

# DEPARTMENT OF ARTIFICIALINTELLIGENCE AND MACHINE LEARNING BATCH: 2020-24 [CREDITS: 175] [2018 Scheme]



# DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

1<sup>st</sup> to 8<sup>th</sup> Semesters Scheme Fifth (5<sup>th</sup>) and Sixth(6<sup>th</sup>) Semester Syllabus Academic Year 2022-2023

# **BATCH: 2020-24**

CREDITS: 175 [2018 Scheme]

	I SEMESTER – PHYSICS CYCLE													
		I SEN	MESTI	E <b>R</b> –	PHY	SIC	S CY	CLE						
				~					<b>a</b>		Mar	ks		
S.No	Course	Course	BOS	Cre	edit D	istribu	ition	Overall	Contac t					
5.110	Code	course	200	T.	Т	Р	S	Credits	Hours	CIE	SEE	Total		
				-	-	-	D							
1	19MAT11A	Applied Mathematics-I	BS	2	1	0	0	3	4	50	50	100		
2	19PHY12A	Engineering Physics	BS	3	0	0	0	3	3	25	25	50		
3	10MEE13A	0	3	3	25	25	50							
5	THEETSA	Engineering	1155	5	0	0	0	5	5	23	25	50		
		Elements of Civil												
4	19CIV14A	Engineering	CV	3	0	0	0	3	3	50	50	100		
5	19EEE15A	Basic Electrical	EE	3	0	0	0	3	3	50	50	100		
	170001011	Engineering	LL	5	0	Ŭ	0	5	5	50	50	100		
6	19PHI 16A	Engineering Physics I ab	BS	0	0	2	0	2	4	50	50	100		
	17111111011		25	Ŭ	Ŭ	2	0	-		50	50	100		
7	10PEE17A	Basic Electrical	FF	0	0	2	0	2	4	25	25	50		
	1)I LLI/K	Engineering Lab	LL	U	U	4	0	2	-	23	25	50		
<b>9</b> 10HSS171A Escential English HSS Mandatory									2	25	25	50		
8	19H331/IA	Essential English	Н22	(	Course	è	U	U	Z	25	25	50		
		Total						19	26	325	325	650		
		10001			-0			0.00						

	II SEMESTER- CHEMISTRY												
		II S	SEMES	STEF CY	R- CH CLE	EMIS	STRY	Ŷ					
S	Course	Course	BOS	Cr	edit Dis	stribut	ion	<b>Overall</b> Credits	Contac t		M ks	ar	
n N O	Code	Course	DOD	L	Т	Р	S	Cicuits	Hours	CIE	CEE	SEE	To tal
1	19MAT21 A	Applied Mathematics-II	BS	2	1	0	0	3	4	50	50	50	10 0
2	19CHE22A	Engineering Chemistry	BS	3	0	0	0	3	3	50	50	50	10 0
3	19CSE23A	Introduction to Programming with C	CSE	3	0	0	0	3	3	50	50	50	10 0
4	19MEE24 A	Computer Aided Engineering Drawing	ME	1	0	2	0	3	5	50	50	50	10 0
5	19ECE25A	Basic Electronics	ECE	3	0	0	0	3	3	50	50	50	10 0
6	19CHL27 A	Engineering Chemistry Lab	BS	0	0	2	0	2	4	25	25	25	50
7	19CSL28A	Programming with C Lab	CSE	0	0	2	0	2	4	25	25	25	50
8	19HSS271 A	Professional Communication	HSS	2	0	0	0	2	2	25	25	25	50
919HSS272 AConstitution of India and Professional EthicsHSSMandatory Course0								0	2	25	25	25	50
	]	[otal	21	30	350	350	350	700					

	THIRD SEMESTER-SCHEME Marks													
2	G		tion				Ma	arks						
S. No	Course Code	Course	BOS	L	Т	Р	S	Credits	Hours	CIE	SEE	Total		
1	20AIM31A	Applied Mathematics-III	BS	2	1	0	0	3	4	50	50	100		
2	20HSS324 /20HSS325	Aadalitha Kannada / Vyavaharika Kannada	HSS	1	0	0	0	1	2	25	25	50		
3	20HSS321A	Economics for Engineers	0	2	2	25	25	50						
4	20AIM33A	Digital Electronics	0	3	3	50	50	100						
5	20AIM34A	Data Structures using C	AI&ML	3	0	0	3	3	50	50	100			
6	20AIM35A	Python Programming	AI&ML	3	0	0	0	3	3	50	50	100		
7	20AIL36A	Digital Electronics Lab	AI&ML	0	0	2	0	2	4	25	25	50		
8	20AIL37A	Data Structures using C Lab	AI&ML	0	0	2	0	2	4	25	25	50		
9	20AIL38A	Python Programming Lab	AI&ML	0	0	2	0	2	4	25	25	50		
1020AIM39AMini Project - IAI&ML0020									0	25	25	50		
11	20DMAT31 A*	Basic Applied Mathematics-1	0	0	2	25	25	50						
12	19HSS171*	Essential English	BS	0	0	0	0	0	2	25	25	50		
Total         23         29 /33*         350/ 400*         350/ 400*         350/ 8												700/ 800*		

\*For Lateral Entry Students Only

		FOU	RTH SE		STE	R-S	CHE	EME				
S.	Course			Cred	lit Di	strib	ution	Overall	Contact		Mai	:ks
N 0	Code	Course	BOS	L	Т	Р	S	Credits	Hours	CIE	SEE	Total
1	20AIM41A	Mathematical Statistics	BS	2	1	0	0	3	4	50	50	100
2	20HSS422A	Life skills for Engineers	HSS	3	0	0	0	3	3	50	50	100
3	20HSS423A	Environmental Science and Awareness	HSS	Mar	ndato	ry Co	urse	0	2	25	25	50
4	20AIM43A	Introduction to Data Science	0	3	3	50	50	100				
5	20AIM44A	Object Oriented Programming with Java	AI&ML	3	0	0	0	3	3	50	50	100
6	20AIM45A	Database Management System	AI&ML	3	0	0	0	3	3	50	50	100
7	20AIL46A	Object Oriented Programming with Java Lab	AI&ML	0	0	2	0	2	4	25	25	50
8	20AIL47A	Database Management System Lab	AI&ML	0	0	2	0	2	4	25	25	50
9	20AIM48A	Mini Project - II	AI&ML	0	0	2	0	2	0	25	25	50
10	20DMAT41 A*	0	0	2	25	25	50					
11	19HSS272*	Constitution of India & Professional Ethics	0	0	2	25	25	50				
		Total		21	26/ 30*	350/ 400 *	350/ 400*	700/ 800*				

\*For Lateral Entry Students Only

			V S	<b>EME</b> S	STER	2							
	Course			Cr	edit D	istribu	tion	Overall	Contact		Ma	rks	
S.No	Code	Course	BOS	L	Т	Р	S	Credits	Hours	CIE	SEE	Total	
1	20AIM51A	Machine Learning	AI&ML	3	0	0	0	3	4	50	50	100	
2	20AIM52A	Operating system	AI&ML	3	0	0	0	3	4	50	50	100	
3	20AIM53A	Big data Technologies	AI&ML	3	0	0	0	3	4	50	50	100	
4	20AIM54XA	Professional Elective - I	AI&ML	3	0	0	0	3	4	50	50	100	
5	5 20AIM55XA Professional Elective - AI&ML 3 0 0 0							3	4	50	50	100	
6	20AIM56A	Design and Analysis of Algorithm	ign and Analysis of Algorithm AI&ML 3 0 0 0					3	4	50	50	100	
7	20AIL57A	Machine Learning Laboratory	AI&ML	0	0	2	0	2	4	25	25	50	
8	20AIL58A	Design and Analysis of Algorithm Laboratory	AI&ML	0	0	2	0	2	4	25	25	50	
9	20AIM59A	Mini Project - III	AI&ML	0	0	2	0	2	2	25	25	50	
	ſ	Total						24	34	375	375	750	
S. NO	COURSE CODE	PROFESSIONAL	LELECT	IVE-1	S. NO	CO	OURSE C	CODE	PRO EL	FESS ECTI	IONAI VE-2	L	
1	20AIM5414	A Information Storag	ge and Re	trieval	1	2	20AIM55	1A	Speecl R	n Syntl ecogni	hesis a tion	nd	
2	20AIM542A	A Introduction to se	ensor and	IOT	2 20AIM552A		2A	Embe	dded S	System	s		
3 20AIM543A Theory of Computation					3	2	20AIM55	3A	Softwa	are Eng	gineeri	ng	
4	20AIM5444	A Parallel Pro	ocessing		4	2	20AIM55	4A	Cryptogra	aphy a Securi	nd Net ty	work	

	VI SEMESTED												
			VI S	EME	STER	Ł							
				(	Tredit T	Distribu	tion				Ν	<b>/</b> larks	
S.N 0	Course Code	Course	BOS	L	T	Р	S	Overall Credits	Contact Hours	CI E	SEE	Total	
1	20AIM61A	Deep Learning Techniques	AI&ML	3	0	0	0	3	4	50	50	100	
2	20AIM62A	Data Visualization	AI&ML	3	0	0	0	3	4	50	50	100	
3	20AIM63A	Artificial Intelligence	AI&ML	3	0	0	0	3	4	50	50	100	
4	20NHOPXX	Open Elective - I	AI&ML	2	0	1	0	3	4	50	50	100	
5     20AIM64XA     Professional Elective - III     AI&ML     3     0     0     0     3     4     50     50										50	100		
6	6     20AIM65XA     Professional Elective - IV     AI&ML     3     0     0							3	4	50	50	100	
7	20AIL66A	6A Deep Learning Laboratory AI&ML 0 0 2 0					0	2	4	25	25	50	
8	20AIL67A	Data Visualization Laboratory	AI&ML	0	0	2	0	2	4	25	25	50	
9	20AIM68A	Mini Project - IV	AI&ML	0	0	2	0	2	2	25	25	50	
			Tot al					24	34	375	375	750	
Professional Elective - Open Elective - III I													
Co	ourse Code	Course		C	c <mark>ourse</mark> Code			(	Course				
20	AIM641A	Biometrics		N	HOP01		Big Da	ata Analy	tics using 1	g HP V	Vertica	ì-	
20	DAIM642A	Soft Computing		N	HOP02		VM W	Vare Virtu	alizatior	n Esse	ntials-	1	
20	AIM643A	Complier Design		N	HOP04		Big Da	ata Analy	tics using 2	g HP V	Vertica	ì-	
20	AIM644A	Computer Network	s	N	HOP05		VM W	Vare Virtu	alization	Esse	ntials-	2	
L			I			I							

Profe	essional Elective - IV	NHOP07	SAP
20AIM651A	Augmented & Virtual Reality	NHOP08	Schneider-Industrial Automation
20AIM652A	Pattern Recognition & Image Processing	NHOP09	Cisco-Routing and Switching-1
20AIM653A	Advanced Java	NHOP10	Data Analytics
20AIM654A	Block chain Technologies	NHOP12	CISCO-Routing and switching-2
		NHOP13	IIOT Embedded Systems
		NHOP14	Block chain
		NHOP15	Product Life Cycle Management

