M. Sc. Data Analytics

Syllabus

AFFILIATED COLLEGES

Program Code:

2020-2021 onwards



BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC, Ranked 13th among Indian Universities by MHRD-NIRF, World Ranking: Times -801-1000,Shanghai -901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)

The PEOs of **M.Sc Data Analytics** programme describe accomplishments that graduates are expected to attain within five to seven years after graduation

PEO1	Apply terminologies and principles in problem solving adapting to applications of Mathematics, Statistics, Business and emerging computing technologies in the field of Data Analytics to conceptualize real world problems.
PEO2	Exhibit proficiency as data analytics professionals through latest technologies to business and organizations in demonstrating the ability for work efficacy
PEO3	Work and collaborate with interdisciplinary backgrounds as a part of team to address the contemporary issues with innovation
PEO4	Pursue entrepreneurship, research and higher studies associated with the program to function efficiently and effectively addressing challenging problems innovatively in the society
PEO5	Communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavor
PEO6	Practice their profession as Data Analyst with high regard to ethical responsibilities.

Program Specific Outcomes (PSOs)

After the successful completion of M.Sc Data Analytics Programme, the students are expected to demonstrate

PSO1	Knowledge on Data Analytics Principles and Components Data Acquisition, Data Transformations, Big Data Platforms for analysis and Interpretation
PSO2	Sound Knowledge of constructing data into meaningful structures by data curation and reporting to predict and gather valuable Data Insights
PSO3	Knowledge on using Statistics, Mathematics in designing Models and Algorithms for achieving Business Objectives
PSO4	Sound Knowledge on Data Analytics, Big Data Technology Tools, Visualization, Database Management, Machine Learning and Programming for Analytics of Large scale Data to support business processes and functions
PSO5	Apply data science methods in assessing data requirements and integrating data analytic problem framework for domain specific applications
PSO6	Communicate data assumptions, analysis and insights in written and visual dashboards and articulate as data story
PSO7	Knowledge on Professional and ethical responsibility on data ownership and data privacy

Program	u Outcomes (POs)
On succe	ssful completion of the M. Sc. Data Analytics program
PO1	Apply knowledge of mathematics, statistics, science and computing appropriately to model the software applications, configure software platform and analyze real time data in heterogeneous domains.
PO2	Design a system, component or process, tools to meet desired needs within realistic constraints such as economic, environmental, social, and ethical and safety contexts.
PO3	Have an ability to design, implement, evaluate, analyze, interpret complex problems and data, provide sustainable computational solutions and synthesis of information to provide valid conclusion for domains of business, healthcare, environment,.
PO4	Create, Select and apply appropriate technologies, tools, techniques for data modeling, processing of complex problems and prediction for data analysis.
PO5	Communicate effectively with the computing community, and with society, about complex computing activities by being able to comprehend and write effective reports, design documentation, demographics and make effective presentations.
PO6	Manage projects and function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO7	Understand the impact of professional analytical solutions in societal and environmental contexts and apply the knowledge for benefit of individual for sustainable development.
PO8	Recognize the need for, and prepare them to engage in independent and life-long learning in the context of technological advancements for the betterment of individuals, organizations, research community and society.
PO9	Apply ethical principles, commit to professional ethics and responsibilities and human values.
PO10	Utilize the knowledge of education in understanding of data, management principles, computing solutions to apply on one's own work, as a member and leaderinateamtomanageprojectinmultidisciplinaryenvironmentsandsocietal contexts.

BHARATHIAR UNIVERSITY : : COIMBATORE 641 046

M.Sc. Data Analytics Curriculum

(For the students admitted during the academic year 2020 – 21 onwards)

SCHEME OF EXAMINATIONS

Course	Title of the Course	Credits	H	ours	Maximum Marks		
Code	The of the Course		Theory	Practical	CIA	ESE	Total
	FIRST	SEMEST	ER				
	Principles of Data	4	4	0	25	75	100
13A	Science						
13B	Probability and Statistics for	4	4	0	25	75	100
	Data Analytics	334					
13C	Data Structure, Design	4	4	0	25	75	100
	and Analysis of Algorithms	100 C	1994				
13D	Python Programming	3	4	0	25	75	100
13E	Data Mining	3	4	0	25	75	100
13P	Data Structures, Design and Analysis	4	0	5	40	60	100
	of Algorithms Lab	A. 1	1	~			
13Q	13Q Python Programming Lab		0	5	40	60	100
Total	No. interest	26	20	10	205	495	700
	SECON	D SEMES	TER			1	1
23A	Advanced Database	4	4	0	25	75	100
	Management		50 1	211			
23B	Mathematical Foundations	4	4	0	25	75	100
	for Machine Learning	1 h h h	- AS	1			
23C	Data Visualization	4	3	0	25	75	100
23D	Data Analytics with R	4	3	0	25	75	100
2EA/ 2EB	Elective-I:	3	4	0	25	75	100
2EC/ 2ED	Elective-II:	3	4	0	25	75	100
23P	Data Analytics with R Lab	4	0	4	40	60	100
23Q	Data Visualization with Tableau Lab	4	0	4	40	60	100
	Total	30	22	8	230	570	800
		50		Ũ	200	270	000

	THIRD	SEMES'	TER				
33A	Virtualization and Cloud	4	4	0	25	75	100
33B	Big Data Frameworks and Tools	4	4	0	25	75	100
33C	Machine Learning	4	4	0	25	75	100
3EA/3E B	Elective – III:	3	4	0	25	75	100
3EC/3E D/3EE	Elective – IV:	3	4	0	25	75	100
33P	Map Reduce Programming Lab	4	0	5	40	60	100
33Q	33Q Machine Learning Lab		0	5	40	60	100
	Total	26	20	10	205	495	700
	FOURT	H SEMES	STER	T	0		r
4PZ	Project and Viva Voce	8			160	40	200
		8			160	40	200
	Grand Total	90	62	28	800	1600	2400
	ONLINE COURSES						
1.	#SWAYAM / MOOC	2					
2.	#Job oriented Certificate	2					
	course						

THIRD SEMESTER

	M.Sc. (Data Analytics)						
	Elec	ctive					
Course Code	Title of the CourseCreditsHoursMaximum Mark						
			Theory	Practical	CIA	ESE	
	Elective I						
	Evolutionary Computing	4	4	0	25	100	
	Text Analytics	4	4	0	25	100	
	Elective II	÷.					
	Internet of Things	4	4	0	25	100	
	Sentiment Analysis	4	4	0	25	100	
	Elective III	5	E.				
	Social Media Mining	4	4	0	25	100	
	Progressive Web Application Development	4	4	0	25	100	
	Elective IV	10.00	159-1	19			
	Semantic Web	4	4	0	25	100	
	NoSQL: Graph Database	4	4 8	0	25	100	
	Health Care Analytics	4	4	0	25	100	
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Online Courses for M.Sc. Data Analytics

1. National Programme on Technology Enhanced Learning -(**NPTEL**)

Course	Duration	Website
Design and Analysis of Algorithm	08 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs37/preview
Deep Learning	12 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs41/preview
Database Management System	08 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs36/preview
Scalable Data Science	08 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs39/preview
Computer Networks and Network Protocol	12 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs29/preview
Programming in C++	08 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs32/preview
Programming, data structures and algorithm using python	08 Weeks	https://onlinecourses.nptel.ac.in/noc18 _cs34/preview

2.SWAYAM – OnlineEducation

Course	Website	Course Fee
Cyber Law	https://swayam.gov.in/courses/public	Free
Information Security	https://swayam.gov.in/courses/public	Free
E-Governance	https://swayam.gov.in/courses/public	Free
Information Technology	https://swayam.gov.in/courses/public	Free

3. IBM – OnlineCourses

Course	Duration	Website	Course Fee
Statistics 101	6 Hrs	https://cognitiveclass.ai/cours	Free
		es/spatistics-d07/7	

Machine Learning	12 Hrs	https://cognitiveclass.ai/cours	Free
with Python		es/machine-learning-with-	
		python/	

4. Stanford School of Engineering - MachineLearning

Course	Duration	Course Period	Website	Course
				Fee
Machine Learning	Based on Session	Autumn : Aug 1 - Sep 10, 2018 Winter: Oct 28 - Dec 10, 2018 Spring : Feb 10 - Mar 18, 2018 Summer: Apr 7 - Jun 17, 2018	https://online.stanfor d.edu/courses/cs229- machine-learning	Free



Course	code	PRINCIPLES OF DATA SCIENCE	L	Т	Р	С	
Core/F	Elective/Supportive	Core	4	4	0	4	
Pre-r	requisite	Basic of Data and Data types	yllal /ersi	bus on	202 202	D- 1	
Cours	e Objectives:						
The m	ain objectives of this	course are to:					
 To understand Data source evolution, data Characteristicsand data processing models. To understand and apply data processing architecture ,Eco System Components of Big D Frameworks HADOOP, SPARKMapReduce To analyze and BuildData Science use cases for specific domain and applications. 							
		and the					
Expec	ted Course Outcome	es:					
On th	e successful completi	on of the course, student will be able to:					
1	1 Understand Data sources, generations, data formats, Data Evolution, Data from					• •	
various domains							
2 Understand Big Data Characteristics What, Why, When, Limitation of traditional approaches and models. Map Big Vs to Data Domains						3	
3	Understand Big Data models – Hbase- Pro MapReduce, Limitat	Processing platform, frameworks, Hadoop, Spark, s gramming Model of Big Data MapReduce, Why ons of Traditional Models	stora	ge	K2)	
4	Understand the Role	of Big Data and Artificial Intelligence – Ethics – AI			K2	<u>!</u> -	
	Applications				K5	j	
5	Analyze various do	nains of Big Data Characteristics, Platform, Progra	amm	ing	K 4	+-	
	Model and Design	Big Data framework ecosystem, and data pro	ocess	ing	K5	,	
framework of domains of Marketing, Health Care and Supply Chain					Ke	ì	
K1 -	Remember; K2 - Unc	erstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K	6 - 0	Create	e		
Unit:	1 Introductio	n to Data Evolution & Sources		12]	hour	S	
Big D Perspe	ata in Industry 4.0 - ective – Data Growth-	Data Evolution: Data Development Time Line – ICT a Perspective – IT Components-Business Process – L	Г Ad ands	vanc	emer -Data	nt-a a to	

Perspective – Data Growth-a Perspective – IT Components-Business Process – Landscape-Data to Data Science – Understanding data: Introduction – Type of Data: Numeric – Categorical – Graphical – High Dimensional Data — Data Classification –-Data Formats: Structured, Semi-Structured and Un-Structured – Data Sources : Time Series – Transactional Data – Biological Data – Spatial Data – Social Network - Data Science: Data Science-A Discipline – Data Science vs. Statistics – Mathematics - Programming Language - Database, - Machine Learning. Data Analytics Relation: Data Science, Analytics, Big Data Analytics..

Unit:2	Big Data Towards Data Science	12hours				
Big Data: Int	roduction To Big Data: - Evolution – Data as Economy - What is	Big Data – Sources				
of Big Data.	– Big Data Myths - Characteristics of Big Data 6Vs – Big Data V	Usecases - Big data-				
Challenges of	f Conventional Systems Data Processing Models Limitati	on of Conventional				
Data Process	Data Processing Approaches - Data Discovery-Traditional Approach, Big Data Technology: Big					
Data Explora	Data Exploration - Data Augmentation – Operational Analysis – 360 View of Customers –					
Security and	Intelligence – Data Analytics – Classification - Descriptive – Dia	gnostic -Predictive				
- Prescriptive	e – Augmented – Pervasive Analytics- Data Science Components	: Data Engineering,				
DataAnalvtic	s-MethodsandAlgorithm.DataVisualization–P"sofDataScience–Pr	cocess-				
People – Plat	form					
100000000000000000000000000000000000000						
Unit:3	Big Data Framework and Components	12hours				
Big Data	Technologies - Hadoop: Basic Concepts-An Overview	of Hadoop-The				
HadoopDistr	ibuted File System-Anatomy of a Hadoop Cluster-Hadoop Ecos	ystem Components.				
SPARK – ir	n Architecture – SPARK Advantages - HBASE: HBase Archi	tecture-HBase API-				
Managing la	ge data sets with HBase - Map Reduce Framework Phases - Map	Reduce Input and				
Output Form	ats - Advanc <mark>ed Concepts - Sample Applications –</mark> Combiner –	Joining datasets in				
Mapreduce jo	bbs – Map - sid <mark>e join</mark> – Reduce - Side join <mark>- Map redu</mark> ce – customi	zation				
Unit:4	Big Data and AI : Roles and Skills	12hours				
AI: Cognitive	e Computi <mark>ng : Le</mark> arning Perceptions – Termin <mark>ologies - M</mark> achine L	earning – Neural				
Networks – I	Deep Learning - NLP – Speech Processing – Big Data and AI – Et	hics in AI Research				
- Advanced A	Applications – AI Myths – Data Science Roles Data Scientist, Dat	a Architect, Data				
Analyst – Ma	ichine Learning Engineer - Skills					
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		IUnours				
Data Science	& Big Data Use cases Specifications and Discussion – Data Sou	rces Identification –				
Frameworks	Data Analytics Classification Applications of AI:	-DIgDala				
Domains · Cu	- Data Analytics Classification - Applications of Al. stomer Insights - Behavioral Analysis Marketing - Retails - I	nsurance – Risk and				
Security –He	alth care – Supply Chain Logistics	insurance Trisk and				
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Unit:6	Contemporary Issues	2 hours				
		T 1 1				
Addressing (controversy views of social media – Big Data Source – Data Scien	nce Technology -				
Animal Testi	ng : Technological Solution – Human Rights and Data					
Expert lectures, online seminars – webinars						
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	Publications, 2016.										
2	Ha	n Hu, Yo	nggang V	Ven, Tat	-Seng, C	hua, Xue	longLi,"	Toward	Scalable	e Systen	ns for Big",
3	Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, first										
	edi	tion. Rep	rint in 20)16							
4	Joe	el Grus,	"Data	Scien	ice fro	m Scra	atch",	2nd E	dition,	O'Reilly	y Publisher,
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Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]											
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1. 3. 4. 5. We 1. 2. 3. Cou Cou Cou Cou Cou Cou Cou Cou Cou Cou Cou Cou	· · · · · · · · · · · · · · · · · · ·	Python for Introduct Intro to I Data Scie Data Scie Ak hthttps://two https://ww https://ww https://ww Designed Mappin PO1 L L L S M S	or Data S tion to D Data Scie ence Cer ence with ouiltin.co vw.udaci vw.tutori by: Dr.V g with P PO2 S L S L S M S	Con Science ata Scier ence(Free tification n Python m/data-s ty.com/c alspoint. 7.Bhuvar rogramn PO3 M S S M S	urse Titl nce in Py e) n Training cience ourse/int com/pytl neswari me Outc PO4 M S S S S S S	e thon (Free g – R Pro g – R Pro arco-to-dat non_data omes PO5 S S S S S S S S S S S	e) pgrammin a-science science PO6 L L M M M	ng eud359 /index.ht PO7 L M S L M	Durat 4 Weeks 4 Weeks 8 Weeks 14 hours 15 hours m M M M M M M M S	tion PO9 M M S S S S	Provider Swayam Coursera Udacity Simlilearn Simplilearn PO10 S M S M S S S S
1. 2. 3. 4. 5. We 1. 2. 3. Cot Cot Cot Cot Cot Cot	- - - - - - - - - - - - - - - - - - -	Python for Introduct Intro to I Data Scie Data Scie Nk hthttps://ww https://ww Designed Mappin PO1 L L L S M S	or Data S tion to D Data Scie ence Cer ence with ouiltin.co vw.udaci vw.tutori by: Dr.V g with P PO2 S L S L S M S	Con Science ata Scier ince(Free tification n Python m/data-s ty.com/c alspoint. 7.Bhuvar rogrami PO3 M S S M S S	urse Titl nce in Py e) n Training cience ourse/int com/pytl neswari me Outc PO4 M S S S S S	e thon (Free g – R Pro ro-to-dat non_data omes PO5 S S S S S S S S	ee) ogrammin ca-science science PO6 L L M M M M	ng eud359 /index.ht PO7 L M S L M	Durat 4 Weeks 4 Weeks 8 Weeks 14 hours 15 hours m PO8 M M M M M M S	tion PO9 M M S S S S	Provider Swayam Coursera Udacity Simlilearn Simplilearn PO10 PO10 S M S S S S S S

Cour	se code		PROBABILITY AND STATISTICS	L	Т	Р	C		
Core	/Elective	/Supportive	Core	4	4	0	4		
Pre	-requisi	te	Basics of Mathematics and Statistics	Syllabus Version		2020- 2021			
Cou	rse Obje	ectives:							
The	1. To understand the ProbabilityTheory 2. To understand theoretical distributions and automatatheory								
Expe	ected Co	ourse Outcomes:							
On	the succe	essful completion of	of the course, student will be able to:						
1	To une	derstand the princip	bles of probability, frequency distribution measures			K2			
2	To une for spe	derstand the correlations	tion and regression, hypothesis test, sampling tech	nique	S	K3			
3	To app	oly probabilisti <mark>c m</mark> o	odels and distribution models			K3			
4	To app	oly hypothesis testi	ng and regression models for specific domain			K4			
5	5 To design statistical models for specific domains and illustrate statistical methods K5, H						K6		
K1	K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create								
			Beneriter and Star						
Uni	it:1	Introduction to S	Set Theory		12	hour	S		
Set T math Cayl	Theory: E lematical ey Hami	Basic set operations induction. Matrice Iton theorem.	, relations and functions, transitive closure relation, s: Properties of determinants, inverse of a matrix, I	, prino Eigen	ciple valu	of es an	d		
			68						
Uni	it:2	Probability Theo	ory and the second s		12	hour	'S		
Intro prob	duction ability, E	to Probability Theo Bayer''s theorem, in	ry: Sample space and events, axioms of Probability dependence of events.	', con	ditio	nal			
1		5							
Uni	it:3	Descriptive Statis	stics		12	hour	'S		
Basic probability theory - distributions and their properties - Frequency Distribution - Continuous or Grouped Frequency Distribution - Magnitude of Class intervals - Cumulative FrequencyDistribution - Two Way Frequency Distribution - Measures of Central Tendency: Arithmetic Mean, Geometric Mean-HarmonicMean-Median,Mode-Dispersion:Overview-MeanDeviation-Standard Deviation - Combined Standard Deviation.									
Uni	it:4	Theoretical Distr	ibution		12	hour	'S		
Theo Norn diffe	oretical D nal Distr rent busi	Distribution: Binom ibution - Poisson - ness domain - ARM	inal Distribution - Obtaining Coefficient - Poison E Cumulative Poisson Process and its generalization MA and ARIMA - Monte Carlo Simulations)istrib - app]	outio licati	n - ons i	n		

