## **Courses and Credit Scheme**

Semester	Core Courses (CC)		Disciplin Elective (DS	e Specific Courses SE)	Skill Enh Cou (SF	ancement rses EC)	Ability Enhancement Courses (AEC)		Open Elective Courses (OEC)		Total Credits
	1	2	3	4	5	6	7	8	9	10	(2+4+6+8+10)
	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	
Ι	6	20	-	-	1	3	1	3	-	-	26
II	4	12	1	4	1	3	1	3	1	4	26
III	1	4	4	12	1	3	1	3	1	4	26
IV	2	18	1	4	-	-	-	-	-	-	22
Sub-total Credits	Core Courses 54		Disciplin Electiv 2	Discipline Specific Ski Elective Courses 20		Skill Enhancement Courses 9		Ability Enhancement Courses 9		Elective Irses 3	Total 100
Sub-total Credits Percentage	Core Courses 54%		Disciplin Electiv 20	e Specific e Courses )%	Skill Enh Cou 9	ancement irses %	Abi Enhan Cou 9	ility cement irses %	Open E Cou 8	Elective Irses %	100%

# **Detailed break-up of Credit Courses**

	Core	Discipline	Skill	Ability	Open	Total
Semester	Courses	Specific	Enhancement	Enhancement	Elective	Courses
		Elective	Courses	Courses	Courses	
		Courses				
Ι	CC1/T		SEC1/T	AEC1/T		8
	CC2/T		SEC1/T			
	CC3/T					
	CC4/T					
	CC5/P					
	CC6/P					
II	CC7/T	DSC1/T	SEC2/T	AEC2/T	OEC1	8
	CC8/T		SEC2/P			
	CC9/P					
	CC10/P					
III	CC11/T	DSC2(i)/T	SEC3/T	AEC3/T	OEC2	8
		DSC2(ii)/T	SEC3/P			

		DSC3(i)/T		
		DSC3(ii)/T		
		DSC4(i)/P		
		DSC4(ii)/P		
		DSC5(i)/P		
		DSC5(ii)/P		
IV	CC12/T	DSC6(i)/T		3
	CC13/P	DSC6(ii)/T		

# M.Sc. Computer Science (Artificial Intelligence and Data Science)

#### M.Sc. Semester 1

Sr.	Course Code	Course Title	Μ	ax. Mar	ks	Credits
No.			Int.	Ext.	Total	
1	MDS/1/CC1/T	DATABASE	30	70	100	4
		SYSTEMS				
2	MDS/1/CC2/T	DATA STRUCTURE	30	70	100	4
		& ALGORITHMS				
	MDS/1/CC2/P	LAB DATA	-	50	50	2
		STRUCTURES				
		&ALGORITHMS				
3	MDS/1/CC3/T	DATA MINING	30	70	100	4
4	MDS/1/CC3/P	LAB DATA MINING	-	50	50	2
5	MDS/1/CC4/T	ARTIFICIAL	30	70	100	4
		INTELLIGENCE				
6	MDS/1/AEC1/T	PROFESSIONAL	25	50	75	3
		ETHICS				
7	MDS/1/SEC1/T	DIGITAL FLUENCY	15	35	50	2
8	MDS/1/SEC1/P	DIGITAL FLUENCY	-	25	25	1
		LAB				
Sub	Total Semester I		160	490	650	26

## M.Sc. Semester 2

Sr.	Course Type	Course Title	Max. Marks			Credits
No.			Int.	Ext.	Total	
1	MDS/2/CC5/T	DATA SCIENCE	30	70	100	4

MDS/2/CC5/D	ΙΑΡΡΑΤΑ		50	50	2
MDS/2/CC3/P	LADDATA	-	50	50	Δ
	SCIENCE				
MDS/2/CC6/T	PROGRAMMING	30	70	100	4
	WITH PYTHON				
MDS/2/CC6/P	LAB PYTHON	-	50	50	2
MDS/2/DSC1(i)/T	BIG DATA	30	70	100	4
	ANALYTICS				
MDS/2/DSC1(ii)/T	SOCIAL NETWORK				
	ANALYTICS				
MDS/2/AEC2/T	CONSTITUTION OF	25	50	75	3
	INDIA				
MDS/2SEC2/T	CYBER SECURITY	15	35	50	2
MDS/2/SEC2/P	CYBER SECURITY	-	25	25	1
	LAB				
MDS/OEC1/T		30	70	100	4
Total Semester II		160	490	650	26
		1		1	
	MDS/2/CC5/P MDS/2/CC6/T MDS/2/CC6/P MDS/2/DSC1(i)/T MDS/2/DSC1(ii)/T MDS/2/AEC2/T MDS/2/AEC2/T MDS/2/SEC2/P MDS/OEC1/T Total Semester II	MDS/2/CC5/PLAB DATA SCIENCEMDS/2/CC6/TPROGRAMMING WITH PYTHONMDS/2/CC6/PLAB PYTHONMDS/2/DSC1(i)/TBIG DATA ANALYTICSMDS/2/DSC1(ii)/TSOCIAL NETWORK ANALYTICSMDS/2/AEC2/TCONSTITUTION OF INDIAMDS/2SEC2/TCYBER SECURITY LABMDS/0EC1/TIntermediateFotal Semester IIIntermediate	MDS/2/CC5/PLAB DATA SCIENCE-MDS/2/CC6/TPROGRAMMING WITH PYTHON30MDS/2/CC6/PLAB PYTHON-MDS/2/DSC1(i)/TBIG DATA ANALYTICS30MDS/2/DSC1(ii)/TSOCIAL NETWORK ANALYTICS30MDS/2/AEC2/TCONSTITUTION OF INDIA25MDS/2/SEC2/TCYBER SECURITY LAB15MDS/2/SEC2/PCYBER SECURITY 15-MDS/0EC1/T3030Total Semester II160	MDS/2/CC5/PLAB DATA SCIENCE-50MDS/2/CC6/TPROGRAMMING WITH PYTHON3070MDS/2/CC6/PLAB PYTHON-50MDS/2/DSC1(i)/TBIG DATA ANALYTICS3070MDS/2/DSC1(ii)/TSOCIAL NETWORK ANALYTICS3070MDS/2/AEC2/TCONSTITUTION OF INDIA2550MDS/2/SEC2/TCYBER SECURITY LAB1535MDS/2/SEC2/PCYBER SECURITY LAB-25MDS/OEC1/T3070	MDS/2/CC5/P         LAB DATA SCIENCE         -         50         50           MDS/2/CC6/T         PROGRAMMING WITH PYTHON         30         70         100           MDS/2/CC6/P         LAB PYTHON         -         50         50           MDS/2/CC6/P         LAB PYTHON         -         50         50           MDS/2/DSC1(i)/T         BIG DATA ANALYTICS         30         70         100           MDS/2/DSC1(ii)/T         SOCIAL NETWORK ANALYTICS         30         70         100           MDS/2/AEC2/T         CONSTITUTION OF INDIA         25         50         75           MDS/2SEC2/T         CYBER SECURITY         15         35         50           MDS/2/SEC2/P         CYBER SECURITY         -         25         25           MDS/OEC1/T         IAB         30         70         100           Total Semester II         I60         490         650

## M.Sc. Semester 3

Sr.	Course Type	Course Title	Ν	lax. Mar	ks	Credits
No.			Int.	Ext.	Total	
1	MDS/3/CC7/T	RESEARCH	30	70	100	4
		METHODLOGY				
2	MDS/3/DSC2(i)/T	EVOLUTIONARY	30	70	100	4
		ALGORITHM				
	MDS/3/DSC2(ii)/T	MACHINE				
		LEARNING				
3	MDS/3/DSC2(i)/P	LAB		50	50	2
		EVOLUTIONARY				
		ALGORITHMS				
	MDS/3/DSC2(ii)/P	LAB MACHINE				
		LEARNING				
4	MDS/3/DSC3(i)/T	PROGRAMMING	30	70	100	4
		WITH MATLAB				
	MDS/3/DSC3(ii)/T	PROGRAMMING				
		WITH R				
5	MDS/3/DSC3(i)/P	LAB MATLAB		50	50	2
	MDS/3/DSC3(ii)/P	LAB R				
		PROGRAMMING				
6	MDS/3/AEC3/T	HEALTH AND	25	50	75	3

		FITNESS				
7	MDS/3/SEC3/T	DIGITAL	15	35	50	2
		MARKETING				
8	MDS/3/SEC3/P	LAB DIGITAL		25	25	1
		MARKETING				
9	MDS/3/OEC2/T		30	70	100	4
Sub '	Total Semester III		160	490	650	26

## M.Sc. Semester 4

Sr.	Course Type	<b>Course Title</b>		Μ	ax Ma	rks	Credits
No.				Int.	Ext.	Total	
1	MDS/4/CC8/T	IOT & CLOU	D	30	70	100	4
		COMPUTING	COMPUTING				
2	MDS/4/DSC4(i)/T	SOFT COMP	UTING	30	70	100	4
	MDS/4/DSC4(ii)/T	DEEP LEARN					
3	MDS/4/CC9/P	RESEARCH	Proposal	75	-	75	3
		PROJECT	Seminar				
			Internal	75	-	75	3
			Assessment				
			Project	-	100	100	4
			Documentation				
			Project Viva	-	100	100	4
Sub	Total Semester IV			210	340	550	22