	N/TT											
				SEN	VII /FSTI	TD						
				SEN	Credit I	Distribut	ion				Ma	rks
S. No	Course Code	Course	BOS	L	T	P	S	Overall Credits	Contact Hours	CIE	SEE	Total
1	XXAIM71A	Cloud Computing	AI&ML	3	0	0	0	3	4	50	50	100
2	XXAIM72A	Web Technology	AI&ML	3	0	0	0	3	4	50	50	100
3	XXNHOPX X	Open Elective - II	AI&ML	2	0	1	0	3	4	50	50	100
4	XXAIM73X	Professional Elective - V	AI&ML	3	0	0	0	3	4	50	50	100
5	XXAIM74X	Professional Elective - VI	AI&ML	3	3 0 0 0 3 4 50 50						50	100
6	XXAIM75A	Natural Language processing	AI&ML	3 0 0 0 3 4 50						50	100	
7	XXAIL76A	Cloud Computing Laboratory	AI&ML	0	0	2	0	2	4	25	25	50
8	XXAIL77A	Web Technology Lab	AI&ML	0	0	2	0	2	4	25	25	50
9	XXAIM78A	Project Phase – I	AI&ML	0	0	2	0	2	0	25	25	50
		]	Fot al					24	32	375	375	750
	Pr	ofessional Elective – V	onal Elective – V OI						en Electiv	ve - II		
Co	ourse Code		Course	Code	Course							
XX	XXAIM731A Recommender System				NHO	P01	Big I	Data Anal	ytics using	ng HP	Vertic	a-1
XXAIM732A Streaming Analytics					NHO	P02	VM Ware Virtualization Essentials-1				-1	
XXAIM733A Information Security					NHOP04 Big Data			Data Anal	ytics usin	ng HP	Vertica	a-2
XXAIM734A Human Computer Interaction					NHOP05         VM Ware Virtualization Essentials-2						-2	

	<b>Professional Elective – VI</b>	NHOP07	SAP
XXAIM741A	Grid Computing	NHOP08	Schneider-Industrial Automation
XXAIM742A	Software Testing	NHOP09	Cisco-Routing and Switching-1
XXAIM743A	Social Network Analysis	NHOP10	Data Analytics
XXAIM744A	Cyber Security, Forensics and Law	NHOP12	CISCO-Routing and switching-2
		NHOP13	IIOT Embedded Systems
		NHOP14	Block chain
		NHOP15	Product Life Cycle Management

	VIII SEMESTER													
				C	redit Di	stributio	n				M	arks		
S.No	Course	Course	BOS		i cuit Di	Sumun		Overall	Contact					
	Code			L	Т	Р	Credits	Hours	CIE	SEE	Total			
1	XXAIM81A	Reinforcement learning	AI&ML	3	0	0	0	3	4	50	50	100		
2	XXAIM82A	Internship Viva	AI&ML	0	0	4	0	4	0	50	50	100		
3	XXAIM83A	Project Phase - II	AI&ML	0	0	12	0	12	0	100	100	200		
	Total							19	04	200	200	400		

				V	SEMES	TFR						
				Cr	edit D	istrihi	ution				Marks	
S.No	Course Code	Cour	BOS					Overall Credits	Contact Hours	CIF	SEE	Total
		se		L	•	Р	5			U.L	011	Total
1	20AIM51A	Machine Learning	AI&ML	3	0	0	0	3	4	50	50	100
2	20AIM52A	Operating system	AI&ML	3	0	0	0	3	4	50	50	100
3	20AIM53A	Big data Technologies	AI&ML	3	0	0	0	3	4	50	50	100
4	20AIM54XA	Professional Elective - I	AI&ML	3	0	0	0	3	4	50	50	100
5	20AIM55XA	Professional Elective - II	AI&ML	3	0	0	0	3	4	50	50	100
6	20AIM56A	Design and Analysis ofAlgorithm	AI&ML	3	0	0	0	3	4	50	50	100
7	720AIL57AMachine Learning LaboratoryAI&ML002							2	4	25	25	50
8 20AIL58A Design and Analysis ofAlgorithm Laboratory AI&ML 0 0 2							0	2	4	25	25	50
9	20AIM59A	Mini Project -III	AI&ML	0	0	2	0	2	2	25	25	50
	Total							24	34	375	375	750

S. NO	COURSE CODE	PROFESSIONAL ELECTIVE-1	S. NO	COURSE CODE	PROFESSIONAL ELECTIVE-2
1	20AIM541A	Information Storage and Retrieval	1	20AIM551A	Speech Synthesis and Recognition
2	20AIM542A	Introduction to sensor and IOT	2	20AIM552A	Embedded Systems
3	20AIM543A	Theory of Computation	3	20AIM553A	Software Engineering
4	20AIM544A	Parallel Processing	4	20AIM554A	Cryptography and Network Security

## MACHINE LEARNING

<b>Course Code</b>	: 20AIM51A	Credits: 3
L: T: P: S	: : 3: 0: 0: 0:	CIE Marks: 50
Exam Hours:	: 3	SEE Marks: 50

<b>Course Outco</b>	mes:	At the end of the Course, the Student will be able to:	
CO#	COURSE	COUTCOME (Student will be able to)	
20AIM51A.1	Apply the	basic principles of Machine learning	
20AIM51A.2	Analyze a	nd formulate the Machine Learning concepts	
20AIM51A.3	Design a model using supervised/unsupervised machine learning algorithms for classification/prediction/clustering		
20AIM51A.4	Evaluate p domain.	erformance of various machine learning algorithms on various data sets of a	
20AIM51A.5	Use pytho	n/R for implementing machine learning algorithms to solve a given problem.	

Mapping of	Cours	se Ou	tcome	s to P	rogra	ım Oı	itcom	les						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM51A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM51A.2	-	3	-	-	3	-	-	-	-	-	-	-	3	2
20AIM51A.3	-	-	3	-	-	-	-	-	-	-	-	-	3	3
20AIM51A.4	-	-	-	3	3	-	-	-	-	-	-	-	3	3
20AIM51A.5	-	-	-	-	3	-	-	-	-	-	-	-	3	3
Corre	elatior	ı level	ls: 1-S	light(	Low)	2-1	Moder	ate(N	lediur	n) 3-S	ubstan	tial(Hi	gh)	

Module No	Module Contents	Hours	COs
1	Introduction: Terminologies in machine learning, Applications, Types of machine learning: supervised, unsupervised, semi-supervised learning, Reinforcement Learning. Features: Types of Data (Qualitative and Quantitative), Scales of Measurement (Nominal, Ordinal, Interval, Ratio), Concept of Feature, Feature construction, Feature Selection and Transformation, Curse of Dimensionality. Linear discriminant Analysis (LDA).	9	CO1 CO3
2	Supervised Learning I: Binary Classification: Linear Classification model, Performance Evaluation- Confusion Matrix, Accuracy, Precision, Recall, ROC Curves, F-Measure. Support Vector Machines- Large margin classifiers, Nonlinear SVM, kernel Functions. Multi-class Classification: Model, Performance Evaluation Metrics – Multiclass Classification techniques -One vs. One, One vs. Rest	9	CO1 CO2 CO3 CO5
3	Supervised Learning II: Decision Trees: Concepts and Terminologies, Classification and Regression Tree (CART) Regression: Introduction, Univariate Regression – Least-Square Method, Model Representation, Cost Functions: MSE, MAE, R- Square, Performance Evaluation, Estimating the values of the	9	CO2, CO3 CO5

	regression coefficients. Multivariate Regression: Model Representation. Naïve Bayes Classifier. K-Nearest Neighbour for Classification. Over fitting and Under fitting, Bias and Variance		
4	Unsupervised learning : Distance Based Models: Distance Metrics (Euclidean, Manhattan, Hamming, Minkowski Distance Metric), Clustering as Learning task: K-means clustering Algorithm-with example, k-medoid algorithm- with example. Principal Component analysis (PCA).	9	CO3, CO4 CO5
5	<b>Reinforcement learning:</b> Learning from rewards – passive reinforcement learning – active reinforcement learning – generalization in reinforcement learning – policy search – inverse reinforcement learning – application Learning Task, Q-learning, Value function approximation, Temporal difference learning	9	CO3 CO5

- 1. Tom Mitchell, "Machine Learning", McGraw Hill, 1997
- 2. E. Alpaydin, "Introduction to Machine Learning", PHI, 2005.

#### **Reference Books:**

- 1. AurolienGeron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow, Shroff/O'Reilly",2017
- 2. ndreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guidefor Data Scientists", Shroff/O'Reilly, 2016

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's	Questions
Category	(50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## **OPERATING SYSTEM**

<b>Course Code</b>	:	20AIM52A	Credits:	3
L: T: P: S:	:	3: 0: 0:	0: CIE Marks:	50
Exam Hours:	:	3	SEE Marks:	50

<b>Course Outco</b>	nes: At the end of the Course, the Student will be able to:	
CO#	COURSE OUTCOME	
20AIM52A.1	Apply the functions of traditional and modern operating systems	
20AIM52A.2	Analyze the concept of process and its management which includes process algorithms.	scheduling
20AIM52A.3	Evaluate the problems related to concurrency, different synchronization me and deadlock handling.	chanisms
20AIM52A.4	Compare and contrast various memory management techniques.	
20AIM52A.5	Evaluate the various file implementation techniques.	

Mapping of	Cours	se Ou	tcome	s to P	rogra	ım Oı	itcom	les						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM52A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM52A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	3
20AIM52A.3	-	3	3	-	-	-	-	-	-	-	-	-	3	3
20AIM52A.4	-	-	-	3	-	-	-	-	-	-	-	-	3	3
20AIM52A.5	-	-	3	-	-	-	-	-	-	-	-	-	3	3
Corre	elation	n level	ls: 1-S	Slight(	Low)	2-1	Mode	ate(N	Iediur	n) 3-S	ubstan	tial(Hi	gh)	

Module No	Module Contents	Hours	Cos
1	Introduction and Operating SystemServices: Basics of Operating Systems: Definition - Operating System structure; Operating System operations – Dual-Mode and Multi- Mode; Kernel Data Structure – Lists, Stacks, and Queues, Trees; Computing Environments – Mobile Computing, Distributed Systems, Client-Server Computing, Peer-to-Peer, Virtualization, Cloud Computing, Real-Time Embedded Systems. Operating System Services; System Calls; Types of System Calls; Operating System Design and Implementation – Design Goals – Mechanisms and Policies – Implementation; Operating System structure – Layered Structure –Microkernels, Modules, Hybrid Systems – Mac OS X, iOS, Android.	9	CO1 CO2
2	<ul> <li>Process Management:</li> <li>Process: Process Concept – The Processes, Process States, PCB;</li> <li>Process Scheduling – Scheduling Queues, Schedulers, Context</li> <li>Switch; Operation; Operation on Process; Inter-Process</li> <li>Communication – Shared-Memory System, Message Passing</li> <li>System.</li> <li>CPU Scheduling: Basic Concepts, CPU-I/O Burst Cycle; CPU</li> <li>Scheduler – Pre- emptive Scheduling, Dispatcher; Scheduling</li> <li>Criteria; Scheduling Algorithms – FCFS Scheduling, SJF</li> <li>Scheduling, Round-Robin Scheduling, Priority Scheduling</li> </ul>	9	CO2 CO3
	<b>Process Synchronization:</b> Background; The Critical Section Problem; Peterson's Solution; Synchronization Hardware; Mutex		