Unit:5	Unit:5Automata Theory: NDFSA and NDFSA10hou					
Introdu	ction to Automata Theory: Introduction - Finite State Automata	– Deterministic	Finite State			
Automa	ata - Non-Deterministic Finite State Automata, NDFSA with E -	Transitions, Mo	oore and			
Mealy I	Machines, Regular Expressions.					
Unit:	5 Contemporary Issues		2 hours			
Applica Unit 1 t	ation of data analytics in different domains – Exploring Case Stu to Unit 5.	idies for the topi	cs given in			
	Total Lect	ure hours	60hours			
Text I	Book(s)					
1 Wi	illiam A. R. Weiss "An Introduction to Set Theory" Publisher	: University of T	oronto 2008			
2 Ra	fVandebril, Marc Van Barel, Nicola Mastronardi, "Matrix Con	nputations and	Semiseparab			
Ma	atrices: Eigenvalue and Singular Value Methods", JHU Press	s, 2009.				
3 By	Vijay K. Rohatgi, A.K. Md. EhsanesSaleh. "An Introduction	To Probability	And			
Sta	atistics", ISBN: 978-1-118-79964-2, 3rd Ed , 2015.					
4 Jac	cques Sakarovitch, "Elements of Automata Theory" , Cambrid	ge University Pr	ess, 2009.			
5 R.S	S.N. Pillai, Bagavathi <mark>, "Statistics</mark> Theory and Practice, S.Chanda	& Company, 201	.3			
	- Anno - E					
Refer	ence Books					
1 C	harles E. Roberts <mark>, Jr, "Introduction to Mathematical Proofs</mark> A	Transition to .	Advanced			
Ν	fathematics" Denny Gulick, 4 th Edition, Published by Pearson,	<mark>I</mark> SBN: 9780134′	746753,			
20	018.					
2 Jo	ohn R. <mark>Hause</mark> r, " Numerical Methods for Nonlinear Engine eri	ng Models", Spi	ringer			
N	letherlands, ISBN: 940 <mark>1777071,</mark> 9789401777070, 1013 pages, 2	017.				
		871				
Relate	ed Online Contents [M <mark>OOC, SWAYAM, NPTEL, W</mark> ebsites of	etc.]				
	Course Title	Duration	Provider			
1 A	Advanced Probability Theory	12 Weeks	Swayam			
2 D	Discrete Mathematics	12 Weeks	Swayam			
3 N	Sumerical Methods And Simulation Techniques For Scientists	8 weeks	Swayam			
a	nd Engineers					
4 T	4 Theory of Automation 8 Weeks					
Course	e Designed By: K.Moorthy and Dr.T.Devi					

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	М	М	М	М	S	S	L	S
CO2	S	М	М	М	М	М	S	S	L	S
CO3	S	S	S	S	М	М	М	М	L	S
CO4	S	S	S	S	М	М	М	М	L	S
CO5	S	S	S	S	S	М	S	S	L	S

Cou co	ırse de		DATA STRUCTURES, DESIGN AND ANALYSIS OF ALGORITHMS	L	LT		С		
Core/	Electiv	e/Supportive	Core	4	2	2	4		
Pre	requis	ite	Knowledge on data, data types	Sylla Versi	bus ion	2020 2021	-		
Cour	rse Obj	ectives:							
The r	 The main objectives of this course are to: 1. To understand the object oriented concepts: Class, Inheritance andPolymorphism. 2. To understand and analysis concepts of Algorithmic analysis and algorithmapproaches. 								
Expe	cted C	ourse Outcomes	- September 2						
On t	he succ	essful completio	<mark>n of the course, student will be</mark> a <mark>ble to</mark> :						
1	Develo of cor structu	op and understan nputer, informat re.	d on data structures, the information arranged ion manipulation with the use of algorithms	in me s in a	mory data	K1, F	K2		
2	2 Formulate general principles with notations, to increase the computation time K3 and size, search nodes to find the depth root of a tree.								
3	Identif classes Inherit	by classes and objects using and objects using and polymore and Polymo	ects from the given problem description and cript of the given problem description and cript of the given problem description and extensibility by morphism	eate neans c	of	K2,K	5		
4	Design techni	n algorithms for p que	problem solving by using the suitable algorithm	nic 👔		K2,K	3		
5	Analy and op	ze a given algorit ptimization techn	hm for its efficiency based on time and space i iques for improving the performance of algorith	t occuj 1ms.	pies	K4,K	5, K6		
K1 ·	- Reme	mber; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evalua	ate; Ke	6 - Cre	eate			
			DUCATE IN SLEVINTS						
Uni	t:1	Introduction to	Data Structures	12-	-hour	S			
Stack Grapl Algor	Stacks – Push and Pop – Stack frames for Sub Programmes – Queues – Tree – Graphs – Directed Graphs – Graph Traversal – List representation – Linked list – File organization – Sorting Algorithms and efficiency considerations – Searching								
Uni	t:2	Algorithmic Ca	ase Analysis	12-	-hour	s			
Asym analy Deter	Onit:2 Algorithmic Case Analysis 12hours Asymptotic Notations: Big Oh notation – O – Omega notation – Theta notation – Average case analysis – Binary tree – Recursion – Towers of Hanoi – Non Recursive Quicksort – Non Deterministic Algorithms. Deterministic Algorithms.								

		SCAA DATED: 23.0				
Unit:3	Object Oriented Language	12hours				
Object orie – Function class – Act Handling.	nted language fundamentals – programming basics – Conditional s - Objects and Classes – Constructors – Overloading. Inheritanc cess specification - Polymorphism – virtual functions – virtual c	statements – Structures e – Hierarchy - Derived class – Files - Exception				
Unit:4	Design of Algorithms	12hours				
Introduction Search, Me Minimum	n to algorithms, Analyzing algorithms. Divide and Conquer: Gene erge sort, Quick sort. Greedy Method: Knapsack problem, Job seq spanning trees, Single source shortest paths.	eral Method, Binary uencing withdeadlines,				
Unit:5	Dynamic Programming	10hours				
problem. E Branch and	Back Tracking: 8-queens problem, Sum of subsets, Graph colori Bound: General method, Travelling salesperson problem.	ng, Hamiltonian cycles.				
Unit:6	Contemporary Issues	2 hours				
 2. Big Data 3. Processo algorithms 	a – Contemporary applications – parallel algorithms–Architectures or – Communication – Predicted complexity – CPU/GPU cycles – – optimizationtools.	s Sequential				
	Total Lecture hours	60bours				
	I otar Lecture nours	00-110015				
Text Book	(s)	1				
1 Kleinl	perg and Tardos: "Algorithm Design", Pearson, ISBN: 013213108	02018.				
2 Bjarne 03215	2 BjarneStroustrup, "The C++ Programming Language", Addison Wesley, 7th Edition, ISBN: 0321563840, 2017.					
3 Ellis I Algor	3 Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications, 2011.					
Reference	Books : EBooks					
1 M.A.V	Weiss, "Data Structures and Algorithm Analysis in C++", Pearson	Education Asia,2013.				
2 Thom Algor	as H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford St ithms", Massachusetts Institute of Technology, MIT Press, III Edi	tein, "Introduction to tion, 2009.				

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
	Course Title	Duration	Provider						
1.	Mastering Data Structures & Algorithms using C and C++	56 hours 20m	Udemy						
2.	Data Structures	5 hours	Coursera						
3.	Data Structures Fundamentals (Free)	6 Weeks	edX						
4.	Design and Analysis of Algorithm (Free)	11 Weeks	NPTEL						

5.	Design and Analysis of Algorithms (Free)	8 Weeks	SWAYAM		
Web link					
1.	https://www.tutorialspoint.com/design and analysis of al	gorithms/			

- 2. https://www.javatpoint.com/daa-tutorial
- 3. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

Course Designed by: Dr. J. Satheeshkumar

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	L	S	L	L	L	L	L	L
CO3	М	S	S	S	L	L	L	L	L	L
CO3	S	М	L	L	L	L	М	М	L	L
CO4	М	М	S	S	L	L	L	S	S	L
CO5	S	L	L	S	P.L	М	L	М	L	S
				87	0.		1.4			

Co	ourse						0. 23.0	Ī	
c	ode		PYTHON PROGRAMMING	L	1	P	U		
Core	e/Elective	e/Supportive	Core	4	2	2	4		
Pre	e-requisi	te	Principles of Programming	Sylla Vers	abus sion	2020 2021)- L		
Cou	rse Obj	ectives:							
1. To understand the basics of Python Data structures and Programming constructs 2. To understand and Apply Python Librarias for Data Science and Machine Learning									
4	$\frac{2}{3} To u$	derstand and app	by Fython Libraries for Data Science and Machi ly Exploratory Data Analytics using Data Visual	izatio	umng v				
	5. 10 ui	derstand and app	ry Exploratory Data Anarytics using Data Visual	1241101	1				
Exp	ected Co	ourse Outcomes:							
On	the succ	essful completion	of the course, student will be able to:						
1	Unders	tand the basic pro	gramming structure-List, Dictionary, Tuple, Stri	ng		K1,I	K2		
2	Unders	tand the Control s	structures and object oriented concepts			K1,]	K2		
3	Design using v	and Analyze data arious tools	set applying statistical models, visualization and	mode	ls	K3,I	ζ4		
4 Understand the visualization methods, packages, statistical packages and other K packages for building data models K						K3,I K6	Κ4,		
5	5 Design data analytic model using the packages in python and provide inferences for K3,K4 multi-disciplinary domains								
K1	- Remei	nber; K2 - Under	stand; K3 - Apply; K4 - Analyze; K5 - Evaluate	; K6 -	Creat	e			
Un	it:1	Introduction			12	hou	rs		
Intro	oduction	to Python: Python	n Introduction, History of Python, Python feature	es, Py	thon i	nterp	reter,		
Uve	rview of	f programming i	n Python, Basic data types, Program input	and F	rogra	m ou Arith	itput,		
One	rators C	omparison Operat	ors Logical (or Relational) Operators Assignme	nt	15.	Anun	netic		
Ope	rators, C	conditional (or ter	mary) Operators. Modules: Importing module, I	Math r	nodul	e Rar	ndom		
mod	ule, Pacl	kages, Compositio	on.						
Un	it:2	Advanced Data	Types		12	hou	rs		
Pyth	ion Strin	gs and string matter	anipulation [Assigning values in strings, Strin	g mar	npula	tions,	Strin	g	
spec Strir	an operation of the second second	adel Python Lie	atting operators, There Quotes, Raw String, O	ist m	aninu	lg, Di lation	ana-m s Tis	l- .t	
Ope	rations.	Indexing, slicing	& matrices. Python Dictionary - Introduct	ion.	Acces	sing	s, Lis values	5. 5.	
Prop	berties, F	unctions in Diction	onary. Python Tuples: Introduction, Operation,	Access	sing, I	Functi	on an	d	
meth	nods in t	uples andData Ty	be Conversion.Python sets		U,				
Un	it:3	Control Structu	ires		12	hou	rs		
Con	ditional	Statement: Branch	ning (if, else-if, nested), Looping: while statemer	t, for	statem	ents,			
ControlStatements:break,continueandpassStatements.PythonExceptionHandling:Try,Catch,									
Con	lioistate	FinallyFunctions : Defining a function, Calling a function, Types of functions, Function Arguments							
Fina	llyFunct	ions : Defining a	function, Calling a function, Types of functions	, Func	tion A	, Argun	nents		

,Mo	odifiers. F	ython OOPs: Class, Object, Inheritance and Constructor.				
Uı	nit:4	Python Libraries for Data Science	12hours			
Rea dim Pan sele Rer fund Cor	iding and idensional idas [Data ection, R name va ctions(sci inputation	Writing CSV Files in Python using CSV Module, NumPy [Arr data structure, Creating array, Indexing array, Reshaping, V a Manipulation]: Create Data Frame, Combining Data Frames, S ows selection (basic), Rows selection (filtering), Sorting, alues, Dealing with outliers.SciPy Introduction, Basic py.special), Integration(scipy.integrate), Optimization(scipy.optim with TensorFlow, Regression with Tesorflow	rays and matrices]: N- Vectorized operations, Summarizing, Columns Descriptive statistics, functions, Special mize).TensorFlow:			
Uı	nit:5	Python Libraries for NLP and Visualization	10hours			
NL clear : mat <u>Histo</u>	TK,: toke ning and r plotlib, S ograms, C	enizing, part-of-speech tagging, stemming,Sentence Segmentation normalizing text.Textblobn-grams, Parsing, Spelling correction. V eabon: Simple Line Plots, Simple Scatter Plots, Density and Con Sustomizing Colorbars, Subplots, Text and Annotation, Visualizat	n, Methods for Visualization libraries tour Plots, tion with Seaborn			
U	nit:6	Contemporary Issues	2 hours			
An	alyze Dat	a to understand Global Issues on health care, pandemic situations	s etc			
		Total Lectur <mark>e hour</mark> s	60hours			
Τe	ext Book(s)				
1	Jake Va	nderPlas, "P <mark>ython D</mark> ata Science Handbook" O' <mark>R</mark> eilly, 1 st Edition,	2017.			
2	Andreas Edition,	C.Muller&SarahGuido"IntroductiontoMachineLearningwithPyth 2016.	ion",O'Reilly,1			
3	Dr. Cha	rles Russell Severance, Sue Blumenberg, Elliott Hauser, AimeeA	ndrion"Python for			
	Everydd	ay: Exploring Data in Python 3, CreateSpace, 2016.				
Re	eference	Books	7			
1	Wesley	J. Chun , "Core Python Programming", 2 nd Edition, Pearson Educa	ation.2016.			
2	Mark Su	immerfield, "Programming in Python 3", Pearson Education, 2018	8.			
Re	elated Or	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]				
1	PYTH	ON - A to Z Full Course for Beginners, https://www.udemy.com/	/			
2	2 Python for Data Science, <u>https://swayam.gov.in/</u>					
3	3 Python for Data Science and Machine Learning Bootcamp, <u>https://www.udemy.com/</u>					
4	4 Introduction to Python Programming, <u>https://www.udacity.com/</u>					
Co	ourse Des	igned By:Dr.J.Ramsingh , Dr.V.Bhuvaneswari				

Mapping with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	L	М	S	М	L	L	L	L	L	L		
CO2	S	L	L	S	L	L	М	L	L	L		
CO3	М	S	S	М	L	L	М	L	L	L		
CO4	S	М	S	L	L	L	L	S	М	М		
CO5	S	S	S	L	L	М	L	L	S	S		

C	ourse code	Core	DATA MINING	L	Т	Р	С			
Core	/Elective/S	upportive	Core	4	4	0	4			
D	•••		Basics of Data, Data Structures and	Sylla	bus	20	20-			
Pre-	requisite		Algorithms	versi	on	20	21			
Cou	rse Object	tives:								
The	main objec	ctives of this cou	irse are to:							
1	Ta un dana	tond the company	to of Data Warshauss analitesture and analy form	~						
1. don	10 unders	tand the concept	is of Data watehouse architecture and apply forv	arious						
2	To unders	tand Data Minir	or techniques Cluster, Classification and Associat	ionRu	le					
2.	Mining.		is teeninques cruster, crustineurion une rissoeriu	ionitu	10					
3.	To unders	tand the concept	ts of Web mining, Text mining and Spatialmining	ς.						
		*	A Martin Mark	<u>.</u>						
Exp	ected Cou	rse Outcomes:	8							
On t	he success	ful completion c	f the course, student will be able to:							
1 Understand data mining tools and techniques for various domains							2			
2 Apply various data mining, text mining and web mining algorithms for real time							;			
	applicatio	ons								
3	Analyze	unsupervi <mark>sed an</mark>	d supervised algorithms for real world application	18		K 4	ł			
4	Illustrate	the mining tech	niques like association, classification and clusteri	ng on		Ke	,			
	datasets		half the all	1						
5	Compare	various approac	ches of data mining algorithms			K5	,			
K1 -	Remembe	er; K2 - Underst	a <mark>nd; K3 - Apply; K4 - Analyze; K5</mark> - Evaluate; K	66 - C1	reate					
		3								
Unit	:1	Data Warehou	sing		12	2 ho	urs			
Intro	duction - I	Definition - Mul	tidimensional data model - OLAP operations - W	'areho	use so	chen	1a -			
Data	warehous	ing architecture	e - Warehouse Schema - Warehouse server - M	Aeta d	lata -	OL	AP			
Engi	ne - Data v	warehouse backe	end process - Data Warehouse Technology - War	ehousi	ingSo	ftwa	ire			
-Clo	uddatawar	ehousing-Otherf	eatures.DataWarehousingCaseStudy:Governmen	t,Tour	ism					
and	Industry									
	-									
Unit	:2	Data Mining			12	$\frac{2 \text{ ho}}{2}$	urs			
Intro	duction –	Data as a Subj	ect - Definitions- KDD vs. Data mining- DM	techni	ques-	Cur	rent			
Tren	ds in Data	Mining. Assoc	that ion Rules: Concepts- Methods to discover A	ssociat	tion r	ules	- A			
priori algorithm – Partition algorithm- Pioneer search algorithm –Dynamic Item set Counting										
algo	nunm- FP-1	tree growth algo	minim-incremental algorithm-Border algorithm-G	reneral	nzed					
ass00	association rule. Analysis of association rule using orange.									
T] :4	.2		hrianag		1/) h -				
Unit	:3	Clustering Te	chinques		L	2 no	urs			