#### Program Total Credits = 100

#### **Courses offered**

Course Name	Course Title	Credits						
Core Courses								
MDS/1/CC1/T	Database Systems	4						
MDS/1/CC2/T	Data Structure & Algorithms	4						
MDS/1/CC3/T	Data Mining	4						
MDS/1/CC4/T	Artificial Intelligence	4						

MDS/1/CC2/P	Lab Data Structure & Algorithms	2								
MDS/1/CC3/P	Lab based on Data Mining	2								
MDS/2/CC5/T	Data Science	4								
MDS/2/CC6/T	Programming with Python	4								
MDS/2/CC5/P	Lab Data Science	2								
MDS/2/CC6/P	Lab Python	2								
MDS/3/CC7/T	Research Methodology	4								
MDS/4/CC8/T	IoT& Cloud Computing	4								
MDS/4/CC9/P	Research Project	14								
	Total	54								
Discipline Specific Elective Courses										
MDS/2/DSC1(i)/T	Big Data Analytics	4								
MDS/2/DSC1(ii)/T	Social Network Analytics	4								
MDS/3/DSC2(i)/T	Evolutionary Algorithm	4								
MDS/3/DSC2(ii)/T	Machine Learning	4								
MDS/3/DSC3(i)/T	Programming with MATLAB	4								
MDS/3/DSC3(ii)T	Programming with R	4								
MDS/3/DSC2(i)/P	Lab Evolutionary Algorithms	2								
MDS/3/DSC2(ii)/P	DS/3/DSC2(ii)/P Lab Machine Learning									
MDS/3/DSC3(i)/P	Lab MATLAB	2								
MDS/3/DSC3(ii)/P	Lab R	2								
MDS/4/DSC4(i)/T	Soft Computing	4								
MDS/4/DSC4(ii)/T	Deep Learning	4								
	Total	20								
	Ability Enhancement Courses									
MDS/1/AEC1/T	Professional Ethics	3								
MDS/2/AEC2/T	Constitution of India	3								
MDS/3/AEC3/T	Health & Fitness	3								
	Total	9								
	Skill Enhancement Courses									
MDS/1/SEC1/T	Digital Fluency	2								
MDS/1/SEC1/P	Digital Fluency LAB	1								
MDS/2/SEC2/T	Cyber Security	2								
MDS/2/SEC2/P	Cyber Security	1								
MDS/3/SEC3/T	Digital Marketing	2								
MDS/3/SEC3/P	Digital Marketing LAB	1								
	Total	9								
	Open Elective Courses	Γ								
MDS/2/OEC1/T		4								
MDS/3/OEC2/T		4								
	Total	8								

	MDS/1/CC1/T: Database Systems												
Cot	ırse Typ	be	C	Course	Conta	act D	elivery	Maxi	mum l	Marks	Exam	Asse	essment
			(	Credit	Hour Wee	rs∕ ∙k	Mode	Exter	nal Ir	nternal	Duratior	n Me	ethods
Cor T	npulsor `heory	y		04	04	Ι	Lecture	70		30	3 Hours	TEE Assig Atte	/MTE/ gnment/ ndance
Instruction cover one w syllab paper additi	Instructions to paper setter for Final-Term Examination: Final-Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will consist of short/objective type questions from the complete syllabus. In addition to the compulsory first question there shall be four units in the question paper each consisting of two questions. Students will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.												
Cour mode	<b>Course Objectives</b> : The objective of this course is to get the students familiar with the concepts, models, architecture and applications of database systems.												
Course OutcomesAt the end of this course, the student will be able to:													
	CO1		der der tec	f <b>ine:</b> s bendenc hniques hitectur	schema ies, nor , databa	archi rmal fo ase sec	tecture, orms, da curity iss	ER ta types sues, se	diagra s, viev mantic	ms, E vs in S c data n	ER moo QL, conc nodels, ar	lel, fur urrency nd client	control server
	CO2		des	scribe: mal for	ER diag ms. SO	gram, ro L cons	elational traints a	model	, EER	model, overv al	functiona gorithm.	l depend	lencies,
	CO3		ap arcl	<b>ply:</b> inl hitectur ter suite	heritance, relatied in dif	e, SQ ional s	L querie chema, situation	es, con recover s.	straint y tech	s, recov inique a	very tech and data	niques. model s	justify: hall be
	CO4		<b>dif</b> fun	ferentia ctional	ate: su depend	bclass encies,	and su normal	perclas forms.	s, spe	ecializat	ion and	general	ization,
						CO-P	О Марр	ing Mat	trix				
Cos	PO 1	P	2 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	1		3	1	1	1	-	3	-	-	2	-	-
СО	2		1	1	3	1	-	3	-	-	2	-	-

2														
CO 3	3	1	1	3	3	-	3	-	-	2	-	-		
CO 4	2	1	1	3	1	-	3	-	-	2	-	-		
CO 5	2	1	3	1	3	-	3	-	-	2	-	-		
Avg	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-		
	Course Content MDS/1/CC1/T: Database Systems													
	Unit	1	Basi char datal datal Data insta & in	<ul> <li>Basic concepts: a historical perspective, file system vs. DBMS, characteristics of the database approach, abstraction and data integration, database users, advantages and disadvantages of a DBMS, implication of database approach.</li> <li>Database system concepts and architecture- data models, schemas and instances, DBMS architecture and data independence database languages &amp; interfaces, DBMS functions and component modules.</li> </ul>										
	Unit - IIEntity-relationship model: entity types, entity sets, attributes & keys, relationships, relationship types, roles and structural constraints, design issues, weak entity types, E-R diagrams, design of an E-R database schema. Conventional data models- an overview of network and hierarchical data models. relational data model- relational model concepts, integrity constraints over relations, relational algebra – basic operations.								keys, lesign se cal data					
Unit – III 5 a i i				<ul> <li>SQL: data definition, constraints, &amp; schema changes in SQL, insert, delete &amp; update statements in SQL, view in SQL, specifying constraints and indexes in SQL, queries in SQL.</li> <li>ORACLE: a historical perspective, basic structure, database structure and its manipulation in Oracle, storage organization in Oracle programming, Oracle applications.</li> <li>Relational database design: functional dependencies, decomposition, desirable properties of decomposition, normal forms based on primary</li> </ul>										

	<b>Practical database design:</b> role of information systems in organizations, database design process, physical database design in relational databases.
Unit – IV	<ul> <li>Transaction processing concepts: introduction to transaction processing, transaction &amp; system concepts, properties of transaction, schemes and recoverability, serializability of schedules.</li> <li>Concurrency control techniques: locking techniques, timestamp ordering, multiversion techniques, optimistic techniques.</li> <li>Recovery techniques: recovery concepts, recovery techniques in centralized DBMS.</li> <li>Database security: introduction to database security issues.</li> </ul>
	Text/Reference Books
Text Books	<ol> <li>Elmasri &amp; Navathe, "Fundamentals of Database System", 3e, Addison Wesley, New Delhi.</li> <li>Korth &amp; Silberschatz, "Database System Concept", 4e, McGraw Hill International.</li> </ol>
Reference Books	<ol> <li>C.J. Date, "An Introduction to Database System", 7e, Addison Western.</li> <li>Abbey Abramson, Cory, "ORACLE SI-A Beginner's Guide", Tata McGraw Hill Publishing Company Ltd.</li> </ol>

	MDS/1/CC2/T: Data Structures & Algorithms													
Course Type	urse Type Cour Contact Deliver Maximum se Hours/Wee y Mode Marks		Exam Duratio	Assessment Methods										
	Cred it	k		Externa l	Interna l	n								
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/Attendan ce							

**Course Objectives**: The objective of this course is to get the students familiar with various types of data structure and different techniques to implement the data structures and their real-life applications.

Course	At the end of this course, the student will be able to:
Outcomes	

	CO1	defi stru	<b>define:</b> abstract data types, algorithms, complexity of algorithms, linear data structures, non-linear data structures, searching, sorting, hashing.											
	CO2	give tech	e: origi	nal exa	mples	of : da hods h	ata stru ashing :	ctures	and its	types;	explain: technicu	sorting les.		
CO3 <b>calculate:</b> (complexity of algo graph, linear search, binary se radix sort, shell sort, merge se							algorithm). use array, stack, queue, linked list, tree, y search, bubble sort, selection sort, insertion sort, e sort, quick sort, heap sort, hash function to solve							
CO4 <b>differentiate:</b> data structure, searching techniques, sorting techniq										echnique	s, hash			
	CO5	eva sort	tunctions; analyze: time and space complexity. <b>evaluate:</b> the complexity of linear search, binary search, bubble sort, selection sort, insertion sort, radix sort, shell sort, merge sort, quick sort, heap sort, hash function and select the best one for a given problem.											
1	CO-PO Mapping Matrix													
CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		
CO 1	1	3	1	1	1	-	3	-	-	-	-	-		
CO 2	2	1	1	3	1	-	3	-	-	-	-	-		
CO 3	3	1	1	3	3	-	3	-	-	-	-	-		
CO 4	2	1	1	3	1	-	3	-	-	-	-	-		
CO 5	2	1	3	1	3	-	3	-	-	-	-	-		
Avg	vg 2 1.4 1.4 2.2 1.5 - 3								-					
			MD	<b>)</b> S/1/CC	C 2/T: I	ourse ( Data Sti	Content ructure	s & Al	gorithn	ns				

