DEPARTMENT OF EMERGING TECHNOLOGIES IN COMPUTER SCIENCE HONORS IN CSE (DS) Scheme of Instruction and Examination (Effective from 2020-2021)

				S Ir per	Scheme of Instruction periods/week		Scheme of Examination Maximum Marks			
S.No	Semester	Course Title	Credits	L	T/D	Р	End Exam Marks	Internal Assessment Marks	Total Marks	
		Theory								
1.	IV	Introduction to Data Mining	4	4	0	0	60	40	100	
2.	V	Data Visualization	4	3	0	2	60	40	100	
3.	VI	Object Oriented Analysis & Design	4	3	0	2	60	40	100	
4.	VII	AdHoc and Sensor Networks	4	4	0	0	60	40	100	
5.		MOOC – 1		0	0	0	0	0	100	
6.		MOOC - 2 / Mini Project	2	0	0	0	0	0	100	
		20								

CSE (DS)	MOOC - 1
1	Machine Learning with Big Data
2	High Performance Computing
3	Digital Image Processing
4	Software Project Management

CSE (DS)	MOOC - 2						
1	Practical Machine Learning						
2	Reinforcement Learning						
3	Advanced Distributed Systems						
4	Software Quality & Testing						

INTRODUCTION TO DATA MINING (IDMG)

Honors IV Sen	nester:				Scheme: 2020						
Common for C	CSE (AIML) &	CSE (I	DS)								
Course Code	Category	Hou	rs/We	ek	Credits	Maximum Marks					
HCM01	Н	L	Т	Р	С	Continuous Internal Assessment	End Exam	TOTAL			
		4	0	0 4 40		40	60	100			
Sessional Exam	Duration: 1½ I	Irs			EndExamDuration:3 Hrs.						
Course Outc	omes: At the end	l of the	e cours	se stud	lents will be	e able to					
CO1: Under	stand the import	ance o	f data	minin	g and the principles of business intelligence.						
CO2: Organ	ize and Prepare	the dat	a need	led for	data minin	g using preproc	essing techniqu	les.			
CO3: Under	stand data minin	g clas	sificati	ion tec	hniques.						
CO4: Imple	ment association	rule n	nining	using	Market bas	ket analysis.					
CO5: Analyze unsupervised clustering mining algorithms.											
UNIT– I											
Data Mining•											

Introduction, What is Data Mining, Motivating Challenges, Data Mining Tasks, Types of Data, Similarity and Dissimilarity between Simple Attributes and Data Objects.

UNIT-II

Data Preprocessing:

Why Pre-process the Data?, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT-III

Classification:

Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, Building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for Decision Tree Induction, Rule Base, Nearest-Neighbour Classifier, Bayes Theorem, using the Bayes theorem for classification, Naive Bayes Classifier.

Association Analysis:

Basic Concepts and Algorithms: Frequent Item Set generation, The Apriori Principle, Apriori Algorithm, Candidate Generation and Pruning, Rule Generation, Confidence-Based Pruning, Rule Generation with an example, FP-Growth Algorithm.

UNIT-V

Cluster Analysis:

What is Cluster Analysis, Types of Clustering, K-Means Algorithm, Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, DBSCAN Algorithm.

UNIT-IV

TextBooks :

- 1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA
- 2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier, 2006 **Reference Books :**
 - 1. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.
 - 2. Data Mining Techniques, Arun K Pujari, Universities Press.

Web References:

- 1. https://onlinecourses.nptel.ac.in/noc18_cs14/
- 2.https://freevideolectures.com/course/3758/databases-data-mining

QuestionPaperPattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

DATA VISUALIZATION (DV)

