



# **DEPARTMENT OF ARTIFICIAL INTELLIGENCE 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> Semester Scheme & Syllabus Academic Year 2023-2024

BATCH:2020-24

CREDITS:175 [2018 Scheme]

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	h) Design and Analysis of Algorithm Lab	
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	h) Data Visualization Lab	
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# **INSTITUTION**

# Vision

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

# Mission

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

# **Quality Policy**

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level

## Values

- ✤ Academic Freedom
- ✤ Innovation
- ✤ Integrity

- Professionalism
- ✤ Inclusiveness
- Social Responsibility

# **DEPARTMENT of AI & ML**

## Vision

To develop an outstanding AI and ML professionals with profound practical, research & managerial skills to meet ever changing Industrial Social and Technological needs of the Society

# Mission

To disseminate strong theoretical and practical exposure to meet the emerging trends in the industry.

To promote a freethinking environment with innovative research and teaching-learning pedagogy.

To develop value based socially responsible professionals with high degree of leadership skills will support for betterment of the society.

# **Program Educational Objectives (PEOs)**

PEO1	Develop and excel in their chosen profession on technical front and progress towards advanced continuing education or Inter-disciplinary Research and Entrepreneurship
PEO2	Become a reputed innovative solution provider- to complex system problems or towards research or challenges relevant to Artificial Intelligence and Machine learning
PEO3	Progress as skilled team members achieving leadership qualities with trust and professional ethics, pro-active citizens for progress and overall welfare of the society

## **PEO to Mission Statement Mapping**

Mission Statements	PEO1	PEO2	PEO3
To disseminate strong theoretical and practical exposure to meet the emerging trends in the industry.	3	3	2
To promote a freethinking environment with innovative research and teaching-learning pedagogy.	2	3	2
To develop value based socially responsible professionals with high degree of leadership skills will support for betterment of the society.	2	3	3

# **Program Outcomes (POs) with Graduate Attributes**

- **PO1** Engineering knowledge: Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems in Computer Engineering.
- **PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems in Computer Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
- **PO3 Design / Development of Solutions:** Design solutions for complex Engineering problems and design system components or processes of Computer Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
- **PO4** Conduct Investigations of Complex Problems: Use research based knowledge and research methods including design of experiments in Computer Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5** Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities in Computer Engineering with an understanding of the limitations.
- **PO6** The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Computer Engineering.
- **PO7** Environment and Sustainability: Understand the impact of the professional Engineering solutions of Computer Engineering in societal and Environmental contexts, demonstrate the knowledge of, and need for sustainable development.
- **PO8** Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms of the Engineering practice.
- **PO9** Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10** Communication Skills: Communicate effectively on complex Engineering activities with the Engineering community and with society, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11 Project Management and Finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
- **PO12** Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# **Program Specific Outcomes (PSOs)**

#### A graduate of the Computer Engineering Program will demonstrate

**PSO1:** Develop models in Data Science, Machine learning, Deep learning and Bigdata technologies, using acquired AI knowledge and modern tools.

**PSO2:** Formulate solutions for interdisciplinary problems through acquired programming knowledge in the respective domains complying with real-time constraints.

	I SEMESTER – PHYSICS CYCLE											
									<b>G</b>		Marks	
S.No	Course Code	Course	BOS	Cro	edit D	istribu	ition	Overall Credits	Contact Hours	CIF	SEE	Total
	couc			L	Т	Р	S			CIL	JEL	1000
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	19MEE13A	Elements of Mechanical Engineering	HSS	3	0	0	0	3	3	25	25	50
4	19CIV14A	Elements of Civil Engineering	CV	3	0	0	0	3	3	50	50	100
5	19EEE15A	Basic Electrical Engineering	EE	3	0	0	0	3	3	50	50	100
6	19PHL16A	Engineering Physics Lab	BS	0	0	2	0	2	4	50	50	100
7	19PEE17A	Basic Electrical Engineering Lab	EE	0	0	2	0	2	4	25	25	50
8	19HSS171A	Essential English	HSS	SS Mandatory 0 Course					2	25	25	50
	Total								26	325	325	650

	II SEMESTER- CHEMISTRY CYCLE												
S.No	Course Code	Course	BOS	Credit Distribution			erall edits	ontact lours		Marks			
				L	Т	Р	S	Ove Cre	C( H	CIE	CEE	SEE	Total
1	19MAT21A	Applied Mathematics- II	BS	2	1	0	0	3	4	50	50	50	100
2	19CHE22A	Engineering Chemistry	BS	3	0	0	0	3	3	50	50	50	100
3	19CSE23A	Introduction to Programming with C	CSE	3	0	0	0	3	3	50	50	50	100
4	19MEE24A	Computer Aided Engineering Drawing	ME	1	0	2	0	3	5	50	50	50	100
5	19ECE25A	Basic Electronics	ECE	3	0	0	0	3	3	50	50	50	100
6	19CHL27A	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	19HSS271A	Professional Communication	HSS	2	0	0	0	2	2	25	25	25	50
9	19HSS272A	Constitution of India and Professional Ethics	HSS	HSS Mandatory 0 Course				0	2	25	25	25	50
	Total		21	30	350	350	350	700					

			III SE	MES	TER	-SCI	HEN	E			M	arks
S.No	Course Code	Course	BOS	Cre L	edit Di	stribu P	tion S	Overall Credits	Contact Hours	CIE	SEE	Total
1	20AIM31A	Applied Mathematics- III	BS	2	1	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	HSS	2	0	0	0	2	2	25	25	50
4	20AIM33A	Digital Electronics	AI&ML	3	0	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		2	4	25	25	50
8	20AIL37A	Data Structures using C Lab	AI&ML	0	0	2		2	4	25	25	50
9	20AIL38A	Python Programming Lab	AI& ML	0	0	2	0	2	4	25	25	50
10	20AIM39A	Mini Project - I	AI& ML	0	0	2	0	2	0	25	25	50
11	20DMAT31 A*	Basic Applied Mathematics-1	BS	0	0	0	0	0	2	25	25	50
12	19HSS171*	Essential English	BS	0	0	0	0	0	2	25	25	50
	,		23	29/33*	350/ 400*	350/ 400*	700/ 800*					

\*For Lateral Entry Students Only

		Γ	V SEME	STI	E <b>R-</b> S	SCH	<b>IEM</b>	E				
S.No	Course	CourseCreditCodeCourseBOSDistribution		<b>Overall</b> Credits	Contact Hours	Marks						
	Coue	course	200	L	Т	Р	S	creates	<b>Hour</b> s	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	Ma	andato	ory Co	ourse	0	2	25	25	50
4	20AIM43A	Introduction to Data Science	AI&ML	3	0	0	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*	Basic Applied Mathematics-2	BS	0	0	0	0	0	2	25	25	50
11	19HSS272*	Constitution of India & Professional Ethics	BS	0	0	0	0	0	2	25	25	50
	Total							21	26/30*	350/ 400*	350/ 400*	700/ 800*

\*For Lateral Entry Students Only

	V SEMESTER											
	G			Credit Distribution					t		Ma	ırks
S.No	Course Code	Course	BOS	L	Т	Р	S	<mark>Overal</mark> Credit	Contac 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	20AIM55XA	Professional Elective- II	AI&ML	3	0	0	0	3	4	50	50	100
6	20AIM56A	Design 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
	Total									375	375	750

S. NO	COURSE CODE	PROFESSIONAL ELECTIVE-1	S. NO	COURSE CODE	PROFESSION AL 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

			VI SE	ME	STE	R						
S No	Course	Course	BOS		Cred	<mark>it Distri</mark> k	oution	all lits	nct rs		IV.	larks
5.110	Code	Course	DOD	L	Т	Р	S	Over Cred	Conts Hour	CIE	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	100
6	20AIM65XA	Professional Elective - IV	AI&ML	3	0	0	0	3	4	50	50	100
7	20AIL66A	Deep Learning Laboratory	AI&ML	0	0	2	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
		Total						24	34	375	375	750
-		_				_			_	_	-	
		Professional Elective -	III			•	Open El	ective - J				
Сог	Course Code Course				Course							

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

Prof	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	NHOP12	CISCO-Routing and switching-2
		NHOP13	IIOT Embedded Systems
		NHOP14	Block chain
		NHOP15	Product Life Cycle Management

			VI	I SEN	1ESTI	ER						
		Course		C	'redit D	istributi	ion			Marks		
<mark>S. No</mark>	Course Code		BOS					erall dits	urs	CIF	SEE	Total
	Couc			L	Т	Р	S	Ove Cre	Con Ho	CIE	SEE	10181
1	20AIM71A	Cloud Computing	AI&ML	3	0	0	0	3	4	50	50	100
2	20AIM72A	Web Technology	AI&ML	3	0	0	0	3	4	50	50	100
3	20AIM73A	Natural Language processing	AI&ML	3	0	0	0	3	4	50	50	100
4	20AIM74X	Professional Elective - V	AI&ML	3	0	0	0	3	4	50	50	100
5	20AIM75X	Professional Elective - VI	AI&ML	3	0	0	0	3	4	50	50	100
6	20AIL76A	Cloud Computing Laboratory	AI&ML	0	0	2	0	2	4	25	25	50
7	20AIL77A	Web Technology Lab	AI&ML	0	0	2	0	2	4	25	25	50
8	20AIM78A	Project Phase – I	AI&ML	0	0	2	0	2	0	25	25	50
9	20NHOPX X	Open Elective - II	AI&ML	3	0	0	0	3	4	50	50	100
Total								24	32	375	375	750

P	Professional Elective – V	Open Elective - II				
Course Code	Course	Course Code	Course			
20AIM741A	Recommender System	20NHOP701	Big Data Analytics using HP Vertica- 1			
20AIM742A	Streaming Analytics	20NHOP702	VM Ware Virtualization Essentials-1			
20AIM743A	Information Security	20NHOP704	Big Data Analytics using HP Vertica- 2			
20AIM744A	Human Computer Interaction	20NHOP707	SAP			

Professional Elective – VI		
Quantum Computing	20NHOP708	Schneider-Industrial Automation
Software Testing	20NHOP709	CISCO-Routing and Switching-1
Social Network Analysis	20NHOP712	CISCO-Routing and switching-2
Cyber Security	20NHOP714	Block chain
	20NHOP715	Product Life Cycle Management
	20NHOP720A	Robotic Process Automation
	20NHOP721A	Industry 4.
	20NHOP722A	Programming of Industrial Robot
	20NHOP723A	5G Communication
	20NHOP725A	VLSI Physical Design -1
	20NHOP726A	VLSI Physical Design -2
	20NHOP727A	Juniper Network Operating System
	20NHOP728A	Database Administration using DB2
	Professional Elective - VI         Quantum Computing         Software Testing         Social Network Analysis         Cyber Security         Image: Professional Elective - VI         Image: Professional Elective - VI         Software Testing         Social Network Analysis         Cyber Security         Image: Profession Pr	Professional Elective - VIQuantum Computing20NHOP708Software Testing20NHOP709Social Network Analysis20NHOP712Cyber Security20NHOP714Quantum Computing20NHOP715Quantum Computing20NHOP715Quantum Computing20NHOP720AQuantum Computing20NHOP721AQuantum Computing20NHOP721AQuantum Computing20NHOP722AQuantum Computing20NHOP723AQuantum Computing20NHOP725AQuantum Computing20NHOP726AQuantum Computing20NHOP727AQuantum Computing20NHOP728AQuantum Computing20NHOP728A

	VIII SEMESTER											
				C	ndit Di	atributio	n			Marks		
S. No	Course Code	Course	BOS	C		stributio		Overall	Contact			
0.100			205	L	Т	Р	S	Credits	Hours	CIE	SEE	Total
1	20AIM81A	Reinforcement learning	AI&ML	3	0	0	0	3	4	50	50	100
2	20AIM82A	Internship Viva	AI&ML	0	0	4	0	4	0	50	50	100
3	20AIM83A	Project Phase - II	AI&ML	0	0	12	0	12	0	100	100	200
		To	19	04	200	200	400					

	III SEMESTER-SCHEME											
				Cre	dit Di	stribu	tion				M	arks
S.No	Course Code	Course	BOS	L	Т	Р	S	Overall Credits	Contact Hours	CIE	SEE	Total
1	20AIM31A	Applied Mathematics- III	BS	2	1	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	HSS	2	0	0	0	2	2	25	25	50
4	20AIM33A	Digital Electronics	AI&ML	3	0	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		2	4	25	25	50
8	20AIL37A	Data Structures using C Lab	AI&ML	0	0	2		2	4	25	25	50
9	20AIL38A	Python Programming Lab	AI& ML	0	0	2	0	2	4	25	25	50
10	20AIM39A	Mini Project - I	AI& ML	0	0	2	0	2	0	25	25	50
11	20DMAT31 A*	Basic Applied Mathematics-1	BS	0	0	0	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*	700/ 800*					

\*For Lateral Entry Students Only

# **APPLIED MATHEMATICS – III**

<b>Course Code</b>	:	20AIM31A	Credits:	3
L: T: P	:	2: 1: 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#	COUR	SE OUTCOME				
20AIM31A.1	Use appropriate numerical methods to solve algebraic equations and transcendental equations					
20AIM31A.2	AIM31A.2 Solve initial value problems using appropriate numerical methods and also Evaluate definite integrals numerically					
20AIM31A.3	Expres	s the periodic functions as Fourier series expansion analytically and numerically.				
20AIM31A.4	Solve t model	e the Continuous model problems using Fourier transforms. Solve the discrete el problems using Z-transforms				
20AIM31A.5	Solve	the discrete model problems using Fast Fourier transform				
20AIM31A.6	Fit a su for a se	hitable curve by the method of least squares and determine the lines of regression et of statistical data				

Mapping of	Mapping of Course Outcomes to Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM31A.1	3	3	3	3	3	-	3	-	-	-	3	3		3
20AIM31A.2	3	3	3	3	3	-	3	-	-	-	3	3		3
20AIM31A.3	3	3	3	3	3	-	-	-	-	-	3	3		3
20AIM31A.4	3	3	3	3	3	-	-	-	-	-	3	3		3
20AIM31A.5	3	3	3	3	3	-	-	-	-	-	3	3		3
20AIM31A.6	3	3	3	3	3	1	3	-	-	-	3	3		3
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module	Module Contents	Hours	CO
No			S
1	Numerical Methods-1: Numerical solution of algebraic and		
	transcendental equations: Regula-falsi method and Newton- Raphson		
	Method-Problems. Interpolation: Newton's forward and backward	0	<b>CO1</b>
	formulae for equal intervals, Newton divided difference and Lagrange's	9	
	formulae for unequal intervals (without proofs)-Problems.		
2	Numerical Methods 2: Numerical solution of ordinary differential		
	equations of first order and of first degree: Modified Euler's method and		
	Runge-Kutta method of fourth- order-Problems. Milne's predictor and		
	corrector methods- Problems. Numerical integration: Simpson's 1/3 <sup>rd</sup> rule,	0	cor
	Simpson's 3/8 <sup>th</sup> rule, Weddle's rule (without proofs)- Problems.	9	CO2
	Applications: Application of numerical integration to velocity of a		
	particle and volume of solids.		
3	Fourier series: Periodic function, Dirichlet's conditions,		
	Fourier series of periodic functions of period $2\pi$ and arbitraryperiod 21,	9	CO3
	half range series. Fourier series and half Range Fourier series of		
	periodic square wave, half wave rectifier, full wave rectifier, Saw-		
	tooth wave with graphical representation, practical harmonic analysis		

4	<ul> <li>Fourier Transforms: Infinite Fourier transforms, Fourier Sine and Cosine transforms, Inverse Fourier transform.</li> <li>Z - Transform: Definition, Z-transforms of some standard functions, properties, damping rule, shifting rule(without proof), initial and final value theorems, inverse Z- transforms. Applications: Solving difference equations using Z-transform.</li> </ul>	9	CO4
5	<b>Discrete Fourier Transform and Fast Fourier Transform:</b> Definition of N-Point DFT, problems for 4-points and inverseDFT for four points only. FFT algorithm to compute theFourier transforms 4-point only. <b>Statistical</b> <b>Methods:</b> Fitting of the curves of the form $y = a + b x$ , $y = a + b x + c x^2$ , $y = ae^{bx}$ , $y = a x^b$ , and $y = ab^x$ by the method of least square, Correlation and Regression, Regression coefficients, line of regression – Problems.	9	CO5 CO6

- 1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10<sup>th</sup> Edition, 2014, ISBN: 978-81-265-5423-2.
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43<sup>rd</sup> Edition, 2014, ISBN: 978-81-7409-195-5.