Data Attribu	te Types – Data Similarity and Dissimilar	ity - Clustering paradigr	ns–Partition						
algorithm-K	- Medeoid algorithms – CLARA- CLARA	NS –Hierarchical DBS	CAN-BIRCH-						
CURE-Categ	gorical clustering algorithms-STIRR-ROC	CK-CACTUS-Other tech	niques:						
Implementat	ion of Clustering techniques using orange	tool.							
Unit:4	Classification Techniques		12 hours						
Introduction	- Decision Trees: Tree Construction Pri	nciple – Attribute Selec	tion measure – Tree						
Pruning - De	ecision Tree construction Algorithm – CA	RT – ID3 - Rainforest -	- CLOUDS - BOAT,						
Pruning Tech	hnique – Model Evaluation –Cross Valida	tion – Bootstrap – Holde	out – Classifier						
Performance	- Boosting – AdaBoost– Bagging								
Unit:5	Web Mining		10 hours						
Basic concep	pts – Web content mining – Web structure	e mining – Web usage m	ining – text mining						
- TextPrepro	ocessing-Textclustering-Spatialmining-Sp	patialminingtasks–Spatia	alclustering						
- Spatial tree	nds – Case Studies: Big Data, Internet of T	hings.							
Unit:6	Contemporary Issues	and the	2 hours						
Write an as	signment on any one of the following:								
1. FeatureE	ngineering								
2. Aspects of data ethics in a changingworld.									
Toxt Book(a		Total Ecclure Hours	00 1100115						
1 Jiawei Han MichelineKamber "Data Mining Concents and Techniques" Morgan Kaufmann									
Publish	ers 2012	icepts and reeninques,							
2 Pieter A	Adriaans, Dolf <mark>Zantinge, "Data Mining", Addi</mark>	son Wesley, 2008.							
3 Krzyszla	of L Cios WitoldPedrycz "Data Mining: A Kr	nowledge Discovery Appro	pach" Springer 2010						
J INEJSER	r v Clos, Wilord Caryoz, Data Mining. Prist		such , springer, 2010.						
Reference B	Books		1						
1 Arun K	Pujari, "Data Mining Techniques", Unive	ersities Press. 2012							
2 ArijayCl	naudhry, Dr. P. S Deshpande, "Multidimensio	nal Data Analysis and Dat	a Mining", Dreamtech						
Related On	line Contents MOOC_SWAVAM_NPT	FL Websites etc]							
1 www.cou	Insera.com [Data Mining Specialization (6 cou	urses) -University of Illino	is]						
I	Data Visualization	4 Weeks	-						
II	Taxt Datriaval and Saarah Engines	6 Wooks							
11		o weeks							
111	Text Mining and Analysis	6 Weeks							
IV	IV Pattern Discovery in Data Mining 4 Weeks								
V	V Cluster Analysis in Data Mining 4 Weeks								
VI	Data Mining Project	6 Weeks							
2 www.ed	www.edureka.com [Data Mining using R]								
3 www.ed	ureka.com [Data Warehouse Concepts]								

4 www.udemy.com [Learn Data Mining and Machine Learning With Python]

Web Link

- 1. http://www.celta.paris-sorbonne.fr/anasem/papers/miscelanea/InteractiveDataMining.pdf
- 2. https://www.javatpoint.com/data-mining-world-wide-web
- 3. https://www.peterindia.net/DataMiningLinks.html

Course Designed By: Dr. M. Punithavalli

Mappi	ng with	Progran	nme Out	comes						
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	Μ	L	L	М
CO2	L	L	L	L	L	L	М	L	L	М
CO3	S	Μ	Μ	S 🧹	L	L	S	L	Μ	S
CO4	S	М	М	S	L	L	S	L	М	S
CO5	М	М	L	S	L	L	S	L	L	S



Data Structures, Design and Analysis of Algorithms Lab – 75 hours

As per the syllabus topics – lab programs should be designed

Python Programming Lab – 75 hours

Syllabus topics content along with latest topics – lab programs should be designed.





Course code		ADVANCED DATABASE MANAGEMENT	L	Т	Р	С						
Core/Elect	ive/Supportive	Core	4	2	2	4						
n	•••	Knowledge on data, tables, files and	Sylla	bus	202	0-						
Pre-requ	isite	databases	rsi	ion	202	1						
Course O	bjectives:											
The main of	objectives of this	course are to:										
1. To 2. To 3. To 4. To M	 To understand the concepts of DBMS, Data Model and Normalforms. To understand the concepts of concurrency control andRecovery. To understand basics of SQL and NoSQLdatabases. To understand and apply MongoDB (NoSQL) for Data Analysis using CURD and User Management. 											
		A DEBUG T										
Expected	Course Outcome	es:										
On the su	ccessful completi	ion of the course, student will be able to:										
1 Understand the structure and model of the relational database management K2 systems.												
2 Understand the concepts of transaction management and SQL, NoSQL database K3 Models												
3 Uno	derstand and creat	te database models using MongoDB	1		K4							
4 App	oly MongoDB op	erators to retrieve data from document data stores	1		K3							
5 Une spe	derstand and appl cific applications	y concepts of data management indexing techniquesf	or		K5 K6	;						
K1 - Ren	nember; K2 - Unc	lerstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; I	X6 - (Crea	te							
			ł									
Unit:1	Database Over	rview		12	hou	rs						
Introduction - Database concepts, Basic components of DBMS, sources of data - data models – hierarchical – network – XML and Stores - Relational Database Design: Anomalies ina Database– Functional Dependency – Lossless Join and Dependency – Preserving Decomposition – Third Normal Form– BoyceCodd Normal Form – Multivalued Dependency – Fourth Normal Form – Join Dependency – Project Join Normal Form –Domain Key Normal Form - SQL: DataDefinition – Data Manipulation – Integrity Constraints–Views–PL/SQL.												
Unit:2	NoSOL			12	hou	rs						
Indexing and Hashing – Query Processing – Transaction Processing – Concurrency Control and Recovery - Advanced Database Concepts and Emerging Applications: Distributed Databases – Object Oriented Databases - Object Relational Databases- Data mining and Data Warehousing – Big Data - Big Databases- SQL–NoSQL Tradeoffs–CAP Theorem–Eventual Consistency - NoSQL–database types – Document Oriented – Columnar – Graph – KeyValue Pair - NoSQL database, design for performance / quality parameters, documents and information retrieval.												

Unit	:3	MongoDB Introduction	12 hours						
Mong	oDB-	Introduction - MongoDb - Need - MongoDBVs RDBMS -	- MongoDB- Driver						
Install	ation	- Configuration - Import and Export - MongoDB Server C	Configuration - Data						
Extrac	ction 1	Fundamentals - Intro to Tabular Formats - Parsing CSV -Parsin	g XLS with XLRD-						
Parsin	ıg XM	L - Intro to JSON - Getting Data into MongoDB - MongoDB- CU	RD – Database						
Creati	on – l	Jpdate – Read – Delete.							
Unit	:4	MongoDB Operators	12 hours						
Using	mong	pimport-Operatorslike\$gt,\$lt,\$exists,\$regex-QueryingArraysandus	ing\$inand						
\$all O	perato	ors -Changing entries: \$update, \$set, \$unset - Data Analysis - Field	Queries -Projection						
Queries- Limiting - Sorting - Aggregation - Examples of Aggregation Framework -The									
Aggre	gatior	Pipeline - Aggregation Operators: \$match, \$project, \$unwind, \$g	roup.						
		and the second se							
Unit	:5	Advanced MongoDB	10 hours						
User N	Manag	ement – Mongo <mark>Db Data Re</mark> plication in Servers – Data Sharding –	MongoDB Indexes						
– Cre	eate –	Find – Drop – Backup – MongoDB – Relationships – A	nalyzing Queries –						
Mong	oDBC	bjectid – Adva <mark>nced MongoDB:MapReduce – Mongo</mark> DB - Text 1	Processing - Regular						
Expre	ssion -	- Case Studies – Text processing of large datasets, Map Reduce us	ing MongoDB						
Unit	:6	Contemporary Issues	2 hours						
Data S	Securi	ry – Perform <mark>ance –</mark> Data Safety – Resource Utility – High Availab	ility.						
Exper	t lectu	res online seminars – webinars							
Liper	. 10010		7						
		Total Lecture hours	60hours						
Text I	Book(s)							
1	Abra	ham Silberchatz Henry K Forth Sudharshan "Database system	Concents" 7 th						
	editi	on, McGraw Hill, 2020.	concepts, /						
2	Prab	u C.S.R, "Object-Oriented Database Systems: Approaches and	Architectures"						
	3 rd E	dition, PHI, 2011.							
3	Kri	stina Chodorow , "MongoDB: The Definitive Guide" , 3 rd Editior	n, O'Reilly Media,						
	ISB	N: 9781491954461, 2019 .							
4	Gu	y Harrison, "Next Generation Databases: NoSQL, NewSQL, ar	nd Big Data",						
	Apı	ess, 2016.							
Refer	ence I	Books : EBooks							
1	Sha	mkantB.Navathe, RamezElamsri''Fundamentals of Database Sy	stems'', 7 th						
	Edi	tion, Pearson Education Limited, 2017.							
2	Dav	vid Hows, Peter Membrey, EelcoPlugge, Timm Hawkins, "The	Definitive Guide						
	to N	AongoDB", 3 rd Edition, Apress, 2015.							
3	Gaur	avVaish, "Getting Started with NoSQL"Packt Publishing, 2013.							

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

	Course Title	Duration	Provider					
1.	Database Management System	12 Weeks	Swayam					
2.	Database Management System	8 Weeks	NPTEL					
3.	NoSQL Systems	4 Weeks	Coursera					
4.	Introduction to MongoDB	3 Weeks	Coursera					
Web	link							
1.	https://www.w3schools.in/dbms/		•					
2.	https://www.guru99.com/nosql-tutorial.html							
3.	3. https://www.tutorialspoint.com/mongodb/index.htm							
Cou	rse Designed by: Dr.S.Gavaskar							

Mapping with Programme Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	M	M	S	М	M	M	М	L	S	
CO3	S	M	M	S	M	М	L	М	L	М	
CO3	S	M	М	S	M	М	L	М	L	М	
CO4	S	M	S	S	М	S	L	М	L	S	
CO5	S	М	S	М	М	М	М	M	L	S	

Cou	irse	MATHEMATICAL FOUNDATIONS FOR	L	Т	Р	С				
CO	de	MACHINE LEARNING								
Core	e/Elective/Supportive	Core	4	4	0	4				
Pre	-requisite	Basic Mathematics	Sylla	bus	202	20-				
	1		Versi	ion	202	21				
Cou	rse Objectives:									
The	main objectives of this c	course are to:								
	1. To understand line	ar programmingmethods.								
	2. To understand Dy	namic programmingapproach.								
	3. To understand con	cepts basics concepts of Linear Algebra								
	4. To understand con	ncepts of vector spaces and matrices								
	5. To understand the	applications of Linear Algebra in MachineLearning								
		A								
Exp	ected Course Outcom <mark>e</mark>	s:								
On	the successful completion	on of the course, student will be able to:								
1	Solve linear programm	ing techniques to optimization problems arising in all			K3					
	Computer fields									
2 Use Dynamic programming approach to real time problems. K3										
3 Understand the basics of Linear Programming constructs K2										
4	Apply vector spaces ar	d their applications in Machine Learning			K3					
5	Lin denoton d the energy	to of motion Councies Elimination and differential and		~	V)					
3	ond Apply the series	is of matrix, Gaussian Emilination and differential equ	ation	8	κ2, ν5	1				
	and Apply the concept	s of Linear Algebra in Machine Learning Algorithms			КЭ					
K1	- Remember; K2 - Und	erstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6	i - Cre	eate						
		EUCATE IN PARIALE								
Uni	it:1 Linear Program	uming Problem		12	2 hou	irs				
Intro	duction to Operations	Research: Basics definition - scope - objectives -	phase	s - r	node	ls -				
limit	ations of Operations Re	search - Linear Programming Problem - Formulation	of LP	P - G	hraph	ical				
solut	tion of LPP - Simplex	Method - Artificial variables - Big-M method - Tv	vo-pha	ase n	nethe	od -				
Dege	eneracy - Unbound solut	ions– Duality in Linear Programming Problems– Dua	l Sim	olex -	-					
Intro	duction to optimization	- gradient descent method - convex optimization.	1							
	r i i i									
Un	it:2 Dynamic Progra	amming		12	2 hou	irs				
Intro	duction - Characteristic	s of dynamic programming – Dynamic programming a	uppro2	ch fo	or					
Prior	Priority Management employment smoothening – capital budgeting – Stage Coach/Shortest Path –									
carg	cargo loading and Reliability problems.									
8		<u> </u>								

Unit	3 Geometry Linear Equations and Vector Spaces		12 hours						
The C	eometry of Linear Equations - An Example of Gaussian	Elimination- Matrix	Notation and						
Matri	Multiplication - Triangular Factors and Row Exchange	s- Inverses and Trans	sposes.						
Vecto	Spaces and Subspaces – Solving Ax=0 and Ax=b - Lin	ear Independence, Ba	asis and						
Dime	sion- The Four Fundamental Subspaces- Graphs and Ne	etworks- Linear Tran	sformations.						
Unit	4 Determinants, Eigenvalues and Eigenvectors		12hours						
Deter	ninants: Introduction- Properties of the Determinan	t- Formulas for th	e Determinant –						
Appli	cations of Determinants. Eigenvalues and Eigenvector	rs: Introduction- Dia	agonalization of a						
Matri	a Difference Equations and Powers A k- Differential E	Equations and e At - C	Complex						
Matri	es- Similarity Transformations – A - Applications of Ma	achine Learning – Us	se cases.						
Unit	5 Positive Definite Matrices		10 hours						
Minir	a, Maxima, and Saddle Points - Tests for Positive Defin	iteness - Singular Va	lue						
Decoi	iposition – Machine Learning Applications – Use cases.								
∐nit	6 Contemporary Issues	1	2 hours						
			2 110015						
Use L	near and Dynamic p <mark>rogra</mark> mming approach to real time p	oroblems. Apply the	concepts of Linear						
Algeb	ra in Machine Le <mark>arning Algorithms and the second second second second second second second second second second</mark>	16.							
Euno	lactures online aminers whines								
Exper	t lectures, onnie seminars – weomars								
	To	tal Loctura hours	60 hours						
Toyt			00 11001 5						
1 1	LK Sharma "Onerations Descards Theory & Applic	ations" 6 th Edition I	ovmi						
1	Publications, 2017.	ations o Edition, I	axiiii						
2	Gilbert Strang, Linear Algebra and Its Application, 5th	Edition, Wellesley Ca	mbridge						
	Press, ISBN: 9780980232776, 2017.	and the second s							
Refer	ance Books · FBooks								
1	P K Gupta and D S. Hira "Operations Research"	S. Chand & co., 2017	1						
2	David C. Lav. Steven R. Lav. Judi J. McDonald "Lin	ear Algebra and Its	Applications"						
-	5 th Edition Pearson Education 2016		ppications						
Relat	ed Online Contents [MOOC, SWAYAM, NPTEL, We	ebsites etc.]							
			-						
	Course Title	Duration	Provider						
1.	Operations Research	15 Weeks	Swayam						
2.	Linear Algebra	12 Weeks	Swayam						
Web	ink								
1.https://stemez.com/subjects/science/1HOperationsReseach/1HOperationsReseach.php									
2.	2.https://www.khanacademy.org/math/linear-algebra								
	Course Designed by: Mr. Moorthy , Dr. T. Devi								

Mapping with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	М	S	М	М	М	S	S	М	S		
CO2	S	S	S	S	М	М	S	S	М	S		
CO3	М	М	М	S	S	М	М	S	L	S		
CO4	S	М	S	S	S	М	S	S	L	S		
CO5	Μ	Μ	Μ	S	S	Μ	Μ	S	L	S		



Cour	se code		DATA ANALYTICS With R	L	Т	Р	С				
Core	/Elective	/Supportive	Supportive/Skill based	4	2	2	4				
Pre	-requisi	te	Knowledge on Data, Statistical Methods forAnalysis	Sylla rsi	bus on	202 202	20- 21				
Cou	rse Obje	ctives:			-	_					
	0										
1	. To un	derstand the bas	ics constructs of R Programming Constructs and Vis	sualiz	atior	l .					
2	. To un	derstand and app	ply Exploring variables using Visualization.								
3	. To un	derstand and ap	bly Exploratory Data Analytics using DataVisualiza	tion							
4	. To un	derstand and ap	bly Inferential Statistics and RegressionModels.								
Expected Course Outcomes											
Expe		urse Outcomes									
On	the succ	essiul completio	n of the course, student will be able to:			774					
1	Underst	tand the basic pr	ogramming structure of R– Data frame, Matrix, Lis	t,		KI,	, K2				
2	Hackage	and various visu	ulization models and gather insights and inference.	of the							
2	Dataset	s	anzation models and gather hisights and interence	or the	2	к?	К3				
3	Apply s	statistical function	ns Central tendency measure Range Variance Sta	andar	d	112	, 113				
5	Deviati	on to perform D	agnostic Analytics	indur	G	K2	, K3				
4	Underst	tand data distrib	ution of data and perform Regression and Annova to) 🔏		K3	,K4				
	predict	the insights		6							
5	Evaluat design	e data set an <mark>d pe</mark> Models	erform EDA and Inferential Analytics to gather insig	ghts a	ind	K5	,K6				
K1	- Remen	nber; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; H	6 - 0	Creat	e					
Uni	t:1	R Basics			9)ha	ours				
Intro	duction:	What is R–Dov	wnloading and Installing R Getting Data into	R :	Firs	t St	ep in				
R:Ty	ping in	Small Datasets -	- Concatenating Data with c Function – Combining	g Var	iable	s wi	th the				
c, cb	ind, rbin	d Functions - V	ector Function -Matrix - Ddata frame - List - Imp	orting	g Ex	cel D	Data —				
Acce	ssing Da	ata from other S	tatistical Packages - Accessing the Database. Fun	ction	s - T	he A	Attach				
Func	tion – Ex	xporting Data -	The Tapply Function – The Supply and Lapply Fund	tion -	–The	2					
Sum	mary an	d Table Functi	on. Importing Data – Csv, Excel, Table, Xml,	, Jso	n,	Data	bases				
Conc	<u>11t10nal –</u>	- Control flow –	Loops- A Function with Multiple Arguments -								
Uni	+•?	Evoloratory D	ata Analytics · Visualization Packagos	<u> </u>	0	ho	ure				
	ning Da	Exploratory D	ata Analytics . Visualization Lackages	Sona	ratin	<u>110</u>	uis Uniting				
Colu	mns - S	tring Manipulat	ion – Filling Missing values – Packages – R Visi	naliza	ntion	5 – Pacl	kages –				
Latti	ce – ggp	lot2 –Plotly . sea	born- understanding plots – aesthetics statistical	func	tion -	His	togram				
– Box Plot – DensityPlot – Scatter Plots The Plot Function – Adding a Smoothing Line The Pie Chart											
– The Bar and Strip Chart – Box Plot – Cleveland Dotplots- Reporting– Data Preparation –											
Emb	Embedding R chunks – Labelling and reusing code chunks – Report Compiling – Configuring – R										
Pack	ages – sł	niny –Flex - ggv	is-								