Unit – I	<b>Data structure and algorithm preliminaries:</b> Definitions, time and space analysis of algorithms, time-space tradeoffs, mathematical notation and functions, asymptotic notations for complexity of algorithms, recursion, divide and conquer strategy.
Unit – II	Linear data structures: abstract data types, array-based implementation, Stack: operations and application of stacks. Queues: operation on queues, circular queue, priority queues and de-queue, Linked list: implementation of linked list, header linked list for polynomial manipulation.
Unit – III	Non-linear data structures: Trees: binary tree, tree traversals, binary search tree, threaded binary tree, AVL tree, B-tree, B+ tree, heap and its applications, Huffman coding. Graph: representation of graphs, types of graphs, graph traversals, topological sort, minimum spanning trees, Kruskal and Prim's algorithm, application of graphs.
Unit – IV	<ul> <li>Searching, sorting and hashing techniques:</li> <li>Searching: linear search, binary search.</li> <li>Sorting: bubble sort, selection sort, insertion sort, radix sort, shell sort, merge sort, quick sort, heap sort,</li> <li>Hashing: hash functions, open addressing, chaining, rehashing.</li> </ul>
	Text/Reference Books
Text Books	<ol> <li>Seymour Lipschutz, "Data Structures (Schaum's Outline Series)", McGraw-Hill Book Company.</li> <li>Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2002.</li> </ol>
Reference Books	Tanenbaum A.M., Langsam Y, Augenstein M.J., "Data Structures using C & C++", Prentice Hall of India, 2002. SartajSahni, "Data Structures, Algorithms and Applications in C++", 2e, Universities Press Orient Longman Pvt. Ltd.

	MDS/1/CC3/T: Data Mining													
Course Type	Course	Contact	Delivery	ivery Maximum Marks		Delivery Maximum Marks Exam		Assessment						
	Credit	Hours/Week	Mode	External	Internal	Duration	Methods							
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance							

addition to the compulsory question. All questions will carry equal marks.

**Course Objectives**: The objective of this course is to get the students familiar with different concepts of data mining namely, OLAP, Association rule mining, classification and prediction.

Course	At the end of this course, the student will be able to :
Outcomes	
CO1	define: the concepts of data mining, data pre-processing, outliers, data
	warehouse ,OLAP, association rule mining, data classification prediction and
	cluster Analysis.
CO2	describe: key process of data mining ,data warehousing, OLAP, data
	warehousing to data mining, association rule, classification and prediction
	methods.
CO3	apply: OLAP technology and association rules.
	use: decision induction, Bayesian and back prorogation classification
	methods.
CO4	differentiate: operational database systems and data warehousing, single
	dimensional and multidimensional association rules, and between various data
	mining classification methods.
CO5	evaluate: data mining and data warehouse, OLAP technology, single and
	multidimensional association rule.

CO-PO Mapping Matrix
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	DOI			DOA				DOG	DOA	<b>DO1</b>	DO11	DO10
COs	POI	PO2	PO3	PO4	P05	PO6	PO7	PO8	PO9	POI0	POII	PO12
C01	1	3	1	1	1	-	3	-	-	1	-	-
CO2	2	1	1	3	1	-	3	-	-	1	-	-
CO3	3	1	1	3	3	-	3	-	-	1	-	-
CO4	2	1	1	3	1	-	3	-	-	1	-	-
CO5	2	1	3	1	3	-	3	-	-	1	-	-
Avg	2	1.4	1.4	2.2	1.8	-	3	-	-	1	-	-

	Course Content MDS/1/CC3/T: Data Mining							
Unit I	<b>Data Mining:</b> Introduction: Motivation, Importance, Knowledge discovery process, data mining, kind of data, Functionalities, interesting patterns, classification of data mining system, Major issues, Data Mining Primitives. Data Pre-processing: Data cleaning, Data Integration and transformation, Data reduction, Discretization and concept hierarchy generation. Data visualization. Outliers, Types of Outliers and Challenges of Outlier Detection.							
Unit - II	<b>Data warehouse and OLAP Technology for data mining:</b> data warehouse, difference between operational database systems and data warehouse, A Multidimensional Data Model, Data warehouse Architecture, Data warehouse Implementation, data warehousing to data mining, Data warehouse usage.							
Unit - III	Association Rule Mining: Mining single-dimensional Boolean association rules from transactional databases, mining multilevel association rules from transaction databases, Mining multidimensional association rules from relational databases and data warehouses, From association mining to correlation analysis, constraint-based association Mining.							
Unit - IV	<ul> <li>Data Mining Classification and Prediction: issues regarding classification and prediction, classification by decision induction, Bayesian classification, classification by back propagation, classification based on concepts from association rule mining and other classification methods.</li> <li>Cluster Analysis: What is Cluster Analysis, Types of Data in Cluster Analysis, Applications and Trends in Data Mining.</li> </ul>							
	Text/Reference Books							
Text Books.	<ol> <li>Ale Berson, Stephen Smith, Korth Theorling, "Data Mining", Tata McGraw Hill.</li> <li>Pieter Adriaans and Dolf Zantinge, "Data Mining", Addison-Wesley Longman.</li> <li>Sam Anahory, "Data Warehousing in the Real World", Addison-Wesley Longman.</li> </ol>							
Reference Books	1. Chanchal Singh, "Data Mining and Warehousing", Wiley.							

	MDS/1/CC4/T: Artificial Intelligence													
Course Type	Course	Contact	Delivery	Maximu	m Marks	Exam	Assessment							
	Credit	Hours/Week	Mode	External	Internal	Duration	Methods							
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/							

											Atte	endance
Instruction cover numb comp question unit in	<b>Instructions to paper setter for Final-Term Examination:</b> The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will consist of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.											
Cour Intelli along	<b>Course Objectives</b> : The objective of this course is to provide an understanding of Artificial Intelligence techniques and their applications. Various search techniques and expert systems along with other components of artificial intelligence in computer science will be covered.											
C Ou	Course tcomes	At	the end	of this	course,	the stud	dent wi	ll be ab	le to:			
	CO1       define: artificial intelligence terms, types of search strategy, production system, knowledge representation, learning techniques and genetic algorithm terminologies.											
	CO2	exj kno beł uno	<b>explain:</b> the types and properties of search algorithm, predicate calculus, knowledge representation and explore the theories that demonstrate intelligent behavior including intelligent editor, learning by induction and dealing with uncertainty									
	CO3	use	e: searcl	n strateg	gy/gene	tic algo	rithm/ f	uzzy lo	ogic and	learning	g techniq	ue.
	CO4	cla ger und	ssify ty netic alg certainty	<b>pes of:</b> gorithm, y.	search knowl	strateg edge rej	y, produ presenta	action a	system, I nd appro	learning, baches th	operator at deal w	r of ⁄ith
	CO5	con ope dea	<b>npare a</b> erator of al with u	and sele f genetion f	e <b>ct type</b> c algori nty.	es of: se thm, kn	earch str nowledg	rategy, ge repre	producti esentatio	ion syste n and ap	m, learn proaches	ing, s that
					CO-P	О Марр	oing Ma	trix				
CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	1	3	1	1	1	-	3	-	-	2	-	-
CO 2	2	1	1	3	1	-	3	-	-	2	-	-

CO 3	3	1	1	3	3	-	3	-	-	2	-	-
CO 4	2	1	1	3	1	-	3	-	-	2	-	-
CO 5	2	1	3	1	3	-	3	-	-	2	-	-
Avg	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-
Course Content MDS/1/CC4/T: Artificial Intelligence												
	Unit – IIntroduction: background and history, overview of AI applications areas The predicate calculus: syntax and semantic for propositional logic and FOPL, clausal form, inference rules, resolution and unification. Knowledge representation: network representation, associative network & conceptual graphs, structured representation, frames & scripts.Unit – IISearch strategies: strategies for state space search, data-driven and goal driven search, Search algorithms: uninformed search (depth-first, breadth-first, depth- first with iterative deepening) and informed search (hill climbing, best first, A* algorithm, mini-max etc.), computational complexity, properties										c and etwork & ad goal depth- best operties inance.	
Unit - IIIProduction system: types of production system-commutative and non- commutative production systems, decomposable and non-decomposable production systems, control of search in production systems. Rule-based expert systems: architecture, development, managing uncertainty in expert systems, Bayesian probability theory, Stanford certainty factor algebra, nonmonotonic logic and reasoning with beliefs, Fuzzy logic, Dempster/Shaffer and other approaches to uncertainty									l non- osable ng tanford th			
	Unit –	IV	Knov intell Gene opera	wledge igent eo etic algo ators: se	acquisi litors, lo orithms election	ition: t earning s: proble , crosso	ypes of by indu em repr ver, mu	learnin action. esentati tation, a	g, learn ion, enc replacei	ing by a coding sc ment etc.	utomata, hemes,	
	Text/Reference Books											
Text Books1. George F. Luger, "Artificial Intelligence", Pearson Education.									n.			

	2.	Dan W. Patterson. "Introduction to Artificial Intelligence and Expert System", PHI.
Reference Books	<ol> <li>1.</li> <li>2.</li> <li>3.</li> </ol>	Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence" Addison Wesley. Wils J. Nilsson, "Principles of Artificial Intelligence", Narosa Publishing house. Jackson Peter, "Introduction to Expert Systems", 3e, Addison Wesley, 2000.