## **Reference Books:**

- 1. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4<sup>th</sup> Edition, 2015, ISBN: 978-0-273-73409-3
- 2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4<sup>th</sup> Edition, 2016, ISBN: 978-0-07-063419-0.
- 3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28<sup>th</sup> Edition, 2012, ISBN: 81-219-0345-9.
- 4. P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9<sup>th</sup> Edition, 2014, ISBN: 978-81-318-0832-0.

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	-

#### ಆಡಕತ ಕನ್ನಡ

#### (Kannada for administration)

<b>Course Code</b>	: 20HSS324/424	Credits : 01
L: T: P	: 1:0:0	CIE Marks : 25
Exam Hours	:2	SEE Marks : 25

#### ಆಡಳಿತ ಕನ್ನಡ ಅಧ್ಯಯವದ ಕಲಿಕಾಂಶಗಳು

- C01 ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಹಾಗೂ ಭಾಷಾ ರಚನೆ ನಿಯಮಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುತ್ತಾರೆ
- C02 ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲನ ದೋಷಗಳು, ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿಹ್ಕೆಗಳನ್ನು ಅರಿತುಕೊಳ್ಳುವರು
- C03 ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಕೆ ಪಡೆಯುವರು
- C04 ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ವಹಿಸಿಕೊಳ್ಳುವರು

#### CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1.00	3242	2	140	127		12	8	2	3	192	-
CO2	6.02	20-32							-	3		
CO3			-	1 1975						3	1.50	
CO4			-	•		3. <b>-</b> 3			-	3		

#### ಪರಿವಿಡಿ (ಪಠ್ಯ ಮಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)

ಅಧ್ಯಾಯ –1 ಕನ್ನಡ ಭಾಷೆ–ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ

- ಅಧ್ಯಾಯ -2 ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾ ಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ
- ಅಧ್ಯಾಯ -3 ಲೇಖನ ಚಿಹೈಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ
- ಅಧ್ಯಾಯ -4 ಪತ್ರ ವ್ಯವಹಾರ
- ಅಧ್ಯಾಯ -5 ಆಡಳಿತ ಪತ್ರಗಳು
- ಅಧ್ಯಾಯ -6 ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು
- ಅಧ್ಯಾಯ -7 ಸಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧ ರಚನೆ (ಪ್ರಿಸೈಸ್ ರೈಟಿಂಗ್),ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ
- ಅಧ್ಯಾಯ -8 ಕನ್ನಡ ಶಬ್ದ ಸಂಗ್ರಹ
- ಅಧ್ಯಾಯ -9 ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತಜ್ಜಾನ
- ಅಧ್ಯಾಯ -10 ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ /ಕಂಷ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು

#### ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಮಸ್ತಕದ ಲೇಖಕರು

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೋ. ವಿ . ಕೇಶವಮೂರ್ತಿ, ಪಕಟಣೆ : ಪಸಾರಾಂಗ, ಬಿ.ತಾ.ಬಿ.ಬೆಳಗಾವಿ

#### ಪರೀಕೈಯ ವಿಧಾನ:

ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (Continuous Internal Evaluation) : 25 ಅಂಕಗಳು ಸಮಿಸ್ಟರ್ ಪರೀಕ್ಷೆ (Semester End Examination) : 25 ಅಂಕಗಳು

Blooms Category	CIE (25)	SEE (25)
Remember	12	12
Understand	13	13

## Vyavaharika Kannada (Kannada for use)

<b>Course Code</b>	:	20HSS325	Credits:	1
L: T: P	:	2: 0	<b>CIE Marks:</b>	25
Exam Hours:	:	2	SEE Marks:	25

Course Out	comes:	At the end of the Course, the Student will be able to					
CO#	COUR	COURSE OUT COME					
CO1	Unders	Understand Kannada Language.					
CO2	Comm	Communicate in Kannada Language					
CO3	Read simple Kannada words						
CO4	Pronounce Kannada words correctly						

Mapping of Co	ourse Outcome	s to Program	Outcomes

mappi	mapping of course outcomes to Hogram outcomes														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2		-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3		-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4		-	-	-	-	-	-	-	-	-	3	-	-	-	-
	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module	Module Contents	Hours	Cos
No			
1	Chapter – 1: Vyavaharika Kannada – Parichaya (Introducton to Vyavaharika Kannada)		
2	Chapter – 2: Kannada Aksharamalehaaguuchharane (Kannada Alphabets and Pronunciation		
3	Chapter – 3: SambhashanegaagiKanandaPadagalu (Kannada Vocabulary for Communication)		
4	Chapter – 4: Kannada in Conversations (Sambhashaneyalli Kannada)		
5	Chapter – 5: Activities in Kannada. (Kannada SambhashanegaagiChatuvatikegalu)		

#### **Text Books:**

1. Vyavaharika Kannada by Dr. L. Thimmesh, Prof. V. Keshavamurthy, published by: VTU, Belagavi

Bloom's Category	CIE(25)	SEE(25)
Remember	12	12
Understand	13	13

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

# **ECONOMICS FOR ENGINEERS**

<b>Course Code</b>	:	21HSS321A	Credits:	2
L: T: P	:	2: 0: 0	<b>CIE Marks:</b>	25
Exam Hours:	:	2	SEE Marks:	25

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to			
CO#	COUR	COURSE OUTCOME			
20AIM421.1	Summa	Summarize the knowledge of economics and its importance in business decision making.			
20AIM421.2	Make ı	Make use of economic concepts in business.			
20AIM421.3	Exami	Examine the impact of market forces on business.			
20AIM421.4	Interpr	et the role of market structure in the economic development of a country.			
20AIM421.5	Evalua	te the role of budgeting in business decisions.			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM421.1	0	1	0	1	1	3	3	3	3	1	2	3		
20AIM421.2	1	1	1	1	2	2	1	2	2	2	3	3		
20AIM421.3	3	2	3	1	1	2	2	3	1	1	2	2		
20AIM421.4	1	2	1	2	1	3	1	2	2	2	2	2		
20AIM421.5	3	2	3	2	2	1	1	2	1	1	3	1		
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)							)							

Module No	Module Contents	Hours	Cos
1	Introduction to Economics: Role of Engineer as an Economist, Types and problem of economies, Basics of economics (GDP, National income, inflation, business cycle, fiscal and monetary policies, balance of payment).	4	CO1
2	Basic concepts of Microeconomics: concept of Demand & Elasticity of Demand. Concept of Supply & Elasticity of Supply, Meaning of Production and factors of production, Production Possibility Curve, Law of variableproportions and returns to scale. Relevance of Depreciation towards industry, Depreciation computing methods.	4	CO2
3	Concepts of cost of production: different types of cost; accounting cost, sunk cost, marginal cost and opportunity cost. Break even analysis, Make or Buy decision. Cost estimation, Elements of cost as Direct Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads.	4	CO3
4	Market structure: Perfect Competition: Features, Determination of Price under Perfect Competition - Monopoly: Features, Pricing under Monopoly, Oligopoly: Features, Kinked Demand Curve, Cartel,	5	CO4

	Price Leadership – Monopolistic Competition: Features, Pricing under Monopolistic Competition, Product Differentiation.		
5	Capital budgeting: Traditional and modern methods, Payback period method, IRR, ARR, NPV, PI Interest and Interest factors: Interest rate, Simple interest, Compound interest, Cash - flow diagrams, Personal loans and EMI Payment. Present worth, Future worth.	7	CO5

- 1. Riggs J.L, Engineering Economy, TMH, 2012 edition
- <sup>2.</sup> Jain T.R., Economics for Engineers, VK Publications, 2008 Edition
- <sup>3.</sup> IM PANDEY, Financial Management, Vikas Pub. House, 2018 Edition
- <sup>4.</sup> D N Dwivedi, Managerial Economics ,Vikas Pub. House, 2018 Edition
- 5. Dr. A.R Sainath, Sasikala Devi, Engineering Economics and Financial accounting, CharulathaPublications,2015 edition

### **Reference Books:**

1. Thuesen H.G, Engineering Economy. PHI,1984

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

Bloom's Category	Tests	Assignments
	(15 marks)	(10 marks)
Remember	5	-
Understand	5	-
Apply	5	-
Analyze	-	5
Evaluate	-	5
Create	-	-

Bloom's Category	Questions (50 marks)
Remember	-
Understand	20
Apply	30
Analyze	-
Evaluate	-
Create	-

# DIGITAL ELECTRONICS FOR AI

<b>Course Code</b>	:	20AIM33A	Credits:	3
L: T: P	:	3: 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#	COUR	COURSE OUTCOME				
20AIM33A.1	Descri	be the significance and basic principles of the digital circuits				
20AIM33A.2	Apply	Apply the concepts of minimization techniques to realize digital circuits				
20AIM33A.3	Analyse different types of combinational and sequential circuits for given specifications					
20 4 11 12 2 4 4	Design	efficient combinational and sequential logic circuit from functional description of				
20AINI33A.4	digital	systems				
20AIM33A.5	IM33A.5 Use CAD/HDL tools to simulate and verify Digital circuits					
20AIM33A.6	Construct and verify CAD/HDL tools to simulate and verify Digital circuits					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM33A.1	-	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM33A.2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
20AIM33A.3	-	3	-	-	-	-	-	-	-	-	-	-	3	-
20AIM33A.4	-	-	3	-	-	-	-	-	-	-	-	-	3	-
20AIM33A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM33A.6														
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Simplification of Boolean Functions:</b> Review of Boolean algebra, logic gates, canonical forms, Three Variable K – Maps, Four Variable K – Maps, Quine- McCluskey minimization technique, Reduced prime implicants Tables, Map Entered Variables.	9	CO1, CO2
2	<b>Combinational Logic Circuits:</b> Introduction, Adders, Subtractors, Carry Look Ahead Adder, Parallel Adder, Magnitude Comparator, Priority Encoders, Decoders, Multiplexers, Read Only memories (ROM), Programmable Logic Arrays (PLAs)	9	CO1, CO2, CO3, CO4
3	<b>Sequential Logic Circuits:</b> The Basic Flip-flop circuit, Clocked Flip-flops, Triggering of Flip-flops, types of Flip- flop, Master Slave Flip-Flops, Conversion of Flip-flops, types of Shift Registers, applications of shift register.	9	CO2, CO3, CO4
4	<b>Analysis of Sequential Circuit:</b> Binary ripple counters, synchronous binary counters, Design of a synchronous mod-n counter using clocked T, JK, D and SR flip-flops, Verilog implementation of counters, Mealy and Moore Models, State Reduction and Assignment, Design Procedure, Design with State Equations.	9	CO2, CO3, CO4

5	Introduction to HDL: Basic Concepts, data types,	9	CO1,
	Compiler directives. Modules and Ports, Module		CO2,
	definition, port declaration, connecting ports, Different		СОЗ,
	types of modelling style, Verilog implementation of		<b>CO4</b> ,
	combinational circuits, Verilog implementation of		CO5,
	sequential circuits, Verilog implementation Moore and		COG
	Mealy.		2.50

- 1. Donald P Leach and Albert Paul Malvino , Digital Principles and Applications, , 8<sup>th</sup>Edition, Tata McGraw Hill, 2014
- 2. Anil K Maini, Varsha Agarwal ,Electronic Devices and Circuits, , 1st Edition, Wiley,2009

#### **Reference Books:**

1. Digital Design: with an Introduction to Verilog HDL, M Morris Mano and Michael DCiletti, 5th Edition, 2013, Pearson Education

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

Bloom's Category	Tests (25 marks)	Assignments (15 marks)	Quizzes (10 marks)
Remember	05	-	5
Understand	05	-	5
Apply	10	7.5	-
Analyze	10	7.5	-
Evaluate	-	-	
Create	-	-	-

Bloom's Category	Questions (50 marks)
Remember	05
Understand	10
Apply	20
Analyze	15
Evaluate	-
Create	-

# DATA STRUCTURES USING C

Course Code L: T: P Exam Hours:	: 20AIM34A : 3: 0: 0 : 3	Credits: CIE Marks: SEE Marks:	3 50 50				
<b>Course Outco</b>	Course Outcomes: At the end of the Course, the Student will be able to						
CO#	COURSE OUTCOME						
20AIM34A.1	Understand the fundamentals of data structure and its application	Understand the fundamentals of data structure and its applications.					
20AIM34A.2	2 Apply dynamic memory allocation techniques for designing data structure						
20AIM34A.3	Analyse the concepts of sorting, linear and non-linear data structure for problem solving.						

20AIM34A.4Investigate the literature about linear data structure and submit report in a team20AIM34A.5Prepare an effective written documentation about nonlinear data structures

20AIM34A.6 Demonstrate different tree data structures used for machine algorithms

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM34A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM34A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM34A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM34A.4	-	-	-	2	3	-	-	-	2	2	-	3	3	2
20AIM34A.5	-	-	-	-	3	-	-	-	-	3	-	3	3	2
20AIM34A.6	3	-	-	-	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 Data Structures:</b> Arrays and Pointers revisited, Sparse matrix, transpose of a sparse matrix, dynamic memory management. Introduction to Data Structures, Classification of Data Structures, Abstract Data Types, Insertion sort, Quick sort, Shell sort, Radix sort.	9	CO1, CO2
2	<ul> <li>Stacks &amp; Queues: Stacks: Definition, Stack representation, Primitive operations on stack, array representation of stacks.</li> <li>Applications of stacks: Recursion, Fibonacci series, Tower of Hanoi problem, Conversion of expressions, Evaluation of postfix expression,</li> <li>Iteration v/s recursion. Queues: Definition, Queue representation, Primitive operations on queue, array representation of queues, Circular queue, Priority queue, Double ended queue, Applications of queues.</li> </ul>	9	CO1, CO2, CO3 CO4
3	Linked Lists: Dynamic memory allocation revisited – malloc, calloc, realloc, free, Introduction to linked list, Representation of linked list in memory, primitive operations on linked list, searching a linked list, circular linked list, doubly linked list, header linked list. Applications of linked list:	9	CO1, CO3, CO4

	Josephus problem, addition of two long integers, addition of two polynomials, Linked representation of stack, Linked representation of queue.		
4	<b>Trees-I:</b> Introduction, Binary tree – strictly binary tree, complete binary tree, representing binary tree in memory, traversing a binary tree, binary Search tree, insertion and deletion in binary search tree, threaded binary tree. Expression trees, construction of an expression tree from prefix and postfix, Heap tree, creation of heap tree, insertion in heap. Deletion from heap.	9	CO1, CO3, CO5, CO6
5	<b>Trees-II &amp; Graphs:</b> AVL Trees, Rotations in AVL tree, Insertion and deletion in an AVL tree, Huffman'salgorithm. <b>Introduction to Graph</b> , Graph theory terminologies, sequential representation of a graph, adjacency matrix and path matrix, Warshall's algorithm, Linked representation of a graph, Operations on a graph, Traversing a graph, Topological sorting	9	CO1, CO3, CO5, CO6

- 1. Seymourlipschutz, Data Structures with C Special Indian Edition, Thirteenth reprint2015, McGrawHill Education
- 2. Aaron M. Tanenbaum, Yedidyah Langsam& Moshe J Augenstein, Data Structures using C, Thirteenth Impression 2014, Pearson Education

## **Reference Books:**

1. Richard F Gilberg and Behrouz A Forouzan , Data Structures – A Pseudo code Approach with C , Second edition, Fifth Indian Reprint 2015, Cengage Learning.