Unit:3	Visualization: Univariate and Multivariate Analysis	9hours					
Variable Analysis – One variable – Understanding outliers through – histogram, boxplot, density plot							
– dataset –	pseudo dataset of facebook Exploring two variables - Under	rstanding Variables and					
relationships	- scatter plots - correlations - condition means - Explore	multivariate variables –					
Visualization	of variables using aesthetics in R – Case study – Explore Di	amond dataset for prize					
prediction	or variables using additiones in it case stady Enprore Dr						
prediction							
Unit:4	Categorical and Numerical Data Insights & Inferences	7-hours					
Data types -	Categorical – Binary – ordinal – Nominal – Continuous – Discr	ete – Data Dimensions –					
Univariate _	bivariate – multivariate – Numerical Measures – Central Tende	ncy – Mean – Median –					
Mode Unde	ustanding data using central tendency plotting histogram de	ney = Mean = Meenan =					
of plot Var	ability Massura Variance Banga IOC and Standard David	ation Sum of squares					
or prot - var	adinty Measure – Variance - Kange - IQC - and Standard Devia	ation – Sum of squares –					
Squared De	viations – Absolute Deviations - Identify outlier using in	nter Quartile Range –					
Visualization	usingboxplot						
		1					
Unit:5	Data Distribu <mark>tion and</mark> Error	9hours					
Data standard	lizing – Z Score – Negative Z Score – Continuous Distributions	- Compute proportions –					
Relative Free	juency histogram - Normalized Distribution using - Ztable – Pr	obability Distributions -					
Probability of mean – location of mean distribution - Sampling Distributions — Klout Sampling							
Distribution – Understanding Shape of Distribution – Standard Error - Standard Deviation of sampling							
distribution – Ratio of Sampling Distribution - Central Limit Theorem R – Mean of sample means							
Advanced Analytics Regression Analysis – Simple Regression Analysis – Logistic Regression –							
Multiple Regression ANNOVA Model – Parametric test - Non Parametric Test							
Unit:6	Contemporary Issues	2 hours					
Analyze Global Datasets to understand Issues on Climate Change, Epidemic and Pandemic Outburst							
	Total Lecture hours	45hours					
	OUCATE TO BASHINE	·					

Text	Book(s)							
1	V. Bhuvaneswari, "Data Analytics with R – S	Step by Step", SciTec	ch Publications, 2016.					
2	Roger D. Peng, " R Programming for Data Science " Lean Publishing, 2014							
3	Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters,"A Beginner's Guide to R" Springer, 2009							
4	Hadley Wickham, "R for Data Science: Impo	ort, Tidy, Transform	, Visualize, and Model					
	Data", First Edition, O'Reilly Media Publisher, ISBN: 9781491910399, 2017							
Refe	rence Books:							
1	Brett Lantz, "Machine Learning with R", Third Edition, ISBN: 9781788295864, 2019, [Packt]							
2	Kaelen Medeiros, "R Programming Fundam	entals", ISBN: 97817	789612998, 2018, [Packt]					
3	VitorBinanchiLanzetta, "Hands-On Data Science with R", ISBN: 9781789139402, 2018.							
	[Packt]							
4	Omar Trejo Navarro, " R Programming by Example ", ISBN: 9781788292542, 2017, [Packt]							
5	Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Second Edition, Pearson Education Publisher, ISBN: 9789386873521, 2018							
6	VigneshPrajapati, "Big Data Analytics with R and Hadoop", First Edition, PACKT Publishing Limited, ISBN: 9781782163282,2013							
7	Nina Zumel, "Practical Data Science with R", Dreamtech Press Publisher, ISBN: 9789351194378, 2014							
8	Hadley Wickham, "Advanced R", Second Edition, CRC Publisher, ISBN: 978-0815384571, 2019							
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
S.	- W D							
No	Course Title	Duration	Provider - Free					
1.	R Programming	4 Weeks	Coursera					
2.	Data Analysis with R	8 Weeks	Udacity					
3.	Introduction to Data Analytics	9 Weeks	Swayam					
4.	Introduction to R Software	9 Weeks	Swayam					
5.	Data Science Certification Training – R	14 hours	Simlilearn					
	Programming							
Web	Link:							
1.	 https://www.datacamp.com/tracks/r-programming 							
2.	. https://www.tutorialspoint.com/r/index.htm							
3.	3. https://www.datamentor.io/r-programming/							
Course Designed by: Dr.V.Bhuvaneswari								

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	L	L	L	L	L	L
CO2	S	S	S	S	S	S	S	М	Μ	S
CO3	S	М	М	S	S	S	L	L	L	L
CO4	S	S	S	S	Μ	М	L	L	L	L
CO5	S	S	S	S	S	S	S	S	S	S


Cou Co	irse de		DATA VISUALIZATION	L	Т	Р	С			
Core	e/Electivo	e/Supportive	Supportive/Skill based	4	2	2	4			
Pre	e-requis	ite	Knowledge on Data, Graphs and plots	Sylla rs	bus ion	202 202	20- 21			
Cou	rse Obj	ectives:								
The	main ob	jectives of this co	ourse are to:							
	1 To 1	inderstand how a	courately represent voluminous complex data se	in web	andf	rom				
othe	r datasoi	inderstand now a	centratery represent volumnous complex data se	. III WCC	anui	IOIII				
	2. To i	understand the m	ethodologies used to visualize large datasets							
	3. To l	know how to wor	k with visualization tools.							
Exp	ected Co	ourse Outcomes	and the							
On	the succ	cessful completio	n of the course, student will be able to:			-				
1	1 Understand the concepts of visualization									
2	2 Understand the methods for visualizing data in D3j, c3j, and Tableau									
3 Apply Visualization methods for different data domains										
4	4 Design Interactive Charts based on Data									
5	Distinguish and Suggest the appropriate data visualization tools for domain 5 specific applications and Design on Interactive data visualization story board for $K4$ $K5$									
U	data	ine applications a		oouru r	51		, 110			
K1	- Reme	mber; K2 - Unde	<mark>rstand; K3 - Apply; K4 - Analyze; K5</mark> - Evaluate	; K6 - (Create	e				
		And A	ant and	3						
Un	it:1	Introduction to	Data Visualization	7		9 ho	urs			
Defi	nition	- Methodology	– Seven Stages of Data Visualization	- Dat	a V	isual	ization			
Tool	ls. Visu	alizing Data: M	apping Data onto Aesthetics – Visualizing	Amoun	ts -	Visu	alizing			
Disti	ributions	s: Histograms a	and Density Plots – Visualizing Propositi	ons:	- 10	V1su	alizing			
Asso	octions of	: Among I wo or	More Quantitative Variables – Visualizing Time	Series	andO	ther				
Tunc		an independent	variable – Trends – visualizing Geospatiai Data							
Un	it:2	Interactive Dat	a Visualization			9 ha	urs			
Intro	duction	to D3 - Fundan	pental Technology: The Web – HTML – DOM	I - CS	$\overline{S - I}$	avaS	cript –			
SVC	G. D3 Se	tup – Generating	Page Elements – Binding Data - Drawing with	data –	Scale	s: Do	omains			
and	Ranges -	– Normalization	- Creating a Scale– Scaling the Scatter Plot – Otl	ner Met	hods	and (Other			
Scales. Axes – Modernizing the Chart – Update the Data – Transition – Updates – Interactivity.										
TT						0.1				
Un	<u>it:3</u>	D3 Based Reus	able Chart Library	01	• ·	$\frac{9 \text{ ho}}{1 \text{ ho}}$	urs			
Char	p and Do	eployment – Gen	Values Size Color Padding Tooltin Use		AX1S	Lab d U	el – nload			
-Sh	ow and	Hide – Focus – T	ransform = Groups = Grid = Regions = Flow = R	41 15. L/ evert —	Jau al Togg	le_I	nioau egend			
	ib chart	– Zoom – Resize	. Customize Style. Building Real time and Live I	Jpdatin	g anir	nate	d			
grap	hs with	C3.		r	9					

Un	it:4	Tableau Introduction		9 hours						
Env	ironment	Setup – Navigation – File & Data Types. TA SOURCE	E: Custom Data V	iew –						
Extr	acting D	ata – Fields Operations – Editing Meta Data – Data Join	ing – Data Blend	ing.						
Wor	ksheets.									
Un	it:5	Basic and Advanced Charts in Tableau		7 hours						
Bar	Chart – I	Line Chart – Pie Chart – Scatter Plot – Bubble Chart –G	antt Chart – Histo	grams -						
Wat	erfall Ch	arts. Dashboard – Formatting – Forecasting – Trend Lir	les.							
	• • •									
Un	it:6	Contemporary Issues		2 hours						
App	ly Visual	lization methods for different domains. Design an Intera	ctive data visuali	zation story						
boar	d for rea	l time data								
Exp	ert lectur	es, online seminars - webinars								
r		A-15810-24								
		Total Lecture	e hours	45 hours						
Text	Book(s									
1	Ben Fr	v. "Visualizing Data: Exploring and Explaining Data	with the Proces	sing						
1	Enviro	nment ". O'Reilly, 1 st Edition, 2008.		S						
2	Scott N	furray "Interactive data visualization for the web: A	n Introduction to) Designing						
_	with D	3 ". O'Reilly, 2 nd Edition, 2017.		, <i>2</i> 0319g						
3	Joshua	N. Milligan, "Learning Tableau 2019: Tools for Busi	ness Intelligence	data prep.						
C	and vis	sual analytics", Packt Publishing Limited, 2019.		, F . • F ,						
4	Claus O	. Wilke, "Fundamentals of Data Visualization: A Primer	on Making Inforn	native and						
	Compe	lling Figures", O.Reilly, 2019.	SVI							
Refe	erence B	ooks : EBooks	F /							
1	Ritchie	S. King, "Visual Storytelling with D3: An Introduct	ion to Data Visua	alization in						
	JavaSc	ript", Addison-wesley Data and Analytics, 2014.	V							
2	Elijah I	Meeks, "D3.js in Action: Data visualization with Java	Script", Second	Edition,						
3	Mannii Lindy I	ig Publications, 2017.	dition Dearson 20)18						
5	Lindy I	(yan, Visual Data Storytching with Tableau , 1st Ex		510.						
		Course Title	Duration	Provider						
1.	Fun	damentals of Visualization with Tableau	4 Weeks	Coursera						
Web) link									
1	l. https:	//c3js.org/gettingstarted.html								
2	2. https://www.tutorialspoint.com/tableau/index.htm									
1	3. https://www.dashingd3js.com/table-of-contents									
	$\frac{1}{11100000000000000000000000000000000$	igned by: Dr. S. Gayaskar								
		121100 Uy. DI. S. Oavaskal								
Rela	ted Onli	ine Contents [MOOC, SWAYAM, NPTEL, Websites	setc.]							
Map	ping wi	th Programme Outcomes								

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	М	М	S	L	S	S	М	S
CO3	S	М	М	Μ	S	L	S	S	Μ	S
CO3	S	S	М	S	S	М	S	S	М	S
CO4	S	S	S	S	S	М	S	S	М	S
CO5	S	S	М	S	S	М	S	S	Μ	S



Data Analytics with R Lab - 60 hours - All Programs should be designed based on the syllabus.

Data Visualization with Tableau Lab – 60 hours - All Programs should be designed based on the syllabus.





Course o	code	VIRTUALIZATION AND CLOUD	L	Т	Р	C					
Core/Ele	ective/Supportive	Core	4	4	0	4					
D	•••	Basic knowledge of data storage,	Sylla	bus	202	0-					
Pre-requ	lisite	Client –Server systems	vers	ion	202	1					
Course	Objectives:										
The main	n objectives of this c	ourse are:									
1. To im	part knowledge on	the concepts of distributed systems, cloud computing a	nd AW	/S							
2. To ga	in knowledge over v	various virtualization and virtual machines									
3. To ga	in understanding ab	out the datacenters									
Expecte	d Course Outcome	s:									
On the su	accessful completion	n of the course, student will be able to:									
CO1	To learn the fundation	mentals of distributed systems		K2							
CO2		K3									
CO3 To understand and perform virtualization K3											
CO4 To create, configure and manage virtual machines K4											
CO5	To learn about data	a center		K5							
K1 - Rer	nember; K2 - Under	stan <mark>d; K3 - Apply; K4 - Analyze; K5</mark> - Evaluate; K6 -	Create	e							
	A COL										
Unit:1	Distributed	Systems AS			12 ho	urs					
Introduct	tion to distributed sy	stems - Distributed algorithm - Distributed Data Store	s - Dis	tribute	ed						
Computi	ng - File Systems - I	Distributed Messaging - Distributed Applications – Dis	stribute	ed Tra	nsacti	on					
- Parallel	and distributed con	nputing - Applications.									
Init.?	Cloud Com				12 ho	iirc					
Cloud Co	oncepts: Introduction	n Cloud Computing - Advantages of Cloud - Public Cl	oud - f	ive es	sentia	1					
character	ristics - three service	models - Four deployment models - Benefits of Cloud	d Com	outing	- Clo	ud					
Vendors	- Traditional Infrast	ructure setup and Challenges – AWS.	1	. 0							
Unit:3	Virtualizati	Dn			12 ho	urs					
Virtualiz	ation: Introduction	to vSphere and the Software - Defined Data Center -	Creatir	ng Vir	tual						
Machine	s-VCenterServer-Co	onfiguringandManaging-VirtualNetworks-Configuring	and N	Ionito	ring						
wianagin	Managing Virtual Storage - Virtual Machine Management - Resource Management and Monitoring.										
Unit:4	Virtual Mac	hines		,	12 ho	urs					
Virtual N	Virtual Machines: vSphere HA - vSphere Fault Tolerance - Protecting Data vSphere DRS - Network										
Scalabili	ty - vSphere Update	Manager and Host Maintenance - Storage Scalability	- Secu	ring V	irtual						
Machine	s.										