MDS/1/CC2/P: Lab- Data Structures & Algorithms											
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maxi Ma	mum rks	Exam Duration	Assessment Methods				
				Externa 1	Interna 1						
Practical	02	04	Lab Work	50	50		TEE/MTE/ Assignment/Attendanc e				
<b>Instruction</b> be conducte basis of prac	<b>Instructions to paper setter for Final-Term Examination:</b> The Final-Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the basis of practical file, performance in practical exam and a viva-voce exam.										
Course Obj data structur	jectives: re concep	The objective ots covered in o	of this cou course <b>MI</b>	urse is to g DS/1/CC2	get the stu / <b>T</b> using	idents han $(c / c++ / )$	ds-on practice with java).				
Course Outcome	At th	ne end of this c	course, the	student v	vill be ab	le to:					
CO1	defin struc	ne: abstract d	ata types, ear data str	algorithm	ns, comp earching	lexity of a	algorithms, linear data nashing.				
CO2	give tech	: original exa	amples of ing metho	data str ds, hashin	ructures g and col	and its ty	ypes; explain: sorting blution techniques.				
CO3	calc grap radiz give	ulate: (complete) h, linear searce k sort, shell so n problems.	exity of al ch, binary ort, merge	gorithm). search, b sort, quic	use arra ubble so k sort, h	y, stack, c rt, selectio eap sort,	ueue, linked list, tree, on sort, insertion sort, hash function to solve				
CO4	diffe func	erentiate: data tions; analyze:	a structure time and	e, searchi space con	ng techn nplexity.	iques, soi	ting techniques, hash				
CO5	eval sort, func	uate: the component insertion sort tion and select	plexity of , radix sor the best of	linear se t, shell so one for a g	arch, bin rt, merge	ary search sort, quic blem.	, bubble sort, selection k sort, heap sort , hash				
CO6	deve	elop: programs	s based on	applicatio	on of stac	k, queue,	searching and sorting.				
			CO-PO M	Mapping N	Aatrix						

CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	1	3	1	1	1	-	3	-	-	-	-	-
CO 2	2	1	1	3	1	-	3	-	-	-	-	-
CO 3	3	1	1	3	3	-	3	-	-	-	-	-
CO 4	2	1	1	3	1	-	3	-	-	-	-	-
CO 5	2	1	3	1	3	-	3	-	-	-	-	-
Avg	2	1.4	1.4	2.2	1.5	-	3	-	-	-	-	-

	MDS/1/CC3/P: Lab Data Mining								
Course	Course Course Contact		Delivery	Maximu	n Marks	Exam	Assessment		
Туре	Credit	Hours/Week	Mode	External	Internal	Duration	Methods		
Practical	02	04	Lab Work	Work 50 3 Hours TEE/MTE/ Assignment/ Attendance					
<b>Instructions to paper setter for Final-Term Examination:</b> The Final-Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the basis of practical file, performance in practical exam and a viva-voce exam.									
Course Objectives: The objective of this course is to get the students hands-on practice with									

data mining concepts covered in course MDS/1/CC3/T.

Co	urse	At t	he end	of this	course	e, the st	udent	will be able	to :			
Outo	comes	1.6	defines the concents of data mining data are processing outlines data									
C	01	den	ne: th	e con	cepts (	of data	a mini	ng, data p	ore-pro	cessing,	outlier	s, data
		clus	cluster Analysis									
C	02	desc	describe: key process of data mining data warehousing OLAD data									
Ŭ	02	war	ehousi	ng to c	lata m	ining .	assoc	iation rule.	classi	fication	and pre	diction
		met	hods.	0		0,					···· ·· ·	
С	03	app	ly: OL	AP tec	hnolog	y and a	associa	tion rules.				
		use:	decis	sion i	nductio	on, Ba	yesian	and bac	k pro	rogation	classif	fication
		met	hods.									
C	04	diff	erentia	ate: op	peration	nal dat	abase	systems an	nd dat	a wareh	nousing,	single
		dim	ension	al and	multidi	imensio	onal as	sociation ru	lles, an	d betwe	en vario	us data
	05	min	ing cla	ssificat	10n me	thods.	- 4 -			1 1	•	1 1
	05	eval	tidime	uata 1	nining	and d	ata wa	irenouse, C	LAP 1	ecnnolo	gy, sing	gie and
C	06	dem	onstra	ate• da	associ	tion rul		ciation rule	and cl	ustering	<del>,</del>	
C	00	uti			ssiiica	uon ru	ic, assc			ustering	•	
CO-PO Mapping Matrix												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
001	4		-	-	-		2					
	I	3	I	1	1	-	3	-	-	I	-	-
CO2	2	1	1	3	1	-	3	-	-	1	-	-
CO3	3	1	1	3	3	-	3	-	-	1	-	-
				~	-		-			-		
CO4	2	1	1	3	1	-	3	-	-	1	-	-
CO5												
	4	1	5	1	5	-	5	-	-	I	-	-
	<u> </u>					<u> </u>						I
Avg	2	1.4	1.4	2.2	1.8	-	3	-	-	1	-	-

MDS/1/AEC1/T Professional Ethics								
Course Type	Course	Contact	Delivery Maximum		n Marks	Exam	Assessment	
	Credit	Hours/Week	Mode	External	Internal	Duration	Methods	
Ability	03	03	Lecture	50	25	3 Hours	TEE/MTE/	
Enhancement							Assignment/	
Course							Attendance	
<b>Instructions to paper setter for Final-Term Examination:</b> The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question								

number one will be compulsory and will consist of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

**Course Objectives**: The objective of this course is to enable the students to create awareness on Ethics and Human Values, instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course	At the end of this course, the student will be able to:
Outcomes	
CO1	<b>define:</b> personal and professional ethics, moral developments, deontology,
	issues in professional ethics.
CO2	explain: the basic ethical principles, virtue theory, right theory, casuist theory
CO3	use: professional practice in their professional life.
CO4	classify: moral absolution ,moral pluralism, moral rationalism.
CO5	compare and select: ethics according to profession.

## **CO-PO Mapping Matrix for Course MDS/1/AEC1/T**

	PO	PO1	PO1	PO1								
	1	2	3	4	5	6	7	8	9	0	1	2
CO s												

CO 1	1	3	1	1	1	-	3	1	-	2	-	-
CO 2	2	1	1	3	1	-	3	2	-	2	-	-
CO 3	3	1	1	3	3	-	3	3	-	2	-	-
CO 4	2	1	1	3	1	-	3	3	-	2	-	-
CO 5	2	1	3	1	3	-	3	3	-	2	-	-
Avg	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-
				MDS	C /1/AE(	ourse C C1/T Pr	Content ofessio	nal Eth	ics			
	Unit – IBasic Concepts: Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.										f Ethics, ssional s and	
Unit – IIBasic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, E Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemma Moral Autonomy.								st Ethical nas,				

Unit - III       Professional Practices: Professions and Norms of Professional Condu         Norms of Professional Conduct vs. Profession; Responsibilities,       Obligations and Moral Values in Professional Ethics, Professional code         of ethics, the limits of predictability and responsibilities of the       engineering profession. Central Responsibilities of Engineers - The         Centrality of Responsibilities of Professional Ethics; lessons from 1979       American Airlines DC-10 Crash and Kansas City Hyatt Regency         Walkway Collapse.       Unit       IV								
Unit – IV	Global issues in Professional Ethics: Introduction Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; BioEthics, Intellectual Property Rights.							
	Text/Reference Books							
Text Books	<ol> <li>R. Subramanian, "Professional Ethics", Oxford University Press, 2015.</li> <li>Caroline Whitbeck, "Ethics in Engineering Practice &amp; Research", 2e, Cambridge University Press, 2015.</li> </ol>							
Reference Books	<ol> <li>Charles E Harris Jr, Michael S Pritchård, Michael J Rabins, "Engineering Ethics: Concepts and Cases", 4e, Cengage learning, 2015.</li> <li>Manuel G Velasquez, "Business Ethics concepts &amp; Cases", 6e, PHI, 2008.</li> </ol>							

MDS/1/SEC1/T Digital Fluency								
Course Type	Course	Contact	Delivery	Maximu	m Marks	Exam	Assessment	
	Credit	Hours/Week	Mode	External	Internal	Duration	Methods	
Skill Enhancement Course	02	02	Lecture	35	15	3 Hours	TEE/MTE/ Assignment/ Attendance	