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

Bloom's Category	Tests (25 marks)	Assignments (15 marks)	Quizzes (10 marks)
Remember	-	-	-
Understand	5	-	5
Apply	5	7.5	5
Analyze	15	7.5	-
Evaluate	-	-	-
Create	-	-	-

Bloom's Category	Questions (50 marks)
Remember	10
Understand	10
Apply	30
Analyze	-
Evaluate	-
Create	-

# PYTHON PROGRAMMING

<b>Course Code</b>	: 20AIM35A	Credits:
L: T: P	: 3: 0: 0	CIE Marks:
Exam Hours:	: 3	SEE Marks:

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to				
CO#	COUR	SE OUTCOME				
20AIM35A.1	Unders	Understand the fundamentals of data structure and its applications.				
20AIM35A.2	Apply dynamic memory allocation techniques for designing data structure					
20AIM35A.3	Analys	Analyse the concepts of sorting, linear and non-linear data structure for problem solving.				
20AIM35A.4	Investigate the literature about linear data structure and submit report in a team					
20AIM35A.5	Prepare an effective written documentation about nonlinear data structures					
20AIM35A.6	Demor	Demonstrate different python packages used for Data science				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM35A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM35A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM35A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM35A.4	-	-	-	2	3	-	-	-	2	2	-	3	3	2
20AIM35A.5	-	-	-	-	3	-	-	-	-	3	-	3	3	2
20AIM35A.6	3	-	-	-	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 Data, Expressions, Statements:</b> Introduction to Python and installation, variables, expressions, statements, Numeric datatypes: Int, float, Boolean, string. Basic data types: list list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters. Tuple tuple assignment, tuple as return value, tuple methods. Sets: operations and methods. Dictionaries: operations and methods.	10	CO1, CO2
2	<b>Control Flow Loops:</b> Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: statements break, continue.	7	CO1, CO2
3	Advanced Functions, Arrays: FunctionsFunction and its use, pass keyword, flow of execution, parameters and arguments, Fruitful functions: return values, parameters,local and global scope, function composition, recursion Advanced Functions: lambda, map, filter, reduce, basic data type comprehensions. Python arrays: Create an array, Access the Elements of an Array, array methods.	10	CO2, CO3

4	<b>Files, Exceptions:</b> Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. <b>Exception handling</b>	9	CO2, CO4
5	<b>Python Packages:</b> Python packages: Simple programs using the built-in functions of packages Matplotlib, numpy, pandas, Lamda etc. <b>GUI Programming</b> : Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples. Python programming with IDE.	9	CO2, CO5 CO6

- 1. J. Jayalakshmi , D. Stalin Alex , B. Mahesh Prabhu, S. , Problem Solving and Python Programming , Chand publication,1 January 2018
- 2. Wesley J. Chun, Core Python Applications Programming, 3rd Edition, Pearson Education, 2016
- 3. Carles Dierbach, Introduction to Computer Science using Python, Wiley, 2015

#### **Reference Books:**

1. Jeeva Jose & P.Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Publishers, New Delhi, 2016

Bloom's Category	Tests (25 marks)	Assignments (15 marks)	Quizzes (10 marks)
Remember	-	-	5
Understand	10	-	5
Apply	15	7.5	-
Analyze	-	7.5	-
Evaluate	-	-	-
Create	-	-	-

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

<b>Bloom's Category</b>	Questions (50 marks)
Remember	10
Understand	10
Apply	30
Analyze	-
Evaluate	-
Create	-

# DIGITAL ELECTRONICS LAB

<b>Course Code</b>	:	20AIL36A	Credits:	2
L: T: P	:	0: 0: 2	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	SE OUTCOME				
20AIL36A.1	Apply the concepts of minimization techniques to realize the digital circuits					
20AIL36A.2	Analys	Analyse different methods to realize the logic circuits				
20AIL36A.3	Simulate logic circuits using HDL tool					
20AIL36A.4	Demor	strate the specific application of digital electronics using suitable digital ICs/				
	Multisi	m/Xlinx/ FPGA board/- etc				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL36A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIL36A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	2
20AIL36A.3	-	-	3	-	-	-	-	-	-	-	-	-	3	2
20AIL36A.4	-	-	-	-	3	-	-	-	-	-	-	-	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Ex. No	Experiments	Hours	COs
1.	Verify (a) Demorgan's Theorem for 2 variables. (b) The sum-of product and product-of-sum expressions using universal gates.	4	CO1, CO2, CO4
2.	Design and implement (a) Full Adder using basic logic gates. (b) Full Subtractor using basic logic gates.	4	CO1, CO2, CO4
3.	Realize the different shift registers using IC7474	4	CO2, CO4
4.	Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC. Simulate and verify its working using Verilog code	4	CO2, CO4
5.	Perform n bit addition / subtraction using 4-bit full adder IC. Simulate and verify its working using Verilog code.	4	CO2, CO4
6.	Design and implement BCD to seven-segment decoder. Simulate and verify given decoder using VERILOG code.	4	СО3,

7.	Design and implement Ring counter and Johnson counter using 4 bit shift register and demonstrate its working. Simulate and verify the working using VERILOG code.		CO4
8. 9.	<ul> <li>Design and implement a mod-n (n&lt;8) synchronous up or down counter using J-K Flip-Flop ICs and demonstrate its working. Simulate and verify mod 8 synchronous up or down counter using VERILOG code.</li> <li>Design and implement an asynchronous counter using</li> </ul>	4	CO3, CO4
	decade counter IC to count from 0 to n (n<=9) and demonstrate its working.		
10.	Design and implement a sequence generator (3 bits) using Moore model and JK flip flop. Simulate and verifythe working using VERILOG code.	2	CO3, CO4

- 1. Stephen Brown and Zvonko Vranesic ,Fundamentals of Digital Logic with Verilog Design , Tata McGraw Hill , 2017
- 2. M Morris Mano and Michael D, Ciletti , Digital Design: with an Introduction to Verilog HDL, 5th Edition, Pearson Education , 2013

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

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

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

# DATA STRUCTURES PROGRAMMING LAB USING C

<b>Course Code</b>	:	20AIL37A	Credits:	3
L: T: P	:	0: 0: 2	<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				
20AIL37A.1	Apply Data structure techniques to solve the problem				
20AIL37A.2	Analys	Analyse the output for a given problem			
20AIL37A.3	Conduct experiments as individual by using C programming language				
20AIL37A.4	Prepare	e an effective report based on experiments			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL37A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL37A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL37A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIL37A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Ex. No	Experiments	Hours	Cos
1.	<ul> <li>Write a C program to sort numbers</li> <li>a. Insertion sort</li> <li>b. Shell sort</li> <li>c. Ouick sort</li> </ul>	4	CO1, CO2, CO3, CO4
2.	Develop a program for STACK that performs following primitive operations: push, pop and display	4	CO1, CO2, CO3, CO4
3.	Develop a program a. To convert INFIX notation to POSTFIX b. Evaluation of POSTFIX notation	4	CO1, CO2, CO3, CO4
4.	Develop a program for QUEUE that performs following primitive operations: insert, delete and display	4	CO1, CO2, CO3, CO4
5.	Develop a program for CIRCULAR QUEUE that performs following primitive operations: insert, delete and display	4	CO1, CO2, CO3, CO4
6.	<ul> <li>Write a menu driven program to perform the following primitive operations on single linked list</li> <li>Create a list with one node <ul> <li>a. Insertion at front, rear ,after any given node</li> <li>b. Deletion at front,, rear ,after any given node</li> <li>c. Display</li> </ul> </li> </ul>	4	CO1, CO2, CO3,

7.	Write a Menu driven program to perform the following primitive operations in double linked list a Insertion b Deletion c Display		CO4
8.	Develop a program to traverse a tree using in-order, pre- order and post order.	4	CO1, CO2,
9.	Develop a program to perform insertion, deletion and traversal of a binary search tree		CO3, CO4
10.	Develop a program to implement BFS and DFS traversal of graph	2	CO1, CO2, CO3, CO4

- 1. Seymourlipschutz, Data Structures with C Special Indian Edition, Thirteenth reprint2015, McGrawHill Education
- 2. Aaron M. Tanenbaum, Yedidyah Langsam& Moshe J Augenstein, Data Structures using C, Thirteenth Impression 2014, Pearson Education

Bloom's Category	Tests (25 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

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

<b>Bloom's Category</b>	Questions (50 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

# PYTHON PROGRAMMING LAB

<b>Course Code</b>	:	20AIL38A	Credits:	2
L: T: P	:	0: 0: 2	<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				
20AIL38A.1	Apply python programming concepts to solve the problem				
20AIL38A.2	Analyse the output for a given problem				
20AIL38A.3	Solve experiments using python programming language individually				
20AIL38A.4	Prepare an effective report based on experiments				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL38A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL38A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL38A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIL38A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

E.No	List of Programs	Hours	COs
	<ul><li>A) Create a list and perform the following methods 1) insert() 2) remove()</li><li>3) append() 4) len() 5) pop() 6) clear()</li></ul>		
1	<ul> <li>B) Create a dictionary and apply the following methods</li> <li>1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()</li> <li>C) Create a tuple and perform the following methods</li> <li>1) Add items 2) len() 3) check for item in tuple 4)Access items</li> </ul>	4	CO1, CO2, CO3, CO4
2	<ul> <li>A) Write a python program to add two numbers.</li> <li>B) Write a python program to print a number is positive/negative using ifelse.</li> <li>C) Write a python program to find largest number among three numbers.</li> <li>D) Write a python Program to read a number and display corresponding day using if_elif_else?</li> </ul>	4	C01, C02, C03, C04
3	<ul> <li>A) Write a program to create a menu with the following options <ol> <li>To perform addition 2. To perform subtraction</li> <li>To perform multiplication 4. To perform division</li> </ol> </li> <li>Accepts users input and perform the operation accordingly. Use functions with arguments.</li> <li>B) Write a python program to check whether the given string is palindrome or not.</li> <li>C) Write a python program to find factorial of a given number using functions</li> </ul>	4	CO1, CO2, CO3, CO4

<ul> <li>D) Write a Python function that takes two lists and returns True if the equal otherwise false</li> <li>A) Write a program to double a given number and add two numbers u lambda()?</li> <li>C) Write a program for map() function to double all the items in the 1:</li> <li>D) Write a program to find sum of the numbers for the elements of th by using reduce ()?</li> <li>A) Demonstrate a python code to implement abnormal termination?</li> <li>B) Demonstrate a python code to print try, except and finally block statements</li> <li>C) Write a python program to open and write "hello world" into a file</li> <li>D) Write a python program to get python version.</li> <li>B) Write a python program to get python version.</li> <li>B) Write a python program to get python version.</li> <li>B) Write a python program to display a particular month of a year usi calendar module.</li> <li>D) Write a python program to print date, time for today and now.</li> <li>B) Write a python program to print date, time using date and time fundule.</li> <li>A) Write a python program to print date, time using date and time fundule.</li> <li>A) Using a numpy module create an array and check the following: <ol> <li>List with type float 2. 3*4 array with all zeros</li> <li>From tuple 4. Random values</li> </ol> </li> </ul>			
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<ul> <li>D) Write a python program to print all the months of given year.</li> <li>A) Write a python program to print date, time for today and now.</li> <li>B) Write a python program to add some days to your present date and the date added.</li> <li>C) Write a python program to print date, time using date and time fun</li> <li>7 D) Write a python program, which accepts the radius of a circle from and computes the area (use math module).</li> <li>A) Using a numpy module create an array and check the following:</li> <li>1. Type of array 2. Axes of array</li> <li>3. Shape of array 4. Type of elements in array</li> <li>B) Using a numpy module create array and check the following:</li> <li>1. List with type float 2. 3*4 array with all zeros</li> <li>3. From tuple 4. Random values</li> <li>C) Using a numpy module create array and check the following:</li> <li>1. Reshape 3X4 array to 2X2X3 array 2. Sequence of integers from 0</li> </ul>	Ð		
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<ul> <li>7 D) Write a python program, which accepts the radius of a circle from and computes the area (use math module).</li> <li>A) Using a numpy module create an array and check the following: <ol> <li>Type of array 2. Axes of array</li> <li>Shape of array 4. Type of elements in array</li> <li>B) Using a numpy module create array and check the following: <ol> <li>List with type float 2. 3*4 array with all zeros</li> <li>From tuple 4. Random values</li> <li>Using a numpy module create array and check the following: </li> </ol> </li> </ol></li></ul>	tions		
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C) Using a numpy module create array and check the following: Reshape 3X4 array to 2X2X3 array 2. Sequence of integers from 0			
	o 30	4	CO1,
with steps of 5 3. Flatten array	0.50	-	CO2, CO3,
9 A) Write a python program to create a package (college),sub-package	1.0		UU4
(alldept), modules (it, cse) and create admin and cabin function to modules). B) Write a python program to create a package (Engg) sub-package	le?		
(years),modules (sem) and create staff and student function to modul	?		
			CO1, CO2.
10 Program to develop calculator using tKinter		2	CO3,
- 1. J. Jayalakshmi , D. Stalin Alex , B. Mahesh Prabhu, S. , Problem Solving and Python Programming , Chand publication, 1 January 2018
- 2. Wesley J. Chun, Core Python Applications Programming, 3rd Edition, Pearson Education, 2016

Bloom's Category	Tests (25 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

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

<b>Bloom's Category</b>	Questions (25 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

### MINI PROJECT - I

<b>Course Code</b>	:	20AIL39A	Credits:	2
L: T: P	:	0: 0: 2	<b>CIE Marks:</b>	25
Exam Hours:	:	3	SEE Marks:	25

<b>Course Outco</b>	mes: At the end of the Course, the S	Student will be able to
CO#	COURSE OUTCOME	
20AIL39A.1	Illustrate the technological needs and/ or environment	societal needs and sustainability of the
20AIL39A.2	Design application using high level prog	ramming language
20AIL39A.3	Analyse and evaluate the outcome of the	project
20AIL39A.4	Test, validate and communicate the iden	tified 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
20AIL39A.1	-	-	-	-	-	3	2	3	-	-	-	3	3	2
20AIL39A.2	-	-	3	-	3	-	-	-	-	-	-	3	3	2
20AIL39A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL39A.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 thecourse 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).

#### Sample Mini project includes:

- 1) Tic-Tac-Toe Game
- 2) Quiz Game
- 3) Library Management
- 4) Telecom Billing Management system
- 5) ERP application etc.,

# CIE- Continuous Internal Evaluation (25 Marks)

<b>Bloom's Category</b>	<b>Review (25marks)</b>
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
Create	-
<b>SEE-</b> Semester End Exa	amination (25Marks)
<b>Bloom's Category</b>	Review (25marks)
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	5
<b>a</b>	

	IV SEMESTER-SCHEME												
S.No	Course	Course	BOS	Cr Dis	Credit Distribution Overall Contact			Marl					
	Coue	Course	DOS	L	Т	Р	S	Creans	nours	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	Ma	andato	ory Co	ourse	0	2	25	25	50	
4	20AIM43A	Introduction to Data Science	AI&ML	3	0	0	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*	Basic Applied Mathematics-2	BS	0	0	0	0	0	2	25	25	50	
11	19HSS272*	Constitution of India & Professional Ethics	BS	0	0	0	0	0	2	25	25	50	
	Total							21	26/30*	350/ 400*	350/ 400*	700/ 800*	

\*For Lateral Entry Students Only

# MATHEMATICAL STATISTICS

<b>Course Code</b>	:	20AIM41A	Credits:	3
L: T: P	:	2: 1: 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#	COUR	SE OUTCOME			
20AIM41A.1	1A.1 Calculate and interpret the various measures of Dispersion, Skewness and Kurtosis.				
20AIM41A.2	Solve the problems related to Combinatorics and Probability				
20AIM41A.3	Gain a proble	bility to use probability distributions to analyse and solve real time ms			
20AIM41A.4	Apply	the stochastic process and Markov chain in prediction of future events			
20AIM41A.5	Apply	the concept of sampling distribution to solve engineering problems			
20AIM41A.6	Use th	e concepts to analyse the data to make decision about the hypothesis			

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM41A.1	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.2	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.3	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.4	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.5	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.6	3	3	3	2	2	-	-	-	1	1	-	1	-	-
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	Measures of Dispersion, Skewness and Kurtosis: Dispersion, Measures of dispersion, Percentile, Range, Quartile deviation, Mean deviation, Coefficient of dispersion, Coefficient of variation, Moments, Skewness, Kurtosis.	9	CO1
2	<b>Combinatorics and Probability:</b> Random variable Permutations and Combinations, Probability, Axioms probability, Events, Addition rule, Conditional probabilit Multiplication rule, Bayes theorem.	9	CO2
3	<b>Probability Distributions:</b> Random variables (discrete and continuous), probability density functions. Discrete Probability distributions: Binomial and Poisson Distributions-Problems. Continuous Probability distributions: Exponential and Normal Distributions- Problems.	9	CO3

4	Joint Probability Distributions and Stochastic process: Concept of joint probability-Joint probability distribution, Discrete and Independent random variables. Expectation, Covariance, Correlation coefficient. Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states.	9	CO4
5	<b>Sampling Theory:</b> Sampling, Sampling distributions, test of hypothesis of large samples for means and proportions, Central limit theorem (without proof), confidence limits for means, Student's t-distribution, F-distribution and Chi-square distribution for test of goodness of fit for small samples.	9	CO5, CO6

- 1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Tenth Revised Edition, 2002, ISBN: 81-7014-791-3.
- Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Probability and Statistics for Engineers & Scientists, Prentice Hall, Ninth Edition, 2012, ISBN: 978-0-321-62911-1.