Uni	it:5]	Datacen	tre							10 hours
Dat	a cen	tre: Dat	a centre	overview	v -Comp	onents -	Provisio	ns - Nee	d of Data	a Centre	- Data Centre
Arc	hitec	ture - D	ifferent l	Racks - I	Data cent	er archit	ecture fo	or cloud of	computir	ng - role	of data centre in
clou	ıd co	mputing	g.								
			<u>a</u> ,								
Un	It:6		Contem	porary I	ssues						2 hours
Exp	bert le	ectures,	online se	eminars –	- webina	rs					
			Total Le	ecture ho	ours						60 hours
Text Book(s)											
1	Geo	rge Cou	ılouris. J	ean Doll	imore. T	im Kind	berg. Go	rdan Bla	ir. "Dist	ributed S	Systems Concepts
and Design", 5 th Edition, Pearson Education, 2012.											
2	Ven	kataJos	yula , Ma	alcolm O	orr , Greg	g Page, "	Cloud C	omputin	g: Auton	nating th	e Virtualized Data
	Cen	ter", 1st	t Edition,	Cisco P	ress, 201	1.					
3 Brian J.S. Chee, Curtis Franklin Jr., "Cloud Computing: Technologies and Strategies of the											
Ubiquitous Data Center", 1st Edition, CRC Press, 2010.											
Ref	eren	ce Bool	KS	2		1 min	5	10			
1	And	lrew S.	Tanenba	um, Maa	rten Van	Steen, '	'Distribu	ted Syste	ems: Pri	nciples a	nd Paradigms", 2 nd
	edit	ion, Cre	atespace	Indepen	dent Pub	olishers,	2016.			1	0
2	Mat	thew Po	ortnoy, "	Virtualiz	ation Ess	sentials"	, 2 nd edit	ion, Wile	ey Public	cation, 2	016.
					100	2 miles				3.4	
Rel	ated	Online	Content	ts [MOO	C, SWA	YAM,	NPTEL,	Websit	es etc.]	1 1	
1	Clo	ud Com	puting a	nd Distri	buted Sy	stems, h	ttps://np	tel.ac.in/	courses/	106/104/	/106104182/
					100	SIL R	1	60 8	1	1	
Cοι	ırse I	Designe	d By: Dr	. T. Amı	udha	TF	The state	13 20	15V	1	
Ma	pping	g with P	rogramm	e Outcon	mes	4		A	e /		
C	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO)1	S	S	L	L	L	T Law	М	L	L	L
CO	02	L	S	М	S	CATL TO	Luc	L	L	L	L
CO	3	L	Μ	S	L	L	L	L	S	L	М
CO	94	L	L	S	Μ	L	L	L	Μ	L	М
CO)5	L	L	S	S	L	L	Μ	Μ	L	L

Course code		BIG DATA FRAMEWORKS AND TOOLS	L	Т	Р	С						
Core/Electiv	e/Supportive	Core	4	2	2	4						
Pre-requis	ite	Basics of Programming	Sylla Versi	bus ion	202 202	20- 21						
Course Obj	ectives:											
 To understand MapReduce programming architecture, processingmodels. To understand and design MapReduce Programming using PIG andHive To understand and compare the architectural and processing of MapReduceProgramming languages Pig, Hive andSPARK 												
Expected C	ourse Outcomes											
1 Uno	lerstand distribute	ed, MapReduce Processing architectures	K	2								
2 Cor Had	figure and setup loop, Spark, Pig	MapReduce Processing architectures Ecosystem – and Hive	K	K1, K2	2							
3 Uno	lerstand and write	e MapReduce program using Pig and Hive, SPARE	K K	3								
4 Crit 4 Ma app	Critically Analyze dataset using Pig, Hive and SPARK and suggest MapReduce Programming models based on domains specific K3 applications											
5 Des	ign and setu <mark>p a E</mark> narios.	Big Data Analytics Ecosystem for specific Business	K	K4 , K	5, K	6						
K1 - Reme	mber; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 - (Create	;							
T T 1 4 4					10	,						
Unit:1	Big Data Fran	nework	Carrie		12-	-hours						
commands - Reduce Arc YARN – Se Hive Config	Anatomy of File hitecture -Hadoop tting up Hadoop uration - SPARK	Write and Read, NameNode, Secondary NameNo Configuration: Environment : Steps – Hadoop 1. Eco System – Oozie – FLUME- STORM – FLUM Configuration – Integration – Hadoop with R – H	de, an D Vers IE - P adoop	d Dat sion V Pig Co with	aNo /sHa onfig Pytł	de - Map doop 2.0 uration – non						
Unit:2	PIG : MapRed	luce			12-	-hours						
Pig Introduction: Overview of Pig - Pig Architecture - Pig Execution modes, Pig Grunt shell and Shell - commands. Pig Latin Basis: Data model, Data Types, Operator - Pig Latin Commands - Load & Store, Diagnostic Operators, Grouping, Cogroup, Joining, Filtering, Sorting, Splitting - Built-In Functions, User define functions Pig Execution Modes - Batch Mode - Embedded Mode - Pig Execution in Batch Mode - Embedding Pig in Python - Use cases - Map Reduce programs with Pig - Pig VsSQL												
Unit:3	Unit:3Hive: Map Reduce - CURD12hours											
Introduction Tables - Tab In Functions	of Hive - Hive F le types - Creatin - Built-In Opera	eatures - Hive architecture -Hive Meta store - Hive ag database, Altering database, Create table, alter t tors, User defined functions –	e data able, I	types Drop 1	– H able	ive e, - Built-						

Un	it:4	Hive: Aggregation and Indexing	12hours								
Hive By J Dyna Setti	By Joins, LIMIT, Distribute By, Cluster By - Sorting And Aggregation – Partitioning – Static – Dynamic – Index Creation - Bucketing – Analysis of MapReduce execution – Hive Optimization – Setting Hiving Parameters. – Usecase :MapReduce using Hive QL – HiveQLVs SQL										
Un	it:5	SPARK Ouerv	10hours								
SPA	$\frac{M}{RK - M}$	apReduce - RDD Transformations – SPARK Operations – Use cas	e with SPARK and								
Comparison - MapReduce – Python – R – Pig – Spark – Hadoop - Limitations – Advantage – SPARK vsHadoop – SPARK Vs Pig and Hive – MapReduce- Spark Transformations											
Un	it:6	Contemporary Issues	2 hours								
Data	Process	ing Architectures Issues – Scalability - Case Study on Industrial Re	eports								
		Total Lecture hours	60hours								
Text	t Book(s):									
	Boris I	ublinsky Kevin T. Smith Alexey Yakubovich, Professional Hadoop	® Solutions, Wiley,								
1	ISBN: 9788126551071,2015.										
2	Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.										
3	Tom W	/hite, " Had<mark>oop: Th</mark>e Definitive Guide ", O'Reilly Media 3rd Edition	on,May 6, 2012								
4	Donald 2012	l Miner, Ada <mark>m Shoo</mark> k, " MapReduce Design Patterns ", O'Reilly N	Media November 22,								
5	Edward edition	l Capriolo,DeanWampler,Jason Rutherglen, " Programming Hive " , October, 2012	", O'Reilly Media; 1								
6	Deepal	Vohra, "Practical Hadoop Ecosystem: ADefinitiveGuidetoH	ladoop-Related								
	Framev	vorks and Tools" First Edition, Apress Publisher, ISBN: 97814842	21983, 2016								
7	Alan G	ates, "Programming Pig", O'Reilly Media; 1st Edition,October, 2	011								
Refe	erence B	ooks:									
1	Sridhar 2018, [Alla, "Big Data Analytics with Hadoop 3", First Edition, ISBN: Packt]	978-1-78862-884-6,								
2	Naresh [Packt]	Kumar, "Modern Big Data Processing with Hadoop", ISBN: 97	781787122765, 2018,								
3	Neerajl	Malhotra,"Data Engineering Skills - Hadoop Shell: A Comprehe	ensive Guide to Hadoop								
	FS 978171	Commands", First Edition, CreateSpace Independent 7577511,2018	Publishing, ISBN:								
4	Vignes 328-2,	hPrajapati, "Big Data Analytics with R and Hadoop", First Editi 2013, [Packt]	on, ISBN: 978-1-78216-								
5	Edward Hadoo	l Capriolo, " Programming Hive: Data Warehouse and Query I p ", First Edition, O'Reilly MediaPublisher, ISBN: 9781449319335	Language for 5,2012								

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]														
S. No			Course	Title			Durat	ion	P	rovider - Free				
1.	Big Dat	a Hadoo	op and S	park Dev	eloper –	R 26	hours		Simplil	earn				
	Program	nming												
2.	Intro to	Hadoop	and Ma	pReduce	;	4	Weeks		Udacity	7				
3.	Hadoop	Platfor	m and A	pplicatio	n	5	Weeks		Coursera					
	Framew	vork												
4.	Big Dat	a Essent	tials: HD	FS, Map	Reduce	and 6	Weeks		Courser	a				
	Spark RDD													
5.	5. Mining Massive Datasets 7 Weeks edX													
Web Link – Video														
1. http://hadooptutorial.info/mapreduce-programming-model/														
2.	https://h	adoop.a	pache.or	g/docs/r	1.2.1/ma	pred_tut	orial.htn	nl						
3.	https://h	adoop.a	pache.or	g/docs/ci	urrent/ha	doop-m	apreduce	e-client/h	adoop-m	apreduce-client-				
	core/Ma	pReduc	eTutoria	l.html	-	Contraction of the local division of the loc	1		-	-				
4.	https://v	www.edu	ireka.co/	/ <mark>blog/ma</mark>	preduce-	tutorial/								
			pr.	1.1	1310	RY.	12	70						
	<u> </u>		V DI	<u> </u>	No.		-	12						
Course	Designed	I By: Dr.	V.Bhuv	aneswari		And	2							
Mapping	g with Pr	ogramm	e Outco	mes	DOF	POL	DOF	DOG		D 010				
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10				
CO1	L	М	M	L	L	L		M	L	L				
CO2	S	S	S	S	М	S	L	M	Μ	М				
CO3	Μ	Μ	M	S	L	L	L	М	L	Μ				
CO4	S	S	S	S	М	М	S	L/	М	S				

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SLILINGONT R-WINS

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CO5

Course c	ode	MACHINE LEARNING	L	Т	Р	С				
Core/Ele	ctive/Supportive	Core	4	2	2	4				
Pre-rec	quisite	Basics on Statistics and Linear Algebra	Sylla Versi	bus ion	2020 2021)- L				
Course	Objectives:									
1. T n	To understand the Co nethods	ncepts of Machine learning algorithms of different	proba	bilis	tic					
2. T	To apply the machine	learning algorithms for various applications.								
CO1	Understand the sone	ents of machina laarning	V	1						
C01	Understand the conc	epis of machine learning		$\frac{1}{2}$						
02	Understand and dist	nguish Supervised Unsupervised and semi	N							
CO3	supervised learning	inguish Supervised, Unsupervised and semi	K	2						
CO4	Apply Supervised, U specific problem	K	[4							
CO5	K4, K3 ,K5									
K1 - Re	emember; K2 - <mark>Unde</mark>	e <mark>rst</mark> and; K3 - Apply; K4 - Anal <mark>yz</mark> e; <mark>K5 - Ev</mark> aluate; l	K6 - (Creat	e					
			A							
Unit:1	Unsupervised	Models	127	12	hour	S				
Types of Applicat EM Algo The Curs Analysis	f machine learning - ionsUnsupervised orithm in General -N se of Dimensionality s - Probabilistic PCA	basic concepts in machine learning Foundations –Overview basic concepts in machine learning Examples of M Learning Clustering- K-means - EM - Mixtures of Iodel selection for latent variable models - high-dir -Dimensionality Reduction - Factor analysis - Prin- Independent components analysis	w – a Iachin of Ga nensio cipal	ippii ne L ussia onal Com	earnii ins - ' space	ng - The S nt				
		N D								
Unit:2	Linear Model	s Pelulioni e-		12	hour	S				
Supervised Learning Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison Linear Models for Classification - Discriminant Functions -Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees - ClassificationTrees-RegressionTrees-Pruning.SupportVectorMachines-Ensemblemethods-Bagging- Boosting – Evaluation Methods										
Unit:3	Graphical Mo	dels		12-	- hou	irs				
Unit:3Graphical Models12 hoursProbabilisticGraphical ModelsDirected Graphical Models - Bayesian Networks - ExploitingIndependenceProperties - From Distributions to Graphs -Examples -Markov Random Fields -Inference inGraphical Models - Learning -Naive Bayes classifiers-Markov Models - HiddenMarkovModels - decoding states from observations, learning HMM parameters-Inference -LearningGeneralization - Undirected graphical models- Markov random fields- Conditionalindependenceproperties-ParameterizationofMRFs-Examples-Learning-Conditional										

fields	(CRFs)) - Structural SVMs								
Unit	:4	Advanced Models	18hours							
Advar	nced Le	arning Sampling – Basic sampling methods – Monte Carlo. Reinfor	rcement Learning-							
K-Arr	ned Ba	ndit Elements - Model-Based Learning- Value Iteration- Policy It	eration. Temporal							
Differ	ence L	earning Exploration Strategies- Deterministic and Non-determini	stic Rewards and							
Action	ns- Elig	gibility Traces - Generalization- Partially Observable States- The	Setting- Example.							
Semi	Semi - Supervised Learning. Computational Learning Theory - Mistake bound analysis, sample									
complexity analysis,										
Unit	:5	Deep Learning Models	10hours							
Neura	l Netw	orks -Feed-forward Network Functions - Error Back propagation	- Regularization -							
Mixtu	re Den	sity and Bayesian Neural Networks - Kernel Methods - Dual Repres	sentations - Radial							
Basis	Functio	on Networks – Sequence Models = Recurrent Net – Types – Word D	bisambiguation –							
Convo	olution	Net – Basics – Applications								
Unit	:6	Contemporary Issues	2 hours							
Ethica	al Cons	iderations in Machine Learning Applications – Ethics and Challenge	es of AI and ML							
as dist	ruptive	technology Use cases – Webinars								
-										
Total Lecture nours 60nours										
Text	Books									
1	Christ	opher Bishop, "Pattern Recognition and Machine Learning" Springe	er, 2006							
2	Kevin	P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT	Press, 2012							
3	Ethen	Alpaydin, "Introduction to Machine Learning 3(Adaptive Computa	tion and Machine							
	Learn	ing Series)", Third Edition, MIT Press, 2014								
4	Tom	M Mitchell, "Machine Learning", First Edition, McGraw Hill Educa	tion, 2013.							
Refei	rence B	ooks								
1	Janne	sKlaas, "Machine Learning for Finance", ISBN: 978178936364, 201	19 [Packt]							
	Giuse	ppe Bonaccorso, "Machine Learning Algorithms", Second Edition, 1	ISBN:							
2	97817	89347999, 2018 [Packt]								
3	Steph	en Marsland, "Machine Learning – An Algorithmic Perspective", CR	RC Press, 2009							
4	Hastie	e, Tibshirani, Friedman, "The Elements of Statistical Learning", Sec	ond Edition,							
	Spring	ger, 2008								
5	Yuxi	Liu, "Python Machine Learning By Example", 2017 [Packt]								
6	John I	Paul Mueller, Luca Massaron, "Machine Learning (in Python and R)	For Dummies",							
-	First I	Edition, Wiley Publisher, ISBN: 9788126563050, 2016								
7	U I Publis	Dinesh Kumar ManaranjanPradhan,,"Machine Learning usi her: Wiley, ISBN: 9788126579907, 2019	ng Python".)							

Online	Course:		
S. No	Course Title	Duration	Provider -Free
1.	Machine Learning	12 hours	Simplilearn
2.	Machine Learning for Data Analysis	4 Weeks	Coursera
3.	Machine Learning Foundations: A Case Study	6 Weeks	Coursera
	Approach		
4.	Machine Learning : Regression	6 Weeks	Coursera
5.	Introduction to Machine Learning	12 Weeks	Swayam - NPTEL
6	Deep Learning Specialization	4 Courses	Coursera

Web Link - Video:

1. https://www.packtpub.com/data/hands-on-machine-learning-with-scikit-learn-and-tensorflow-

2-0-video

2. https://www.packtpub.com/data/machine-learning-projects-with-tensorflow-2-0-

video3.https://www.packtpub.com/application-development/complete-machine-learningcourse-python-video

Mapping with Programme Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	L	L	М	M	М	L	
CO2	S	S	S	L	L	L	L	L	L	L	
CO3	S	S	L	L	L	L	L	L	L	L	
CO4	S	S	S	S	L	M	M	М	M	М	
CO5	S	S	S	S	S	S	S	S	S	S	
*S-Strong; M-Medium; L-Low											
			N.	W Que			sh.				

 $Map \ Reduce \ Programming \ Lab-75 \ hours \ \text{-} \ \text{All Programs should be designed based on the syllabus.}$

Machine Learning Lab -75 hours - All Programs should be designed based on the syllabus.





Course		EVOLUTIONARY COMPUTING	L	Т	Р	С			
Core/Ele	ctive/Supportive	Core	4	4	0	4			
Pre-requ	isite	Knowledge on algorithms and design strategies	Sylla vers	bus ion	202 202	0- 1			
Course () bjectives:								
The main	objectives of the c	course are							
1. To und 2. To und 3. To und	erstand the evoluti erstand Optimizati erstand multi-obje	onary and heuristic technique and value representa on Algorithm, Genetic Algorithm and Neural Netw ctive optimization and applications of heuristic tech	tion. /orks. hnique						
Expected	Course Outcome								
On the su	ccessful completio	n of the course, student will be able to:							
CO1	Develop knowled	ge of evolutionary computation methodologies in the	ne.	K 2)				
context of modern heuristic methods									
CO2 Gain experience in matching various evolutionary computation methods K3									
and algorithms for particular classes of problems									
CO3	Understand Single	objective and Multi-objective optimization proble	ms	K2	2				
CO4	Solve optimization	n problems using suitable algorithms		K5	5				
CO5	Develop evolution	nary algorithms for real-world applications	Å	Kć	5				
K1 - Ren	nember; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 - C	reate					
		a contraction of	1						
Unit:1	Introduction to	Evolutionary Computing		1	2 ho	urs			
Introduct	ion to evolutionary	and heuristic techniques - Principles and Historica	l Persp	ectiv	es;	_			
Applicati	on potential in opti	mization, dimensionality reduction, data mining ar	id anal	ytics,	Gen	etic			
Algorithi	ils, Evolutionary S	rategies, Evolutionary Programming							
Unit:2	Optimization A	Igorithms		1	2 ho	urs			
Introduct	ion to Representati	ons, Binary Strings, Real-Valued Vectors, Various	Select	ion S	trateg	gies			
Introduct	ion to Search Oper	rators, Crossover and Mutation, Ant Colony Optin	nization	ı, Phe	erom	one			
mediated	search and Explor	ation and Exploitation strategies, Particle swarm op	otimiza	tion b	oasic				
PSO strat	egies and variants,	different neighborhood topologies							
Unit:3	Artificial Neura	l Networks		1	2 ho	urs			
Fundame	ntals of Artificial	neural networks – Architecture – Learning Para	digms	- A	ctiva	tion			
Functions - Multi-Objective optimization problem- principles of Multi-objective optimization-									
Dominance and pareto-optimality - Pareto Front and Non-dominated Solutions - Classical									
methods									
Unit•4	Fuzzy Logic	Ι		1	2 ho	ure			
Fuzzy log	ric - Fuzzy Sets – (Deperations on Fuzzy Sets – Fuzzy Relations – Mem	bershi	p Fun		15 -			
Fuzzy Ru	les and Fuzzy Rea	soning – Fuzzy Inference Systems – Fuzzy Expert	System	s - F	uzzy				
Decision	Making - Adaptive	e Neuro-Fuzzy Inference Systems.	•		5				