(	Course		At the end of this course, the student will be able to:										
Ot	tcome	8											
	CO1		define: the basic computer concepts, internet applications, virtual learning										
			environn	nent sys	tems, el	ffective	usage o	of virtua	al learni	ng envir	onment.		
	CO2		explain:	the effe	ective us	sage of	a virtua	l learni	ng envi	ronment	, features	s of an	
			LMS / V	LE / CN	MS and	digital	editing	tools.	-				
	CO3	i	use: of	multime	edia app	lication	is in edu	acation,	multim	nedia dev	elopmer	nt	
			Environr	nent and	d usage	of virtu	al learr	ning env	vironme	nt			
	CO4		classify:	multin	nedia to	ols virt	ual lear	ming er	vironm	ent and o	digital ec	liting	
			tools.			015, 111							
	005				1	e	1.1	1. 4	1	11 .	· ·		
	CUS		compare	and se	elect typ	Des 01: 1	nuitime	edia too	is, virtu	ai iearni	ng envir	onment	
			and digit		ig tools	•							
			C	<b>:O-PO</b>	Mappir	ng for (	Course	MDS/1	/SEC1				
	PO	PO	PO	РО	PO	PO	РО	РО	РО	PO1	PO1	PO1	
	1	2	3	4	5	6	7	8	9	0	1	2	
~~~													
CO													
S													
CO	1	3								_	_		
1	T	5	1	1		-	5	1	_	2	-	-	
CO	2	1	1	3	1	-	3	2	-	2	-	-	
2													
			_										
								-					
CO	3	1	1	3	3	-	3	3	-	2	-	-	
3													
CO	2	1											
	4	I	1	5		-	5	3	-	2	-	-	
												L	
co	2	1	3	3 1 3 - 3 3 - 2									
5							-						

Avg	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-
	Course Content MDS/1/SEC1/T Digital Fluency											
	Unit -	- I	Bas and Proo their Edu	<b>Basic Computer Concepts and Operations:</b> Basic Computer Concept and Operations, Computers in Daily Activities, Computer Components Productivity suites for teaching and learning, Educational Programs and their uses, Basic File Handling Operations, Technology Trends in Education.								
	Unit –	II	Inte App lear	<b>Internet Fundamentals and Applications:</b> Using the Internet, Internet Applications, Google Advanced Search, Web 2.0 applications for learning, Using Google forms, Internet Ethics and Security.								
	Unit -	III	Virt Env Virt VLF Mul App Env	<ul> <li>Virtual Learning Environments: Basics of Virtual Learning Environment, Virtual Learning Environment systems, Effective usage of Virtual Learning Environment, Investigate the Features of an LMS / VLE / CMS, Example of a Virtual Learning Environment.</li> <li>Multimedia Fundamentals: Multimedia Elements, Multimedia Applications in Education, Multimedia Development Environments, basic Multimedia Production.</li> </ul>								isage of IS /
	Unit –	IV	<ul> <li>Digital Editing: Learning Objectives, Digital Editing Overview, Digital Content and Media, Digital editing tools, Editing Digital Text, Editing Digital Audio.</li> <li>Importance of the following: Effective Communication Skills, Creati Problem Solving &amp; Critical Thinking, Collaboration and Teamwork</li> </ul>							Digital diting Creative ork skills.		
					Text/	Refere	nce Bo	oks				,
Text	Books		1. 5	S P Saiia	an, "Di	gital Flu	iency 2	021", E	kalavva	a e-Educ	ate	
Refer	ence B	ooks	1. " Deli	<ol> <li>S P Sajjan, "Digital Fluency 2021", Ekalavya e-Educate</li> <li>"Digital Fluency Book", Cambridge Publishing Company Online. Delivered by Amazon.</li> </ol>								ıline.

MDS/1/SEC1/P Digital Fluency	

Course Type	Course	Contact	Delivery	Maximu	Maximum Marks		Assessment	
	Credit	Hours/week	Mode	External	Internal	Duration	Methods	
Skill Enhancement Course	01	02	Lecture	25		3 Hours	TEE/MTE/ Assignment	
							Attendance	

Course	At the end of this course, the student will be able to:
Outcomes	
CO1	<b>define</b> : the basic computer concepts, internet applications, virtual learning environment systems, effective usage of virtual learning environment.
CO2	<b>explain:</b> the effective usage of a virtual learning environment, features of an LMS / VLE / CMS and digital editing tools.
CO3	<b>use:</b> of multimedia applications in education, multimedia development Environment and usage of virtual learning environment
CO4	<b>classify:</b> multimedia tools, virtual learning environment and digital editing tools.
CO5	<b>compare and select types of:</b> multimedia tools, virtual learning environment and digital editing tools.

	CO-PO Mapping for Course MDS/1/SEC1											
	PO 1	PO 2	РО 3	РО 4	PO 5	PO 6	РО 7	РО 8	PO 9	PO1 0	PO1 1	PO1 2
CO s												
CO 1	1	3	1	1	1	-	3	1	-	2	-	-

CO 2	2	1	1	3	1	-	3	2	-	2	-	-
CO 3	3	1	1	3	3	-	3	3	-	2	-	-
CO 4	2	1	1	3	1	-	3	3	-	2	-	-
CO 5	2	1	3	1	3	-	3	3	-	2	-	-
Avg	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-

### MDS/2/CC5/T Data Science

Course Type	Cours	Contact	Delivery	Maximu	m Marks	Exam	Assessment	
	e Cradit	Hours/We	Mode	External	Internal	Duratio	Methods	
	Clean	ek				11		
Compulsory	04	04	Lecture	70	30	3 Hours	TEE/MTE/	
Theory							Assignment/	
							Attendance	

**Instructions to paper setter for Final-Term Examination:** The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will consist of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

**Course Objectives**: The objective of this course is to get the students familiar with the concepts and processes of Data Science including collection, filtering, processing, analysis and visualization.

Course	At the end of this course, the student will be able to :
Outcomes	
	define: data science process, classification of data, big data, web data,
CO1	sampling, data analysis techniques-correlation, regression, mean, mode,
	kurtosis, Bayesian inference etc., neural network, fuzzy logic, rule of mining,
	hadoop, hive, cloud database, and visualization.
CO2	understand and describe: graphical representation of data, storage and
	retrieval of data, evolution of analytic scalability, sampling distribution, data
	analysis techniques, Bayesian model and network, induction rule, neural
	network, fuzzy logic, data mining techniques, data analysis framework and
	visualization.
CO3	use: data science process, modern data analytic tools, statistical concepts, data
	analysis techniques, Bayesian network, induction rule, fuzzy logic, data mining
	techniques, hadoop file system, hive, S3, cloud database, inference and
	visualization.
CO4	categorize: analytic processes and tools, analysis, reporting, sampling and
	resampling, data analysis techniques, linear and non-linear time series,
	sequential, temporal and spatial mining, egonets systems and application.
CO5	choose: data science process, data storage, data analytic tools and processes,
	sampling method, data analysis technique, time series, mining techniques,
	visual data analysis framework and technique suitable in given situation.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	-	-	1	-	-
CO2	2	1	1	3	1	-	3	-	-	1	-	-
CO3	3	1	1	3	3	-	3	-	-	1	-	-
CO4	2	1	1	3	1	-	3	-	-	1	-	-
CO5	2	1	3	1	3	-	3	-	-	1	-	-
Avg	2	1.4	1.4	2.2	1.8	-	3	-	-	1	-	-

#### **CO-PO Mapping Matrix**

	Course Content MDS/2/CC5/T Data Science							
Unit I	Introduction to Data Science: data science process, exploratory data analysis, collection of data, graphical presentation of data, classification of data, storage and retrieval of data, big data, challenges of conventional systems, web data, evolution of analytic scalability, analytic processes and tools, analysis vs reporting, modern data analytic tools; Statistical Concepts: sampling distributions, re-sampling, statistical inference, prediction error.							
Unit – II	<b>Data Analysis:</b> Correlation, regression, probability, Conditional probability, random variables, analysis using mean, median, mode, standard deviation, skewness, kurtosis, regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods; Analysis of Time Series: linear systems analysis, nonlinear dynamics.							
Unit – III	<ul> <li>Data Mining Techniques: Rule induction: neural networks: learning and generalization, competitive learning, principal component analysis and neural networks.</li> <li>Fuzzy Logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods, neuro fuzzy modeling.</li> <li>Association Rule Mining: clustering, outlier analysis, sequential pattern mining, temporal mining, spatial mining, web mining.</li> </ul>							
Unit – IV	<b>Data Analysis Frameworks and Visualization:</b> Map Reduce, Hadoop, Hive, sharding, NoSQL databases, cloud databases, S3, Hadoop Distributed File Systems, visualizations, visual data analysis techniques, interaction techniques, social network analysis, collective inferencing, Egonets systems and applications.							
	Text/Reference Books							
Text Books.	<ol> <li>Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.</li> <li>AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.</li> </ol>							