3	<ul> <li>Locks; Semaphores –Semaphore Usage, Semaphore Implementation, Deadlock and Starvation.</li> <li>Classical Problems of Synchronization – The Reader- Writer Problem, Dining-Philosopher Problem.</li> <li>Deadlocks: System Model; Deadlock Characterization – Necessary Conditions, Resource-Allocation Graph; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery.</li> </ul>	10	CO3
4	Memory Management:Main Memory: Background; Swapping; Contiguous MemoryAllocation – Memory Protection, Memory Allocation,Fragmentation; Paging – Basic Method, Hardware Support,Protection; Structure of Page Table – Hierarchical Paging, Hash-Page Table; Segmentation – Basic Method, SegmentationHardware.Virtual Memory: Background; Demand Paging; PageReplacement – Basic Page Replacement – FIFO PageReplacement, Optimal Page Replacement, LRU PageReplacement; Allocation of Frames – Minimum Number ofFrames, Allocation Algorithms, Global Vs Local; Thrashing –Causes of Thrashing	9	CO3 CO4
5	<ul> <li>File System Interface and Implementation:</li> <li>File-System Interface: File Structure; Access methods – Sequential Access, Direct Access, Other Access Methods</li> <li>Implementation: Overview, Partitions and Mounting, Directory</li> <li>Implementation – Linear List, Hash Table; Allocation Methods – Contiguous Allocation, Linked Allocation, Indexed Allocation</li> <li>Free Space Management – Bit-Vector, Linked List, Grouping Counting.</li> <li>Mass Storage Structures: Overview; Disk Structure; Disk Scheduling – FCFS, SSTF, SCAN Scheduling, CSCAN Scheduling, LOOK Scheduling, Selection of Disk Scheduling Algorithm.</li> </ul>	8	CO4 CO5

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons, Inc., 9th Edition, 2012, ISBN 9781118063330.

#### **Reference Books:**

1. William Stallings, "Operating Systems: Internals and Design Principles", Eighth Edition, Prentice Hall, 2015.

## CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## **BIG DATA TECHNOLOGIES**

<b>Course Code</b>	:	20AIM53A	Credits :	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

<b>Course Outco</b>	nes: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM53A.1	Apply the Big Data concepts and identify its Business Implications.
20AIM53A.2	Analyze the components of Hadoop and Hadoop Eco-System
20AIM53A.3	Design and Process Data on Distributed File System
20AIM53A.4	Manage Job Execution in Hadoop Environment
20AIM53A.5	Develop Big Data Solutions using Hadoop Eco System

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM53A.1	3	-	-	-	-	-	-	-	-	-	-	3	-	-
20AIM53A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	3
20AIM53A.3	-	3	3	-	-	-	-	-	-	-	-	3	3	3
20AIM53A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	3
20AIM53A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Corre	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.	9	CO1 CO2
2	HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.	9	CO2 CO3
3	Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	9	CO3 CO3
4	Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.	9	CO4 CO2
5	Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Introduction to Big SQL.	9	CO4 CO5

- 1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012
- 2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

#### **Reference Books:**

- 1. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
- 2. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## DESIGN AND ANALYSIS OF ALGORITHM

<b>Course Code</b>	: 20AIM56A	Credits:	3
L: T: P: S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
Exam Hours:	: 3	SEE Marks:	50

Course Outco	mes:	At the end of the Course, the Student will be able to:					
CO#	COURSE	COUTCOME					
20AIM56A 1	Apply the	algorithms to solve complex problems by determining various					
20AINIJ0A.1	design tec	design techniques					
20AIM56A.2	Identify ap	Identify appropriate algorithms to assess and formulate solution					
20AIM56A.3	Design a	Design a strategy to solve graph and knapsack Problems					
20AIM56A.4	Develop a	design technique to solve searching and sorting problems					
20AIM56A.5	Apply bac	ktracking and branch & bound technique to assess an algorithm and formulate					
	Solution						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM56A.1	3	3	-	-	-	-	-	-	-	-	-	-	3	3
20AIM56A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	3
20AIM56A.3	-	-	3	-	-	-	-	-	-	-	-	-	3	3
20AIM56A.4	-	-	3	3	-	-	-	-	-	-	-	-	3	3
20AIM56A.5	-	-	-	-	3	-	-	-	-	-	-	-	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>INTRODUCTION TO ALGORITHMS &amp; GROWTH OI</b> <b>FUNCTIONS</b> Introduction to Algorithms, Role of algorithms in computing, Fundamentals of Algorithmic problem solving, Fundamentals of Analysis of Algorithms, Analysis Framework, Asymptotic notations, Standard notations and common functions, Important problem types – Searching, sorting, string processing, graph problems.	9	C01
2	<b>DIVIDE &amp; CONQUER:</b> General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum ,Merge sort, Quick sort , Strassen's matrix multiplication, Advantages and Disadvantages of divide and conquer.	9	CO2
3	<b>GREEDY METHOD &amp; DYNAMIC PROGRAMMING</b> <b>GREEDY METHOD:</b> Introduction, Job scheduling problem, Minimum Spanning tree algorithms – Kruskals & Prims, Shortest Path algorithm – Dijkstra's,	9	CO3
	Huffman Trees, Knapsack problems, Travelling Salesman problem <b>DYNAMIC PROGRAMMING:</b> Introduction, Computing Binomial Coefficients, Transitive closure - Warshall's and Floyds algorithm		

4	<ul> <li>DECREASE &amp; CONQUER, TRANSFORM &amp; CONQUER</li> <li>DECREASE &amp; CONQUER: Introduction – Decrease by constant, decrease by constant factor, variable size decrease, Breadth First search traversal, Depth First search traversal, Topological sorting</li> <li>TRANSFORM &amp; CONQUER: Introduction, Balanced Search trees – AVL trees &amp; 2-3 trees, Red Black Trees</li> </ul>	9	CO4
5	Backtracking, Branch and Bound BACKTRACKING: Introduction, N Queens problem, subset sum problem, BRANCH & BOUND: Introduction, Travelling Salesman problem, Knapsack problem, Assignment problem, NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP-Complete problems.	9	CO5

1. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", SECOND Edition, PEARSON Education

#### **Reference Books:**

1. Thomas H Cormen, Charles E Leiserson, Ronald R Rivest& Clifford Stein, "Introduction to Algorithms", THIRD Edition, Eastern Economy Edition

## CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## MACHINE LEARNING LABORATORY

Course Code	: 20AIL57A	Credits :	2
L: T: P:S:	: 0: 0: 2:0:	CIE Marks:	25
Exam Hours:	: 3	SEE Marks:	25

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to			
CO#	COUR	COURSE OUTCOME			
20AIL57A.1	Unders	Understand the implementation of procedures for machine learning algorithms.			
20AIL57A.2	Design	Design Java/Python programs for various Learning algorithms.			
20AIL57A.3	Analyz	Analyze and apply the appropriate data sets for Machine Learning algorithms.			
20AIL57A.4	Identify	Identify and apply Machine Learning algorithms to solve real world problems.			

Mapping of C	Mapping of Course Outcomes to Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL57A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL57A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL57A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIL57A.4	-	-	-	3	3	-	-	-	-	-	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Ex. No	Experiments	Hours	COs
1.	Implement and demonstrate the Linear discriminant Analysis (LDA).	4	CO1, CO2, CO3, CO4
2.	Develop a Support Vector Machine model considering a Sample Dataset and evaluate the model.	4	CO1, CO2, CO3, CO4
3.	Write a program to demonstrate the working of the decision tree Based CART algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new Sample.	4	CO1, CO2, CO3, CO4
4.	Develop a simple regression model for the given dataset and evaluate its performance.	4	CO1, CO2, CO3, CO4
5.	Apply multivariate regression model using suitable library function to make necessary predictions.	4	CO1, CO2, CO3, CO4
6.	Implement a program in python to illustrate the Bias Variance Trade-off in a machine learning model		C01,
7.	Apply k-means algorithm to generate clusters for the given dataset and evaluate its performance.	4	CO2, CO3, CO4
8.	Implement and demonstrate the Principal Component analysis (PCA)	4	CO1, CO2, CO3, CO4

9.	Implement Reinforcement learning with suitable example.	4	CO1, CO2, CO3, CO4
10.	Implement text classification model using suitable algorithm.	4	CO1, CO2, CO3, CO4

- 1. Tom Mitchell, "Machine Learning", McGraw Hill, 1997
- 2. E. Alpaydin, "Introduction to Machine Learning", PHI, 2005.

#### **Reference Books:**

- 1. AurolienGeron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow, Shroff/O'Reilly",2017
- 2. ndreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guidefor Data Scientists", Shroff/O'Reilly, 2016

#### **CIE-** Continuous Internal Evaluation (25 Marks)

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

## DESIGN AND ANALYSIS OF ALGORITHM LABORATORY

Course Code	: 20AIL58A	Credits:	2
L: T: P:S:	: 0: 0: 2:0:	<b>CIE Marks:</b>	25
Exam Hours:	: 3	SEE Marks:	25

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to			
CO#	COURSE OUTCOME				
20AIL58A.1	Analyze tł	Analyze the complexities of various applications in different domains			
20AIL58A.2	Implement efficient algorithms to solve problems in various domains				
20AIL58A.3	Use suitable design technique to develop efficient algorithms				
20AIL58A.4	Compare,	Compare, implement and understand when to apply various design techniques			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL58A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL58A.2	-	3	3	3	-	-	-	-	-	-	-	3	3	2
20AIL58A.3	-	-	-	3	3	-	-	-	-	-	-	3	3	2
20AIL58A.4	-	-	-	3	3	-	-	-	-	-	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Exp. No	Experiment	Hours	CO
1	Write a program to find GCD of two numbers using differential Algorithms	4	CO1
2	Write a program to implement string matching using Brute force	4	CO1
3	Write a program to implement Merge Sort	4	CO2, CO3
4	Write a program to implement Quick Sort	4	CO2, CO3
5	Write a program to obtain minimum cost spanning tree using Prim's Algorithm	4	CO2, CO3
6	Write a program to obtain minimum cost spanning tree using Kruskal's Algorithm	4	CO2, CO3
7	Write a program to obtain shortest path using Djikstra's algorithm	4	CO2, CO3
8	Write a program to obtain shortest path using Floyds algorithms	4	CO2, CO3
9	Write a program to compute Transitive closure using Warshall's Algorithm	4	CO2, CO3
10	Write a program to implement Topological sorting	4	CO2, CO3
11	Write a program to implement Subset Sum problem using Backtracking	4	CO4
12	Write a program to implement N Queens problem using Backtracking	4	CO4

1. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", SECOND Edition, PEARSON Education

#### **Reference Book:**

1. Thomas H Cormen, Charles E Leiserson, Ronald R Rivest& Clifford Stein, "Introduction to Algorithms", THIRD Edition, Eastern Economy Edition

#### CIE- Continuous Internal Evaluation (25 Marks)

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

#### MINI PROJECT -III

Course Code	:	20AIM59A	Credits:	2
L: T: P:S:	:	0: 0: 2:0:	<b>CIE Marks:</b>	25
Exam Hours:	:	3	SEE Marks:	25

Course Out	comes: At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIM59.1	Understand the technological needs and/ or societal needs and sustainability of the environment
20AIM59.2	Design application using Big Data Technologies
20AIM59.3	Analyse and evaluate the outcome of the project
20AIM59.4	Develop, Test, validate and communicate the identified solutions in a structured way.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM59.1	-	-	-	-	-	3	2	3	-	-	-	3	3	2
20AIM59.2	-	-	3	-	3	-	-	-	-	-	-	3	3	2
20AIM59.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIM59.4	-	-	-	3	-	-	-	-	3	3	3	3	3	2
	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Each team capable of identifying a problem and carry out a mini project on the problem defined. A panel of experts will review the code developed towards the project during the course of the semester. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project, the team will submit a project report, which will be evaluate by duly appointed examiner(s).

#### CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

Bloom's Category	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

# INFORMATION STORAGE AND RETRIVEVAL

Course Code	:	204 2.	AIM541	lA	Credits:	3
Exam Hours:	:	3: 3	0. 0		SEE Marks:	50 50
0 0 1			A 4 41		11 4	

<b>Course Outcomes:</b>	At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM541A.1	Understand and apply the concept of Information retrieval
20AIM541A.2	Analyze the storage and retrieval process of text and multimedia data.
20AIM541A.3	Evaluate the performance of any information retrieval system
20AIM541A.4	Know the importance of recommender system.
20AIM541A.5	Use modern tools for information retrieval in multimedia and distributed systems.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM541A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM541A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	3
20AIM541A.3	-	-	3	3	-	-	-	-	-	-	-	-	3	3
20AIM541A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	3
20AIM541A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	Basic Concepts of IR, Data Retrieval & Information Retrieval, text mining and IR relation, IR system block diagram. Automatic Text Analysis: Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing Inverted file, Suffix trees & suffix arrays, Signature Files, Scatter storage or hash addressing, Clustered files, Hypertext and XML data structures.	9	CO1 CO2
2	Retrieval strategies: Vector Space model, Probabilistic retrieval strategies. Language models, Inference networks, Extended boolean retrieval, Laten semantic indexing, neural networks, Fuzzy set retrieval Retrieval utilities Relevance feedback, Cluster Hypothesis, Clustering Algorithms: Single Pass Algorithm, Single Link Algorithm.	9	CO1 CO2
3	Performance evaluation: Precision and recall, MRR, F-Score, NDCG, user oriented measures, cross fold evaluation. Visualisation in Informatio System: Starting points, document context, User relevance judgemen Interface support for search process.	9	CO3 CO4
4	Distributed IR: Introduction, Collection Partitioning, Source Selection Query Processing, web issues. MULTIMEDIA IR: Introduction, Dat Modeling, Query languages, Generic multimedia indexing approach, On dimensional time series, two dimensional color images, Automatic feature extraction	9	CO4 CO3
5	Searching the Web: Challenges, Characterizing the Web, Search Engines Browsing, Mata-searchers, Web crawlers, Meta-crawler, Web data mining Finding needle in the Haystack, Searching using Hyperlinks, Page ranking algorithms: Page rank, Rank SVM	9	CO4 CO5

1. David A. Grossman, Ophir Frieder, Information Retrieval – Algorithms and Heuristics, Springer, 2nd Edition(Distributed by Universal Press), 2004

#### **Reference Books:**

- 1. Soumen Chakrabarti, Mining the Web: Discovering Knowledge from Hypertext Data, Morgan –Kaufmann Publishers, 2002.
- 2 Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theory and Implementation, Springer, 2004.

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## INTRODUCTION TO SENSOR AND IOT

<b>Course Code</b>	:	20AIM542A	Credits :	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to:
CO#	COUR	SE OUTCOME
20AIM542A.1	Identify	y and apply various types of sensors used in IOT
20AIM542A.2	Analyze and display the connection of sensors to processing devices.	
20AIM542A.3	Define	and explain basic issues, policy and challenges in the IoT
20AIM542A.4	Illustra	te Mechanism and Key Technologies in IoT
20AIM542A.5	Use the	latest technologies that are Standards of the IoT

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM542A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
20AIM542A.2	-	3	3	-	-	-	-	-	-	-	-	3	3	3
20AIM542A.3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
20AIM542A.4	-	-	-	3	-	-	-	-	-	-	-	-	3	-
20AIM542A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	-
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	Introduction: What are sensors/transducers, Principles, Classification, Parameters, Environmental Parameters & Characteristics. Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain gauge, Inductive Sensors, Capacitive Sensors, Force/Stress sensors, Ultrasonic Sensors.	9	CO1 CO2
2	Thermal Sensors: Introduction, Gas Thermometric Sensors, Thermal Expansion type thermometric sensors, Dielectric constant and refractive index thermo sensors, magnetic thermometer, resistance change type thermometric sensors, thermoemf sensors, thermal radiation sensors, Quartz crystal thermoelectric sensors, Spectroscopic thermometry, noise thermometry, heat flux sensors. Magnetic sensors: Introduction, Sensors and principles, magnetoresistive sensors, Hall effect sensors, inductive and eddy current sensors, Angular/Rotary movement sensors, Eddy current sensors, Electromagnetic flowmeter, SQUID sensors	9	CO2 CO3
3	Introduction to Internet of Things(IoT): What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks:-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples:-Overview, Smart Metering/Advanced Metering Infrastructure e- Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, Over-The-Air- Passive Surveillance/Ring of Steel, Control Application Examples, Myriad	9	CO2 CO3

	Other Applications.		
4	<ul> <li>Fundamental IoT Mechanism and Key Technologies:-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies.</li> <li>Evolving IoT Standards:-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Low power WPAN, Zigbee IP(ZIP),IPSO.</li> </ul>	9	CO2 CO4
5	Layer 12 Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M. Layer 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6,Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.	9	CO4 CO5

- 1. Patranabis D, "Sensors and Transducers," Prentice Hall of India, 2004
- 2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Wiley, 2013.
- 3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands on Approach" Universities Press., 2015

#### **Reference Books:**

- 1. Callaway EH, "Wireless Sensor Networks : Architecture and Protocols," Auerbach Publications
- 2. Michael Miller," The Internet of Things", First Edition, Pearson, 2015.

Bloom's Category	Tests (25 Marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

#### CI - Continuous Internal Evaluation (50 Marks)

Bloom's	Questions
Category	(50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## THEORY OF COMPUTATION

<b>Course Code</b>	: 20AIM543A	Credits :	3
L: T: P:S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
Exam Hours:	: 3	SEE Marks:	50

Course Outcome	es: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM543A.1	Apply and design a finite automaton to accept a set of strings of a language.
20AIM543A.2	Analyze and tell whether the given language is regular or not.
20AIM543A.3	Design context free grammars to generate strings of context free language
20AIM543A.4	Design push down automata and the equivalent context free grammars and Design Turing machine.
20AIM543A.5	Interpret the difference between computability and non-computability, Decidability and un-decidability.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM543A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM543A.2	-	3	2	-	-	-	-	-	-	-	-	3	3	3
20AIM543A.3	-	-	3	2	-	-	-	-	-	-	-	3	3	3
20AIM543A.4	-	-	-	3	3	-	-	-	-	-	-	3	3	3
20AIM543A.5	20AIM543A.5 3 3 3 3													
Corre	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	The Theory Of Automata: Introduction to automata theory, Examples of automata machine, Finite automata as a language acceptor and translator, Deterministic finite automata. Non-deterministic finite automata, finite automata with output (Mealy Machine. Moore machine), Finite automata with $\varepsilon$ moves, Minimizing number of states of a DFA, My hill Nerode theorem, Properties and limitation of FSM, Application of finite automata.	9	CO1 CO2
2	Regular Expressions: Alphabet, String and Languages, Regular expression Properties of Regular Expression, Finite automata and Regular expressions Arden's Theorem, Regular Expression to DFA conversion & vice versa Pumping lemma for regular sets, Application of pumping lemma, Regular sets and Regular grammar, Closure properties of regular sets. Decision algorithm for regular sets and regular grammar.	9	CO2 CO1
3	Grammars: Definition and types of grammar, Chomsky hierarchy of grammar, Relation between types of grammars, Context free grammar, Left most & right most derivation trees, Ambiguity in grammar, Simplification of context free grammar, Chomsky Normal From, Greibach Normal From, properties of context free language, Pumping lemma for context free language, Decision algorithm for context tree language.	9	CO2 CO3
4	Push Down Automata And Turing Machine:Basic definitions, Deterministic push down automata and non-deterministic push down automata, Acceptance of push down automata, Push down automata and context free language, Turing machine model, Representation of Turing Machine, Construction of	9	CO3 CO4

	Turing Machine for simple problem's, Universal Turing machine and other modifications .Church's Hypothesis, , Halting problem of Turing Machine		
5	Computability: Introduction and Basic concepts, Recursive function, Partial recursive function, Initial functions, Composition of functions, Ackerman's function, Recursively Enumerable and Recursive languages, Decidable and undecidable problem, Post correspondence problem, Space and time complexity.	9	CO4 CO5

- 1. Theory of Computer Science (Automata Language & Computation), K.L.P. Mishra and N. Chandrasekran, PHI.
- 2. Introduction to Automata theory. Language and Computation, John E. Hopcropt & Jeffery D. Ullman, Narosa, Publishing House.

#### **Reference Books:**

- 1. John Martin, "Introduction to Languages and the Theory of Computation", Tata McGraw Hill
- 2 Kamala Krithivasan, Rama R., "Introduction to Formal Languages Automata Theory and Computation", 2 nd Edition, Pearson Education.

Bloom's	Tests	Assignment 1	Assignment 2	Quiz1	Quiz2
Category	(25 marks)	(7.5 Marks )	(7.5Marks)	(05Marks)	(05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## PARALLEL PROCESSING

<b>Course Code</b>	: 20AIM544A	Credits:	3
L: T: P:S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
Exam Hours:	: 3	SEE Marks:	50

Course Outcome	s: At the end of the Course, the Student will be able to:					
CO#	COURSE OUTCOME					
20AIM544A.1	Understanding and apply the parallel computer architecture and different models for parallel computing					
20AIM544A.2	To analyze the concepts related to memory consistency models, cache coherence, interconnection networks, and latency tolerating techniques.					
20AIM544A.3	Develop structural intuition of how the hardware and the software work, starting from simple systems to complex shared resource architectures.					
20AIM544A.4 Know the current practical implementations of parallel architectures.						
20AIM544A.5 Using latest tools to design parallel programs and to evaluate their execution						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM544A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM544A.2	-	3	-	-		-	-	-	-	-	-	3	3	3
20AIM544A.3	-	3	3	-	-	-	-	-	-	-	-	3	3	3
20AIM544A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	3
20AIM544A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hour	COs
1	Introduction & Technique of Parallelism: Trends towards parallel computing, parallelism in Uniprocessor systems, Architectural classification schemes, Amdahl's law, Moore's law, Principles of Scalable Performance, Parallel Processing in Memory, Parallel Algorithms, Parallel Algorithm Complexity, Models of Parallel Processing, Cache coherence, Cache coherence Protocols	9	CO1 CO2
2	Pipeline & Vector Processing: Conditions of Parallelism: Data & Resource dependencies, Programflow mechanisms: Control-flow .vs. Data flow computers Principle of pipelining and vector processing: principlesof linear pipelining, classification of pipeline processors. General pipelines and reservation tables. Instruction and arithmetic pipelines, vector processing architecture of Cray –1, Pipeline hazards, VLIW computers, ArrayProcessing.	9	CO1 CO2
3	Parallel Models & Mesh-Based Architectures: PRAM and Basic Algorithms. Data Broadcasting, Parallel Prefix Computation, Shared- Memory Algorithms Parallel Selection Algorithm, Sorting and Selection Networks, Circuit-Leve Examples, Tree-Structured Dictionary Machine, Sorting on a 2D Mesh or Torus, Routing on a 2D Mesh or Torus, Other Mesh-Related Architectures Meshes of Trees, Low-Diameter Architectures, Hyper-cubes and Their Algorithms, The Cube Connected Cycles Network , Shuffle and Shuffle- Exchange Networks.	9	CO2 CO3

4	Multiprocessor architecture and Programming: Emulation and Schedulii Emulations among Architectures, Distributed Shared Memory, Data Stora, Input, and Output, Multithreading and Latency Hiding, Parallel I/ Technology Defect-Level Methods, Fault-Level Methods, Error-Lev Methods, Paralle Programming Parallel Operating Systems, Parallel File Systems.	9	CO3 CO4
5	Parallel System Implementations: Shared-Memory MIMD Machine Variations in Shared Memory, MIN-Based BBN Butterfly, Vector-Paral Cray Y-MP, CC-NUMA Stanford DASH, Message-Passing MIMD Machines Data-Parallel SIMD Machines, Processor and Memory Technologies.	9	CO3 CO5

- 1. Computer Architecture & Parallel processing Kai Hwang 7 Briggs.(MGH)
- 2. Parallel Computers: Arch.& Prog., Rajaraman & Siva Ram Murthy, PHI.