## **Reference Books:**

- Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Probability and Statistics, Schaum's Outline Series, McGraw-Hill company, Fourth Edition, 2013, ISBN: 978-0-07-179557-9
- <sup>2.</sup> T. Veerarajan, Probability, Statistics and Random Processes, Tata McGaw-Hill Publishing Company, Limited, Third Edition, 2008, ISBN: 978-0-07-066925-3
- 3. Athanasios Papoulis and Unni Krishna Pillai, Probability, Random Variables and Stochastic Processes, Tata McGaw-Hill Publishing Company Limited, Fourth Edition, 2002, ISBN: 0-07-112256-7
- 4. Sheldon M. Ross, Stochastic Processes, John Wiley & Sons. Inc., Second Edition, 1996, ISBN: 0-471-12062-6

Bloom's Category	Tests (25 Marks)	Assignment-1 (7.5 Marks)	Assignment-2 (7.5 Marks)	Quiz-1 (05 Marks)	Quiz-2 (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)

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

## LIFE SKILLS FOR ENGINEERS

Course Code L: T: P Exam Hours:	20HSS422A : 3: 0: 0 : :	Credits: CIE Marks: SEE Marks:	2 50 50
<b>Course Outco</b>	omes: At the end of the Course, the Student will be able to		
CO#	COURSE OUTCOME		
20AIM422.1	Set personal and professional goals		
20AIM422.2	Develop critical and creative thinking skills and practise leadership	).	

20AIM422.3Demonstrate and understand personal and professional responsibility20AIM422.4Apply the concepts of personality development and grooming in corporate life20AIM422.5Understand self and work with groups20AIM422.6Articulate and convey ideas and thoughts with clarity and focus

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM422.1	-	-	-	-	-	-	-	-	3	-	3	3	-	-
20AIM422.2	-	-	-	-	-	2	-	2	3	-	2	3	-	-
20AIM422.3	-	-	-	-	-	2	2	3	3	-	-	3	-	-
20AIM422.4	-	-	-	-	-	-	-	-	3	3	-	3	-	-
20AIM422.5	-	-	-	-	-	-	-	-	3	-	3	3	-	-
20AIM422.5	-	-	-	-	-	2	2	-	3	3	2	3	-	-
(	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	Cos
1	Goal Setting: Importance of Goals: Achiever's goal - Creating SMART for personal and professional life, Right action at right time, career planning, overcoming fear and face uncertainty, Mind Mapping. Communication – Intellectual preparation/Idea generation.	6	CO1 CO6
2	You are the creator - Taking Ownership, Being Responsible and Accountable. Meaning of Ownership, Responsibility and Accountability, Practicing these philosophies in course, career. Social responsibility. Communication – Organising thought flow.	6	CO3 CO6
3	Self-Awareness and Self-Management: Emotional Intelligence, Know yourself- understanding personality, perception, techniques to understand self – Johari window and SWOT, reason for fall and opportunities to grow. Individual behaviour, attitude towards change and work, being proactive and positive. Interpersonal skills - Knowing others, working well with others. Communication – Structured articulation	9	CO5 CO6

4	Leadership, meaning, self - motivation, coming out of comfort zone, mental preparation - accepting failure and resilience, decision making, thinking skills – critical and creative, six thinking hats, watchfulness - proactive risk management, problem solving mind set. Communication – Tips for Jam session, GD and Presentation	9	CO2, CO6
5	Personality Development and Grooming: - Expectations from the industry, building personal presence, corporate grooming, corporate etiquettes, Personal branding and image management. Communication – Mock GD sessions	6	CO4 CO6

### **Reference Books:**

- 1. The 7 Habits of Highly Effective People, Stephen R Covey, Neha Publishers
- 2. Seven Habits of Highly Effective Teens, Convey Sean, New York, Fireside Publishers, 1998.
- 3. Emotional Intelligence, Daniel Coleman, Bantam Book, 2006.
- 4. How to win friends and influence people Dale Carnegie
- 5. The Bhagavad-Gita for college students Sandeepa Guntreddy

Bloom's				Peer
Category	Tests	Assignments	Self-Study	Evaluation
Marks (out of 50)	10	15	15	10
Remember	-	-	-	-
Understand	-	-	-	-
Apply	5	5	-	5
Analyse	-	-	5	-
Evaluate	-	-	-	
Create	5	10	10	5

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

<b>Bloom's Category</b>	Questions (50 marks)
Remember	5
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	10

## ENVIRONMENTAL SCIENCE AND AWARENESS

Course Code L: T: P Exam Hours:	: 20HSS423A : 0: 0: 0 : 2	Credits: CIE Marks: SEE Marks:	0 25 25				
<b>Course Outcom</b>	es: At the end of the Course, the Student will be able to						
CO#	COURSE OUTCOME						
20HSS323A.1	Explain the concepts of environment, ecosystem and biod	Explain the concepts of environment, ecosystem and biodiversity.					
20HSS323A.2	Analyze the use of natural resources for sustainability.						
20HSS323A.3	Understand the control measures of Environmental pollut Government and NGO in solving Socio-Environmental is	ion, the role of sues.					
20HSS323A.4	Apply the Environmental ethics, acts and amendments in Environment and human health.	protecting					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19HSS323.1	-	-	-	-	-	3	3	-	-	-	-	-	-	-
19HSS323.2	-	-	-	-	-	3	3	-	-	-	-	3	3	-
19HSS323.3	-	-	-	-	-	3	3	3	-	3	-	3	3	-
19HSS323.4	-	-	-	-	-	3	3	3	-	3	-	3	3	-
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	Cos
1	Introduction to Environment, Ecosystem and biodiversity: Environment - Components of Environment, Scope and importance of Environmental studies, Ecosystem: Types & Structure of Ecosystem, Energy flow in the ecosystem, Food chains – food webs & ecological pyramids. Biodiversity – Definition, Hot-spots of biodiversity, Threats to biodiversity, Conservation of biodiversity.	05	CO1
2	Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems. Role of an individual in conservation of natural resources. Water conservation, rain water harvesting. Balanced use of resources for sustainable lifestyle – strategies.	04	CO2

3	<b>Environmental Pollution:</b> Definition, Causes, effects and control measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise pollution, Thermal Pollution and Nuclear hazards. Role of an individual in prevention of pollution - Waste management – urban and industrial wastes.	04	CO3
4	<b>Social Issues and Environment:</b> Environmental ethics – issues and possible solutions. Environment protection act – Air (prevention and Control of pollution) act & Water (prevention and Control of pollution) act. Role of government: Swatch Bharat Abhiyan, National Mission for Clean Ganga (NMCG), River rejuvenation, Role of Non- governmental Organizations (NGOs), Global warming and climate change.	04	CO3 CO4
5	<b>Human Population and Environment:</b> Population growth & explosion, Family welfare programme. Environment and human health, Human rights, Value education. Role of Technology in protecting environment and human health.	05	CO4

- 1. "Environmental Studies: Basic Concepts" by Ahluwalia, V. K The Energy and Resources Institute (TERI) Publication, 2<sup>nd</sup> edition, 2016, ISBN: 817993571X, 9788179935712.
- "Textbook of Environmental Studies for Undergraduate Courses of all branches of Higher Education" by Bharucha, Erach for UGC, New Delhi, 2004. ISBN: 8173715408, 9788173715402.

## **Reference Books:**

- 1. Digital Design: with an Introduction to Verilog HDL, M Morris Mano and Michael DCiletti, 5th Edition, 2013, Pearson Education
- Handbook of Environmental Engineering by Rao Surampalli, Tian C. Zhang, Satinder Kaur Brar, Krishnamoorthy Hegde, Rama Pulicharla, MausamVerma; McGraw Hill Professional, 2018. ISBN: 125986023X, 9781259860232
- 3. Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
- 4. Environmental Science- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10 <sup>th</sup>Edition ,ISBN: 10: 0534424082

# CIE- Continuous Internal Evaluation (25 Marks).

Bloom's Category	Tests (15 marks)	Assignments (5 marks)	Quizzes (5 marks)
Remember	2	0	0
Understand	5	0	2
Apply	4	2	3
Analyze	4	3	0
Evaluate	0	0	0
Create	0	0	0

Bloom's Category	Questions (25 marks)
Remember	5
Understand	10
Apply	5
Analyze	5
Evaluate	0
Create	0

# INTRODUCTION TO DATA SCIENCE

<b>Course Code</b>	:	20AIM43A	Credits:	3
L: T: P	:	3: 0: 0	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outco	es: At the end of the Course, the Student will be able to				
CO#	OURSE OUTCOME				
20AIM43A.1	Explore predictive modeling techniques with necessary python packages				
20AIM43A.2	pply predictive modeling and descriptive statistics concepts for data preparation				
20AIM43A.3	xamine and use appropriate methods for data wrangling				
20AIM43A.4	spect and submit efficient solution for the given data source as a team.				
20AIM43A.5	repare an effective written documentation about significance of feature selection				
20AIM43A.6	emonstrate Big data tools used for analytics				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM43A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.4	-	-	-	3	3	-	-	-	2	2	-	3	3	-
20AIM43A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	-
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Basic Concepts:</b> Predictive Modeling , Data preparation, Importance of Data preparation , Data Cleaning , Feature selection , Data Transform , Feature selection , Dimensionality reduction, K-fold cross validation , Data Leakage and avoidance measure <b>Python Packages:</b> Numpy , Matplotlib , pandas , scipy , scikit , Data frame , Loading Machine Learning data	9	CO1, CO2
2	<b>Descriptive Statistics:</b> Mean Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map Correlation Statistics – ANOV. <b>Data Preparation:</b> Need for Data Pre-processing, Data Transforms, and Rescale Data Standardize Data, Normalize Data, Binarize Data, Univariate Selection, Recursive Feature Elimination, Principal Component Analysis.	9	CO1, CO2, CO4, CO6

3	<b>Data Cleaning:</b> Basic data cleaning, Outlier Identification and Removal, How to Mark and Remove Missing Data, Statistical Imputation, KNN Imputation, Iterative Imputation. <b>Feature Selection:</b> Statistics for feature selection, Methods for categorical input, Methods for Numerical input, Select Features for Numerical Output, RFE for Feature Selection, Significance of feature selection.	9	CO1, CO3, CO4
4	<b>Data Transforms:</b> Scaling data source, min-max scalar and standard scaler, Scale data with outliers, Encode categorical data, Make Distributions More Gaussian, Approach for Numerical Data Distributions, Deriving new input variables. <b>Dimensionality reduction :</b> Techniques for Dimensionality Reduction , Linear Discriminant Analysis , PCA Dimensionality Reduction , SVD Dimensionality Reduction		CO1, CO3, CO4, CO6
5	<b>Other Transforms:</b> Transform numerical to categorical , Transform Numerical and Categorical Data , Transform the Target in Regression , Save and load thetransformation , case studies for Binary classification, Multi classification and regression		CO1, CO4, CO5, CO6

- 1. Data Preparation for Machine Learning by Jason Brownlee, 2020
- 2. Master Machine Learning Algorithms Discover How They Work and Implement Them From Scratch by Jason Brownlee, 2016.

## **Reference Books:**

Evaluate

Create

1. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers,2016

		/	
Bloom's Category	Tests (25 marks)	Assignments (15 marks)	Quizzes (10 marks)
Remember	5	-	5
Understand	5	-	5
Apply	10	7.5	-
Analyze	5	7.5	-
Evaluate	-	-	-
Create	-	-	-
SEE- Semester End Exa	mination (50Ma	arks)	
Bloom's Category	Questions (5	) marks)	
Remember	10		
Understand	10		
Apply	20		
Analyze	10		

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

# **OBJECT ORIENTED PROGRAMMING USING JAVA**

<b>Course Code</b>	:	20AIM44A	Credits:	3
L: T: P	:	3: 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#	COUR	SE OUTCOME						
20AIM44A.1	Desc	Describe the object oriented concepts of Java						
20AIM44A.2	Apply OOP's concept to implement a given problem using Java.							
20AIM44A.3	Analyze the flow of a program is correct according to OOP's principles							
20 4 13 4 4 4 4	Inves	tigate the concept of Multithreading in concurrent programming available in						
20A11v144A.4	litera	literature and submit report in a team						
20AIM44A.5	A.5 Prepare an effective written documentation about significance of various packages							
20AIM44A.6	Demo	onstrate the web based applications development using java.						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM44A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM44A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM44A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM44A.4	-	-	3	-	3	-	-	-	2	2	-	3	3	2
20AIM44A.5	-	-	3	-	3	-	-	-	-	2	-	3	3	2
20AIM44A.6	3	-	-	-	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 Java:</b> Basics of Java programming - Dissecting the "Hello, World" Program, Compiling and Running a Java Program, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Math class, Arrays in java	9	CO1 CO2
2	<b>Objects and Classes:</b> Working with Objects, Implementing Classes, Object Construction, Static Variables and Methods, Constructors, Overloading Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, this reference, nested classes.	9	CO1, CO2, CO6
3	<b>Inheritance and Polymorphism:</b> Inheritance and types, Super and sub class, Overriding, Polymorphism, Dynamic binding, Casting objects, Instance of operator, Abstract class, Interface, Package, Object class	9	CO1, CO2, CO6

4	<ul> <li>Exception Handling: Exception Types, Uncaught Exceptions, using try and catch, Multi catch clauses, Nested try statements, throw, throws, finally, Java's Built-in Exceptions.</li> <li>Threads: The java Thread Model, The main Thread,</li> </ul>	9	CO1, CO2, CO3, CO4, CO6
	Creating a Thread, Creating multiple Threads, Thread Priorities, Synchronization, Inter thread Communication, Suspending, resuming and Stopping Threads, using Multithreading.		
5	<b>I/O basics:</b> Reading input, writing output, Reading and Writing files <b>The Collections Framework:</b> Collections Overview, The Collection Interfaces- The List Interface, The Set Interface, The Queue Interface, The Collection Classes – Array List Class, Linked List Class, Tree set Class	9	CO1, CO2, CO5, CO6

- 1. Herbert Schildt, Java<sup>TM</sup>: The Complete Reference, McGraw-Hill, Tenth Edition, 2018
- 2. Cay S.Horstmann, Core Java®SE9fortheImpatient, Addison Wesley, Second Edition, 2018

## **Reference Books:**

- 1. Cay S. Horstmann, Core Java<sup>™</sup> Volume I—Fundamentals, Prentice Hall, Tenth Edition,2015
- 2. Rogers Cedenhead and Leura, Lemay SAMS teach yourself Java- 2, 3rd Edition by Pub. Pearson Education, 2004
- 3. Ken Kousen, Modern Java Recipes, O'Reilly Media, Inc., 2017

# CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignments (15 marks)	Quizzes (10 marks)
Remember	-	-	5
Understand	10	-	5
Apply	10	7.5	-
Analyze	5	7.5	-
Evaluate	-	-	-
Create	-	-	-

SEE-	Semester	End	Examination	(50Marks)
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<b>Bloom's Category</b>	Questions (50 marks)
Remember	-
Understand	10
Apply	30
Analyze	10
Evaluate	-
Create	-