Unit	t:5	Opti	mizatio			10 k	ours					
App	licatio	ns of	evolutio	onary & l	Heuristic	techniq	ues in lar	ge scale	Optimiz	ation, C	ombinatori	al &
Fund	ction o	ptimi	zation -	NSGA,	Applicat	ions to la	arge scal	e cluster	ing class	ification	, rule mini	ng
and	Data d	lriven	Modeli	ng, Varia	able Sele	ction and	d Inform	ative Da	ita reduct	ion and	parameter	
optii	mizati	on in	predictiv	ve data a	nalytics							
TT		C	4	T							21	
Unit		Con	1.	ary Issu	2S						2 f	lours
Exp	ert lec	tures,	online s	eminars	– webin	ars					<0. 1	
							То	otal Lec	ture hou	rs	60 k	iours
Text	t Book	x(s)										
1	David	l E	Gol	dberg,	"Genet	ic Al	gorithms	in	Search,	Opti	mization	and
	Mach	ine Lo	earning	", Pearso	n Educa	tion Indi	a, 2013.					
2	S. Raj	jaseka	ıran, G.	A.Vijaya	ılakshmi	Pai, "Ne	ural Netv	vorks, F	uzzy Log	gic and H	Evolutionar	y
	Algor	ithms	: Synthe	sis & Aj	oplicatio	ns", Prei	ntice-Hal	l of Indi	a Pvt. Lt	d., II edi	tion, 2017.	
3	S.N.S	ivana	ndam ar	d S.N.D	eepa, "P	rinciples	of Soft	Comput	ing", 3 rd	edition,	Wiley India	a Pvt
	Ltd, 2	018.				-						
4	Andri	es P.	Engelbr	echt, "Fu	indamen	tals of C	omputati	onal Sw	arm Inte	lligence'	", Wiley	
	public	cation	s, 2005.	de la	11.	1 250		2 -	A.			
					1.1	1 in	100					
Refe	erence	e Bool	KS	6	11 13		1A	-	31			
1	Xin S	he Ya	ung, "Na	ture-Insp	oired Co	mputatio	n and Sv	varm Int	elligence	- Algor	ithms, The	ory
	and A	pplic	ations",	1st Editi	on, Acad	lemic Pr	ess, 2020).	- 10	100	1	
2	Marco	o Dor	igo, Tho	mas Stu	tzle, "An	t Colony	y Optimiz	zation",	MIT Pre	ss, 2010	•	
3	Oded	Maim	on, Lior	Rokach	(<mark>Eds), "I</mark>	Data Mir	ing and	Knowle	dge disco	very ha	ndbook",	
	Spring	ger, 2	005.						1 3	1		
I			1. 10	CA.	100 0.0	1	1000	22 V	A.			
Rela	ated O	nline	Conter	ts [MO	OC, SW	AYAM,	NPTEL	, Websi	ites etc.]			
1	Introd	luctio	n to Sof	t Compu	ting, http	os://npte	l.ac.in/co	urses/10)6/105/10)610517	3/	
-									1.100,10			
Cour	rse De	sione	d Bv· D	r T Am	udha	U.S. ILE III	1 and an	and the second				
Cou		515110			uulla	and the second second	and the second sec					
Mar	oping	with	Program	nme Ou	tcomes				-		<u>.</u>	
CO	s P	01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10)

005			- 00	-0.	100	-00	-01	-00	- 07	1010
CO1	S	S	L	L	L	L	L	L	L	L
CO2	L	S	Μ	S	L	L	L	L	L	L
CO3	L	М	S	L	L	L	М	Μ	L	S
CO4	L	L	S	S	L	L	L	Μ	L	М
CO5	L	L	S	S	L	L	М	Μ	L	S

Course codeTEXT ANALYTICSLTP										
Core	/Elective	/Supportive	Elective	4	3	1	4			
Pre	-requisi	te	Knowledge on Txtdata,NLP	Sylla ver:	bus sion	2020 2021)- 1			
Cour 1 2 3	rse Obje To un To un text a To un	ectives: Iderstand the tex Iderstand and ap nalytics. Iderstand and ap	t mining and NLP techniques ply probabilistic models, clustering and classifica ply text analytics approaches in different domains	tion f	òr					
Exp	ected Co	ourse Outcome	s:							
On	the succ	essful completion	on of the course, student will be able to:							
1	Underst	and the text min	ing and text pre-processing techniques			K1,	K2			
2 Understand the concepts of text mining in information retrieval and extraction K1,										
3	Apply t	he probabilistic 1	nodels, clustering and classification for text analyti	cs		K3				
4	To appl	y the text analyti	cs approaches in different domains			K3-1	K5			
5 Design a text analytic framework to analyze text data for domainspecific applications K4-K3										
K1	- Remer	nber; K2 - Unde	e <mark>rsta</mark> nd; K3 - Apply; K4 - Analyze; <mark>K5 - E</mark> valuate	; K6 -	- Crea	ate				
Uni Text unstr Sente for p matr Uni Infor searc	Unit:1Text Mining18hoursText Mining - Definition - General Architecture - Core Text mining Operations. Nature of unstructured and semi-structured text, Collecting documents NLP : Text pre-processing- Sentence Segmentation tokenization - lemmatization - stemming - Parsing text - keywords,- POS, Bag of Words Model, n-grams, chunking and Named Entity Recognition (NER) Corpus - sentence boundary determination - Textual information to numerical vectors -vector generation for prediction- document standardization and Representation - Inverted Index-term document matrix (TDM)-TDM Frequency12hoursUnit:2Information retrieval and Extraction12hours									
and Unsu Repr	Relation pervised esentatio	Extraction-Ter Algorithms for Driftuence of	nplate filling and database construction –Applie Information Extraction. Text Summarization Tec Context -Indicator representations	icatio	- Ivan ns. In ues-T	hed E hducti	ive -			
Text for T speci Baye Defin simil Lear	Categor Cext Classific measures Classi nition- Harities-H ningPatt	rization – Defin sification, Gini sure Classification fiers - Linear C Feature Selection lierarchical c ern Extraction -	ition – knowledge engineering,Text Classificatio Index, Information Gain .Evaluating model : cor on models : Decision Tree Classifiers -Rule- base lassifiers-Classification of Linked and Web Data n and Transformation Methods for Text Cluster luster –K-means -Semi- Supervised Cli Apriori Algorithm – FP Tree algorithm - Resultss	n, Fe nfusic d Cla a –Te ering usteri	ature on ma ssifie xt Cl –Dis ng aaries	nou Selec trix, c rs - N usteri tance -Tran	rs ction class laive ng – and nsfer			

Unit:4Probabilistic Models for Text Mining12hours
Probabilistic Models: Introduction, Mixture Models, Stochastic Processes in Bayesian
Nonparametric Models, Graphical Models, Probabilistic Models with Constraints, Parallel
Learning Algorithms. Probabilistic Models for Information Extraction -Hidden Markov Models-
Stochastic Context-Free Grammars - Maximal Entropy Modeling -Maximal Entropy Markov
Models - Conditional Random Fields
Unit:5Text Analytics Use Cases10hours
Text Analytics in Social Media, Modeling text sentiments, Spam Detection, Mining Text
$\label{eq:streams} Streams, Opinion Mining and Sentiment Analysis, Text Visualization Approaches-Architectural$
Considerations – Common Visualization Approaches for text mining. Case study :
Unit:6Contemporary Issues2 hours
Challenges of text analytics approaches for regional specific languages
Total Lecture hours 60hours
Text Book(s)
1 MuruganAnandarajan "Practical Text Analytics: Maximizing the Value of Text Data", Springer; 2018
2 Charu C. AggarwalMachine Learning for Text 2018
3 Steven Bird, Ewan Klein and Edward Loper"Natural Language Processing with Python"
Reference Books
1 Markus Hofmann, Andrew Chisholm "Text Mining and Visualization: Case Studies Using
Open-Source Tools,", CRC press, Taylor & Francis,2016
2 Charu C. Aggarwal ,ChengXiangZhai,Mining Text Data, Springer; 2012
3 DipanjanSarkar Text Analytics with Python, 2016
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1 Business Analytics & Text Mining Modeling Using Python,IIT Roorkeehttps://swayam.gov.in/
2 NaturalLanguageProcessing, IITKharagpurhttps://swayam.gov.in/
3 Text Mining and Natural Language Processing in Rhttps://www.udemy.com/
Course Designed By:

Mapping with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	L	L	L	L	L	L	L	L		
CO2	L	S	М	S	L	L	L	L	L	L		
CO3	L	М	S	L	L	L	М	Μ	L	S		
CO4	L	L	S	S	L	L	L	М	L	М		
CO5	L	L	S	S	L	L	М	M	L	S		

Course c	ode		INTERNET OF THINGS	L	Т	Р	C			
Core/Ele	ective/	Supportive	Elective	4	3	1	4			
Pre-requ	isite		Basic knowledge of hardware, Programming in C	Sylla vers	bus ion	202 202)- 1			
Course (Object	tives:								
The main	objec	ctives of this cour	se are:							
1. To gai	n insi	ght about the arcl	nitecture and enabling technologies of Internet of Th	ings						
2. To unc	lerstar	nd Arduino micro	controller and IDE							
3. To dev	elop s	imple IoT Applic	cations for different domains							
T										
Expected	1 Cou	rse Outcomes:	the course student will be able to:							
On the st		tul completion of	the course, student will be able to:		17.1	1				
COI	To le	arn the important	ce of smart objects and smart environment		K	L				
CO2	To ui	nderstand and use	the microcontroller and various sensors		K2	2				
CO3 To create programs using Arduino IDE and extract data										
CO4 To perform WiFi data communications, remote data storage in cloud, and K3, K handle the data using web applications										
CO5 To identify potential problems and develop solutions using IOT										
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create										
	Ь	A 1985								
Unit:1 Introduction to IoT 12 hours										
Introduct	ion to	IOT - Enabling	technologies of IOT - AI and Machine Learning - P	hysic	al an	d log	ical			
design o	f IoT	- IOT Referen	nce Architecture - IOT Functional Architecture	- Io	Γ lev	vels	and			
deployme	enttem	plates-Applicati	ondomainsofIoT:Homeautomation-Cities-Environn	nent-						
Energy –	Indus	try – Agriculture	- Transportation - Health care & Lifestyle.							
TT T T T T T T T T 		D. I. D.								
Unit:2		Basic Electroni	cs for loT & Arduno IDE]	$\frac{12}{3}$ ho	urs			
Understa	nding	basic electronic	components and power elements Electric Charge, I	kesist	ance,	Curi	ent			
and volta	age –	Resistors, Capac	itors, Diodes, LED, Potentiometer, circuit boards -		bg an	a aig	ital			
Anduino	- MICIO	Just lation and	Set up $Programming Fundamentals with C up$	wiat.	n IVIC Andru		.1011 DE			
Drogrom	IDE. Struct	instantation and	Sei-up - Flogramming Fundamentals with C up	sing I	Yondi	tiona				
Statemen	te and	Loope - Using	Arduino C Library functions for Serial delay a	nd of	her i	invok	1 ing			
functions	us and	i Loops - Osing	Additio C Library functions for Serial, delay a	nu ot		IIVOK	mg			
Unit:3Arduino Microcontroller and sensors12 hours										
Working	Working with Arduino: LED and Switch - Data acquisition with IOT Devices - Understanding Sensors									
and Devices - Understanding the Inputs from Sensors - Working with Temperature Sensors - Working										
with Ultrasound Sensor - Working with humidity sensor - Working with Motion Sensor - Working										
with IR Sensor - Working with Proximity Sensor - Working with Accelerometer and vibrationsensor.										
TT. •4 4		Marang			-	<u>- 1</u>				
Unit:4		Ivienical Sensor	S and Actuators	Court	1	2 not	ırs			
Dressure	naing	r - Airflow consor	: Flow Sensor - Oplical Sensor - Body Temperature	Senso	or - B	1000 nd				
11055010	561150	-Annow sensor	(orcanning) - 1 anent position sensor (acceleronneler) - ru	150 al	uu				

Dxygen in blood sensor (SPO2) - Galvanic skin response (GSR - sweating) sensor.									
Understanding the Outputs through Actuators - Activating LED Lights - Activating Relays -									
Activating Buzzer - Running DC Motors - Running Stepper Motors and ServoMotors.									
Unit:5 Data Communication from IOT devices	10 hours								
Building and Using Communication Devices to transfer data from IOT Devices - Underst	tanding the								
Communication Principles to Transfer the data from IOT Devices; Using WIFI to Transfer the data									
from IOT Sensor; Programming Fundamentals with Web Applications for handling Data									
Communication from IOT Device; Remote Communication to cloud/external application.									
Unit:6 Contemporary Issues	2 hours								
Expert lectures, online seminars – webinars									
Total Lecture hours	60 hours								
Text Book(s)									
1 ArshdeepBahga,VijayMadisetti,,,InternetofThings:AHands-OnApproach",UniversitiesF 2015.	Press,								
2 Boris Adryan, DominikObermaier, Paul Fremantle, "The Technical Foundations of IoT Artech Houser Publishers, 2017.	ee ?								
3 Michael Margolis, "Arduino Cookbook" 2nd Edition, O'Reilly Media, 2012.									
4 Marco Schwartz, "Internet of Things with ESP8266", Packt Publishing, 2016.									
Reference Books									
1 Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015.									
 Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015. Michael Miller, "The Internet of Things", Pearson India, 2015. 									
 Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015. Michael Miller, "The Internet of Things", Pearson India, 2015. 									
 Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015. Michael Miller, "The Internet of Things", Pearson India, 2015. Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 									
 Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015. Michael Miller, "The Internet of Things", Pearson India, 2015. Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] Introduction to IOT, https://nptel.ac.in/courses/106/105/106105166/ 									
 Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015. Michael Miller, "The Internet of Things", Pearson India, 2015. Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] Introduction to IOT, https://nptel.ac.in/courses/106/105/106105166/ 									

	Statument a with											
Mapping with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	L	L	L	L	L	L	L	L		
CO2	L	L	S	S	L	L	S	L	L	L		
CO3	L	Μ	L	L	L	L	S	Μ	L	М		
CO4	L	L	S	S	L	L	M	M	L	M		
CO5	L	L	М	М	L	L	L	L	L	L		

Course		SENTIMENT ANALYSIS	L	Т	Р	С				
Core/Electi	ve/Supportive	Elective	4	4	0	4				
Pre-requis	site	Basics of data and data classification methods	Syllabus Version	3	2020- 2021	<u> </u>				
Course Ob	jectives:									
The main ol	ojectives of this course	are to:								
To understa	nd representation and	handling of opinions by people in different wa	iys.							
To analyze	different challenges in	sentiment analysis								
To understa	fake opinion detection	and intention classification								
To understa	nd machine learning te	echniques for sentiment analysis at different le	vels							
Expected C	Expected Course Outcomes:									
On the suc	cessful completion of	the course, student will be able to:								
1Introduction to sentiment analysis and its applicationsK1,K2										
2 Understand Sentiment analysis using supervised and unsupervised learning K2										
3 Discuss the challenges in sentiment analysis classification K4										
4 Create different types of opinion summary from the given data sources K1,K3										
5 Under	stand the aspect orient	ed sentiment analysis		J	K3,K4					
6 Identi	fying opinion quality, a	author intention and fake opinions	â	J	K1,K4					
K1 - Reme	ember; K2 - Understan	d; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 - Crea	te						
		hand a start								
Unit:1	Introduction to Sen	timent Analysis	1	10-	-hours	5				
Introduction as Mini NL Summary - Standpoint. Sentiment C Cross-Lang	a: Sentiment Analysis P. The Problem of So Affect, Emotion, an Document Sentiment (Classification - Sentim uage Sentiment Classif	Applications - Sentiment Analysis Research entiment Analysis: Definition of Opinion - I ad Mood - Different Types of Opinions - Classification: Supervised Sentiment Classific ent Rating Prediction - Cross-Domain Senti fication - Emotion Classification of Document	- Sentime Definition Author ation -Un ment Cla	ent of and suj ssi	Analy Opini d Read pervise fication	'sis ion der xd n -				
0	0									
Unit:2	Subjectivity Classif	ication and Challenges]	10-	-hours	3				
Sentence S Classification with Sarcas Discourse In	Sentence Subjectivity and Sentiment Classification: Subjectivity - Sentence Subjectivity Classification - Sentence Sentiment Classification - Dealing with Conditional Sentences - Dealing with Sarcastic Sentences - Cross-Language Subjectivity and Sentiment Classification - Using Discourse Information for Sentiment Classification - Emotion Classification of Sentences.									
Unit:3 Aspect Oriented Classification 14hours										
Aspect Sen Modality an - Rule Repr Extraction: Learning-M - Entity Ext	timent Classification: d Sentiment - Coordin esentation - Word Sen Frequency-Based Asp appingImplicitAspects raction and Resolution	- Rules of Sentiment Composition - Negating Conjunction But - Sentiment Words in Negative Disambiguation and Co reference Resolutive ect Extraction - Exploiting Syntactic Relations-GroupingAspectsintoCategories-ExploitingT - Opinion Holder and TimeExtraction.	tion and Non-opini on. Aspec is - Using 'opicMod	Sei on t a ; Si els	Conte nd Ent upervis	t - xts tty sed				

Uni	t:4	Sentiment Lexicon generation and Summarization	14hours							
Senti and Com and Enha Sum Retri Fine-	Sentiment Lexicon Generation: Dictionary-Based Approach - Corpus-Based Approach - Desirable and Undesirable Facts. Analysis of Comparative Opinions: Problem Definition - Identify Comparative Sentences - Identifying the Preferred Entity Set - Special Types of Comparison - Entity and Aspect Extraction. Opinion Summarization and Search: Aspect-Based Opinion Summarization - Enhancements to Aspect-Based Summary - Contrastive View Summarization - Traditional Summarization - Summarization of Comparative Opinions - Opinion Search - Existing Opinion Retrieval Techniques. Mining Intentions: Problem of Intention Mining - Intention Classification - Fine-Grained Mining of Intentions.									
Uni	t:5	Identifying intention, fake and quality of opinion	10hours							
Detecting Fake or Deceptive Opinions: Different Types of Spam - Supervised Fake Review Detection - Supervised Yelp Data Experiment - Automated Discovery of Abnormal Patterns - Model- Based Behavioral Analysis - Group Spam Detection - Identifying Reviewers with Multiple User ids - ExploitingBusinessinReviews-SomeFutureResearchDirections.QualityofReviews:Quality Prediction as a Regression Problem - Other Methods - Some New Frontiers.										
Uni	t:6	Contemporary Issues	2 hours							
Exp	ert lec	tures, online seminars – webinars								
		Total Lecture hours	60hours							
Text	Books									
1	Bing	Liu "Sentiment Analysis: Mining Opinions, Sentiments and Emotions, C	Cambridge							
Dofo	Unive	Proks. 2015.								
	Ding	DOOKS	lishara 2012							
1	Dilig Erik (Cambria Dipankar Das "A Practical Guida to Sontiment Analysis" Sprin	ngor 2017							
		Line Contenta INOOC SWAVAM NETEL Websites et al	liger, 2017.							
Rela	teu OI	inne Contents [WOOC, SwATAM, NPTEL, websites etc.]								
		Course Title								
1.	http	s://www.coursera.org/projects/twitter-sentiment-analysis								
2.	http	s://www.udemy.com/course/sentiment-analysis-with-lstm-and-keras-in-	python/							
Web	link		1							
	. http 6c94	s://towardsdatascience.com/sentiment-analysis-concept-analysis-and-ap 4d6f58c17	plications-							
2	2. https://www.lexalytics.com/technology/sentiment-analysis									
3	3. https://web.stanford.edu/class/cs124/lec/sentiment.pdf									
4	4. https://www.utas.edu.au/research/degrees/available-phd-projects/phd-projects/college-of-									
	scie	nces-and-engineering/school-of-technology,-environments-and-design/i	nformation-and-							
	com	munication-technology/a-machine-learning-approach-for-sentiment-ana	alysis-or-opinion-							
Con	min	ing ianad Dau Ma S D alanisany								
Cour	se Des	Igneu Dy. MIG. S. Palanisanny								

