteria or basis	Marks
Review-1	Internship letter Submission Internship title to be described.	Internal	Supervisor / Guide & Internship Coordinator	Feasibility Study of the Internship	20
Review-2	A short presentation about the internship work	Internal	Supervisor / Guide & Project Coordinator	Clarity of the idea, Preliminary work done.	30
Internship Report	Evaluation of internship Report	External	Examiner(s)/ Reviewer(s)	Presentation, Handling Q&A	30
Viva-Voce	Final Presentation				20

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

*Student has to be present for the viva voce for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'