# DATABASE MANAGAEMENT SYSTEM

<b>Course Code</b>	:	20AIM45A	Credits:	3
L: T: P	:	3: 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
20AIM45A.1	Descri	be the concepts of DataBase Management Systems
20AIM45A.2	Analyse the various database concepts using ER diagram	
20AIM45A.3	Make u	use of Relational Database techniques for solving real world problems
20AIM45A.4	Constr	uct database for the structured data by applying normalization techniques
20AIM45A.5	Design	database for the unstructured data with effective documentation report as a team
20AIM45A.6	Demor	strate the databases used for big data

Mapping of C	Mapping of Course Outcomes to Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM45A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.3	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.4	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.5	3	-	-	-	3	-	-	-	3	3	-	3	3	2
20AIM45A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	2
C	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	Introduction to Databases: Definition of database, DBMS; Characteristics of Database approach; Advantages of using DBMS approach; when not to use a DBMS Database Concept and Architecture: Data models, schemas and instances; Data Abstraction; Three-schema architecture and data independence; Components of a DBMS - Database Designer- Database Administrator - Database Users. Introduction to Entity-Relationship Model: Entity Types, Attributes and Keys; Relationship types, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two; Reduction of an E-R schema to relational Tables	10	CO1, CO2

2			[]
2	Introduction to Logical Design and Relational Model: Domains, Attributes, Tuples, and Relations; Relational Model Constraints; Relational Database Schemas; <b>SQL-1</b> : Overview of SQL language; SQL Data Definition and Data	10	CO1, CO3
	Types; Schema change statements in SQL; Enforcing basic constraints in SQL: Basic structure of SQL queries		
	Joins; Logical connectives - AND, OR and NOT; Addition		
	basic operations ; Set operations; Aggregate function;		
	Comparisons Involving NULL and Three-Valued Logic;		
	SQL modification language; Select, Delete, Update clause		
3	<b>SQL -2:</b> Introduction to Nested Queries; Correlated Nested Queries; Introduction to Views: creation, implementation, update of views; Introduction to Assertion and Trigger	7	CO1, CO2, CO3
4	Index Structures: Indexes on Sequential Files: dense,		
	sparse index; multilevel indexing; Hash Based Indexing:		
	Static Hashing and dynamic hashing. Database		
	<b>Refinement:</b> Informal Design Guidelines for Relation		CO1,
	Schemas; Functional Dependencies; Normalization on Relational Data Rescul NE 2NE 2NE RCNE: Transaction	9	CO2,
	Management: The ACID Properties: Transactions and		CO4
	Schedules		
5	<b>NOSOL Databases:</b> What is NoSOL, Need of NOSOL.		
	Features OF NOSQL, CAP Theorem, ACID v/s BASE,		
	Advantages & Disadvantages of NOSQL, Types of		
	NOSQL: Key-Value database- Document-based database-		
	Column-based database- Graph based database.		CO1.
	Introduction to Cassandra: Architecture, Gossip protocol,	9	CO5,
	Snitches, Virtual Nodes, write consistency level and write		CO6
	process, read consistency level and read data operation,		
	indexing, compaction, Anti-entropy, Tomostones		

- 1. Ramez Elmasri and Shamkant B. Navathe: Fundamentals of Database Systems, 7th Edition, Pearson, 2016.
- 2. Abraham Silberschatz , Henry F. Korth , S. Sudarshan," Database System Concepts", 6th Edition,McGrawHill, 2011
- 3. Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled", Pearson education Inc, Nov 2014

## **Reference Books:**

- 1. Johannes Gehrke, Raghu Ramakrishnan, Database Management Systems 3rd Edition, McGraw Hill Education,2014.
- 2. Shashank Tiwari, "Professional NoSQL", John Wiley & Sons, Inc, 2011

# CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 marks)	Assignments (15 marks)	Quizzes (10 marks)
Remember	5	-	-
Understand	5	-	5
Apply	10	7.5	5
Analyze	5	7.5	-
Evaluate	-	-	-
Create	-	-	-

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

# **OBJECT ORIENTED PROGRAMMING USING JAVA LAB**

<b>Course Code</b>	:	20AIL46A	Credits:	2
L: T: P	:	0: 0: 2	<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	SE OUTCOME
20AIL46A.1	Apply	OOP concepts with basic Java constructs to solve the given problem.
20AIL46A.2	Analy	ze the output for the programs in Java.
20AIL46A.3	Condu	act experiments as individual by using modern tools like JDK
20AIL46A.4	Prepa	re an effective report based on experiments

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL46A.1	-	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIL46A.2	3	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIL46A.3	-	3	-	-	-	-	-	-	3	-	-	3	3	2
20AIL46A.4	-	-	-	-	-	-	-	-	3	3	-	-	3	2
(	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Ex. No	Experiments	Hours	COs
1.	Write a Java Program to demonstrate math class and arrays		CO1
2.	Write a Java Program to define a class, describe its		CO2
	constructor, overload the Constructors and instantiate its	4	CO3
	object, and use static members.		CO4
3.	Write a Java program to demonstrate String class, String		CO1
	Buffer class and its Methods		CO2
4.	Write a Java program to demonstrate nested classes and		CO3
	array of objects	4	CO4
5.	Write a Java Program to implement inheritance and		
	demonstrate use of method overriding		CO1
6.	Write a Java Program to implement multilevel inheritance		CO2
	by applying various access controls to its data members	4	CO3
	and methods		CO4
7.	Write a program to demonstrate use of implementing		CO1
	interfaces	4	CO2
8.	Write a program to demonstrate use of extending	4	CO3
	interfaces		CO4
9	Write a Java program to implement the concept of importing		
	classes from user defined package and creating packages		CO1
	Write a Java Program to demonstrate dynamic binding	4	
	generic programming		CO3
	Berner Leebermung		

10.	Write a program to implement the concept of threading by extending Thread Class		CO4
11.	Write a program to implement the concept of threading by implementing Runnable Interface		
12.	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints .If the value is odd, the third thread will print the value of cube of the number	4	CO1 CO2 CO3 CO4
13.	Write a program to implement the concept to of Exception Handling using pre-defined exception	4	CO1 CO2
14.	Write a program to implement the concept of Exception Handling by creating user defined exceptions		CO3 CO4
15.	<ul> <li>a) Write a program to demonstrate File I/O Operations</li> <li>b) Write a program to demonstrate Array List Class, Linked List Class, Tree set Class</li> </ul>	2	CO1 CO2 CO3 CO4

- 1. Herbert Schildt, Java<sup>TM</sup>: The Complete Reference, McGraw-Hill, Tenth Edition, 2018
- 2. Cay S. Horstmann, Core Java® SE 9 for the Impatient, Addison Wesley, Second Edition, 2018

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

Bloom's Category	Tests (25 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-
SEE Someston End Even	vination (25Monka)

Bloom's Category	Questions (50 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

# DATABASE MAGAGEMENT SYSTEM LAB

<b>Course Code</b>	:	20AIL47A	Credits:	2
L: T: P	:	0: 0: 2	<b>CIE Marks:</b>	25
Exam Hours:	:	3	SEE Marks:	25
Course Outcon	105	At the end of the Course, the Student will be able to		

Course Oute	Tes. At the end of the Course, the Student will be able to	
CO#	COURSE OUTCOME	
20AIL47A.1	Apply database management techniques to solve the problem	
20AIL47A.2	Analyse database for the given problem	
20AIL47A.3	Conduct experiments as individual by using MySQL/Oracle	
20AIL47A.4	Make an effective report based on experiments	

Mapping of (	Course	e Outo	comes	to Pro	ogram	o Outco	omes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL47A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL47A.2	1	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL47A.3	1	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIL47A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
(	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Ex. No	Experiments	Hours	COs
1.	Draw E-R diagram and convert entities and relationshipsto relation table for a given scenario. a. Two assignments shall be carried out i.e. consider twodifferent scenarios (eg. bank, college)	3	CO1,CO2, CO3,, CO4
2.	<ul> <li>Write relational algebra queries</li> <li>a. Viewing all databases, Creating a Database,</li> <li>b. Viewing all Tables in a Database,</li> <li>c. Creating Tables (With and Without Constraints),</li> <li>d. Inserting/Updating/Deleting</li> <li>e. Records in a Table, Saving (Commit) and Undoing(rollback)</li> </ul>	3	CO1, CO2, CO3,CO4
3.	<ul> <li>Write relational algebra queries</li> <li>a. Altering a Table,</li> <li>b. Dropping/Truncating/Renaming Tables,</li> <li>c. Backing up / Restoring a Database.</li> </ul>	3	CO1, CO2, CO3,CO4
4.	Consider the following database for student enrolment forcourse: STUDENT (snum: integer, sname: string, major: string,level: string, age: integer) CLASS (name: string, meets at: time, room: string, fid:integer) ENROLLED (snum: integer, cname: string) FACULTY (fid: integer, fname: string, deptid: integer) The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two	3	CO1, CO2, CO3,CO4

character code with 4 different values (example	: Junior: JR	
etc)		
Write the following queries in SOL. No duplic	cates	
should be printed in any of the answers.		
i Find the names of all Juniors (level = IF	R) who are	
enrolled in a class taught by	() who are	
ii. Find the names of all classes that either me	et in room	
R128 or have five or more Students enrolled		
iii Find the names of all students who are and	llad in two	
allosses that most at the same time		
iv Find the names of faculty members who tas	ch in avory	
room in which some class is tought	ch ni every	
Find the names of feaulty members for	whom the	
v. Find the names of faculty members for	whom the	
there fine	each is less	
unan nive.	allod in any	
vi. Find the names of students who are not enro	oned in any	
Class.	to find the	
vii. For each age value that appears in Studen	its, find the	
level value that appears most often. For example	ple, if there	
are more FR, level students aged 18 than SR,	JR, or SO	
students aged 18, you should print the pair (18,	$\frac{FR}{1}$	
5. Consider the following database that keeps trac	ck of airline	
flight information:	1. /	
FLIGHIS (fino: integer, from: string, to: strin	g, distance:	
integer, departs: time, arrives: time, price: integ	er)	
AIRCRAFT (ald: integer, aname: string, cru	isingrange:	
CEDTIFIED (sid: integer sid: integer)		
EMPLOYEE (aid: integer, and integer)	r integer)	
Note that the Employees relation describes pile	ts and other	
kinds of amployees as well: Every pilot is certif	is and other	
for some aircraft, and only pilots are certified to	fly	
Write each of the following queries in SOI	ily.	
i Find the names of aircraft such that all pilots	certified to	
operate them have solaries more than Rs 80,000		
ii. For each pilot who is certified for more than	three 2	CO1, CO2
aircrafts find the aid and the maximum cruising	tince 5	CO2, CO3 CO4
the aircraft for which she or he is cortified	g range or	003,004
iii Find the names of pilots whose salary is h	ass than the	
ni. That the hames of phots whose salary is for	rankfurt	
iv For all aircraft with cruising range over 100	Mrs find	
the name of the aircraft and the average salary	of all pilots	
certified for this aircraft		
v Find the names of nilots cartified for so	me Boeing	
v. Find the names of phots certified for sol	ne boeing	
vi Find the aids of all aircraft that can be use	d on routes	
from Bengaluru to New Dalbi		
vii A customer wants to travel from Madis	on to New	
York with no more than two changes of flig	ht List the	
FOR whith no more than two changes of mg		I

	choice of departure times from Madison if the customer		
	viji Print the name and salary of every non-pilot whose		
	salary is more than the average salary for pilots.		
6.	Consider the following relations for an Order Processing		
01	database application in a company.		
	CUSTOMER (CUST #: int. cname: String. city: String)		
	ORDER (order #: int. odate: date. cust #: int. ord-Amt:		
	int)ITEM (item #: int. unit-price: int)		
	ORDER-ITEM (order #: int, item #: int, qty: int)		
	WAREHOUSE (warehouse #: int, city: String)		
	SHIPMENT (order #: int, warehouse #: int, ship-date:		
	date)		CO1
	i. Create the above tables by properly specifying the	3	CO2,
	primary keys and the foreign keys and the foreign keys.		CO3,CO4
	ii. Enter at least five tuples for each relation.		
	iii. Produce a listing: CUSTNAME, #of orders,		
	AVG_ORDER_AMT, where the middle column is the		
	total numbers of orders by the customer and the last column		
	is the average order amount for that customer.		
	iv. List the order# for orders that were shipped from all		
	warehouses that the company has in a specific city.		
	v. Demonstrate how you delete item# 10 from the ITEM		
	table and make that field null in the ORDER_ITEM table.		
7.	The following tables are maintained by a book dealer:		
	AUTHOR(author-id: int, name: String, city:		
	DUDI ISUED (nublichen id. int. nome). String, eitu		
	String country: String)		
	CATALOG (book-id: int_title: String_author-id: int		
	publisher-id: int_category-id: int_year: int_price: int)		
	CATEGORY(category-id: int, description: String)		
	ORDER-DETAILS(order-no: int, book-id: int, quantity:		CO1,
	int)	3	CO2,
	i. Create the above tables by properly specifying the		C03,C04
	primary keys and the foreign keys.		
	ii. Enter at least five tuples for each relation.		
	iii. Give the details of the authors who have 2 or more		
	books in the catalog and the price of the books in the catalog		
	and the year of publication is after 2000.		
	iv. Find the author of the book, which has maximum sales.		
	v. Demonstrate how you increase the price of books		
	published by a specific publisher by 10%.		

8.	Consider the following database of student enrollment		
	incourses and books adopted for each course.		
	STUDENT (regno: String, name: String, major: String,		
	bdate: date)	2	CO1,
	COURSE (course #: int, cname: String, dept: String)	3	CO2,
	ENROLL (regno: String, cname: String, sem: int,		003,004
	marks:int)		
	BOOK ADOPTION (course #: int, sem: int, book-		
	ISBN:int)		
	TEXT(book-ISBN:int, book-title:String, publisher:String,		
	author:String)		
	i. Create the above tables by properly specifying the		
	primary keys and the foreign keys		
	ii Enter at least five tuples for each relation		
	iii Demonstrate how you add a new textbook to the		
	database and make this book be adopted by some		
	department		
	iv Produce a list of textbooks (include Course # Book-		
	ISBN Book title) in the alphabetical order for courses		
	offered by the 'AIMI' department that use more than two		
	books		
	v List any department that has all its adopted books.		
	v. List any department that has an its adopted books		
0	Consider the scheme for Movie Detabase:		
9.	ACTOP(Act id Act Name Act Conder)		
	DIRECTOR(Dir id Dir Name Dir Phone)		
	MOVIES(Mov id Mov Title Mov Vear Mov Lang		
	Dir id)		
	MOVIE CAST(Act id Mov id Role)		
	RATING(Mov id Rev Stars)		
	Write SOL queries to		
	i. List the titles of all movies directed by 'Hitchcock'		CO1.
	i. Find the movie names where one or more actors	3	CO2,
	II. Find the movie names where one of more actors		CO3,CO4
	iii. List all actors who acted in a movie before 2000 and in		
	a movie after 2015 (use IOIN operation)		
	iv Find the title of movies and number of stars for each		
	movie that has at least one rating and find the highest		
	number of stars that movie received Sort the result by		
	movie title		
	y Undate rating of all movies directed by 'Steven		
	Spielberg' to 5		
10	Consider the scheme for College Database:		
10.	STUDENT(USN SName Address Phone Gender)		
	SFMSEC(SSID Sem Sec)		
	CLASS(USN_SSID)		
	SUDIECT(Subanda Titla Sam Cradita)		
	IAMARKS(USN Subcode SSID Test1 Test2 Test2		

<ul> <li>FinalIA)</li> <li>Write SQL queries to <ol> <li>List all the student details studying in fourth</li> <li>semester'C' section.</li> <li>Compute the total number of male and female students in each semester and in each section.</li> <li>Create a view of Test1 marks of student USN '1NH20AI101' in all subjects.</li> <li>Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.</li> </ol> </li> </ul>	3	CO1, CO2, CO3,CO4
If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C- section students.		