#### **Reference Books:**

- 1. Parallel Computer 2 Arch..& Algo., Adam Hilger, R.W. Hockney, C.R. Jesshope,.
- 2 Parallel computing- Theory and practice Michael J Quinn- Mc Graw Hill.

## **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-


## SPEECH SYNTHESIS AND RECOGNITION

<b>Course Code</b>	: 20AIM551A	Credits:	3
L: T: P:S:	: 3: 0: 0:0:	CIE Marks:	50
Exam Hours:	: 3	SEE Marks:	50

Course Outcome	s: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM551A.1	Understand and apply the speech production and perception process
20AIM551A.2	Analyze speech signals in time and frequency domain.
20AIM551A.3	Design and implement algorithms for processing speech signals.
20AIM551A.4	Build a simple speech recognition/TTS system.
20AIM551A.5	Use latest multimedia tools for speech synthesis and processing

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM544A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM544A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	3
20AIM544A.3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
20AIM544A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	3
20AIM544A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hour	COs
1	Basic Concepts: Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short- Time Fourier Transform, Filter-Bank and LPC Methods.	9	CO1 CO2
2	Speech Analysis: Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.	9	CO2 CO3
3	Speech Modeling: Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.	9	CO3
4	Speech Recognition: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – ngrams, context dependent sub-word units; Applications and present status.	9	CO3 CO4
5	Speech Synthesis: Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.	9	CO4 CO5

- 1. Lawrence Rabinerand Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.
- 2. Daniel Jurafsky and James H Martin, "Speech and Language Processing An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education.

#### **Reference Books:**

- 1. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", California Technical Publishing
- 2 Thomas F Quatieri, "Discrete-Time Speech Signal Processing Principles and Practice", Pearson Education.

#### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

# **EMBEDDED SYSTEMS**

<b>Course Code</b>	: 20AIM552A	Credits :	3
L: T: P: S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
Exam Hours:	: 3	SEE Marks:	50

Course Outcome	: At the end of the Course, the Student will be able to:
CO#	<b>COURSE OUTCOME</b>
20AIM552A.1	Understand and apply the Fundamentals of embedded computer systems.
20AIM552A.2	Design and development of communication bus network
20AIM552A.3	Analyze how device driver routine works
20AIM552A.4	Design and develop modules using RTOS.
20AIM552A.5	Use modern tools with error free software to obtain target system

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM552A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIM552A.2	-	-	3	3	-	-	-	-	-	-	-	3	3	2
20AIM552A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIM552A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	2
20AIM552A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Introduction to embedded systems:</b> Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.	9	CO1 CO2
2	<b>Devices and communication buses for devices network:</b> IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols-parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems network protocols, Wireless and mobile system protocols	9	CO2 CO3
3	<b>Device drivers and interrupts and service mechanism:</b> Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle,	9	CO2 CO3 CO4

	Direct memory access, Device driver programming.					
4	<ul> <li><b>Real-time operating systems:</b> OS Services, Process management, Time functions, Event functions, Memory management, Device, file and IC subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues Introduction to embedded software development process and tools, Hos and target machines, Linking and location software.</li> </ul>					
5	Embedded Software Development Tools: Host and Target machines, Linker/Locators forEmbedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.	9	CO3 CO5			

- Raj Kamal, "Embedded Systems: Architecture, Programming, and Design" 2nd / 3<sup>rd</sup> edition, Tata McGraw hill-2013.
- 2. An Embedded Software Primer, David E. Simon, Pearson Education

#### **Reference Books:**

1. Marilyn Wolf, "Computer as Components, Principles of Embedded Computing System Design" 3rd edition, Elsevier-2014.

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	5	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

## SOFTWARE ENGINEERING

<b>Course Code</b>	:	20AIM553A	Credits :	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outcomes:		At the end of the Course, the Student will be able to:				
CO#	COURS	SE OUTCOME				
20AIM553A.1	Apply se	oftware engineering principles in real life projects				
20AIM553A.2	Analyze for appropriate software development model in developing systems					
20AIM553A.3	Develop software requirement sheet for a real life project, keeping in mind the project an SRS document					
20AIM553A.4	AIM553A.4 Interpret mathematical models for calculating the size, cost and duration of real lif projects					
20AIM553A.5	Use late testing t	st tools in software engineering to test the developed system using different echniques				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM553A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM553A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	3
20AIM553A.3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
20AIM553A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	3
20AIM553A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hour	COs
1	Introduction: The Software And Software Engineering Problem, Approach and Goals of Software Engineering. Software Processes and Models: Processes, Projects And Products, Component Software Processes, Characteristics Of A Software Process, Software Development Process, Project Management Process, Software Configuration Management Process. Models: Linear Sequential, Prototyping, Rad, Incremental, Spiral, Winwin Spiral, Concurrent Development Model	9	CO1 CO2 CO3
2	<b>Software requirement Analysis and Specification</b> : Software requirement Feasibility study, need for SRS, characteristics and component of SRS specification languages, structured analysis, object oriented modeling Requirement analysis, DFD, Structure of a requirement document, validation of SRS, requirement reviews, Cost estimation, uncertainties in cost estimation, building cost estimation. Size estimation:- COCOMO model.	9	CO1 CO2
3	Function Oriented design: Design principles, coupling, cohesion, design notation and specification, structured design technology, verification. Object Oriented Design : Overview of Object oriented design, UML diagram, Use CASE diagram, class diagram, interaction diagram (Sequence and collaboration diagram), Activity diagram Connected Cycles Network , Shuffle and Shuffle–Exchange Networks.	9	CO2 CO3 CO4

4	Software Testing techniques and strategies: Software testing objectives & principles, test case design, white box testing, black box testing.: A Strategic Approach to software testing, strategic issues, unit, integration testing, validation testing, system testing, object oriented program testing, debugging	9	CO4 CO2	
5	<b>Software Re-engineering:</b> Software reengineering, software maintenance, a software reengineering process model, reverse engineering, restructuring code data restructuring, forward engineering, the Economics of reengineering. Computer Aided software Engineering: What is CASE, building blocks for CASE, taxonomy of CASE tools, integrated CASE environment, the integration architecture, the case repository. Component Based Software Engineering: CBSE process, domain engineering, Component based development, economics of CBSE.	9	CO4 CO5 CO1	

1. Pressman Roger, Software Engineering: A Practitioner's Approach TMH, Delhi.

2. JalotePankaj: An Integrated Approach to software Engineering, Narosa, Delhi.

#### **Reference Books:**

- 1. R.E. Fairly, Software Engineering Concepts, McGraw Hill, Inc 1985
- 2 Rajib Mall, "Fundamental of Software Engineering", PHI.

#### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## **CRYPTOGRAPHY AND NETWORK SECURITY**

<b>Course Code</b>	:	20AIM554A	Credits:	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outcome	es: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM554A.1	Understand and apply the cryptography algorithms and its principles
20AIM554A.2	Analyze the standard algorithms used to provide confidentiality, integrity and Authenticity
20AIM554A.3	Illustrate Public and Private key cryptography
20AIM554A.4	Design and analyze the authentication and hashing techniques
20AIM554A.5	Develop strong password methods

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM554A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIM554A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	2
20AIM554A.3	-	-	3	2	-	-	-	-	-	I	1	1	3	2
20AIM554A.4	-	-	-	3	-	-	-	-	-	-	-	-	3	2
20AIM554A.5	-	-	-	3	2	-	-	-	-	-	-	-	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No.	Module Contents	Hours	COs
1	<b>Introduction to security attacks</b> Services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, data encryption standard (DES), block cipher modes of operations, triple DES.	9	CO1, CO2, CO3
2	<b>Encryption Technique</b> AES, RC6, random number generation. S-box theory: Boolean Function, S-box design criteria, Bent functions, Propagation and nonlinearity, construction of balanced functions, S-box design.	9	CO1, CO2, CO3
3	Public Key Cryptosystems Principles of Public Key Cryptosystems, RSA Algorithm, security analysis of RSA Modular Arithmetic. Key Management in Public Key Cryptosystems: Distribution of Public Keys, Distribution of Secret keys using Public Key Cryptosystems, Diffie-Hellman Key Exchange	9	CO1, CO2, CO3

4	Message Authentication and Hash Function Authentication requirements, authentication functions, messag authentication code, hash functions, birthday attacks, security of hash functions and MAC, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm	9	CO1, CO2, C04	
5	Pretty Good Privacy IP Security: Overview, IP Security Architecture, Authentication Header Encapsulation Security Payload in Transport and Tunnel mode with multiple security associations. Strong Password Protocols: Lamport's Hash, Encrypted Key Exchange.	9	CO1, CO5,	

1. Stalling Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.

#### **Reference Books:**

- 1. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson, 2002
- 2 Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson, 2006

#### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

	VI SEMESTER								Monka			
	Course			Crec	lit Di	strib	ution	Overall	Contact			
S.No	Code	Course	BOS	L	Т	Р	S	Credits	Hours	CIE	SEE	Total
1	20AIM61A	Deep Learning Techniques	AIML	3	0	0	0	3	4	50	50	100
2	20AIM62A	Data Visualization	AIML	3	0	0	0	3	4	50	50	100
3	20AIM63A	Artificial Intelligence	AIML	3	0	0	0	3	4	50	50	100
4	21NHOPXX	Open Elective – I	AIML	2	0	1	0	3	4	50	50	100
5	20AIM64XA	Professional Elective – III	AIML	3	0	0	0	3	4	50	50	100
6	20AIM65XA	Professional Elective – IV	AIML	3	0	0	0	3	4	50	50	100
7	20AIL66A	Deep Learning Laboratory	AIML	0	0	2	0	2	4	25	25	50
8	20AIL67A	Data Visualization Laboratory	AIML	0	0	2	0	2	4	25	25	50
9	20AIM68A     Mini Project IV     AIML     0     0     2				2	0	2	2	25	25	50	
	Total							24	34	375	375	750