Course Code Category Hours/Weck Credits Maximum Marks IICM02 II L T P C Continuous Internal Assessment End Exam TOTAL 3 0 2 4 40 60 100 Sessional Exam Duration : 1½ IFs End Exam Duration: 3 IIrs End Exam Duration: 3 IIrs CO21: Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset. CO21: Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset. CO3: Relate the visualization sight of ang dataset using various visualization techniques and tools. CO4: Denotravitate the analysis of large dataset using various visualization techniques and tools. CO3: Relate and interpret plots using RPython Introduction to Data Visualization: Overview of data visualization - Data Abstraction - Task Abstraction - Analysis: Four Levels for Validation. UNIT - I Visualization techniques: Scalar and point techniques - Coloring and contouring, Height Plots. Vector Visualization techniques: Vector Propertics - Vector G1, Vector color coding, Matrix Visualization techniques. UNIT - II Visual Analysis: Visual Variables- Networks and Trees - Map Color and Other Channels- Manipulate View- Heat Map. UNIT - V Visualization Tools & Techniques: Introuction to various data v	Honors V Semester: Common for CSE (AIML) & CSE (DS)							S	cheme : 2020		
HCM02 H L T P C Continuous Internal Assessment End Exam TOTAL Sessional Exam Duration 13/H rrs 5 0 2 4 40 60 100 Sessional Exam Duration 13/H rrs End Exam Duration: 31 Hrs End Exam Duration: 31 Hrs End Exam Duration: 31 Hrs CO1: Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset. CO2: Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset. CO3: Design visualization dashboard to support the decision making on large scale data. CO4: Demonstrate the analysis of large dataset using various visualization techniques and tools. CO5: Ability to create and interpret plots using RPython. UNIT - I Introduction to Data Visualization: Overview of data visualization - Data Abstraction - Task Abstraction - Analysis: Four Levels for Validation. UNIT - II Visualization techniques: Scalar and point techniques: Coloring and contouring, Height Plots. Vector Visualization techniques: Vector Properties - Vector GI, Vector color coding, Matrix Visualization techniques. UNIT - II Visual Analytics: Visual Variables- Networks and Trees - Map Color and Other Channels- Manipulate View- Heat Map. UNIT - IV Visualization Tools & Techniques: Introduction to various data visualization tools: R —basies, Data preprocessing, Statistici ana	Course Code	Category	Ho	ours/W	'eek	Credits Maximum Marks			ks		
Image: Control of the construction of the constru	HCM02	Н	L	Т	Р	С	Continuous Internal Assessment	End Exam	TOTAL		
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Reference Books: 1. Dr.Chun-hauh Chen, W.K.Hardle, A.Unwin, Handbook of Data Visualization, Springer publication, 2016. 2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication, 2020. 3. Alexandra C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014. Web References:	2. Araş O'R	gues, Anthony. Vi eilly Media, Inc.	isualizir , 2018.	ng Stre	aming D	Data: Interac	tive Analysis Bey	ond Static L	imits.		
1. Dr.Chun-hauh Chen, W.K.Hard1e, A.Unwin, Handbook of Data Visualization, Springer publication, 2016. 2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication,2020. 3. Alexandra C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014. Web References:	Reference I	Books:									
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Web References:	3. Alexandra C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.										
	Web References:										
1. <u>https://www.kaggle.com/learn/data-visualization</u>	1. <u>https://</u>	1. https://www.kaggle.com/learn/data-visualization									
2. https://www.tutorialspoint.com/business_writing_skills/data_visualization.htm	2. <u>https://v</u>	www.tutorialspoi	nt.com/	/busine	ss_writi	ng_skills/d	ata_visualization.	<u>htm</u>			

3. https://www.javatpoint.com/what-is-data-visualization

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

List of Experiments:

- 1. Implement data acquisition and plotting data.
- 2. Demonstrate the Financial analysis using Clustering, Histogram and Heat Map.
- 3. Implement Statistical Analysis such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance.
- 4. Time-series analysis stock market.

OBJECT ORIENTED ANALYSIS AND DESIGN (OOAD)

Honors VI Semester:							\$	Scheme : 2020	
Common fo	or CSE (AIML)	& CSE	2 (DS)						
Course Code	Category	Но	ours/W	'eek	Credits	Maximum Marks			
HCM03	Н	L	Т	Р	С	Continuous Internal Assessment	End Exam	TOTAL	
		3	0	2	4	40	60	100	
Sessional E	xam Duration	1 /2 Hrs		.1 .	1 / 111		nd Exam Di	iration: 3 Hrs	
Course Out	tcomes : At the e	nd of th	ne cour	se the st	udent will I	be able to			
CO2: Describe the structural and behavioral modeling of a software system									
$\begin{array}{c} \textbf{CO2. D} \\ \textbf{CO3. D} \end{array}$	esign an event dr	iven sv	stem w	ith dyna	mic dimen	sions			
CO4 : D	esign logical eler	nents of	f a syst	em		510115.			
CO5: C	onstruct an archit	ectural	templa	te for at	oplications	and deployment d	jagrams.		
			·····			·····			
	4 TIME			U I					
Introductio	n to UML	nainlas	ofmo	taling a	biost orign	tad madaling can	contuel mod	aloftha	
IIIIportance	itecture Software	noipies • Devel	onmen	t I ife C	vele Mech	anisms Artifacts	Hello World	4	
Basic Struc	tural Modeling		opmen	t Life C	yele, wieen	amonio, 7 minueto,		4.	
Classes, Re	elationships, Com	mon m	echani	sms, Dia	agrams, Cla	ss diagrams.			
	1 /			UN	II – II				
Advanced S	Structural Modeli	ing			·				
Advanced c	lasses, advanced	relation	nships,	Interfac	es, Types a	nd Roles, Package	es, Instances	, Object	
diagrams, C	components.		1						
Basic Beha	vioral Modeling								
Interactions	, Use cases, Use	case dia	agrams	, Interac	tion diagrai	ms, Activity diagr	ams.		
				UN	IT – III				
Advanced E	Behavioral Model	ling							
Events and	signals, state mac	hines,	process	ses and T	Threads, Ti	me and Space, Sta	te diagrams		
				UN	$\mathbf{IT} - \mathbf{IV}$				
Architectur	al Modeling								
Artifacts, D	eployment, Colla	boratio	ns, Coi	nmon n	nodeling tec	chniques.			
				UN	$\mathbf{T} - \mathbf{V}$				
Architectur	al Modeling					-			
Patterns and	l Frameworks, Ai	rtifact d	iagram	is, Deplo	oyment diag	grams, Systems an	nd Models.		
Applying th	e UML	ma a set ar	ratarra	Onling	hominogra	atom			
Case Stuay- Library management system, Online shopping system.									
1 Crady Booch James Rumbaugh Juar Jacobson [2nd Edition] The Unified Modeling Language User									
Guide, Pearson Education, 2015.									
Reference l	Books:								
1 Craig	1 Creis Lemman Appling UMI and Dettermer An Interdention (O1' (O' (1A 1' 1D '								
and Ite	rative Developme	ent Pear	rson Fa	lucation	.2015		Chicu Allaly	sis and Design	
2. Hans-F	Erik Eriksson. Ma	ignus P	enker.	Brian L	yons. David	l Fado, UML 2 To	olkit. WILF	EY Dreamtech	
India P	vt. Ltd,2004.	3 1		·	, , , –	,	,		
Ouestion Paper Pattern:									