- 1. Ramez Elmasri and Shamkant B. Navathe: Fundamentals of Database Systems, 7th Edition, Pearson, 2016.
- 2. Abraham Silberschatz , Henry F. Korth , S. Sudarshan," Database System Concepts", 6th Edition,McGrawHill, 2011

<b>Bloom's Category</b>	Tests
	(25 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

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

<b>Bloom's Category</b>	Questions (50 marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

## MINI PROJECT - II

Course Code	:	20AIL48A	Credits:	2
L: T: P	:	0: 0: 2	CIE Marks: 2	5
Exam Hours:	:	3	SEE Marks: 2	5

Course Outco	mes: At the end of the Course, the Student will be able to	
CO#	COURSE OUTCOME	O# COUR
20AIL48A.1	Illustrate the technological needs and/ or societal needs and sustainability of the environment	OAIL48A.1 Illustra
20AIL48A.2	Design application using high level language	OAIL48A.2 Design
20AIL48A.3	Analyse and evaluate the outcome of the project	OAIL48A.3 Analys
20AIL48A.4	Test, validate and communicate the identified solutions in a structured way.	OAIL48A.4 Test, v

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL48A.1	-	-	-	-	-	3	2	3	-	-	-	3	3	2
20AIL48A.2	-	-	3	-	3	-	-	-	-	-	-	3	3	2
20AIL48A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL48A.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 thecourse 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 teamwill submit a project report, which will be evaluate by duly appointed examiner(s).

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

<b>Bloom's Category</b>	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	-

	V SEMESTER											
	C			Credit Distribution					t		Ma	arks
S.No	Course Code	Course	BOS	L	Т	Р	S	Overal Credits	Contac 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	20AIM55XA	Professional Elective- II	AI&ML	3	0	0	0	3	4	50	50	100
6	20AIM56A	Design 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
	Total 24 34 375 37						375	750				

S. NO	COURSE CODE	PROFESSIONAL ELECTIVE-1	S. NO	COURSE CODE	PROFESSION AL 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 OUTCOME (Student will be able to)					
20AIM51A.1	Apply the basic principles of Machine learning					
20AIM51A.2	Analyze and formulate the Machine Learning concepts					
20AIM51A.3	Design a model using supervised/unsupervised machine learning algorithms for classification/prediction/clustering					
20AIM51A.4	Evaluate performance of various machine learning algorithms on various data sets of a domain.					
20AIM51A.5	Use python/R for implementing machine learning algorithms to solve a given problem.					

Mapping of Course Outcomes to Program Outcomes														
	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	Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	<b>Introduction:</b> 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	9	CO1 CO3
	Measurement (Nominal, Ordinal, Interval, Ratio), Concept of Feature, Feature construction, Feature Selection and Transformation, Curse of Dimensionality. Linear discriminant Analysis (LDA).		
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 va. One va. Beat	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 regression coefficients. Multivariate Regression: Model Representation. Naïve Bayes Classifier. K-Nearest Neighbour for Classification. Over fitting and Under fitting, Bias and Variance	9	CO2, CO3 CO5

4	<b>Unsupervised learning :</b> 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 Category	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## **OPERATING SYSTEM**

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

Course Outco	nes: At the end of the Course, the Student will be	e 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	n includes process scheduling
	algorithms.	
20AIM52A 3	Evaluate the problems related to concurrency, different sy	nchronization mechanisms
20AIN152A.5	and deadlock handling.	
20AIM52A.4	Compare and contrast various memory management techn	niques.
20AIM52A.5	Evaluate the various file implementation techniques.	

Mapping of Course Outcomes to Program Outcomes														
	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
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	Introduction and Operating System Services: 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; Process Scheduling – Scheduling Queues, Schedulers, Context Switch; Operation; Operation on Process; Inter-Process Communication – Shared-Memory System, Message Passing System.</li> <li>CPU Scheduling: Basic Concepts, CPU-I/O Burst Cycle; CPUScheduler – Pre- emptive Scheduling, Dispatcher; Scheduling</li> <li>Criteria; Scheduling Algorithms – FCFS Scheduling, SJFScheduling, Round-Robin Scheduling, Priority Scheduling. Synchronization: The</li> </ul>	9	CO2 CO3

3	<ul> <li>Process Synchronization: Background, The Critical Section</li> <li>Problem, Peterson's solution; Synchronization Hardware;</li> <li>Locks; Semaphores –Semaphore Usage, Semaphore Implementation,</li> <li>Deadlock and Starvation.</li> <li>Classical Problems of Synchronization – The Reader- Writer Problem,</li> <li>Dining-Philosopher Problem.</li> <li>Deadlocks: System Model; Deadlock Characterization –</li> <li>Necessary Conditions, Resource-Allocation Graph; Methods for</li> <li>Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance;</li> <li>Deadlock Detection and Recovery.</li> </ul>	10	CO3
4	Memory Management:Main Memory: Background; Swapping; Contiguous MemoryAllocation-MemoryProtection, Memory Allocation,Fragmentation; Paging – Basic Method, Hardware Support,Protection; Structure of Page Table – Hierarchical Paging, Hash- PageTable; Segmentation – Basic Method, Segmentation Hardware.Virtual Memory: Background; Demand Paging; Page Replacement –Basic Page Replacement – FIFO PageReplacement, Optimal Page Replacement, LRU Page Replacement;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; Implementation: Overview, Partitions and Mounting, DirectoryImplementation – Linear List, Hash Table; Allocation Methods –Contiguous Allocation, Linked Allocation, Indexed Allocation; 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> <li>Process Synchronization: Background; The Critical Section Problem; Peterson's Solution; Synchronization Hardware; Mutex</li> </ul>	8	CO4 CO5

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	-

# **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>	mes: 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
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.

## 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	-

# 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	es: At the end of the Course, the Student will be able to:				
CO#	COURSE OUTCOME				
2011.0561	Apply the algorithms to solve complex problems by determining various				
20AINI30A.1	design techniques				
20AIM56A.2	Identify appropriate algorithms to assess and formulate solution				
20AIM56A.3	Design a strategy to solve graph and knapsack Problems				
20AIM56A.4	Develop a design technique to solve searching and sorting problems				
20AIM56A.5	Apply backtracking 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	INTRODUCTION TO ALGORITHMS & GROWTH OF FUNCTIONS 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	CO1
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 Pathalgorithm – 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	<b>DECREASE &amp; CONQUER, TRANSFORM &amp; CONQUER</b> <b>DECREASE &amp; CONQUER:</b> Introduction – Decrease by constant, decrease by constant factor, variable size decrease, Breadth First search traversal, Depth First search traversal, Topological sorting <b>TRANSFORM &amp; CONQUER:</b> Introduction, Balanced Search trees – AVL trees & 2-3 trees, Red Black Trees	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 andNP- 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, PEARSONEducation

## **Reference Books:**

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

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	_	
# MACHINE LEARNING LABORATORY

Course Code L: T: P: Exam Hours:	: S: : :	20AIL57A 0: 0: 2:0: 3	Credits : CIE Marks: SEE Marks:	2 25 25		
Course Outcomes: 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 Java/Python programs for various Learning algorithms.

20AIL57A.3 Analyze and apply the appropriate data sets for Machine Learning algorithms.

20AIL57A.4 Identify and apply Machine Learning algorithms to solve real world problems.

### Mapping of Course Outcomes to Program Outcomes

3

	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,
2.	Develop a Support Vector Machine model considering a Sample Dataset and evaluate the model.	4	CO4 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	C01, C02, C03, C04
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. Andreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guidefor DataScientists", Shroff/O'Reilly, 2016

### **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	-

# DESIGN AND ANALYSIS OF ALGORITHM LABORATORY

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

<b>Course Outco</b>	omes: At t	he end of the Course, the Student will be able to			
CO#	COURSE OUTCOME				
20AIL58A.1	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, 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	СО
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)

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	-

### MINI PROJECT -III

Course Code L: T: P: Exam Hours	e : S: ::	: 20AIM59A : 0: 0: 2:0: : 3	Credits: CIE Marks: SEE Marks:	2 25 25
<b>Course Out</b>	comes:	At the end of the Course, the Student will be able to		
CO#	COUR	SEOUTCOME		

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 RETRIEVAL

(	Course Code	: 20AIM541A	Credits:	3
I	L: T: P:S:	: 3: 0: 0:0:	<b>CIE Marks:</b>	50
I	Exam Hours:	: 3	SEE Marks:	50
	Course Outcomes	s: At the end of the Course, the Student will be able to		
	CO#			
	20AIM541A.1			

20/11/13/11/1.1	Charistand and apply the concept of information fettle var
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														
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
20AIM541A.1	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, Latentsemantic indexing, neural networks, Fuzzy set retrieval Retrieval utilities: Relevance feedback, Cluster Hypothesis, Clustering Algorithms: Single PassAlgorithm, Single Link Algorithm.	9	CO1 CO2
3	Performance evaluation: Precision and recall, MRR, F-Score, NDCG, user oriented measures, cross fold evaluation. Visualisation in Information System: Starting points, document context, User relevance judgement, Interface support for search process.	9	CO3 CO4
4	Distributed IR: Introduction, Collection Partitioning, Source Selection Query Processing, web issues. MULTIMEDIA IR: Introduction, Data Modeling, Query languages, Generic multimedia indexing approach, One 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
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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	-	-	-	-	-

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

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:	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				
20AIM542A.1	dentify 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	Illustrate 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

mapping of 00														
	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, thermosemf sensors, thermal radiation sensors, Quartz crystal thermoelectric sensors, Spectroscopic thermometry, noise thermometry, heat flux sensors. Magnetic sensors: Introduction, Sensors and principles, magneto resistive 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.	9	CO2 CO3

4	Fundamental IoT Mechanism and Key Technologies: -Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. 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.	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'sTestsCategory(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 Category	Tests
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

# THEORY OF COMPUTATION

Course Code L: T: P: S: Exam Hours:	: 20AIM543A : 3: 0: 0:0: : 3	Credits : CIE Marks: SEE Marks:	3 50 50							
Course Outcome	Course Outcomes: 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 la	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 lan	nguage								
20AIM543A.4	20AIM543A.4 Design push down automata and the equivalent context free grammars and Design Turing machine.									
20AIM543A.5	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													
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 & rightmost 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, Acceptanceof push down automata, Push down automata and context free language, Turing machine model, Representation of Turing Machine, Construction of Turing Machine for simple problem's, Universal Turing machine and other modifications .Church's Hypothesis, , Halting problem of Turing Machine	9	CO3 CO4
5	Computability: Introduction and Basic concepts, Recursive function, Partialrecursive 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<sup>nd</sup> 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	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:	CIE Marks:	50
Exam Hours:	: 3	SEE Marks:	50

Course Outcome	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

mupping of course outcomes to regram 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, Program flow mechanisms: Control-flow .vs. Data flow computers Principle of pipelining and vector processing: principles of 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, Array Processing.	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-Level 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 Scheduling Emulations among Architectures, Distributed Shared Memory, Data Storage Input, and Output, Multithreading and Latency Hiding, Parallel I/ Technology, Defect-Level Methods, Fault-Level Methods, Error-Lev Methods, Parallel 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-Parall 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	-	-	-	-	-

<b>SEE- Semester End</b>	Examination	(50Marks)
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Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

# SPEECH SYNTHESIS AND RECOGNITION

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

<b>Course Outcome</b>	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

mapping of 00														
	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", PearsonEducation, 2003.
- 2. Daniel Jurafsky and James H Martin, "Speech and Language Processing An Introduction toNatural 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", CaliforniaTechnical Publishing
- 2. Thomas F Quatieri, "Discrete-Time Speech Signal Processing Principles and Practice", PearsonEducation.

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	-

# **EMBEDDED SYSTEMS**

<b>Course Code</b>	: 20AIM55	ČZA Cr	edits :	3
L: T: P: S:	: 3: 0: 0	0: 0: CI	E Marks:	50 50
Exam Hours:	: 3	SE	LE Marks:	50

<b>Course Outcome</b>	At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
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 usingISA, PCI, PCI-X and advanced buses, Internet enabled systems network 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, Direct memory access, Device driver programming.	9	CO2 CO3 CO4
4	<b>Real-time operating systems:</b> OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS taskscheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues. Introduction to embedded software development process and tools, Host and target machines, Linking and location software.	9	CO3 CO4
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	9	CO3 CO5

]	Laboratory Tools, An Example System.	

- 1. Raj Kamal, "Embedded Systems: Architecture, Programming, and Design" 2nd / 3<sup>rd</sup> edition, TataMcGraw 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" 3rdedition, 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	-	-	-	-	-

<b>Bloom's Category</b>	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: CIE Mai	rks: 50								
Exam Hours:	: 3 SEE Man	rks: 50								
Course Outcomes: At the end of the Course, the Student will be able to:										
CO# COURSE OUTCOME										
20AIM553A.1	Apply software engineering principles in real life projects	Apply software 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 pro of an SRS document										
20AIM553A.4	AIM553A.4 Interpret mathematical models for calculating the size, cost and duration of real life projects									
20AIM553A.5 Use latest tools in software engineering to test the developed system using different testing techniques										

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	Hours	COs
1	Introduction: The Software And Software Engineering Problem, Approachand 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. Jalote Pankaj: 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	-	-	-	-	-	-	-	-	3	2
20AIM554A.4	-	-	-	3	-	-	-	-	-	-	-	-	3	2
20AIM554A.5	-	-	-	3	2	-	-	-	-	-	-	-	3	2
Correl	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, message 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	<b>Pretty Good Privacy</b> 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											
					Cred	it Dictrib	ution				Ν	larks
S.No	Course	Course	BOS		Creu			erall dits	tact ars	CIE	SEE	Total
	Cout			L	Т	Р	S	Ove Cre	Con Hoi		SEE	10181
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	100
6	20AIM65XA	Professional Elective - IV	AI&ML	3	0	0	0	3	4	50	50	100
7	20AIL66A	Deep Learning Laboratory	AI&ML	0	0	2	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
	Total								34	375	375	750

	Professional Elective - III	Open Elective - I						
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	Professional Elective - IVNHOP07SAP					
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			

# **DEEP LEARNING TECHNIQUES**

Course Code	: 20AIM61A	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 o	f the Course, the Student will be able to:						
CO#	<b>COURSE OUTCOME</b>	OURSE 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 n	nodels in Tensor Flow and interpret the results						
20AIM61A.4	Design convolutional ne	ural networks, training deep networks and high-level interfaces						
20AIM61A.5	Use the language and fu problems.	ndamental 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	-	-	-	I	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.

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	-

# 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

<b>Course Outco</b>	mes:	At the end of the Course, the Student will be able to:						
CO#	COURSE	DUTCOME						
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 eff network etc	ectively the various visualization structures (like tables, spatial data, tree and .)						
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	-	-	-	-	-	-	-	3	2
20AIM62A.4	-	-	3	-	-	-	-	-	-	-	-	-	3	3
20AIM62A.5	-	-	-	3	3	I	-	I	-	-	I	-	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 – Changingviewpoint – 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

1. 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.
- 2. Nathan Yau, Visualize This: The FlowingData Guide to Design, Visualization and Statistics, John Wiley & Sons, 2011.

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	-

# **ARTIFICIAL INTELLIGENCE**

<b>Course Code</b>	: 20AIM63A	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>	mes:	At the end of the Course, the Student will be able to:						
CO#	COUR	<b>COURSE OUTCOME</b>						
20AIM63A.1	Apply t intellig	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) 2-Moderate(Medium) 3-Substantial(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

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	-

# **DEEP LEARNING LABORATORY**

Course Code L: T: P: S Exam Hours:	: 20AIL66A S: : 0: 0: 2:0: : 3	Credits : CIE Marks: SEE Marks:	2 25 25					
Course Outcomes: At the end of the Course, the Student will be able to:								
CO#	COURSE OUTCOME							
20AIM66A.1	Apply the various deep learning algorithms in Python.							
20AIM66A.2	Analyze and improve deep learning models							
20AIM66A.3	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

9.	Network Visualization: Saliency maps, Class Visualization	4	CO1 CO2 CO3 CO4
10.	Generative Adversarial Networks	4	CO1 CO2 CO3 CO4
11.	Chatbot using bi-directional LSTMs	4	CO1 CO2 CO3 CO4
12.	Familiarization of cloud based computing like Google colab	4	CO1 CO2 CO3 CO4

- 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	-

Bloom's Category	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:	CIE Marks:	25
Exam Hours:	: 3	SEE Marks:	25

Course Outcome	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	CO1
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

 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 Flowing Data Guide to Design, Visualization and Statistics, JohnWiley & Sons, 2011.