Mappi	Mapping with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	Μ	L	L	L	L	L	L	S	S	S			
CO2	S	L	L	S	L	S	М	L	L	L			
CO3	Μ	L	L	S	S	Μ		М	М	М			
CO4	L	М	S	S	L	S	S	S	М	S			
CO5	L	L	L	S	L	Μ	L	L	L	S			
CO6	L	М	М	S	М	М	S	S	S	S			



Course		SOCIAL MEDIA MINING	L	Т	Р	С					
Core/Elective/	Supportive	Elective	4	-	-	4					
Dro roquisi		Knowledge on Complex data	Sylla	abus	2020	2021					
Pre-requisit	le	structures, algorithm and web	Ver	sion	2020	-2021					
Course Obje	ctives:										
The main object 1. To une others 2. To une 3. To une	ectives of this co derstand how ac ources derstand the mo derstand social l	burse are to: ocurately analyze voluminous complex data dels and algorithms to process large datase behavior and recommendation challenges a	ts ndmeth	ocial r odolog	nedia a gies	and					
Expected Co	urse Outcomes	:									
On the succe	essful completio	n of the course, student will be able to:									
1 Understand the concepts of Graph Models, social communities K1, K2											
2 Unders		X3									
3 Underst structur	tand and apply a set and recommendations and recommendations and recommendations and recommendations are as a s	llgorithms to model data using graph and n	etwork	ŀ	K2,K5						
4 Brief or	n algorithms on	social data diffusion and apply for various	domain	s F	K2,K3,	K4					
5 Disting applica algorith	5 Distinguish and Suggest the appropriate algorithms for domain specific applications for data modelling and information diffusion, Evaluate the algorithms for metrics K4,K5, K6										
K1 - Remen	iber; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Ev	valuate;	K6 – (Create						
				3							
Unit:1	Social Media M	fining	AND	1	12	hours					
Social Media Challenges - Undirected – Graphs – Sul Shortest path Fulkerson alg	Mining - Intro Graphs - Basi Weighted - Gr b graphs – Pla algorithms Dijk orithm	oduction – Atoms – Molecules – Interact cs – Nodes – Edges – Degree of Distr aph Connectivity - Tress and Forests – I nar Graphs - Graph Representation - Gr astra"s - Spanning tree algorithms – Prims	ions – S ibution- Bipartite aph Tra - Bipar	Social Type graph wersal tite ma	Media es –Di hs – C Algo atching	a mining rected – Complete rithms – g - Ford-					
Unit:2	Network Mode	ls			12	hours					
Unit:2Network Models12hoursNetwork Models – Measures – Node : Eigen Centrality – Page Rank – Group Measures – Betweenness centrality - group degree centrality, centrality, and group - Closeness centrality - Node Linking Behavior - Transitivity and reciprocity - Linking Analysis - Cluster coefficient – Jaccard - Case Study : -Modeling small networks with real world model											
Unit:3	Social Media C	ommunities			12	hours					
Social media Node Similar modular–dens Evolution - E	Communities rity – Node re se-hierarchical-S valuation.	– Social Communities – Member based achability - Group Based detection met SpectralClustering:BalancedCommunityalg	Detection hods - gorithm	on – 1 balanc Comm	Node (ed – unity	legree – robust -					

TT	• 4 • 4									
U	nit:4	Social Network	12hours							
Soc	ial Netv	vork – Information Diffusion – Types - herd behavior - infor	mation cascades diffusion of							
inn	ovation -	– epidemics – Diffusion Models Case Study – Herd Behavio	r – Information Cascades							
Me	thods – S	Social Similarity – assortativity – Social Forces - Influence h	omophily – Confounding -							
Ass	ortativit	y measures – Influence measures – Predictive Models								
U	nit:5	Recommender System	10hours							
Rec	commen	dation Vs Search – Recommendation Challenges –	nender algorithms - Content-							
Bas	Based Methods- Collaborative Filtering – Memory Based – Model Based – Social Media									
Rec	commen	dation – User friendship – Recommendation Evaluatio	on – Precision – Recall –							
Beł	navioral-	- User Behavior – User – Community behavior – User Entity	v behavior – Behavioral							
Ana	alytics –	Methodology								
		1								
U	nit:6	Contemporary Issues	2 hours							
1. S	ocial M	edia Plagiarism – Legal and E <mark>thical issue</mark> s – Social Media M	larketing							
2. L	lack of f	ocus – Productivity – Relationship – Infidelity – Privacy – F	ake Identities							
3. N	3. Negative impact on Academics – Cyber-crime – Bullying									
		Total Lecture hours	60hours							
		Total Lecture hours	60hours							
Тех	xt Book((s) Total Lecture hours	60hours							
Tex 1	at Book (Reza Z	(s) Zafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press. 2014 – (Free E-book available http://dmml.as	60hours							
Tex 1	at Book (Reza Z by Car	(s) Zafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as	60hours							
Tex 1	xt Book (Reza Z by Car Memo Spring	(s) Zafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as on, N., Xu, J.J., Hicks, D.L., Chen, H. (Eds.), Data Mining fe er – Annals of Information Systems ,ISBN 978-1-4419-6287	60hours n Introduction – Published u.edu/smm/chapter) or Social Network Data- 7-4							
Tex 1 2 3	at Book Reza Z by Car Memo Spring Lam T	Total Lecture hours (s) Zafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as on, N., Xu, J.J., Hicks, D.L., Chen, H. (Eds.), Data Mining fe er – Annals of Information Systems ,ISBN 978-1-4419-6287 huy Vo, 2019, "Mining Social Media: Finding Stories in Inte	60hours n Introduction – Published u.edu/smm/chapter) or Social Network Data- 7-4 ermet Data							
Tex 1 2 3 Ref	at Book Reza Z by Car Memo Spring Lam T	Total Lecture hours Total Lecture hours Zafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as on, N., Xu, J.J., Hicks, D.L., Chen, H. (Eds.), Data Mining fe er – Annals of Information Systems ,ISBN 978-1-4419-6287 huy Vo, 2019, "Mining Social Media: Finding Stories in Inte Books : EBooks	60hours n Introduction – Published u.edu/smm/chapter) or Social Network Data- 7-4 ernet Data							
Tex 1 2 3 Ref 1	at Book(Reza Z by Car Memo Spring Lam T Cerence 2 Matthe	Total Lecture hours Total Lecture hours Total Lecture hours Zafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as on, N., Xu, J.J., Hicks, D.L., Chen, H. (Eds.), Data Mining fe er – Annals of Information Systems ,ISBN 978-1-4419-6287 huy Vo, 2019, "Mining Social Media: Finding Stories in Inte Books ew A. Russel and Mikhail Klassen, 2018, "Mining the Social	60hours							
Tex 1 2 3 Ref 1	At Book Reza Z by Car Memo Spring Lam T Cerence Matthe Facebo	Total Lecture hours Total Lecture hours Cafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as on, N., Xu, J.J., Hicks, D.L., Chen, H. (Eds.), Data Mining for er – Annals of Information Systems ,ISBN 978-1-4419-6287 huy Vo, 2019, "Mining Social Media: Finding Stories in Into Books : EBooks ew A. Russel and Mikhail Klassen, 2018, "Mining the Social pok, Twitter, LinkedIn, Instagram, GitHub	60hours							
Tex 1 2 3 Ref 1 2	At Book(Reza Z by Car Memo Spring Lam T Cerence Matthe Facebo Gungo and Ar	Total Lecture hours Total Lecture hours (s) Cafarani , Mohhammad AliAbbasi – Social Media Mining: A nbridge press, 2014 – (Free E-book available http://dmml.as on, N., Xu, J.J., Hicks, D.L., Chen, H. (Eds.), Data Mining fe er – Annals of Information Systems ,ISBN 978-1-4419-6287 huy Vo, 2019, "Mining Social Media: Finding Stories in Into Books : EBooks ew A. Russel and Mikhail Klassen, 2018, "Mining the Social book, Twitter, LinkedIn, Instagram, GitHub rPolatkan, AntonoisChalkiopoulos, P. Oscar Boykin et.al., 2 halytics.	60hours							

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]											
	Course Title	Duration	Provider									
1.	Social Media Data Analytics (Free)	4 Weeks	Coursera									
2.	Introduction to Social Media Analytics	4 Weeks	Coursera									
3.	Social Media Analytics: Using Data to Understand Public Conversations	3 Weeks	Future Learn									
4.	Starting with social network analysis	2 hours	Udemy									

Web link

- 1. https://learn.g2.com/social-media-data-mining
- 2. https://www.javatpoint.com/social-media-data-mining
- 3. https://www.igi-global.com/dictionary/applying-critical-theories-to-social-media-mining-and-analysis/50376
- 4. https://www.cambridge.org/core/books/social-mediamining/introduction/75F143896832B7B9339F2CE663C4815B

Course Designed by: Dr. V. Bhuvaneswari

Mappi	Mapping with Programme Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	М	М	L	L	est L	L	S	S	L	L			
CO3	L	S	L	М	S	L	M	L	М	L			
CO3	S	М	M	L	М	L	L	L	L	М			
CO4	L	L	Μ	S	L	L	L	L	L	L			
CO5	S	М	L	L	L	L	L	L	М	S			
			St.	11.	1255	L'Y							



PROGRESSIVE WEB											
Course code		APPLICATION DEVELOPMENT	L	T	P	С					
Core/Elective	/Supportive	Elective	2	0	2	4					
Dro roquici	to	HTML, CSS and Object Oriented	Syllab	ous	202	0-					
rre-requisi	le	Programming using JavaScript	Versi	on	202	1					
Course Obje	ctives:										
The main obj	ectives of this cours	e are to:									
1. To unde	rstand the basics of	progressive webapplications									
2. To unde	rstand the fundamen	tals of Angular and develop Angularapplicat	ions								
3. To creat	e, build and deploy	progressive web applications using Angular									
0. 10 0. 000	e, suite and deproy	progressive wes appreadons donigringata									
Expected Co	urse Outcomes:										
On the succe	essful completion of	the course, student will be able to:									
1To learn the basics of Angular and Progressive Web ApplicationsK2											
2 To understand and use Angular forms, dependency injection and routing											
3 To create build and deploy an Angular application using Angular CLI K											
4 To exp	olore Service Worke	rs, Data Storage, App Manifest and Notificat	ions in		K3						
Progre	essive Web <mark>Applica</mark> t	ions									
5 To bui	ld and depl <mark>oy resp</mark> o	nsive, fast and reliable Progressive Web App	lication	IS	K6						
using .	Angular	Constant and the total									
K1 - Remen	nber; K2 - Understa	nd; <mark>K3 - Apply; K4 - Analyze; K5</mark> - Evaluate	; K6 -	Crea	te						
		and the second second	1								
Unit:1	Building Blocks	of Angular	1	12-	-hou	:S					
TypeScript:	Built-in Types – Cla	asses – Utilities – Working with Angular CLI	– Buil	ding	Bloc	ks					
of Angular:	Modules – Compone	ents – Templates – Metadata – Data Binding -	– Direc	tives	_						
Services – De	ependency injection										
Unit:2	Data Architectu	e and Testing in Angular		12	- hor	irs					
Forms in Ang	ular – HTTP - Rout	ing – Data Architecture in Angular: Overv	iew – C)bsei	vable	28					
and $RxJS - R$	edux in Angular – 7	Cesting : Testing Tools – End-to-End and Uni	t Testir	ig – [Festir	ig					
Services and	HTTP – Resting Ro	uting to Components – Testing Forms – Test	ing HT	TP re	eques	ts					
Unit:3	Service Workers	s in Progressive Web Apps (PWAs)		12-	hour	`S					
Introduction	to Progressive W	Veb Apps (PWA) – Current and Future PV	WA Su	ppor	t – V	Vhy					
Angular – Ir	stalling Node and	NPM – Service Workers: Understanding	Servic	e W	orker	· _					
Service Work	ter Life Cycle – Service	vice Worker Functional Events – Cache API -	- Cache	e Stra	ategie	s–					
Kuntine Cac	ne in Angular Servic	ce worker									
Unit:4	App Manifest, N	otifications and App Shell		12-	hour	.s					
BackgroundS	yncAPI-DataStora	ge:IndexedDBandlocalForage–AppManifest	t:TheW	'eb							
App Manifes	t – Adding Web Apr	Manifest to Home Screen – Notifications:	Web No	otific	ation	s –					
11	0 11										

Push Notifications – App Shell: App Shell Model – Angular App Shell – Further Optimizations –											
Exp	Exploring HTTP/2 and Server Push										
U	nit:5	Debugging PWAs and Modern Web APIs	10hours								
Del	ougging	NGSW Debug - Web App Manifest - Service Workers -	Storage – Cache –								
Me	asuremen	t: Audit – Analytics – Safety Service Worker: Fail-safe – Safet	ty Worker – Modern								
We	b APIs: C	redential Management – Payment Request – Video and Audio C	Capturing -								
Geo	olocation										
U	nit:6	Contemporary Issues	2 hours								
Ex	pert lectur	es, online seminars – webinars									
		Total Lecture hours	60hours								
Te	ext Book(s										
1	Nathan M	lurray, Felipe C <mark>oury, Ari Lerner and Carlos Taborda</mark> , "ng-book:	The Complete								
	Guide to	Angular", Full <mark>stack.io,</mark> 2018									
2	MajidHa	ian, "Progressive Web Apps with Angular", Apress, 2019.									
3	Dennis S	heppard, "Beginning Progressive Web App Development", Apre	ess, 2017.								
Re	eference B	ooks	L 4								
1	TalAter,	BuildingProgressive Web Apps",O"ReillyMedia, 2017.									
2	Chris L	ove, "Progressive Web Application Development By Example",	Packt Publishing								
	Ltd, 201	8.									
3	John M	Wargo, "Learning Progressive Web Apps", Addison Wesley, 2	020.								
		CALL STAR INVERSE									
Re	elated On	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	Develop	bing Dynamic Web Applications Using Angular									
	(https://	www.edx.org/course/developing-dynamic-web-applications-usin	ng-angular)								
Co	ourse Desi	gned By: Dr. R. Rajeswari									

Mappi	Mapping with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	S	S	L	L	L	L	L	L	L	L			
CO2	L	L	S	S	L	L	L	L	L	L			
CO3	L	М	L	L	L	L	L	L	М	М			
CO4	L	L	S	S	L	L	L	L	М	М			
CO5	L	L	М	М	L	L	L	L	L	L			

Cours code	e	SEMANTIC WEB	L	Т	Р	С					
Core/El	ective/Supportive	Elective IV	4	4	0	4					
Pre-re	quisite	Knowledge on Complex data structures, algorithm and web	Syllat Versi	ous on	2020 2021)-					
Course	Objectives:										
The mai	in objectives of this co	urse are to:									
 To un To ur Graph To an applicat 	iderstand web 2.0 and iderstand and apply ki h based validation. halyze and Build Data ions.	web 3.0, the basics of semantic web, features, wowledge representation methods, standard name integration semantic layer use cases for specification seman	web sta tespac c dom	andaı es, ain a	rds. nd						
Expecte	ed Course Outcomes										
On the	On the successful completion of the course, student will be able to:										
1Understand Web standards, features, Distributed web data, limits of the web, Need of languagesK1, K2											
2 Understand the concept of Ontology, Knowledge representation, scheme K6											
3Understand the platform to model, semantic web tools: Triple stores, Development environments, Inference enginesK4											
4	Understand the Seman Representation format	tic web layer for integration, Issues addressed, s, Mining stack and knowledge graphs.		4	K2-F	ζ4					
5	Analyze various doma semantic processing fr	ins, Platform, Mapping of knowledge models, a amework of domains of Transportation.	and		K4-H K6	ζ5					
K1 - R	emember; K2 - Under	sta <mark>nd; K3 - Apply; K4 - Analyze; K5</mark> - Evalua	te; K6	-Cr	eate						
			77								
Unit:1	Introduction to	Semantic Web	÷.	12	2hou	rs					
Web 2.0 semantic vision c WebOnt RDFS –	and 3.0 – Meaning of c web – Data across the of the semantic web – tologyLanguage–SPA Machine Readability	of Semantic Data – Distributed web of data – N ne web – The basics of semantic web - The Lin - Semantic web standards – RDF – RDF Sch RQLProtocol–RDFQueryLanguage(SPARQL) – core elements of RDFS – XML Schema – RI	Aetada mits of eme (1 -Need DF sch	ta - l f the RDF of tema	Featur web – S) – C	es of The DWL					
Unit:2	Knowledge Rep	resentation Methods		12	2hou	rs					
The concept of Ontology - SKOS – Representation of thesauri - Glossaries – Scheme classification – Taxonomies – Controlled Vocabularies - Hierarchical Structure – Formal Representations - Standard Namespaces – JSON based serialization for Linked Data - RDF Triple stores – Turtle – RDFa – Internal Identifiers - URI – RDFS – Classes – Resources – Inferred PropertyCharacterization–Literals–LinkedOpenData–DBpedia–QueryingRDFGraphs–Vocabularies – Graph based validation - Shape constraint Language (SHACL)											
Unit:3	Tools			12	2hou	rs					
Triple s Environ Develop DartGrie	s tore: Jena – Allegro (ment – Content M omentEnvironment:F d – Zitgist, Inference	Graph – Mulgara – Sesame – Flickurl - Top Br anagement System: Falcon – Drupal 7 - Protégé–Ontotext–OpenAnzo–RDFGateway–R Engines: SWI-Prolog, Semantic Works–Onto	aid – S - Red DFLib brokei	Suite lland	– Virt – P	uoso ellet,					