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List of Experiments:

- 1. Exam registration
- 2. E-ticketing
- 3. Credit card processing
- 4. Library management system

ADHOC AND SENSOR NETWORKS (ASN)

Honors V Common fo	II Semester: or CSE (AIML)	(DS)					Scheme : 2020			
Course Code	Category	Ho	ours/W	eek	Credits	Maximum Marks				
HCM04	Н	L	Т	Р	С	Continuous Internal Assessment	End Exam	TOTAL		
		4	0	0	4	40	60	100		
Sessional E	xam Duration 1	¹ / ₂ Hrs					End Exam	Duration: 3 Hrs		
Course Out	tcomes : At the e	nd of th	ne cour	se the st	udent will	be able to				
CO1: Expla	in the concepts, i	network	c archit	ectures	and applica	tions of ad hoc an	nd wireless			
Senso	or networks.	- 1 f -	.1 1	!1						
CO2: Desci	in characteristics	ols of a	a noc v	vireless	networks.	of routing and tra	nonart lavor	matacala		
in ad	hoc wireless netw	, desigi vorks	ii issue	s and cla	issification	of routing and tra	nsport layer	protocols		
CO4: Sumr	narize the archite	cture o	f WSN	along w	vith MAC r	protocols for WSN	Is.			
CO5: Unde	rstand routing iss	ues. lo	calizati	on and (DoS in WS	N.				
	8	,		I	NIT _ I					
T (1)	F 1 (1 (· • • • • • • • • • • • • • • • • • • •	1		· • • 1 1	T 1	F1 (
Introductio	<i>n</i> : Fundamenta	uls of	W1r	cless	Communic	ation Technolo	gy, The	Electromagnetic		
Spectrum, R	kadio propagation	$\sim (MA)$, Charac	wireless	anger network	$\frac{(WSN_{c})}{(WSN_{c})}$	concents and		
architecture	s Applications	of Δd	Hoc	and S	ensor netv	vorks Design ('hallenges i	in Ad hoc and		
Sensor Netv	vorks.	or At	1 1100	and 5		voiks, Design e	indifenges	in Ad not and		
				U	NIT – II					
<i>MAC Protocols for Ad Hoc Wireless Networks</i> : Issues in designing a MAC Protocol, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi channel MAC-IEEE 802.11.										
				U	NIT – III					
Routing Protocols and Transport Layer in Ad Hoc Wireless Networks: Issues in designing a routing and Transport Layer protocol for Ad hoc networks, proactive routing, reactive routing (on-demand), hybrid routing, Classification of Transport Layer solutions, TCP over Ad hoc Wireless Networks										
				UI	NIT – IV					
<i>Wireless Sensor Networks (WSNs) and MAC Protocols:</i> Single node architecture: hardware and software components of a sensor node, WSN Network architecture: typical network architectures, data relaying and aggregation strategies, MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.										
				U	NIT – V					
WSN Routing, Localization & QoS: Issues in WSN routing, OLSR, Localization: Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization, Transport Layer issues.										
1. C. Siva Ram Murthy and B. S. Manoj, Ad Hoc Wireless Networks: Architectures and										
Protocols, Prentice Hall Professional Technical Reference, 2008.										
Reference l	Books:									
1. Carl Theo	Reference Books: 1. Carlos De Morais Cordeiro and Dharma Prakash Agrawal, Ad Hoc & Sensor Networks: Theory and Applications, World Scientific Publishing Company, 2006.									

2. Jagnnathan Sarangapani, *Wireless Ad Hoc and Sensor Networks-Protocols, Performance and Control*, CRC press, Taylor & Francis group, 2007.

Web References:

- 1. <u>http://cse.iitkgp.ac.in/~smisra/course/wasn.html</u>
- 2. https://www.youtube.com/playlist?list=PLJ5C_6qdAvBHroAfekCO7K4xphEF74UPc

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