	Professional Elective - III	<b>Open Elective - I</b>						
Course Code	Course	Course Code	Course					
20AIM641A	Biometrics	NHOP01	Big Data Analytics using HP Vertica-1					
20AIM642A	Soft computing	NHOP02	VM Ware Virtualization Essentials-1					
20AIM643A	Complier Design	NHOP04	Big Data Analytics using HP Vertica-2					
20AIM644A	Computer Networks	NHOP05	VM Ware Virtualization Essentials-2					

Pro	fessional Elective - IV	NHOP07	SAP
20AIM651A	Augmented & Virtual Reality	NHOP08	Schneider-Industrial Automation
20AIM652A	Pattern Recognition & Image Processing	NHOP09	Cisco-Routing and Switching-1
20AIM653A	Advanced Java	NHOP10	Data Analytics
20AIM654A	Block chain Technologies	NHOP11	Product Life Cycle Management
		NHOP12	CISCO-Routing and switching-2
		NHOP13	IIOT Embedded Systems
		NHOP14	Block chain

# **DEEP LEARNING TECHNIQUES**

<b>Course Code</b>	: 20AIM61A	Credits :	3
L: T: P:S:	: 3: 0: 0: 0:	CIE Marks:	50
Exam Hours:	: 3	SEE Marks:	50

Course Outcomes:		At the end of the Course, the Student will be able to:					
CO#	COURSE OUTCOME						
20AIM61A.1	Understand the concepts of Neural networks, its main functions, operations and the execution pipeline						
20AIM61A.2	Apply deep learning algorithms, neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.						
20AIM61A.3	Analyze deep	learning models in Tensor Flow and interpret the results					
20AIM61A.4	Design convolutional neural networks, training deep networks and high-level interfaces						
20AIM61A.5	Use the langu problems.	age and fundamental concepts of artificial neural networks to solve real world					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM61A.1	2	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM61A.2	3	-	-	-	-	2	-	-	-	-	-	-	3	-
20AIM61A.3	-	3	-	-	-	-	-	-	-	-	-	-	3	2
20AIM61A.4	-	-	3	-	-	-	-	-	-	-	-	-	3	3
20AIM61A.5	-	-	-		3	-	-	-	-	-	-	-	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	BASICS OF NEURAL NETWORKS: Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.	9	CO1
2	INTRODUCTION TO DEEP LEARNING : Feed Forward Neural Networks , Gradient Descent, Back Propagation Algorithm: Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout.	9	CO2
3	CONVOLUTIONAL NEURAL NETWORKS : CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning	9	CO2, CO3
4	MORE DEEP LEARNING ARCHITECTURES : LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- Variational Autoencoders – Adversarial Generative Networks – Autoencoder and DBM	9	CO2, CO3, CO4
5	APPLICATIONS OF DEEP LEARNING 9 Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision.	9	CO2, CO3, CO4 CO5

- 1. Ian Good Fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
- 2. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.
- 3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018

#### **Reference Books:**

- 1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009
- 2. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.

#### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## DATA VISUALIZATION

<b>Course Code</b>	:	20AIM62A	Credits:	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outco	mes:	At the end of the Course, the Student will be able to:					
CO#	COURSE OUTCOME						
20AIM62A.1	Understand	Understand the key techniques and theory behind data visualization					
20AIM62A.2	Apply visualization techniques for various data analysis tasks.						
20AIM62A.3	Analyze effectively the various visualization structures (like tables, spatial data, tree and						
	network etc	.)					
20AIM62A.4	20AIM62A.4 Design and build data visualization systems						
20AIM62A.5	Evaluate in effectivene	formation visualization systems and other forms of visual presentation for their ss					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM62A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM62A.2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
20AIM62A.3	-	3	-	-	3	-	-	I	-	-	I	-	3	2
20AIM62A.4	-	-	3	-	-	-	-	-	-	-	-	-	3	3
20AIM62A.5	-	-	-	3	3	-	-	-	-	-	-	-	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	Value of Visualization – What is Visualization and Why do it: External representation – Interactivity – Difficulty in Validation. Data Abstraction: Dataset types – Attribute types – Semantics. Task Abstraction – Analyze, Produce, Search, Query. Four levels of validation – Validation approaches – Validation examples. Marks and Channels	9	C01
2	Rules of thumb – Arrange tables: Categorical regions – Spatial axis orientation – Spatial layout density. Arrange spatial data: Geometry – Scalar fields – Vector fields – Tensor fields.	9	CO1, CO2, CO3
3	Arrange networks and trees: Connections, Matrix views – Containment. Map color: Color theory, Color maps and other channels.	9	CO2, CO3
4	Manipulate view: Change view over time – Select elements – Changing viewpoint – Reducing attributes.	9	CO3, CO4
5	Facet into multiple views: Juxtapose and Coordinate views – Partition into views – Static and Dynamic layers – Reduce items and attributes: Filter – Aggregate. Focus and context: Elide – Superimpose – Distort – Case studies.	9	CO4, CO5

## **Text Books:**

 Tamara Munzner, Visualization Analysis and Design, A K Peters Visualization Series, CRC Press, 2014.

### **Reference Books:**

- 1. Scott Murray, Interactive Data Visualization for the Web, O'Reilly, 2013.
- Nathan Yau, Visualize This: The FlowingData Guide to Design, Visualization and Statistics, John Wiley & Sons, 2011.

### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

## **ARTIFICIAL INTELLIGENCE**

Course Code	: 20AIM63A	Credits :	3
L: T: P:S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
Exam Hours:	: 3	SEE Marks:	50

Course Outco	mes: At the end of the Course, the Student will be able to:					
CO#	COURSE OUTCOME					
20AIM63A.1	Apply the basic knowledge representation, problem solving, and learning methods of artificial intelligence.					
20AIM63A.2	Analyze various search techniques used to solve AI problems.					
20AIM63A.3	Design the machine learning, fuzzy logic, genetic algorithms to solve problems.					
20AIM63A.4	Evaluate the various statistical reasoning techniques to solve AI problems.					
20AIM63A.5	Use analytical concepts for solving logical problems using heuristics approaches.					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM63A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM63A.2	-	3	-	-	3	-	-	-	-	-	-	-	3	2
20AIM63A.3	-	-	3	-	-	-	-	-	-	-	-	-	3	3
20AIM63A.4	-	-	-	3	3	-	-	-	-	-	-	-	3	3
20AIM63A.5	-	-	-	-	3	-	-	-	-	-	-	-	3	3
Correlation levels: 1-Slight(Low)					Low)	2-Mod	lerate(N	Aedium	) 3-Sub	stantial(l	High)			

Module No	Module Contents	Hours	COs
1	Basics of AI, Artificial Intelligence Problems, Artificial Intelligence Techniques, applications of AI Problem Spaces and Search : Defining the problem as a state space search, Production systems, Production system characteristics, Problem characteristics	9	CO1
2	Informed Search Strategies : Heuristic functions, Generate and Test, Hill Climbing, Simulated Annealing, Best first search, A* algorithm, Constraint satisfaction	9	CO2
3	Knowledge Representation : Representations & mappings, Approaches in knowledge representation, Issues in knowledge representation, Propositional logic, Predicate logic, Procedural versus declarative knowledge	9	CO3
4	Statistical reasoning : Probability & Bayes' theorem, Bayesian networks, Certainty factors & rule-based systems Weak slot and filler structures : Semantic nets, Frames Strong slot and filler structures : Conceptual dependency	9	CO4
5	AI Programming language: Introduction to PROLOG and LISP, Programming techniques, Syntax and Numeric Functions; predicates and conditionals, List manipulation, redundancy and termination, Iteration and Recursion	9	CO5, CO6

1. Artificial Intelligence by Rich, Knight, McGraw Hill Education

#### **Reference Books:**

- 1. Artificial Intelligence By Kevin Knight, Elaine Rich, B. Shivashankar Nair, Tata Mcgraw Hill, India
- 2. Artificial Intelligence And Intelligent System BY N. P. Padhy, Oxford University Press

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's	Questions
Category	(50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## DEEP LEARNING LABORATORY

Course Code	: 20AIL66A	Credits :	2
L: T: P:S:	: 0: 0: 2:0:	<b>CIE Marks:</b>	25
Exam Hours:	: 3	SEE Marks:	25

Course Outco	omes: At the end of the Course, the Student will be able to:					
CO#	COUR	COURSE OUTCOME				
20AIM66A.1	Apply	Apply the various deep learning algorithms in Python.				
20AIM66A.2	Analyz	Analyze and improve deep learning models				
20AIM66A.3	Build o	Build deep learning models in TensorFlow and interpret the results				
20AIM66A.4	Evaluate different deep learning frameworks like Keras, Tensor flow, PyTorch, Caffe etc.					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM66A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM66A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM66A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	3
20AIM66A.4	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Ex. No	Experiments	Hours	COs
1.	Basic image processing operations : Histogram equalization, thresholding, edge detection, data augmentation, morphological operations	4	CO1 CO2 CO3 CO4
2.	Implement SVM/Softmax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network	4	CO1 CO2 CO3 CO4
3.	Study the effect of batch normalization and dropout in neural network classifier	4	CO1 CO2 CO3 CO4
4.	Familiarization of image labelling tools for object detection, segmentation	4	CO1 CO2 CO3 CO4
5.	Image segmentation using Mask RCNN, UNet, SegNet	4	CO1 CO2 CO3 CO4
6.	Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)	4	CO1 CO2 CO3 CO4
7.	Image Captioning with Vanilla RNNs	4	CO1 CO2 CO3 CO4
8.	Image Captioning with LSTMs	4	CO1 CO2 CO3

			CO4
			<b>CO1</b>
0	Nativerk Viewalization: Salianay mana Class Viewalization	4	CO2
9.	Network visualization. Samency maps, Class visualization	4	<b>CO3</b>
			CO4
			CO1
10	Generative Adversarial Networks	4	CO2
10.			<b>CO3</b>
			CO4
			CO1
11	Chatbot using bi-directional LSTMs		CO2
11.		4	CO3
			CO4
			CO1
10	Equilibrization of aloud based computing like Coogle calch		CO2
12.	Familiarization of cloud based computing like Google colab		CO3
			<b>CO4</b>
	9. 10. 11. 12.	9.       Network Visualization: Saliency maps, Class Visualization         10.       Generative Adversarial Networks         11.       Chatbot using bi-directional LSTMs         12.       Familiarization of cloud based computing like Google colab	9.Network Visualization: Saliency maps, Class Visualization410.Generative Adversarial Networks411.Chatbot using bi-directional LSTMs412.Familiarization of cloud based computing like Google colab4

- 1. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.
- 2. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

#### **Reference Books:**

- 1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009
- 2. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.