Un	it:4	Data Integration Semantic Layer			12hours								
Data	Integra	ation issues- Data Interoperability – Data Migration – Da	ita Repre	sentation	Formats –								
Data	Silos–I	inkedDataManagement-KnowledgeMiningStack-	1	NLP – Na	amedEntity								
Reco	ognition	– Machine Learning – Knowledge Graphs											
Un	it.5				10bours								
Ulse	C2868	Use cases Specifications and Discussion: - Transportation: Data	Source	Ren	resentation								
Link	ed Dat	a Mapping - Knowledge Modeling – Telecommunicati	i = 0	nowledge	Modeling –								
Customer Care Support Documents – Internal Reports – Named Entity Recognition – Linked Data													
Map	ping	11 1	5										
Un	it:6	Contemporary Issues			2 hours								
Cust	omer p	rovider mismatch – Interlinking domain specific informa	tion – C	ombining	g different								
servi	lces from	m different providers – contrast with contemporary web	applicati	ons									
Mar	kup lang	guages – Object Access Protocols – Service description -	- Discov	ery – mu	egration								
		Total Lecture	hours		60hours								
Toy	Book	s)	iouis										
1	Dean	Allemang, James Hendler: "Semantic Web for the Work	ing Onto	logistEff	ective								
1	Model	ing in RDFs and OWL", 2 nd Edition, 2008.		logistEll	cetive								
2	Liyang	g Yu, "Introduction to the Semantic Web and Semantic v	veb servi	ces" Cha	pman &								
	Hall/C	RC, Taylor <mark>& Franc</mark> is group, 2007.		64	-								
3	Toby S	Segaran, Coli <mark>n Evan</mark> s, Jamie Taylor, "Programming the S	Semantic	: Web", 1	st Edition,								
	July 2	009.											
4	Pollo	ck, J.T.: Semantic web for dummies. Wiley Publishing, I	nc., Indi	anapolis,	2009.								
Refe	erence l	Books : EBooks	\$ 2	1									
1	Grigo	is Antoniou and Frank van Harmelen, A Semantic Web	Primer, 7	The MIT	Press								
2	(2004)	I, ISBN: 0262012103	Web Te	-11:	2000								
2	P. HIL	zler, R. Sebastian, M. Kroizsch: Foundation of. Semantic	web Ie	<u>Chnologi</u> Sustama	es, 2009.								
3	Practic	ces and Applications IGI Global 2009 ISBN 978-1-605	66-894-9	systems	integration -								
4	Martir	Große-Rhode Semantic Integration of Heterogeneous S	Software	Specific	ations								
-	Spring	er-Verlag Berlin and Heidelberg GmbH & Co. KG, 2010	0, ISBN	978-3-64	207-306-9								
Rela	ted On	line Contents [MOOC, SWAYAM, NPTEL, Website	s etc.]										
					D								
1		Course Title	Dura	ation	Provider								
1. Semantic web Technologies (Free) 6 Weeks OpenH													
2.	Lin	Ked Data Engineering (Free)	6 Week	S	OpenHPI								
3.	Intr	oduction to a Web of Linked Data	4 Week	S	Fun Inria								
4.	We	b of Data	17 hour	S	Coursera								
5.	Dy	namics of Knowledge Organization (Free)	2 hours		Udemy								

Web link

1. http://www.linkeddatatools.com/semantic-web-basics

- 2. http://www.cambridgesemantics.com/blog/semantic-university/intro-semantic-web
- 3. https://www.mkbergman.com

4. http://euclid-project.eu

Course Designed by: Dr.V.Bhuvaneswari

Mapping with Programme Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	М	L	L	М	М	L	L	L	L		
CO2	L	L	L	L	L	L	S	S	-	М		
CO3	L	L	L	S	L	L	L	L	М	L		
CO4	L	S	S	L	М	L	М	L	L	L		
CO5	S	S	М	L	L	М	L	L	L	М		



Course co	ode		GRAPH DATABASES	L	Т	Р	C			
Core/Elect	tive/S	Supportive	Elective IV	4	2	2	4			
Pre-requ	uisite		Basics of Data, Graphs and databases	Syllabus Version	_	2020- 2021				
Course O	bjec	tives:								
The main	obje	ctives of this cours	se are to:							
1. To	unde	erstand Non-relation	onal databases							
2. 10 3. To	appl	y and understand	graph oriented database features.							
Expected	Cou	rse Outcomes:								
On the successful completion of the course, student will be able to:										
1 Understand databases, transaction problem, graph theory, new generation databases, non-standardized query language.										
2 Un dat	derst tabas	tand the database tes.	tools, characteristics, different types of non-rela	tional		K4				
3 Un	derst	tand Graph oriente	ed databases, indexes, paths and networking			K4				
4 Un env	derst viron	tand the Graph dat ment, parameter c	abase platform Neo4j, Components, setup deve onstraints	elopment		K5				
5 Implement the query using text mining techniques using the graph database K6 platform Neo4i, Use predictive and descriptive analysis, cypher script,										
K1 - Rer	nemł	per; K2 - Understa	nd; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 – Cre	ate		-			
			Construction of the state of the	10						
Unit:1		Introduction to	NoSQL Database	1	2-	-hours	5			
Database Connected Unstructu Distribute Issues-No Cypher.	– T d Da red ed – 0 on-Sta	ransactions – Gr ata – Data mode Data – Develop Open source – Be andardizedqueryla	aph – Graph theory – Relational Databases els – The Labeled property graph model - ment model – New Generation Databases enefits – High Performance - Schema less – H nguage–Transactionproblem–Integrity-Queryir	s – NoSO Data S – Non-I Horizonta nggraph–	QL tru rela	– St cture ational calable	ore e			
II. 4 O		N.COL D.A.L		1		1				
Unit:2	۰. ۸ ۰۰۰ -	NoSQL Databa	ase 1001s	toncy A	2	-nours	3			
Predictive Analysis – Transactional Systems — Characteristics – CAP – Consistency – Availability – Partition Tolerance – Use Base Property – Types of non-relational database – Key –value storage – column oriented databases – Document – oriented database – Graph Oriented Database Tools: Column Oriented Databases: Amazon DynamoDB, Cassandra, Voldemort – RAMCloud – Flare, Document Oriented Databases: CouchDB – MongoDB – Cloudkit – XML Databases – DB2 pureXML, Graph Oriented Databases: Neo4j – Hyperbase-DB - InfoGrid Characteristic Comparison: Performance – Scalability – Flexibility – Complexity – Functionality										
Unit:3		Connected Data		1	2-	hours	5			
Graph Ori – NonDire – Neo4J –	Unit:3Connected Data12hoursGraph Oriented Database – Indexes – Properties - Graph – Relationships – Nodes - Directed Graphs – NonDirectedGraphs–Traversal–Paths–Algorithm-Networkrepresentation–Implementation – Neo4J – Hyperbase-DB – InfoGrid – The GraphStore.12hours									

Unit:4	•	Fraph Or	riented D	atabase	Platform	: Neo4j			12hours		
Graph	Databases	s – Mod	el relatio	onal data	– Prope	erty grap	h mode	1 – Neo4j	Graph	Platform –	
Compo	nents – Fe	eatures –	Benefits	of Neo4j	j – Setup	Develop	ment Er	vironment	: – Neo4j	Sandbox-	
Neo4jD	esktop-C	Cypher-M	latch–Gra	aphnode 1	retrieval-	Graph rel	lations r	etrieval–G	raph		
properti	es retriev	val – No	des – Re	lationshi	ps – Mei	rge data	into gra	iph – Para	ameter co	onstraints –	
Monitor	r query ex	kecution -	- Indexes	– Relatio	onal Data	•					
Unit:5	5 U	Jse cases							1	0hours	
Implement Graph Database with Neo4j											
NoSQL Database – Neo4j – Queries – Text Mining techniques – Descriptive and Predictive											
Analysis – University – Journal Conference Publications – Capture data – Design Graph Database –											
Populat	Populate – Obtain Machine Learning Groups – Journal Article Numbers – Publishes Articles –										
Cypher	script – C	Jraph Da	ta.								
TI		1 4								2 h	
		ontempo	$\frac{\mathbf{prary 1ss}}{c_1}$	ues			. 1 1 .	DC	•	2 nours	
Maintai	ning cons	sistency of	of data, m	odelling	highly int	terconnec hotupon	ted data	, Performa	ince issue	es,	
mdexin	g, mer-re	egional co	Simmunic	ations, Co	onnection	Detween	antere	it schemas	.		
			1	-		Tota		o hours	6	0 hours	
			1			101a	I Lectur	e nours	U	vnours	
Text Bo	pok(s)		pr. 1		1000	CY(3)		1			
1 An	kurGoel,	Neo4j C	ookbook,	PACKT	publishin	ng, 2015,	ISBN: 9	0 <mark>7</mark> 8-1-7832	28-725-3		
2 Ch	ris Kemp	er, Begi <mark>n</mark>	ning Nec	94j, 2015,	Apress,	ISBN: 97	8-1-484	<mark>2-</mark> 1227-1			
3 Ma	ahesh Lal	, Neo4j <mark>C</mark>	<mark>raph D</mark> at	a Modeli	ng, PACl	KT publis	shing, 20	<mark>)1</mark> 5, ISBN:	: 978-1-7	8439-344-	
1				1.1.1	The second se	-	1 50				
4 Th	omas Fris	sendral, C	Braph Dat	ta Modeli	ing for No	oSQL and	I SQL, T	Technis Pu	blication	s, 2016,	
ISI	3N: 978-1	1-634-62	1-212.	New	States -	5/	See.	2007	1		
Referer	ice Book	: EBook	8.9			/	11	SVI			
1 Ian Da	ı Robinso ta. O''Rei	n, Jim W illy, 2 nd e	ebber & dition, 20	Emil Eifr 15. ISBN	em, Grap V: 978-1-4	h Databa 191-9320	<mark>ses</mark> Nev 0-1	^y Opportur	ities for	Connected	
Related	Online (Contents	IMOOC	C. SWAY	AM. NP	TEL. W	ebsites of	tc.]			
					, _ , _ , _ , _ , _ , _ , _ , _ , _ , _		8 1]			
			Cou	rse Title	Linessit	e-million	Alter and	Duration	Pr	ovider	
1.	Introduc	tion to N	eo4i (Fre	e)	TE TO BE	LALOUT	5	Weeks	Graph	Academy	
2	NoSOL	Systems	(Free)	- /			<u> </u>	Weeks	Course	era	
Z. Wob lir	nton QL	5 ystems	(1100)					W CORB	Course	<i></i>	
	http://po	ali aam/	davalana		atabaga/						
1. C	nups://ne	04J.COIII/0		graph-u	atabase/						
Course	e Designe	ea by: Dr.	v.Bnuva	neswari							
Mappir	ng with P	rogram	ne Outco	omes					I		
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	L	S	S	L	L	L	L	L	S	
CO2	L	М	L	L	L	L	L	L	L	М	
CO3	М	L	L	L	L	L	L	S	М	L	
CO4	L	L	L	S	М	М	L	М	L	L	
CO5	М	L	М	L	L	L	S	L	L	L	
Cos CO1 CO2 CO3 CO4	PO1 S L M L	PO2 L M L L	PO3 S L L L	PO4 S L L S	PO5 L L L M	PO6 L L L M	P07 L L L L	PO8 L L S M	PO9 L L M L	PO10 S M L L	
CO5	M	L	M	L	L	L	S	L	L	L	

Course		HEALTH CARE DATA ANALYTICS	,	Γ.	т	Р	С				
code					-	•	C				
Core/Ele	ctive/Supportive	Elective IV		4	2	2	4				
Pre-requisite		Basics on Statistics and Linear AlgebraSylVe		Syllabus Version		2020- 2021					
Course Objectives:											
1 To understand the Process Concents and Procedures in Health Care Data Digital Systems											
2. Understand Data standards used in Health Care Domain											
3. Design Integrated Health Care Data Models for Data Analytics											
4. Understand and Remember the Ethics of Managing and Analyzing Health Care Data											
Expected Course Outcomes:											
CO1	Understand the Process and Data Functionalities of Health Care Data					K1, K2					
CO2	Understand the various Data Sources, diagnostic standards and					K2, K1					
CO2	Components of Data Analytics						V2 V5				
CO_{4}	Understand and design integrated Data Model for analytics				$\mathbf{K}_{2}, \mathbf{K}_{3}$						
04	Create and evaluate r	rediction models in healthcare applications for	<u></u>	N		Κ4					
CO5	preventive care and r	prediction models in heatincale applications for			K6						
preventive care and personalized incurences											
K1 - Remember: K2 - Understand: K3 Apply: K4 Applyze: K5 Evoluto: K6 Croote											
IXI - IXX		stand, NS - Appry, N4 - Anaryze, NS - Evan	iate, IX	<u>U - C</u>	10						
	Health Care S	viter Electronic Health Com December (Cli			14	nour	8				
Introduction :Health Care Entities – Electronic Health Care Records – Clinical Data - Health Care											
Insurance	e Data Diagnostic Da	a Clinical Data – Social Media Survey Data	Data - Family	– III Data	lag	ing D	ata-				
Data Ou	ality – Data Ethics –	Data Integration Challenges	anniy.	Data							
2 2			· · · · ·								
Unit:2	Data Models a	nd Data Standards			12	hour	s				
Data Models : Relational Models Hierarchical Models Data warehousing					g Models – Star						
Schema – Normalized Data and Deformalized – Health Care Knowledge Representation											
Ontologies – Diagnosis Standards – ICD 9/10 - DSMI – DSM II – Drug Standards SNOWMED –											
LOINC – Laboratory Standards – Data Challenges in Data Mapping -Data Standards as Linked											
Data											
Unit:3	Big Data and I	Data Analytics			12	hour	S				
Data A	nalytics: Data Clea	ning and Pre-Processing – Data Proces	sing a	and	Μ	odeling	<u> </u>				
Classific	ation – Clustering	- Dimensionality Reduction - Prediction	Macl	hine	L	earning	g —				
MicrosoftAzureCloud-DataVisualizing-Histogram-Boxplot-ScatterPlot-Bar-Pie-											
Mosaic Plot – Trends Lines – Heat Maps – Density Plots - Dashboard – Creation - Presentation											
T T •4 4			——————————————————————————————————————		1.4						
Unit:4 Advanced Health Care Analytics						12hours					
Genomics Data Analysis – Microarray Data – Sequence Data – Research Survey Analysis – Text Mining – Tele Health – Virtual HealthCare Assistance -											

Unit:5		Health Care Use case		10hours					
Prediction of Risk of Co morbidity Individuals – Outbreak – Epidemics - Personalized Medical									
Care Tharmaceutears and Fatient Data Integration – Chinear Data									
Unit	:6	Contemporary Issues		2 hours					
Challenges and Gap – Health Care Data Integration – Analysis of Developing Countries									
Total Lecture			Lecture hours	60 hours					
Text Books:									
1	Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2006								
2	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012								
3	EthemAlpaydin, "Introduction to Machine Learning 3(Adaptive Computation and Machine								
	Learning Series)", Third Edition, MIT Press, 2014								
4	Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013.								
Reference Books									
1	JannesKlaas, "Machine Learning for Finance", ISBN: 978178936364, 2019 [Packt]								
	Giuseppe Bonaccorso, "Machine Learning Algorithms", Second Edition, ISBN:								
2	9781789347999, 2018 [Packt]								
3	Stephen Marsland, "Machine Learning – An Algorithmic Perspective", CRC Press, 2009								
4	Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2008								
5	Yuxi Liu, "Python Machine Learning By Example", 2017 [Packt]								
6	John Paul Mueller, Luca Massaron, "Machine Learning (in Python and R) For Dummies", First Edition, Wiley Publisher, ISBN: 9788126563050. 2016								
7	U Dinesh Kumar ManaranjanPradhan,,"Machine Learning using Python".) Publisher: Wiley, ISBN: 9788126579907, 2019								
Onlin	e Cour	se:	No.						
S.		Course Title	Duration	Provider -Free					
No									
1.	Machi	ne Learning	12 hours	Simplilearn					
2.	Machi	ne Learning for Data Analysis	4 Weeks	Coursera					
3.	Machi	ne Learning Foundations: A Case Study	6 Weeks	Coursera					
	Appro	ach							
4.	Machi	ne Learning : Regression	6 Weeks	Coursera					
5.	Introd	uction to Machine Learning	12 Weeks	Swayam - NPTEL					
6	Deep	Learning Specialization	4 Courses	Coursera					
Web Link - Video:

1. https://www.packtpub.com/data/hands-on-machine-learning-with-scikit-learn-and-tensorflow-2-0-video

2. https://www.packtpub.com/data/machine-learning-projects-with-tensorflow-2-0-

video3.https://www.packtpub.com/application-development/complete-machine-learning-course-python-video

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	М	М	М	L	L	L	S	S	S	S
CO2	М	М	М	S	L	L	S	S	S	S
CO3	S	S	S	S	S	М	S	S	S	S
CO4	S	S	S	S	S	and the	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low





M.Sc. Data Analytics

Syllabus

(With effect from 2020- 2021)

Program Code :