Reference Books	<ol> <li>Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley &amp; Sons, 2012.</li> <li>Jiawei Han, MichelineKamber, "Data Mining Concepts and Techniques", 2e, Elsevier.</li> <li>Rachel Schutt, Cathy O'Neil, "Doing Data Science", O'Reilly Publishers, 2013.</li> <li>Foster Provost, Tom Fawcet, "Data Science for Business", O'Reilly Publishers, 2013.</li> <li>Bart Baesens, "Analytics in a Big Data World: The Essential Guide to</li> </ol>							

Data Science and its Applications", Wiley Publishers, 2014.	
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MDS/2/CC6/T Programming with Python											
Course Type	Cours e	Contact Hours/Wee	Deliver y Mode	Maxi Ma	mum rks	Exam Duratio	Assessment Methods				
	Credit	k		Externa 1	Interna l	n					
Compulsory Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/Attendanc e				

**Course Objectives:** The objectives of this course is to get the students familiar with basic concepts of Python programming, decision making and functions, file handling and object oriented programming concepts, database programming and to implement machine learning concepts.

Co Out	ourse comes	At	the end	of this	course,	, the stu	ident w	ill be a	ble to			
C	CO1	def obj	ine: ins	stallatic	ons, wo ogramr	rking, s ning co	structur ncepts,	es, con pythor	trol sta 1 librari	tements, es.	operator	rs, lists,
C	CO2	exp con	explain: conditional & control statements ,strings, OOPs ,file handling concepts ,libraries and packages of python programming.									
C	203	use app	<b>use:</b> various python libraries such as numpy, matplotlib, pandas. apply: python programming constructs to solve real world problems.									
C	CO4	cat fun	<b>categorize:</b> data types, dictionaries, conditional & control statements, functions, python libraries.									
C	CO5	con fun	npare:	data python	types, librarie	dicties.	onaries	,conditi	ional	& cont	rol stat	ements,
C	CO6	des	<b>ign:</b> ba	sic and	advanc	ed app	lication	ns in py	thon.			
1	CO-PO Mapping Matrix											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	1	3	1 1	1	1	-	3	1	-	-	-	-
CO2	2	1	1	3	1	-	3	2	-	-	-	-
CO3	3	1	1	3	3	-	3	3	-	-	-	-
CO4	3	3	1	3	1	-	3	3	-	-	-	-
CO5	3	1	1	3	3	-	3	3	-	-	-	-
CO6	3	3	3	3	3	-	3	3	-	-	-	-
Avg	2.5	2	1.3	2.6	2	-	3	2.5	-	-	-	-
			Μ	DS/2/C	Co CC6/T 1	ourse C Progra	Content mming	, with <b>F</b>	Python			
Un	it – I	Inst Prog key Nun Sco	allation gram, C words, neric da pe of a	n and V Control Literals ata type Variab	<b>Workin</b> flow, In s, Varia es: int, f le, Wor	ng with nterpret bles, P loat, co king w	<b>Pytho</b> ter shell ython b omplex, ith: Stri	n: Usin l, Tokei asic Op using s ing, Lis	g Help ns, Iden perators string d t, Tuple	, Structur tifiers, R , Declari ata type. es and D	re of a P Reserved ing and u Python ictionario	ython using Casting, es.
Uni	Unit – II       Conditional blocks: Conditional blocks using if, else and elif, For loops in python, While loops, Continue, Break and Else, organizing python codes using functions.         Modules: Creating Modules, using Modules and Built-in Modules.         Packages: Package Types, Importing Package, Viewing Package Content and Documentation. Powerful Lambda Function in python.         Programming: Using Functions.											
Uni	Unit – IIIObject Oriented Programming: Concept of Class, Object and Instances, Constructor, Class Attributes and Destructors, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Overloading Operators, Data Hiding, Exception Handling, Programming using Oops concepts.File Handling: Creating, Opening, Closing, Writing & Reading File Content, Deleting a File. Programming using file operations.											

Unit – IV	<ul> <li>Python NumPy: Array Slicing, Array Indexing, Data Types, Array Shape &amp; Reshape, Array Join, Array Split, Random.</li> <li>Python Pandas: Data Frames, Read CSV, Analyzing Data and Cleaning Data.</li> <li>Python Matplotlib: Line, Grid, Scatter, Bars, Histograms and Pie Charts.</li> <li>Machine Learning: Mean, Median, Mode, Standard Deviation, Percentile,</li> </ul>
	Normal Data Distribution, Scatter Plot and Linear Regression.
	Text/Reference Books
Text Books	<ol> <li>Chun, J Wesley, "Core Python Programming", 2e, Pearson, 2007.</li> <li>E. Balagurusamy, "Introduction to Computing and Problem Solving Using Python", McGraw Hill Education, 2016.</li> </ol>
Reference Books	<ol> <li>Barry and Paul, "Head First Python", 2e, O Reilly, 2010.</li> <li>Lutz and Mark, "Learning Python", 4e, O Reilly, 2009</li> </ol>

	MDS/2/DSC1(i)/T: Big Data Analytics												
Course	Course	Contact	Delivery	Maximur	n Marks	Exam	Assessment						
Туре	Credits	Hours/ Week	Mode	External	Internal	Duration	Methods						
Optional Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance						

**Course Objectives:** The objective of this course is to get the students familiar with different concepts of Big Data and their realization/implementation using Hadoop and Map Reduce tool sets.

Course	At the end of this course, the student will be able to :
Outcomes	
CO1	define: Big Data and Hadoop, digital data, Apache Hadoop, analyzing Data
	with Unix tools and Hadoop, Hadoop Streaming, Hadoop Ecosystem, IBM Big
	Data Strategy, HDFS, Hadoop Ecosystem, Pig, Hive shell and services,
	HBasics, Big SQL.
CO2	understand and describe: Big Data and Hadoop, Analyzing Data with Hadoop,
	Hadoop Streaming, Hadoop Ecosystem, IBM Big Data Strategy, Hadoop
	Distributed File System, command line interface, job scheduling, shuffle and
	sort, task execution, Hadoop Ecosystem, Pig, HiveQL, Hbase.
CO3	apply and use: Apache Hadoop, HDFC, HBasic, Big Data and Hadoop, HDFS

		command line interface, Hadoop file system interfaces, data flow, Hive services.											
C	04	classi Hive	fy: Bi	g Data Hive se	and H	adoop,	Big D	ata Ana	alytics,	Apache	Hadoop	, HDFS	
C	05	Com	pare: th	e featur	re set of	f Pig, H	ladoop,	HDFS	•				
CO-PO Mapping Matrix													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	1	3	1	1	1	-	3	-	-	1	-	-	
CO2	2	1	1	3	1	-	3	-	-	1	-	-	
CO3	3	1	1	3	3	-	3	-	-	1	-	-	
CO4	2	1	1	3	1	-	3	-	-	1	-	-	
CO5	2	1	3	1	3	-	3	-	-	1	-	-	
Avg	2	1.4	1.4	2.2	1.8	-	3	-	-	1	-	-	
			M	DS/2/D	Co SC1(i)/	ourse C /T: Big	Content	: Analyti	cs				
Unit -I		<b>Introd</b> Data,V analyzi Hadoop	uction s of Big ng Data o Ecosy	<b>to Big</b> I g Data, a with U rstem, I	Data an Big Da Jnix too BM Big	nd Had ta Anal ols, Ana g Data S	loop: T lytics, H alyzing Strateg	ypes of Iistory Data w y,Big D	digital of Had vith Had ata app	data, int oop, Apa loop, Ha lications	roductio ache Had adoop Str	n to Big oop, reaming,	
Unit–I	I	HDFS comma flume a Hadoo	(Hadoo nd line nd Sqo p I/O: o	op Dist interfactor op and compre	<b>ributed</b> ce, Had Hadooj ssion, s	<b>l File S</b> loop file p archiv serializa	<b>ystem</b> ) e syster ves. ation, A	The don interf	esign of faces, d d file-ba	f HDFS, ata flow, ased data	HDFS co data ing structur	oncepts, est with es.	
Unit –l	II	Map R and sor	educe: t, task e	Anator	ny of a on, Mar	Map R	teduce j ce types	job run s and fo	, failure ormats,	es, job sc Map Rec	heduling luce feat	, shuffle ures.	
Unit –	[V	Hadoo	p Ecos	ystem:	Introdu	iction,f	eatures			-			

	<ul> <li>Pig: Introduction to Pig, execution modes of Pig, comparison of Pig with databases, grunt, Pig latin, user defined functions, data processing operators.</li> <li>Hive: Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions.</li> <li>Hbase: HBasics, concepts, clients, example, Hbase Vs RDBMS.</li> <li>Big SQL: Introduction</li> </ul>									
	Text/Reference Books									
Text Books	<ol> <li>Tom White, "Hadoop: The Definitive Guide", 3e, O'reilly Media, 2012.</li> <li>Seema Acharya, Subhasini Chellappan, "Big Data Analytics", Wiley 2015.</li> <li>Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", MC Press.</li> </ol>									
Reference Books	<ol> <li>Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.</li> <li>Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications.</li> <li>Anand Rajaraman and Jeffrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.</li> <li>Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley &amp; Sons, 2012.</li> </ol>									

MDS/2/DSC1(ii)/T: Social Network Analytics												
Course	Course	Contact	Delivery	Maximu	m Marks	Exam	Assessment					
Туре	Credits	Hours/ Week	Mode	External	Internal	Duration	Methods					
Optional Theory	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance					

**Course Objectives:** The objective of this course is to understand the concept of Social Media Analytics, NLP techniques, analytics of Facebook, collection and analysis of data related to social media.

Course	At the end of this course, the student will be able to :											
Outcomes												
CO1	define: Social Media Analytics, Web analytics tools, Network											
	Analysis(LinkedIn, Instagram, YouTube Twitter etc. Google analytics).											
CO2	understand and describe: Link Prediction, Collective Classification,											