#### **CIE-** Continuous Internal Evaluation (25 Marks)

Bloom's Category	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

### DATA VISUALIZATION LABORATORY

<b>Course Code</b>	: 20AIL67A	Credits :	2
L: T: P:S:	: 0: 0: 2: 0:	<b>CIE Marks:</b>	25
Exam Hours:	: 3	SEE Marks:	25

Course Outcome	S: At the end of the Course, the Student will be able to:			
CO#	COURSE OUTCOME			
20AIM67A.1	Apply visualization on Trends and uncertainty			
20AIM67A.2	Demonstrate basics of Data Visualization			
20AIM67A.3	Implement visualization of distributions			
20AIM67A.4	Design and develop visualization of time series, proportions & associations			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM67A.1	3	-	-	-	3	-	-	-	-	-	-	3	3	3
20AIM67A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM67A.3	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM67A.4	-	-	3	-	-	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Exp. No	Experiment	Hours	COs
1	Download the House Pricing dataset from Kaggle and map the values to Aesthetics	4	C01
2	Use different Color scales on the Rainfall Prediction dataset	4	CO1
3	Create different Bar plots for variables in any dataset	4	CO2, CO3
4	Show an example of Skewed data and removal of skewedness	4	CO2, CO3
5	For a sales dataset do a Time Series visualization	4	CO2, CO3
6	Build a Scatterplot and suggest dimension reduction	4	CO2, CO3
7	Use Geospatial Data-Projections on datasets in http://www.gisinindia.com/directory/gis-data-for-india	4	CO2, CO3
8	Create the a trend line with a confidence band in any suitable dataset	4	CO2, CO3
9	Illustrate Partial Transparency and Jittering	4	CO2, CO3
10	Illustrate usage of different color codes	4	CO2, CO3

### **Text Books:**

 Tamara Munzner, Visualization Analysis and Design, A K Peters Visualization Series, CRC Press, 2014.

#### **Reference Books:**

- 1. Scott Murray, Interactive Data Visualization for the Web, O'Reilly, 2013.
- Nathan Yau, Visualize This: The FlowingData Guide to Design, Visualization and Statistics, John Wiley & Sons, 2011.

#### **CIE-** Continuous Internal Evaluation (25 Marks)

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

#### MINI PROJECT - IV

Course Code	:	20AIM68A	Credits :	2
L: T: P:S:	:	0: 0: 2:0:	<b>CIE Marks:</b>	25
Exam Hours:	:	3	SEE Marks:	25

<b>Course Out</b>	comes: At the end of the Course, the Student will be able to	tcomes:				
CO#	COURSE OUTCOME					
20AIM39.1	Understand the technological needs and/ or societal needs and sustainability of the					
20/110139.1	environment					
20AIM39.2	Analyze and evaluate the outcome of the project					
20AIM39.3	Design application using Deep learning techniques					
20AIM39.4	Evaluate, validate and communicate the identified solutions in a structured way.					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM39.1	3	-	-	-	-	3	2	3	-	-	-	3	3	2
20AIM39.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIM39.3	-	-	3	-	3	-	-	-	-	-	-	3	3	2
20AIM39.4	-	-	-	3	-	-	-	-	3	3	3	3	3	2
Correlation levels: 1-Slight(Low)							2-Mod	lerate(N	/ledium	) 3-Subs	stantial(I	High)		

Each team capable of identifying a problem and carry out a mini project on the problem defined. A panel of experts will review the code developed towards the project during the course of the semester. Plagiarized projects will automatically get an "F" GRADE and the student will be liable for further disciplinary action. At the completion of a project, the team will submit a project report, which will be evaluated by duly appointed examiner(s).

#### **CIE-** Continuous Internal Evaluation (25 Marks)

Bloom's Category	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

Bloom's Category	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-

## **BIOMETRICS**

<b>Course Code</b>	: 20AIM641A	Credits :	3
L: T: P:S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
Exam Hours:	: 3	SEE Marks:	50

<b>Course Outcomes</b>	:	At the end of the Course, the Student will be able to:				
CO#	COURS	E OUTCOME				
20AIM641A 1	Be able t	o draw a system-level diagram for any biometric system and discuss its				
201101011111	compone	nts				
20AIM641A 2	Be able to solve verification, identification, and synthesis problems for a variety of					
20/11/10/17.2	biometric	s such as fingerprint, face, iris, hand gestures and cryptography.				
201116411.4.3	Be able t	o use the biometrics ingredients of existing system to obtain a given security				
20AII041A.3	goal.					
20AIM641A.4	Be able to design a biometric solution for a given application					
20AIM641A.5	Apply se	Apply security features in block chain technologies				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM641A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM641A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	3
20AIM641A.3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
20AIM641A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	3
20AIM641A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

		Hours	COs
Module	Module Contents		
1	Biometrics: definition, history, basic working architecture, types; Performance measures of biometrics; applications and benefits of biometrics; design of biometrics; biometric identification versus verification	9	CO1
2	Background of face and iris recognition; Face recognition methods: Eigen face methods, contractive transformation method; Challenges of face biometrics; Design of iris biometrics: image segmentation, image preprocessing, determination of iris region; Advantages and disadvantages of face and iris biometrics.	9	CO2 CO3
3	Fingerprint matching: image acquisition, image enhancement and segmentation, image binarization, minutiae extraction and matching; Sign language biometrics: Indian sign language (ISL) biometrics, SIFT algorithm, advantages and disadvantages of ISL and fingerprint biometrics.	9	CO3
4	Introduction to biometric cryptography; general purpose cryptosystems; Cryptographic algorithms: DES and RSA; Privacy concerns and issues related to biometrics; biometrics with privacy enhancement; soft biometrics; comparison of various biometrics; Identity and privacy Multimodal biometrics: basic architecture and	9	CO4 CO2 CO3
5	fusion scheme, application, example of AADHAAR; scope and future market of biometrics; role of biometrics in enterprise and border security; DNA biometrics; biometric standards; biometric APIs.	9	<b>CO2</b>

- 1. Introduction to biometrics by Anil K Jain, Arun Ross and Karthik Nandakumar, Springer, 2011.
- 2. Biometrics Identity verification in a networked world by Samir nanawati, Michael Thieme and Raj Nanawati, US editionof WileyIndia,2012.

#### **Reference Books:**

- 1. Privacy Enhancing Biometric, Chuck Wilson, Vein pattern recognition, CRC press 2010
- 2. Biometrics: Identity Verification in a Network, 1stEdition, Samir Nanavathi, Michel Thieme, and Raj Nanavathi, Wiley Eastern, 2002

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	5	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	_	-	-	-

Bloom's	Questions
Category	(50 marks)
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

# Soft Computing

<b>Course Code</b>	: 20AIM642A	Credits	: 3
L: T: P: S	: 3: 0: 0: 0	<b>CIE Marks</b>	: 50
Exam Hours	:3	SEE Marks	: 50

Course	At the end of the course, students should be able to
Outcomes:	
CO#	Course Outcomes
20AIM642A.1	Recognize and apply soft computing theories in the creation of intelligent machines.
20AIM642A.2	Identify and determine the feasibility of applying neural networks to a particular problem.
20AIM642A.3	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
20AIM642A.4	Apply genetic algorithms to optimization problems
20AIM642A.5	Design neural networks for pattern classification and regression problems
20AIM642A.6	Compare different neural network approaches.

## Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM642A.1	3	3	3	-	-	-	-	-	-	-	-	-	3	2
20AIM642A.2	3	3	3	-	2	-	-	-	-	-	-	-	3	2
20AIM642A.3	3	3	-	-	-	-	-	-	-	-	-	-	3	3
20AIM642A.4	3	2	3	3	-	-	-	-	-	-	-	-	3	3
20AIM642A.5	3	3	3	2	-	-	-	-	-	-	-	-	3	3
20AIM642A.6	3	2	2	-	-	-	-	-	-	-	-	-	3	2

Module No.	Module Contents	Hours	COs
1	<b>INTRODUCTION TO SOFT COMPUTING</b> Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary of Neural Networks- Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network- Madaline Network.	9	CO1, CO2
2	ARTIFICIAL NEURAL NETWORKS Back propagation Neural Networks - Kohonen Neural Network - Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional, Associative Memory -Adaptive Resonance Theory Neural Networks.	9	CO1, CO2
3	<b>FUZZY SYSTEMS</b> Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.	9	CO3

4	<b>GENETIC ALGORITHMS</b> Basic Concepts – Working Principle – Procedures of GA – Flow Chart of GA – Genetic Representation: (Encoding) Initialization and Selection – Genetic Operators: Mutation, Generational Cycle – Applications	9	CO4
5	Hybrid Soft Computing Techniques:Neuro-Fuzzy Hybrid Systems-Adaptive Neuro-Fuzzy InferenceSystem(ANFIS)-Genetic Neuro-Hybrid Systems-Genetic FuzzyHybrid and Fuzzy Genetic Hybrid Systems- Simplified FuzzyARTMAP- Applications	9	CO5, CO6

- 1. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Third Edition, Wiley-India, 2008
- 2. S. Rajasekaran, G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", Prentice Hall of India, 2010.

#### **Reference Books :**

- 1. Siman Haykin, "Neural Networks", Prentice Hall of India, 1999.
- 2. Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 2016.
- 3. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education, 2008.

#### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	2.5	2.5
Understand	5	2.5	2.5	2.5	2.5
Apply	10	2.5	2.5	-	-
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## **COMPILER DESIGN**

<b>Course Code</b>	:	20AIM643A	<b>Credits</b> :	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outcomes:		At the end of the Course, the Student will be able to:			
CO#	COURSE OUTCOME				
20AIM643A.1	the concepts of different Parsing techniques and implement the knowledge to Yacc				
20AIM643A.2	AIM643A.2 Analyse the concepts of Compilers and roles of the lexical analyzer.				
20AIM643A.3	Implen manage	nent the principles of scoping, parameter passing and runtime memory ement.			
20AIM643A.4	Develo	p syntax directed translation schemes.			
20AIM643A.5	Use the terms of	e new code optimization techniques to improve the performance of a program in of speed & space and develop algorithms to generate code for a target machine.			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM643.1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM643.2	-	3	-	-	3	-	-	-	-	-	-	-	3	2
20AIM643.3	-	3	-	-	3	-	-	-	-	-	-	-	3	3
20AIM643.4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
20AIM643.5	-	-	-	3	3	-	-	-	-	-	-	-	3	3
	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	Introduction : Introduction to Compiler, single and multi-pass compilers, Translators, Phases of Compilers, Compiler writing tools, Finite Automata and Lexical Analyzer: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata, from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer with LEX.	9	CO1, CO2
2	Syntax Analysis and Parsing Techniques : Context free grammars, Bottom-up parsing and top down parsing, Top down Parsing : elimination of left recursion, recursive descent parsing, Predicative Parsing, Bottom Up Parsing : Operator precedence parsing, LR parsers, Construction of SLR, Canonical LR and LALR parsing tables, Construction of SLR parse tables for Ambiguous grammar, parser generator- YACC, error recovery in top down and bottom up parsing	9	CO1, CO2
3	Syntax Directed Translation & Intermediate Code Generation : Synthesized and inherited attributes, Construction of syntax trees, bottom up and top down evaluation of attributes, S- attributed and Lattributed definitions ,Postfix notation; Three address codes, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expression and Procedure Calls.	9	CO3, CO4
4	Run-time Environment: Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation.	9	CO3, CO4
5	Code Optimization and Code Generation : Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data	9	CO3, CO5

flow	analysis,	Loop inv	variant	comp	utations.	Issue in	the de	sign of
Code	generator	r, register	alloc	ation,	the targe	t machin	e, and	simple
Code	generator							

- 1. Compilers Principles, Techniques and Tools, Alfred V. Aho, Ravi Sethi and Ullman J.D., 2nd edition, Addison Wesley.
- 2. Principle of Compiler Design, Alfred V. Aho and J.D. Ullman, Narosa Publication