CIE- Commuous Interna	CIE- Continuous Internal Evaluation (25 Marks)				
Bloom's Category	Review (25marks)				
Remember	-				
Understand	-				
Apply	10				
Analyze	10				
Evaluate	5				
Create	-				

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

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

# MINI PROJECT - IV

Course Code	:	20AIM68A			
L: T: P:S:	:	0:	0:	2: 0:	
Exam Hours:	:	3			

Credits :	2
CIE Marks:	25
SEE Marks:	25

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to					
CO#	COUR	COURSE OUTCOME					
20AIM39.1	Unders	tand the technological needs and/ or societal needs and sustainability of the					
20/11/13/11	enviror	nment					
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-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 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**

Course Code	: 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#	COURSE OUTCOME
20AIM641A.1	Be able to draw a system-level diagram for any biometric system and discuss its components
20AIM641A.2	Be able to solve verification, identification, and synthesis problems for a variety of biometrics such as fingerprint, face, iris, hand gestures and cryptography.
20AIM641A.3	Be able to use the biometrics ingredients of existing system to obtain a given security goal.
20AIM641A.4	Be able to design a biometric solution for a given application
20AIM641A.5	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)														

Module No	Module Contents	Hours	COs
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: Eigenface 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; Privacyconcerns and issues related to biometrics; biometrics with privacy enhancement; soft biometrics; comparison of various biometrics;	9	CO4 CO2 CO3
5	Identity and privacy Multimodal biometrics: basic architecture and 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	CO5
- 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 edition of 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, andRaj Nanavathi, Wiley Eastern, 2002

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)

Bloom's Category	Questions(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	CIE Marks	: 50
Exam Hours	:3	SEE Marks	: 50

<b>Course Outcomes:</b>	At the end of the course, students should be able to
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

## Mapping of Course Outcomes to Program Outcomes

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	PSO1	PSO2		
20AIM642/	4.1	3	3	3	-	-	-	-	-	-	-	-	-	-	3	2		
20AIM642	4.2	3	3	3	-	2	-	-	-	-	-	-					3	2
20AIM642/	4.3	3	3	-	-	-	-	-	-	-	-	-	-	-	3	3		
20AIM642/	4.4	3	2	3	3	-	-	-	-	-	-	-	-	-	3	3		
20AIM642/	4.5	3	3	3	2	-	-	-	-	-	-	-	-	-	3	3		
Module No.			1			Mo	dule (	Conten	its	1	L			H	ours	COs		
1	INTRODUCTION TO SOFT COMPUTINGIntroduction-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.									ms- Ns- elta-		9	CO1, CO2					
2	AR Bac Qua dire	TIFIC k prop ntizati ctional	CIAL N Dagatio Ion -H I, Asso	NEUR n Neu Hammi ociative	AL NI ral Net ng Net e Mem	ETWC tworks eural ory -A	ORKS - Koh Netwo daptiv	onen 1 ork - re Reso	Neural M Hopfiel	Networ d Neu Theory	k -Lear 1ral Ne Neural	ning Ve twork- Network	ctor Bi- ss.		9	CO1, CO2		
3	<ul> <li>FUZZY SYSTEMS</li> <li>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</li> </ul>								9	CO3								
4	GENETIC ALGORITHMS 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 Inference System (ANFIS)- Genetic Neuro-Hybrid Systems-Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems- Simplified Fuzzy ARTMAP- Applications.								9	CO5								

- 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.

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	-	-	-	-	-

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

SEE- Semester End Examination (50Marks)

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

# **COMPILER DESIGN**

Cou	ırse (	Code	:	<b>20</b> A	AIM	543A	
L:	T:	<b>P: S:</b>	:	3:	0:	0:	0:
Exa	am He	ours:	:	3			

Credits:3CIE Marks:50SEE Marks:50

<b>Course Outcon</b>	nes:	At the end of the Course, the Student will be able to:					
CO#	COUR	SE OUTCOME					
20AIM643A.1	Apply t tool.	Apply the concepts of different Parsing techniques and implement the knowledge to Yacc tool.					
20AIM643A.2	Analyse	Analyse the concepts of Compilers and roles of the lexical analyzer.					
20AIM643A.3	Implem	ent the principles of scoping, parameter passing and runtime memory					
20AIM643A 4	Develor	n syntax directed translation schemes					
201 11110 - 51 1	Use the	now code optimization techniques to improve the performance of a program in					
20AIM643A.5	terms of	f 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 flow analysis, Loop invariant computations. Issue in the design of Code generator, register allocation, the target machine, and simple Code generator.	9	CO3, CO5

- 1. Compilers Principles, Techniques and Tools, Alfred V. Aho, Ravi Sethi and Ullman J.D., 2ndedition, 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-Continuo	/IE- Continuous Internai Evaluation (30 Marks)										
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	Questions (50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

# **COMPUTER NETWORK**

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

<b>Course Outcon</b>	s: 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	<sup>1</sup> A.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
Cor	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, NetworkTopologies 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. Multimedia Networking: Internet Telephony, RTP, RTCP, RTSP. Network Security: Principles of Cryptography, Firewalls, Attacks and Countermeasures.	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 Featuringthe 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	Questions
Category	(50 marks)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## AUGMENTED AND VIRTUAL REALITY

Cou	rse (	Code		:	<b>20</b> A	AIM	651A	
L:	T:	P:	S:	:	3:	0:	0:	0:
Exa	m Ho	ours:		:	3			

<b>Course Outcome</b>	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	Introduction to Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality. Multiple Models of Input and Output Interface in Virtual Reality: Input -Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output Visual /Auditory / Haptic Devices	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

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)

<b>Bloom's Category</b>	Questions(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#			COUR	COURSE OUTCOME											
20AIN	/1625A	1	Unders quantiz	stand th	ne basi	cs of	Image	forma	tion an	d tran	sformat	ion usir	ng san	pling and	1
20AIN	/1625A	.2	Apply	Apply compression and coding techniques used for image data											
20AIN	/1625A	3	Analyz	e diffe	rent ty	pes Se	gmenta	ation T	echniq	ues.					
20AIN	/1625A	4	Evalua classifi	Evaluate the trade-offs, and appropriateness of the different feature types and lassification techniques such as Bayesian, maximum-likelihood, etc											
20AIN	/1625A	5	Investi	gate the	e natur	e and in	nheren	t diffic	ulties	of the	pattern 1	recognit	ion pr	oblems	
Mapping	g of Co	urse	Outcom	es to Pr	ogram	Outco	mes						-		
		POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	2 PSO1	PSO2
20AIM6	25A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM6	25A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
20AIM6	25A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM0	25A.4	3	-	-	3	3	-	-	-	-	-	-	3	3	3
ZUAINIO	23A.3	-	- Correlat	י ס leve	- 5 els: 1-9	- Slight(I	- .0W)	- 2-Mode	- erate(M	2 (edium)	- 2 3-Subs	- tantial(H	j (igh)	3	3
Module			contena		<b>210.</b> I C	Jingin (L		2 11104	orace(11)	ourum)	5 5465	unnun(1)	<u>.</u>		
No					1	Modul	e Cont	tents						Hours	COs
	Intro	ducti	on to Iı	nage l	Proces	sing:	Image	forma	tion, in	mage	geometr	vperspe	ective		
1	and of	ther t	ransform	nation,	stered	o imag	ing ele	ements	of vis	ualper	ception	. Digita	1	0	CO1
1	Image	e-sam	pling an	d quan	tizatio	n seria	1 & pa	rallel I	magep	process	sing.			9	COI
2	Image Restoration: 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									tion age tive and	9	CO1, CO2			
3	3 Segmentation Techniques: 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,								hes, ing, nage ber, orm,	9	CO3, CO4				
	topo	logic	al and te	exture a	nalvsi	s. shap	e matc	hing.		, , ,	0		- ,		
	Patt	ern l	Recogni	tion: E	Basics	of patt	ern red	cogniti	on, De	sign p	rinciple	s of pa	ttern		
	reco	gnitio	on syste	m, Le	arning	and	adapta	tion, I	Pattern	recog	nition	approac	ches,		~~ (
4	Math	nema	tical fou	ndatior	ns – Li	near al	gebra,	Proba	bility T	heory	, Expect	ation, n	nean	9	CO4,
	and	cova	riance, l	Normal	distri	bution	, multi	ivariat	e norm	al den	sities,	Chi squ	ared		005
	test.														
5	<ul> <li>5</li> <li>Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions, Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods – Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation- maximization (EM), Hidden Markov Models</li> </ul>								hods: nsion linear odels	9	CO5				
<u>.</u>		,,			/-										

- 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

Bloom's Category	Tests (25 marks)	Assignment 1 (7.5 Marks)	Assignment 2 (7.5 Marks)	Quiz1 (05 Marks)	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)

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: 5	50
Exam Hours:	: 3	SEE Marks: 5	50

Course (	Course Outcomes: At the end of the Course, the Student will be able to:														
CO#		(	COURS	E OUI	COM	Έ									
20AIM6	53A.	1	Impleme	nt clier	t-serve	er appl	ication	s and T	ICP/IP	socke	t progra	ms			
20AIM6	53A.	2	Analyze developii	the neo	ed for lular a	advan nd effi	ced Ja cient p	va con rogran	cepts ] ns	like en	umerati	ons and	l colle	ctions in	
20AIM6	53A.	3 ]	Design so	olution	s using	g maps	and co	mpara	tors						
20AIM6	53A.	4	Evaluate how services fit into Java-based web application architecture												
20AIM6	20AIM653A 5 Use IDBC API to demonstrate database access and details for managing information														
Mapping	Mapping of Course Outcomes to Program Outcomes														
11 8		PO	1 PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM65	3A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	3
20AIM65	3A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM65	3A.3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
20AIM65	3A.4	-	-	-	3	3	-	-	-	-	-	-	3	3	3
20AIM65	3A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	3
			Correlati	on level	s: 1-S	light(Lo	ow) 2	-Moder	rate(Me	dium)	3-Substa	ntial(Hi	gh)		
Module No					]	Modul	e Cont	ents						Hours	COs
	Java	Net	tworking	: Net	work H	Basics	and So	cket o	verviev	w, TCI	P/IP clie	nt sock	ets,		
	URL	., TC	CP/IP ser	ver soc	kets, I	Datagra	ims, ja	va.net	packag	ge Socl	ket, Ser	ver Socl	ket,	9	CO1
1	Inet	Add	ress, UR	L, URI	L Con	nection	1								
	Enumerations, Autoboxing and Annotations: Enumerations, Enumeration									n					
	fund	ndamentals, the values() and valueOf() Methods, java enumerations are class									SS				
	type	s, ei	enumerations Inherits Enum, example, type wrappers, Autoboxing,										g,		
	Auto	boxi	ing and	Meth	ods,	Autob	oxing/l	Unbox	ing o	ccurs	in Exp	pression	s,		
	Auto	boxi	ing/Unbo	oxing,	Boole	an and	l chara	acter v	values,	Autol	oxing/l	Jnboxin	ıg	9	CO2
2	help	s pro	event er	rors, A	word	l of V	Varning	g. Anı	notatio	ns, Ai	notatio	n basic	s,		
	spec	ifyin	g retenti	ion po	licy, (	Obtain	ing A	nnotati	ions a	t run	time b	y use o	of		
	refle	ctior	n, Annota	ated ele	ement	Interfa	ce								
	The	colle	ections a	nd Fra	mewo	rk : T	he coll	ection	s and H	Framev	vork: Co	ollection	ıs		
	Over	view	v, Rece	nt Ch	anges	to Co	ollectio	ns, Th	ne Col	lection	Interfa	ices, Th	ne		CON
3	Colle	ectio	n Classe	s, Acce	essing	a colle	ction V	/ia an	Iterato	r, Stor	ing Use	r Define	ed	9	$CO_2$ ,
	Clas	ses 1	in Collec	ctions,	The F	kandon	n Acce	ess Int	erface,	Work	ing Wi	th Map	s,		005
	Com	para	tors, The	Collec	ction A	lgorith	ims, W	hy Ge	neric C	Collecti	ons?, T	he legac	сy		
	Clas	ses a	ind Interf	aces, F	arting	Thoug	ghts on	Collec	ctions.						
4	Baci	sgro lot D	unu: Ba	ckgrou	na; 11	a Sorv	5 Cyci lot: Tl	e o a	$vlot \Lambda$	$DI \cdot T$	ang 10 bo Iava	mcat 10	or	0	COA
4	Pack	age.	Reading	Servle	t Para	meter.	The Is	ic Sei	ervlet l	httn na	ckage l	Handlin	σ	9	CO4
	НТТ	iage, ΈRε	equests a	nd Res	nonseg	s Usin		cies. S	ession	Tracki	no Iav	Server	5		
	Раде	s (IS	SP): JSP	JSP T	ags. To	omcat	Reque	est Stri	ng. Us	er Ses	sions. C	Cookies			
	Sess	ion (	Objects			uu,	1.094								
	The	Con	cept of	JDBC	: The	Conce	ept of	JDBC	JDBO	C Driv	er Type	es; JDB	C		1
5	Pack	ages	; A Bri	ef Ov	erview	of th	ne JDI	BC pr	ocess:	Datab	ase Co	nnection	n;		CO4
	Asso	ciati	ing the J	IDBC/	ODBC	Bridg	ge with	the 1	Databa	se; Sta	atement	Object	s;	9	CO5
	Resu	ilt Se	et; <u>T</u> ransa	action I	Proces	sing; N	Ietada	ta, Dat	a types	s; Exce	ptions.	5		,	

- 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:	<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#	COURSE OUTCOME							
20AIM654A.1	Understand the basic concepts and technology used for blockchair	n.						
20AIM654A.2	Develop Ethereum block chain contract.	Develop Ethereum block chain contract.						
20AIM654A.3	Apply security features in blockchain technologies							
20AIM654A.4	Analyze the primitives of the distributed computing and cryptog blockchain.	raphy related to						
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
Correla	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, Modelingfaults and adversaries, Byzantine Generals problem, Consensusalgorithms 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, Bitcoinscripting 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

- 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 (05 Marks)	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)

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

	VII SEMESTER											
	Course				C <mark>redit</mark> I	Distribut	ion	II S	ਸ਼ ,,		Ma	rks
S. No	Code	Course	BOS	L	Т	Р	S	Overa Credit	Contae Hours	CIE	SEE	Total
1	20AIM71A	Cloud Computing	AI&ML	3	0	0	0	3	4	50	50	100
2	20AIM72A	Web Technology	AI&ML	3	0	0	0	3	4	50	50	100
3	20AIM73A	Natural Language processing	AI&ML	3	0	0	0	3	4	50	50	100
4	20AIM74X	Professional Elective - V	AI&ML	3	0	0	0	3	4	50	50	100
5	20AIM75X	Professional Elective - VI	AI&ML	3	0	0	0	3	4	50	50	100
6	20AIM76A	Cloud Computing Laboratory	AI&ML	3	0	0	0	2	4	25	25	50
7	20AIL77A	Web Technology Lab	AI&ML	0	0	2	0	2	4	25	25	50
8	20AIL78A	Project Phase – I	AI&ML	0	0	2	0	2	0	25	25	50
9	20NHOPX X	Open Elective - II	AI&ML	3	0	0	0	3	4	50	50	100
Total		·						24	32	375	375	750

Р	rofessional Elective – V	Open Elective - II			
Course Code	Course	Course Code	Course		
20AIM741A	Recommender System	20NHOP701	Big Data Analytics using HP Vertica-1		
20AIM742A	Streaming Analytics	20NHOP702	VM Ware Virtualization Essentials-1		
20AIM743A	Information Security	20NHOP704	Big Data Analytics using HP Vertica-2		
20AIM744A	Human Computer Interaction	20NHOP707	SAP		