		I	Applicatio	ons in A	Advertis	sing and	l Game	Analy	tics.			
(	CO3	8	apply an	d use:	techni	iques c	of Proc	essing	and V	isualizin	g Data,	Natural
	204	I	Language	Proces	sing Te	chniqu	es for N	Aicro-te	ext Ana	lysis.	1 4 1	
(	204	(	classify:	Social .	Media A	Analytı	cs, Wel	o analy	tics and	Faceboo	ok Analy	vtics.
0	205	0	compare:	techn	iques o	f Proce	ssing a	nd Visu	alizing	g Data, N	latural L	anguage
CO-PO Mapping Matrix												
COs	PO1	PO	PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12									
CO1	1	3	1	1	1	-	3	-	-	1	-	-
CO2	2	1	1	3	1	-	3	-	-	1	-	-
CO3	3	1	1	3	3	-	3	-	-	1	-	-
CO4	2	1	1	3	1	-	3	-	-	1	-	-
CO5	2	1	3	1	3	-	3	-	-	1	-	-
Avg	2	1.4	1.4	2.2	1.8	-	3	-	-	1	-	-
			Γ	MDS/2/	Co /DSC1(	ourse ( (ii)/T: S	Content Social N	t Networ	k Anal	ytics		
Unit-I		<b>Intro</b> SMA; SMA	duction t SMA in in differe	o Socia small c nt areas	<b>l Medi</b> organiza s.	<b>a Anal</b> ations, S	<b>ytics (S</b> SMA ir	SMA):	Social organiz	media lai ations, aj	ndscape, pplicatio	Need for n of
	<b>Network fundamentals and models:</b> The social networks perspective - nodes, ties and influencers, social network and web data and methods. Graphs and Matrices-Basic measures for individuals and networks. Information visualization.											
Unit–I	I	Maki	ng conne	ctions:	Link a	nalysis	. Rando	om grap	hs and	network	evolutio	on.
		Social	l contexts	s: Affil	iation a	nd ider	ntity.					
		Web	analytics	tools:	Click st	tream a	nalysis	, A/B te	esting, o	online su	rveys, W	/eb

	crawling Analysis.	crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis.												
Unit–III	Facebool audience. campaign evaluating etc. Goog	<b>'acebook Analytics:</b> Introduction, parameters, demographics. Analyzing page udience. Reach and Engagement analysis. Post- performance on FB. Social ampaigns. Measuring and Analyzing social campaigns, defining goals and valuating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter tc. Google analytics. Introduction. (Websites)												
Unit–IV	<b>Data Collection and Analysis:</b> Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration.													
	Text/Reference Books													
Text Books	1. Matthew Ganis, Avinash Kohirkar, "Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media", Pearson.													
Reference Books	<ol> <li>Jim S Your</li> <li>Olive Effort</li> </ol>	terne, Jim Stern Marketing", Wi r Blanchard, "S s in Your Organ	ne, "Social ley. ocial Medi nization (Q	Media Me a ROI: Ma ue Biz-Tec	etrics: Hov anaging a ch)", Que	w to Measu nd Measurin Publishing.	re and Optimize ng Social Media							
		MDS/2	2/CC5/P: L	ab Data S	cience									
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximur External	m Marks Internal	Exam Duration	Assessment Methods							
Practical	02	04	Lab Work	50		3 Hours	TEE/MTE/ Assignment/ Attendance							
<b>Instruction</b> be conducte basis of prac	s to paper d by a pane ctical file, p	setter for Fina el of internal an performance in	<b>l-Term Ex</b> d external e practical ex	amination examiners. am and a	<b>1:</b> The Fin Examine viva-voce	al-Term exa es will be ev exam.	amination will valuated on the							
Course Obj data science	<b>Objectives</b> : The objective of this course is to get the students hands-on practice with ence concepts covered in course <b>MDS/2/CC5/T</b> .													

~															
Cours	se mos	At the	e end of	t this co	ourse, th	ne stude	ent will	be able	e to :						
Outco	mes	defin	e• data	science	nroces	s class	ificatio	n of da	ta hig	data wel	n data				
C	<b>D</b> 1	sampl	ing da	ta analy	vsis tecl	hniques	s-correl	ation r	egressi	on mear	mode.				
		kurtos	sis, Bay	vesian i	nferenc	e etc., 1	neural r	network	, fuzzy	logic, r	ule of mi	ning,			
		hadoo	p, hive	, cloud	databa	se, and	visuali	zation.	· •	0 /		U,			
CO	02	unde	rstand	and de	scribe:	graphi	cal rep	resenta	tion of	data, stor	age and				
		retriev	val of d	ata, evo	olution	of anal	ytic sca	alability	, samp	ling dist	ribution,	data			
		analys	sis tech	niques,	Bayes	ian moo	del and	networ	k, indu	ction rul	e, neural				
		netwo	ork, tuz	zy logi	c, data i	mining	technic	lues, da	ita anal	ysis fram	nework a	nd			
	73	Visual	se: data science process, modern data analytic tools, statistical concepts, data												
	<i>JS</i>	analy	ise: data science process, modern data analytic tools, statistical concepts, data nalysis techniques, Bayesian network, induction rule, fuzzy logic, data mining												
		techni	echniques, hadoop file system, hive, S3, cloud database, inference and												
		visual	risualization.												
CO	D4	categ	ategorize: analytic processes and tools, analysis, reporting, sampling and												
		resam	esampling, data analysis techniques, linear and non-linear time series,												
	~ ~	seque	sequential, temporal and spatial mining, egonets systems and application.												
C	55	choos	choose: data science process, data storage, data analytic tools and processes,												
		visual	ing me data ai	tnoa, a nalveie	ata ana	iysis teo	d techn	ique su	itable i	nining te	vituation	8,			
C	76	devel	on: apr	lication	n using	concer	ts of d	ata scie	nce		situation.				
		uover	• <b>p</b> • upp	neuno	u using	concer	, 15 01 <b>u</b>								
I					CO-PC	) Mapp	ing Ma	trix							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	1	3	1	1	1	-	3	-	-	1	-	-			
CO2	2	1	1	2	1		2			1					
	Z	1	1	3		-	5	-	-	1	-	-			
<b>├</b> ──															
CO3	3	1	1	3	3	-	3	-	-	1	-	-			
				_	_		_								
CO4	2	1	1	3	1	-	3	-	-	1	-	-			
<u> </u>															
005		1		1						1					
	2		5		5	-	5	-	-	1	-	-			
					1	1	1	1		l					

Avg	2	1.4	1.4	2.2	1.8	-	3	-	-	1	-	-
											<u>.</u>	

		MDS/2/0	CC6/P: La	ab Progra	mming v	with Pytho	on					
Course	Course	Contact	Delivery	Maximu	m Marks	Exam	Assessment Methods					
Туре	Credit	Hours/Week	Mode	External	Internal	Duration						
Practical	02	04	Lab Work	ab 50 3 Hours TEE/M York Assignment								
<b>Instruction</b> be conduct basis of p	ructions to paper setter for Final-Term Examination: The Final-Term examination will onducted by a panel of internal and external examiners. Examinees will be evaluated on the of practical file, performance in practical exam and a viva-voce exam.											
Course C python pr	<b>)bjective</b> ogramm	es: The objectiving concepts c	ve of this c overed in c	course is t course <b>MI</b>	o get the <b>DS/2/CC</b>	students ha 6/T.	ands-on practice with					
			.1 .	4 4 1		11 4						
Outco	rse	At the end of	this course	e, the stud	ent will b	e able to						
CO	)1	<b>define:</b> install object oriented	lations, wo d program	orking, str ming cond	uctures, o cepts, pyt	control stat hon librari	tements, operators, lists, es.					
CO	02	<b>explain:</b> conditional & control statements ,strings, OOPs ,file handling concepts ,libraries and packages of python programming.										
CO	CO3 <b>use:</b> various python libraries such as numpy, matplotlib, pandas. apply: python programming constructs to solve real world problems.											

0	CO4	cat fun	egorize	e: data	types librario	, dicties.	onaries	, cond	itional	& con	trol stat	ements,			
(	CO5	cor fun	npare:	data python	types, librario	dictio es.	naries,	condi	tional	& cont	trol stat	ements,			
C	CO6	des	s <b>ign:</b> ba	sic and	advan	ced app	licatior	ns in py	thon.						
ł	CO-PO Mapping Matrix														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	1	3	1	1 1 - 3 1											
			-												
CO2	2	1	1	1 3 1 - 3 2											
CO3	3	1	1	3	3	-	3	3	-	-	-	-			
CO4	3	3	1	3	1	-	3	3	-	-	-	-			
CO5	3	1	1	3	3	-	3	3	-	-	-	-			
CO6	3	3	3	3	3	-	3	3	-	-	-	-			
Avg	2.5	2	1.3	2.6	2	-	3	2.5	-	-	-	-			

MDS/2/AEC2/T Constitution of India											
Course	Course	Contact	Delivery	Maximu	n Marks	Exam	Assessment				
Туре	Credits	Hours/ Week	Mode	External	Internal	Duration	Methods				

Compulsory Theory	03	03	Lecture	50	25	3 Hours	TEE/MTE/ Assignment/ Attendance			
Instructions to paper setter for Final-Term Examination: The Final-Term examination shall										
cover the whole c	content of	the course.	The total nu	umber of qu	uestions sl	nall be nine	. Question			
number one will	be compul	sory and w	ill consist of	f short/obje	ective-type	e questions	from the			

complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

**Course Objectives:** The course aims at providing complete knowledge about the framework that demarcates fundamental political structure, procedure, powers.

Co	ourse	At th	e end o	f this co	ourse, tl	ne stude	ent will	be able	to:					
(	CO1	defir right	ne: du s,direct	ties of ive prin	f gove ciples a	ernment and duti	instit es of ci	tutions tizens.	and	sets ou	t funda	amental		