#### **Reference Books:**

- 1. Compiler Design in C, A.C. Holub, PHI.
- 2. Compiler Design, O.G. Kakde, 4th edition, Laxmi Publication.
- 3. Compiler construction (Theory and Practice), A. Barret William and R.M., Bates, Galgotia Publication

#### CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## **COMPUTER NETWORK**

<b>Course Code</b>	:	20AIM644A	Credits :	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

<b>Course Outcon</b>	nes: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM644A.1	Understand the basic structure of an abstract layered Network protocol model for any Networking environment
20AIM644A.2	Identify and apply basic theorems and formulae for the information-theoretic basis of communication and the performance of TCP/IP network protocols.
20AIM644A.3	Analyze necessary tools to support a career in Computer Networking at advanced professional level.
20AIM644A.4	Evaluate different protocols, software, and network architectures, their topologies, protocols in any networking application domains.
20AIM644A.5	Use security measures in real world scenario

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM644.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM644.2	3	3	-	-	-	-	-	-	-	-	-	3	3	3
20AIM644.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIM644.4	-	-	-	3	3	-	-	-	-	-	-	3	3	3
20AIM644.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	Introduction: OSI, TCP/IP and other networks models, Network Topologies WAN, LAN, MAN. Transmission media copper, twisted pair wireless, switching and Multiplexing and De- multiplexing, Networking Devices.	9	CO1, CO2
2	Data link layer: Framing, Error detection and correction, Flow Control. Multiple Access Protocols – Data Link Layer Addressing, ARP, RARP, DHCP, Ethernet standards. Media Access Control Protocols. MAC addresses. Wireless LANS. High Level Data Link Control, Asynchronous Transfer Mode.	9	CO1, CO2
3	Network Layer: Internet Protocol (IP), IPv4 and IPv6, Sub-netting and Super-netting, ICMP, Unicast Routing Protocols: Link State Routing, Distance Vector Routing, Hierarchical Routing, RIP, OSPF, BGP Multicast Routing, Multicast Routing Protocols: DVMRP, MOSPF, CBT, PIM, MBONE, Mobile IP, IPsec.	9	CO3
4	Transport Layer: Transport Layer Services Connectionless Protocols: UDP, UDP segment, Reliable Data Transfer. Connection-Oriented Protocols: TCP Segment Structure, RTT estimation, Flow Control, Connection Management, Congestion Control, Integrated and Differentiated Services: Intserv – Diffserv.	9	CO2, CO3, CO4
5	Application Layer: Principles of Network Applications, The Web and HTTP, FTP, Electronic Mail, SMTP, Mail Message Formats and MIME, DNS, Socket Programming with TCP and UDP.	9	CO2, CO3, CO5

- 1. Data Communications and Networking Behrouz A. Forouzan. Third Edition TMH
- 2. Computer Networks Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI

#### **Reference Books:**

- 1. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, Third edition, 2006
- 2. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

### AUGMENTED AND VIRTUAL REALITY

<b>Course Code</b>	:	20AIM651A	Credits:	3
L: T: P: S:	:	3: 0: 0: 0:	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outcome	s: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
20AIM651.1	Understand the importance of Augmented reality
20AIM651.2	Apply the computer vision for Augmented reality and its applications
20AIM651.3	Implement the basic concepts of Virtual Reality
20AIM651.4	Analyze the importance of Tracking system.
20AIM651.5	Use the concepts of Computer Graphics and allied concepts for design of Virtual Reality

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM651.1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
20AIM651.2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
20AIM651.3	3	3	-	-	-	-	-	-	-	-	-	-	3	3
20AIM651.4	-	3	-	-	3	-	-	-	-	-	-	-	3	2
20AIM651.5	-	-	-	3	3	-	-	-	-	-	-	-	3	3

Module No	Module Contents	Hours	COs
1	Introduction to Augmented Reality: What Is Augmented Reality - Defining augmented reality, history of augmented reality, Examples, Displays-Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model	9	CO1
2	Tracking: Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion	9	CO1, CO2, CO4
3	Computer Vision for Augmented Reality-Marker Tracking, Multiple- Camera Infrared Tracking, Natural Feature Tracking by Detection, Incremental Tracking, Simultaneous Localization and Mapping, Outdoor Tracking Calibration and Registration-Camera Calibration, Display Calibration, Registration	9	CO1, CO4
4	<ul> <li>Introduction to Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.</li> <li>Multiple Models of Input and Output Interface in Virtual Reality: Input - Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus &amp; 3DScanner etc. Output Visual /Auditory / Haptic Devices</li> </ul>	9	CO3, CO4, CO5
5	Visual Computation in Virtual Reality: Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering. Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR.X3D Standard; Vega, MultiGen, Virtools etc.	9	CO3, CO5

- 1. Augmented Reality: Principles and Practice by Dieter SCHMALSTIEG, Tobias HOLLERER
- 2. Virtual Reality Technology Burdea, G. C. P. Coffet Wiley-IEEE Press 2nd Edition 2003/2006

#### **Reference Books:**

- 1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494
- 2. Developing Virtual Reality Applications, Foundations of Effective Design Alan Craig William Sherman Jeffrey Will Morgan Kaufmann 2009

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

Bloom's	Questions
Category	(50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## PATTERN RECOGNITION AND IMAGE PROCESSING

<b>Course Code</b>	: 20AIM652A	Credits : 3	
L: T: P: S:	: 3: 0: 0: 0:	CIE Marks: 50	
Exam Hours:	: 3	SEE Marks: 50	

Course Outcomes	At the end of the Course, the Student will be able to:					
CO#	COURSE OUTCOME					
2010 10 1625 1	Understand the basics of Image formation and transformation using sampling and					
20/11/10/25/4.1	quantization					
20AIM625A.2	Apply compression and coding techniques used for image data					
20AIM625A.3	Analyze different types Segmentation Techniques.					
201116251	Evaluate the trade-offs, and appropriateness of the different feature types and					
20AIM023A.4	classification techniques such as Bayesian, maximum-likelihood, etc					
20AIM625A.5	25A.5 Investigate the nature and inherent difficulties of the pattern recognition problems					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM625A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM625A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM625A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM625A.4	3	-	-	3	3	-	-	-	-	-	-	3	3	3
20AIM625A.5	-	-	3	3	-	-	-	-	2	2	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Introduction to Image Processing:</b> Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception. Digital Image-sampling and quantization serial & parallel Image processing.	9	C01
2	<b>Image Restoration:</b> Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.	9	CO1, CO2
3	<b>Segmentation Techniques:</b> Segmentation Techniques-thresh holding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications, Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, Skelton detection, Hough trans-form, topological and texture analysis, shape matching.	9	CO3, CO4
4	<b>Pattern Recognition:</b> Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	9	CO4, CO5
5	<b>Statistical Patten Recognition:</b> Bayesian Decision Theory, Classifiers, Normal density and discriminant functions, Parameter estimation	9	CO5

methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods – Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectationmaximization (EM), Hidden Markov Models (HMM),Gaussian mixture models.

#### **Text Books:**

- 1. Digital Image Processing Ganzalez and Wood, Addison Wesley, 1993.
- 2. Fundamental of Image Processing Anil K.Jain, Prentice Hall of India.
- 3. Pattern Classification R.O. Duda, P.E. Hart and D.G. Stork, Second Edition John Wiley, 2006

#### **Reference Books:**

- 1. Digital Picture Processing Rosenfeld and Kak, vol.I & vol.II, Academic, 1982
- 2. An Introduction to Digital Image Processing Wayne Niblack, Prentice Hall, 1986
- 3. Pattern Recognition and Machine Learning C. M. Bishop, Springer, 2009.
- 4. Pattern Recognition S. Theodoridis and K. Koutroumbas, 4th Edition, Academic Press, 2009

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	5	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

### ADVANCED JAVA

Course Code	: 20AIM653A	Credits :	3
L: T: P:S:	: 3: 0: 0: 0:	CIE Marks:	50
Exam Hours:	: 3	SEE Marks:	50

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to:					
CO#	COURS	SE OUTCOME					
20AIM653A.1	Impleme	ent client-server applications and TCP/IP socket programs					
2011116531 2	Analyze	Analyze the need for advanced Java concepts like enumerations and collections in					
20AIM055A.2	develop	developing modular and efficient programs					
20AIM653A.3	Designs	solutions using maps and comparators					
20AIM653A.4	Evaluate	e how servlets fit into Java-based web application architecture					
20AIM653A.5	Use JDF	BC API to demonstrate database access and details for managing information					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM653A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	3
20AIM653A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM653A.3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
20AIM653A.4	-	-	-	3	3	-	-	-	-	-	-	3	3	3
20AIM653A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	Java Networking Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URLConnection	9	CO1
2	Enumerations, Autoboxing and Annotations Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface	9	CO2
3	The collections and Framework The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.	9	CO2, CO3
4	Background Background; The Life Cycle of a Servlet; Using Tomcat for Servlet	9	CO4

	Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Reques String, User Sessions, Cookies, Session Objects		
5	The Concept of JDBC The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brier Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet Transaction Processing; Metadata, Data types; Exceptions.	9	CO4, CO5

- 1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
- 2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.

#### **Reference Books:**

- 1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
- 2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

#### **CIE-** Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	5	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-
# **BLOCK CHAIN TECHNOLOGY**

<b>Course Code</b>	: 20AIM654A	Credits :	3	
L: T: P:S:	: 3: 0: 0: 0: CIE Marks:			
Exam Hours:	: 3	SEE Marks:	50	
<b>Course Outcomes:</b>	At the end of the Course, the Student will be able to:			
CO#	COURSE OUTCOME			
20AIM654A.1	Understand the basic concepts and technology used for blockchain.			
20AIM654A.2	Develop Ethereum block chain contract.			
20AIM654A.3	Apply security features in blockchain technologies			
20AIM654A.4	Analyze the primitives of the distributed computing and cryptography related to blockchain.			
20AIM654A.5	Use Bitcoin Scripting language for secure transaction.			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM654A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM654A.2	3	-	3	-	-	-	-	-	-	-	-	3	3	3
20AIM654A.3	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM654A.4	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM654A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Introduction:</b> Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Nakamoto's concept with Blockchain based cryptocurrency, Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.	9	CO1
2	<b>Basic Distributed Computing &amp; Crypto primitives:</b> Atomic Broadcast, Consensus, Byzantine Models of fault tolerance, Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero- knowledge systems.	9	CO2, CO3, CO4
3	<b>Bitcoin basics:</b> Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.	9	CO3, CO5
4	<b>Ethereum basics:</b> Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts, Writing smart contracts using Solidity & JavaScript.	9	CO2, CO4, CO5
5	<b>Privacy, Security issues in Blockchain:</b> Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks.	9	CO3

## **Text Books:**

- 1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies A Comprehensive Introduction", Princeton University Press.
- 2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

### **Reference Books:**

- 1. Imran Bashir, "Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained", Packt Publishing.
- 2. Merunas Grincalaitis, "Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols", Packt Publishing.

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks )	Assignment 2 (7.5Marks)	Quiz1 (05Marks)	Quiz2 (05 Marks )
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	5	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

## **CIE-** Continuous Internal Evaluation (50 Marks)

#### **SEE- Semester End Examination (50Marks)**

Bloom's	Questions
Category	( <b>50</b> marks)
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-