(	CO2	unde funda of sta dutie prop	<b>Inderstand and describe:</b> duties of government institutions and sets out undamental rights, directive principles and duties of citizens, directive principles of states policy, enforcement of directive principles(article 36-51), fundamental luties(article 51 A), extent of liability of the state(article 299,300), right to property(article 300-A). <b>Ise:</b> Right to Life & Personal Liberty (Article 21) Protection in case of arrest &											
(	203	Use: Deter Freed 29-30	<b>use:</b> Right to Life & Personal Liberty (Article 21) Protection in case of arrest & Detention (Article 22) Right Against Exploitation (Article 23, 24) Right to Freedom of Religion (Article 25-28) Cultural & Educational Rights (Articles 29-30).											
(	CO4	class case 24) F (Arti	<b>ify:</b> ar of arreading to arreading and a construction of a construction of the arreading and a construction of the arreading and a construction of the arreading and a arreading and a construction of the arreading and a construction of the arread	ticles F st & De Freedo -30).	Right to etention m of Ro	Life & (Articl eligion	2 Perso le 22) F (Article	nal Lib Right A 25-28)	erty (A gainst I ) Cultur	article 21 Exploitat al & Edu	1) Protection (Art	ction in icle 23, Rights		
(	CO5	Com arres Righ (Arti	<b>pare:</b> 1 t & De t to Fre cles 29-	Right to etention eedom -30).	• Life & (Artic of Reli	k Perso le 22) gion (A	nal Lib Right Article 2	erty (A Against 25-28)	rticle 2 Explo Cultura	1) Prote itation ( 1 & Edu	ction in Article 2 cational	case of 23, 24) Rights		
			CO-PC	) Mapp	ing Ma	atrix fo	r Cour	se MDS	S/2/AE	C2/T				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		
CO s														
CO 1	1	3	1	1	1	-	3	1	-	2	-	-		

CO 2	2	1	1	3	1	-	3	2	-	2	-	-		
CO 3	3	1	1	3	3	-	3	3	-	2	-	-		
CO 4	2	1	1	3	1	-	3	3	-	2	-	-		
CO 5	2	1	3 1 3 - 3 3 - 2 -								-	-		
Avg	2	1.4	1.4 2.2 1.8 - 3 2.4 - 2											
	Course Content MDS/2/AEC2/T Constitution of India													
Unit l	[	Ci (A 13 Ec (A	tizenshi rticle 1 ) Right Juality rticles	ip (Artio 2); Doc t to Eq of Oppo 17, 18).	cles 5-1 etrines ( uality ( ortunity	1) Fund of Ultra (Article (Artic	damenta – Vire 14) P les 15,	al Right s, Seve rohibiti 16) Ab	ts in Ge rability on on olition	neral; D , Eclipse Discrimi of Unto	efinition e,Waiver nation, uchabilit	of State (Article Right to y, Titles		
Unit -	- II	Ri Fr Fr Pr Do	ght to eedom eedom otectior ouble Je	Freedo of As of Res in res copardy	om und sembly sidence spect o Self-in	er Arti Freed Freed f Conv crimina	cle 19 om of om of iction tion.	Freedo Assoc Occup under	om of iation ation, 7 Article	Speech Freedom Frade an 20 Ex	and Ex n of M nd Busin post fac	pression ovement ness etc to Laws		
Unit -	- III	Ri De Fr 29	Right to Life & Personal Liberty (Article 21) Protection in case of arrest & Detention (Article 22) Right Against Exploitation (Article 23, 24) Right to Freedom of Religion (Article 25-28) Cultural & Educational Rights (Articles 29-30).											
Unit -	- <b>IV</b>	W co po du	Writ jurisdiction of the Supreme Court and High Court, nature and general conditions of Writ jurisdiction(article 32, 226), directive principles of states policy, enforcement of directive principles(article 36-51), fundamental duties(article 51 A), extent of liability of the state(article 299,300), right to											

	property(article 300-A).
	Text/Reference Books
Text Books	<ul> <li>4. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reilly Media, 2012.</li> <li>5. SeemaAcharya, Subhasini Chellappan, "Big Data Analytics", Wiley 2015.</li> <li>3. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press.</li> </ul>
Reference Books	<ol> <li>Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.</li> <li>Jay Liebowitz, "Big Data and Business Analytics" AuerbachPublications, CRC press (2013)</li> <li>AnandRajaraman and Jeffrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.</li> <li>Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley &amp;Sons, 2012.</li> </ol>

#### MDS/2/SEC2/T Cyber Security

Course Type	Course	Contact	Delivery	y Maximum Marks		Exam	Assessment
	Credit	Hours/Week	Mode	External	Internal	Duration	Methods
Compulsory	02	02	Lecture	35	15	3 Hours	TEE/MTE/
Theory							Assignment/
							Attendance

**Instructions to paper setter for Final-Term Examination:** The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will consist of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

(	Course	A	At the en	d of this	s course	e, the st	udent w	ill be a	ble to:						
Ou	tcomes	8		1 0	•	<u>a 1</u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			1 4					
	CO1	C	lefine: c	yber Se	curity,	Cybers	bace, Cy	yber thr	eats, Cy	yber Atta	icks,				
			nformati	ion Seci	irity Ar	chitecti	ire, Vul	nerabil	ity Asse	essment	and				
		ł	enetration	on.											
	CO2	e	xplain:	the imp	ortance	e and ch	allenge	es in Cy	ber Sec	urity, M	alware tl	nreats,			
		S	Sniffing,	iffing, Role of forensics Investigator and Forensics Investigation Process.											
	CO3	ι	se: defe	e: defense Strategies, Vulnerability Assessment and Penetration.											
	<u>CO</u> 4		loccify	cyber th	proote (	<sup>7</sup> vbor A	ttacks	Dafana	o Strato	mines					
	04		1a5511 y .	cyber u	neats, C	yber A	macks,	Defells	e Strate	gies.					
	CO5	8	pply: c	yber Se	curity r	nechani	sms ag	ainst M	alware	threats.					
					CO-PO	Э Марр	ing Ma	trix							
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1			
	1	2	3	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$											
CO															
S															
CO	1	3	1	1	1	-	3	1	-	2	-	-			
1															
CO	2	1	1	2	1		2	2		2					
	2	I	1	3	1	-	3	2	-	2	-	-			
4															
CO	3	1	1	2	3		2	3		2					
	3	1	1	3	3	-	3	3	-	2	-	-			
3															
CO	2	1	1	3	1	_	3	3	_	2		_			
	4	1	1	3	1	-	3	3	-	4	-	-			
-															
co	2	1	3												
5	-	-													
Avg	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-			
Ū															

Course Content MDS/2/SEC2/T Cyber Security							
Unit – I	<b>Introduction:</b> Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security, Organizational Implications.						
Unit – II	<b>Cyber Attacks:</b> Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.						
Unit - III	<b>Ethical Hacking:</b> Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modeling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration, testing, types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defense Strategies.						
Unit – IV	<b>Introduction to Cyber Forensics:</b> Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013.						
	Text/Reference Books						
Text Books	<ol> <li>Donaldson S., Siegel S., Williams, C.K., Aslam A., "Enterprise Cyber security -How to Build a Successful Cyber Defense Program against Advanced Threats", 1e, Apress, 2015.</li> <li>Nina Godbole, Sumit Belapure, "Cyber Security", Willey, 2011.</li> </ol>						
Reference Books	<ol> <li>Roger Grimes, "Hacking the Hacker", 1e, Wiley, 2017.</li> <li>2. Cyber Law by Bare Act, Govt of India, IT Act 2000.</li> </ol>						

		MDS/2/SEC	C2/P Cybe	r Security		
Course Type	Course	Contact	Delivery	Maximum Marks	Exam	Assessment

	Credit	Hours/Week	Mode	External	Internal	Duration	Methods
Compulsory Theory	01	02	Lecture	25	-	3 Hours	TEE/MTE/ Assignment/ Attendance

Course	At the end of this course, the student will be able to:
Outcomes	
CO1	define: cyber Security, Cyberspace, Cyber threats, Cyber Attacks,
	Information Security Architecture, Vulnerability Assessment and
	Penetration.
CO2	explain: the importance and challenges in Cyber Security, Malware threats,
	Sniffing, Role of forensics Investigator and Forensics Investigation Process.
CO3	use: defense Strategies, Vulnerability Assessment and Penetration.
CO4	classify: cyber threats, Cyber Attacks, Defense Strategies.
CO5	apply: cyber Security mechanisms against Malware threats.

CO s	PO 1	PO 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	1	3	1	1	1	-	3	1	-	2	-	-
CO 2	2	1	1	3	1	-	3	2	-	2	-	-
со	3	1	1	3	3	-	3	3	-	2	-	-

3												
CO 4	2	1	1	3	1	-	3	3	-	2	-	-
CO 5	2	1	3	1	3	-	3	3	-	2	-	-
Avg	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-
	Course Content MDS/2/SEC2/P Cyber Security											
	Unit – IIntroduction: Introduction to Cyber Security, Importance and challenge in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security Organizational Implications.								nallenges A Triad, security,			
Ţ	U <b>nit</b> –	II	<b>Cyber Attacks:</b> Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.									
τ	U <b>nit -</b> I	<b>Ethical Hacking:</b> Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modeling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration, testing, types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defense Strategies.										
τ	J <b>nit</b> –	IV	<b>Introduction to Cyber Forensics:</b> Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013.									
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