	<b>Professional Elective – VI</b>		
20AIM751A	Quantum Computing	20NHOP708	Schneider-Industrial Automation
20AIM752A	Software Testing	20NHOP709	CISCO-Routing and Switching-1
20AIM753A	Social Network Analysis	20NHOP712	CISCO-Routing and switching-2
20AIM754A	Cyber Security	20NHOP714	Block chain
		20NHOP715	Product Life Cycle Management
		20NHOP720A	Robotic Process Automation
		20NHOP721A	Industry 4.0
		20NHOP722A	Programming of Industrial Robot
		20NHOP723A	5G Communication
		20NHOP725A	VLSI Physical Design -1
		20NHOP726A	VLSI Physical Design -2
		20NHOP727A	Juniper Network Operating System
		20NHOP728A	Database Administration using DB2

# **CLOUD COMPUTING**

Course Code	: 20AIM71A	Credits: 3
L:T:P:S:	: 3: 0: 0: 0:	CIE Marks: 50
Exam Hours:	: 3	SEE Marks: 50

Course Outo	comes:	At the end of the Course the Student will be able to:					
CO#	COURS	COURSE OUT COME (Student will be able to)					
20AIM71A.1	<b>20AIM71A.1</b> Understand basic concepts, principles and paradigm of Cloud Computing.						
20AIM71A.2	A.2 Apply the levels of virtualization and tools for resource provisioning.						
20AIM71A.3	Compare cloud Res	<b>Compare</b> the cloud platform architectures of virtualized data centers and Inter- cloud Resource Management.					
20AIM71A.4	<b>Analyze</b> t of data in	ne principles of Security and Trust management to protect confidentiality the Cloud.					
20AIM71A.5	<b>Develop</b> a algorithm	solution and explore Cloud Simulator to implement a scheduling for cloud resource sharing scenario.					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM71A.1	2	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM71A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM71A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	-
20AIM71A.4	-	3	-	-	-	-	-	-	-	-	-	3	3	-
20AIM71A.5	-	-	3	-	-	-	-	-	-	-	-	3	3	-
Correlationlevels:1-Slight (Low) 2-Moderate (Medium)3-Substantial (High)														

Module No	Module Contents	Hours	COs
1	<b>Introduction</b> , Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility- Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google App Engine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Aneka.	9	CO1 CO2
2	<b>Cloud Computing Architecture</b> , Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects.	9	CO2 CO3

3	<b>Concurrent Computing:</b> Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent.	9	CO3 CO4
4	<b>Data Intensive Computing: Introduction-</b> Characterizing Data-Intensive Computations, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka Map Reduce Programming, Introducing the Map Reduce Programming Model, Example Application.	9	CO4 CO5
5	Cloud Platforms in Industry: Amazon Web Services: Compute Services, Storage Services, Communication Services, And Additional Services. Google App Engine: Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations. Microsoft Azure: Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications in Healthcare and Scientific.	9	CO3 CO4 CO5

- Douglas Comer, "The Cloud Computing Book : The Future of Computing Explained", 1<sup>st</sup> Edition, Chapman and Hall/CRC,2021.
- 2. Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi Mastering Cloud. Computing McGraw Hill Education,2013

### **Reference Book:**

1. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

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

\* Assessments are to be selected from the assessment list attached to page 163. **SEE-Semester End Examination (50Marks)** 

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

# WEB TECHNOLOGY

<b>Course Code</b>	: 20AIM72A	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	E OUT COME (Student will be able to)					
20AIM72A.1	Understa	Understand HTML, XHTML syntax, and semantics to build web pages.					
20AIM72A.2	Apply the XML and CSS concepts to design web page.						
20AIM72A.3	<b>Classify</b> t	he different Data Interchange formats in Web					
	Design C	lient-Side Scripts using JavaScript and Server-Side Scripts using PHP to					
20AIM72A 4	generate a	nd display the contents dynamically.					
20AIM72A.5	Examine	PHP programs to demonstrate Error handling and Exceptions.					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
														2
20AIM72A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM72A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM72A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	-
20AIM72A 4	-	-	3	-	3	-	-	-	-	-	-	3	3	-
20AIM72A.5	-	3	-	-	-	-	-	-	-	-	-	3	3	-
Correlationlevels: 1-Slight(Low) 2-Moderate(Medium)3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Introduction to HTML/XHTML</b> : Origins and Evolution of HTML and XHTML, Basic Syntax of HTML, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5, Syntactic Differences between HTML and XHTML.	9	CO1
2	Introduction to Styles sheets and Frameworks Cascading Style Sheets: Levels of Style Sheets - Style Specification Formats, Selector Forms, Property-Value Forms, Font Properties, List Properties, Alignment of Text, Color, The Box Model, Background Images, The span and div Tags. Frameworks: Overview and Basics of Responsive CSS Frameworks – Bootstrap	9	CO2
3	<b>Introduction to Data Interchange Formats XML</b> : The Syntax of XML, XML Document Structure, Namespaces, XML Schemas, Displaying Raw XML Documents, Displaying XML Documents with CSS, XSLT Style Sheets, XML Applications. <b>JSON</b> (Basics Only): Overview, Syntax, Datatypes, Objects, Schema, Comparison with XML.	9	CO2 CO3

4	<b>JavaScript:</b> Client-Side Scripting, JavaScript Design Principles, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development	9	CO3 CO4
	with PHP, what is Server-Side Development, A Web Server's Responsibilities, Ouick Tour of PHP, Program Control, Functions		
5	<b>PHP</b> : Arrays and Super global, Arrays, \$_GET and \$_POST, Super global Arrays, \$_SERVER Array, \$_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, Errors and Exceptions.	9	CO4 CO5

- 1. P. J. Deitel, H.M. Deitel, Internet & World Wide Web How To Program, 5/e, Pearson International Edition 2010.
- 2. Robert W Sebesta, Programming the World Wide Web, 7/e, Pearson Education Inc., 2014

#### **Reference Books:**

- 1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1stEdition, Pearson Education India. (ISBN:978-9332575271)
- 2. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4thEdition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
- 3. Chris Bates, Web Programming Building Internet Applications, 3/e, Wiley India Edition 2009
- 4. Lindsay Bassett, Introduction to JavaScript Object Notation: A To-the-Point Guide to JSON 1st Edition, O'Reilly.[Chapter 1,2,3,4]
- 5. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)

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

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	-	5
Understand	5	10
Apply	10	10
Analyze	5	
Evaluate	5	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# NATURAL LANGUAGE PROCESSING

<b>Course Code</b>	:	20A	IM7	3A		Credits:	3
L:T:P:S:	:	3:	0:	0:	0:	CIE Marks: 5	50
Exam Hours:	:	3				SEE Marks: 5	<b>50</b>

Course Outcomes :		At the end of the Course, the Student will be able to:					
CO#	COURSE	COURSE OUTCOME (Student will be able to)					
20AIM73A.1	Understa	Understand basics of linguistics, probability and statistics associated with NLP.					
<b>20AIM73A</b> .2	Apply the modeling	<b>Apply</b> the concepts of natural language processing, its applications and language modeling techniques.					
<b>20AIM73A</b> .3	Analyze 1	nguistic structure in text using parsing and CFG.					
20AIM73A.4	Design a r approache	<b>Design</b> a model to determine the sense of a word in NLP using different approaches.					
20AIM73A.5	<b>Interpret</b> methods for recognising a sentence's structures.						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM73A 1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM73A</b> .2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM73A</b> .3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM73A</b> .4	-	-	3	-	-	-	-	-	-	-	-	2	3	-
20AIM73A.5	-	-	-	3	-	-	-	-	-	-	-	2	3	-
Correlation levels: 1-Slight (Low) 2- Moderate (Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Natural Language Processing</b> – Components - Basics of Linguistics and Probability and Statistics – Words-	9	CO1
	Tokenization-Morphology-Finite State Automata.		CO2
2	<b>N-grams and Language models</b> –Smoothing- Evaluating Language Model -Text classification- Naïve Bayes classifier –	9	CO2
	Vector Semantics – TF-IDF - Word2Vec- Evaluating Vector	-	CO3
	Models –Sequence Labeling – Part of Speech – Part of Speech Tagging -Named Entities –Named Entity Tagging		
3	Constituency –Context Free Grammar –Lexicalized	0	CO3
5	Parsers -Partial Parsing – Dependency Relations- Dependency	9	CO4
	Parsing -Transition Based - Graph Based		
4	<b>Word Senses and WordNet</b> – Word Sense Disambiguation – Semantic Role Labeling – Proposition Bank- FrameNet-		CO4
	Selectional Restrictions - Information Extraction - Template	9	CO5
	Filling		
	<b>Discourse Coherence</b> – Discourse Structure Parsing –Question		CO3
	Answering – Applications and Implementation of NLP:		$CO_3$
5	Sentiment Analysis - Text Classification- Text Summarization-	9	CO4
	systems		200

1.Daniel Jurafsky and James H.Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition (Prentice Hall Series in Artificial Intelligence), 2020

2. Jacob Eisenstein. "Natural Language Processing ", MIT Press, 2019

### **Reference Books:**

1.Samuel Burns "Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019

2. Christopher Manning, "Foundations of Statistical Natural Language Processing", MIT Press, 2009.

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

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# **RECOMMENDER SYSTEM**

Course Code	: 20AIM741A	Credits: 3
L:T:P:S:	: 3: 0: 0: 0:	CIE Marks: 50
Exam Hours:	: 3	SEE Marks: 50

Course Outco	omes:	At the end of the Course, the Student will be able to:				
CO#	COURSE	COUTCOME (Student will be able to)				
20AIM741A.1	Understan	d the basic principles and concepts of recommender systems the field of science				
	and techno	logy.				
<b>20AIM741A</b> .2	Apply the concept of content-based recommendation system and Classification algorith					
	in filtering					
20AIM741A 3	Analyze th	e Collaborative Filtering in carrying out performance evaluation of				
	recommend	ler systems based on various metrics.				
<b>20AIM741A</b> .4	<b>Design</b> a si	mple recommender system application with robust recommendation algorithm.				
<b>20AIM741A</b> .5	Evaluate t	he limitations of recommender system using different accuracy metrics and user				
	studies					

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM741A.1	2	-	-	-	-	-	-	-		-	-	2	3	-
<b>20AIM741A</b> .2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM741A</b> .3	-	3	-	-	-	-	-	-	I	-	-	2	3	-
<b>20AIM741A</b> .4	-	-	3	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM741A</b> .5	-	-	-	3	3	-	-	-	-	-	-	2	3	-
Correlationlevels:1-Slight(Low) 2-Moderate(Medium)3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>INTRODUCTION:</b> Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)	9	CO1 CO2
2	<b>CONTENT-BASED RECOMMENDATION SYSTEMS</b> : High- level architecture of content-based systems, Advantages and drawbacks of content-based filtering - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.	9	CO2 CO3
3	<b>COLLABORATIVE FILTERING</b> : A systematic approach, Nearest- neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection).	9	CO3 CO4

4	<b>ATTACK-RESISTANT RECOMMENDER SYSTEMS:</b> Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.	9	CO4 CO5
	EVALUATING RECOMMENDER SYSTEMS: Evaluating Paradigms		
	– User Studies – Online and Offline evaluation – Goals of evaluation design		CO3
5	– Design Issues – Accuracy metrics – Limitations of Evaluation measures,	9	CO4
	Evaluation on historical datasets.		CO5

- 1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
- 2. Dietmar Jannach, Markus Zanker, Alexander Felfernig and Gerhard Friedrich, Recommender Systems: An Introduction, Cambridge University Press (2011), 1st Ed.

#### **Reference Book:**

1. Francesco Ricci, Lior Rokach, Bracha Shapira, Recommender Systems Handbook, 1st edition, Springer (2011).

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

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# **STREAMING ANALYTICS**

<b>Course Code</b>	: 20AIM742A	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#	COURSE OUTCOME (Student will be able to)
20AIM742.1	<b>Understand</b> thecharacteristicsofdatastreamsthatmakeitusefulltosolvereal- worldproblems
20AIM742.2	<b>Apply</b> appropriate algorithms for analyzing the data streams for variety of problems.
20AIM742.3	<b>Identify</b> the different algorithms for analyzing the data streams.
20AIM742.4	<b>Analyze</b> the working of Very Fast Decision Tree Algorithm in data streams and clustering.
20AIM742.5	<b>Design</b> the solution for data stream and pattern mining using different algorithms.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM742.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM742.2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM742.3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
20AIM742.4	-	3	-	-	-	-	-	-	-	-	-	2	3	-
20AIM742.5	-	-	3	-	-	-	-	-	-	-	-	2	3	-
Correlationlevels:1-Slight(Low) 2-Moderate(Medium)3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>INTRODUCTION</b> Characteristics of the data streams, Challenges in mining data streams Requirements and principles for real time processing, Concept drift Incremental learning	9	CO1 CO2
2	DATA STREAMS Basic Streaming Methods, Counting the Number of Occurrence of the Elements in a Stream, Counting the Number of Distinct Values in a Stream, Bounds of Random Variables, Poisson Processes, Maintaining Simple Statistics from Data Streams, Sliding Windows, Data Synopsis, Change Detection: Tracking Drifting Concepts, Monitoring the Learning Process	9	CO2 CO3
3	<b>DECISION TREE</b> Very Fast Decision Tree Algorithm (VFDT), The Base Algorithm, Analysis of the VFDT Algorithm, Extensions to the Basic Algorithm: Processing Continuous Attributes, Functional Tree Leaves, Concept Drift.	9	CO3 CO4

4	CLUSTERING FROM DATA STREAMS Clustering Examples: Basic Concepts, Partitioning Clustering- The Leader Algorithm, Single Passk-Means, Micro Clustering, Clustering Variables: A Hierarchical Approach	9	CO4 CO5
5	<b>FREQUENT PATTERN MINING</b> Mining Frequent Item sets from Data Streams- Landmark Windows, Mining Recent Frequent Item sets, Frequent Item sets at Multiple Time Granularities, SequencePatternMining- ReservoirSamplingforSequentialPatternMiningoverdata streams	9	CO3 CO4 CO5

1. Joao Gama, "Knowledge Discovery from Data Streams", CRC Press, 2010.

### **Reference Books:**

- 1. DavidLuckham, "ThePowerofEvents: AnIntroductiontoComplexEventProcessinginDis tributedEnterpriseSystems", AddisonWesley, 2002.
- 2. CharuC.Aggarwal, "DataStreams:MoelsAndAlgorithms", KluwerAcademicPublishers, 2007

<b>CIE-Continuous</b>	s Internal	Evaluation	(50Marks)
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Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	_	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# **INFORMATION SECURITY**

<b>Course Code</b>	: 20AIM743A	Credits: 3	5
L:T:P:S:	: 3: 0: 0: 0:	CIE Marks: 50	0
Exam Hours:	: 3	SEE Marks: 50	0

<b>Course Outcomes:</b>		At the end of the Course, the Student will be able to:			
CO#	COURS I	EOUTCOME (Student will be able to)			
20AIM743A.1	<b>Understand</b> the security parameters and access control methods in information security.				
20AIM743A.2	Apply the legal, ethical and professional issues in information security.				
20AIM743A.3	Analyse the fundamental policies and design principle of computing resources.				
20AIM743A.4	Classify the different security policies in system design.				
20AIM743A.5	Design t	he system with all Security measures.			

Mapping of	Mapping of Course Outcomes to Program Outcomes													
CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM743A.1	2	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM743A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM743A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	-
20AIM743A.4	-	3	-	-	-	-	-	-	-	-	-	3	3	-
20AIM743A.5	-	-	3	-	-	-	-	-	-	-	-	3	3	-
Corre	elatior	nlevel	s:1-Sli	ght(L	ow)2-	Mode	erate(]	Mediu	ım)3-	Substa	ntial(H	ligh)		

Module No	Module Contents	Hours	Cos
1	<b>Confidentiality, integrity and availability</b> ; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.	9	CO1 CO2
2	Access Control Models: Operating system access controls, Hardware protection, Distributed Systems: Concurrency, Fault tolerance and failure recovery, Naming.	9	CO2 CO3
3	<b>Security Policies</b> : Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards.	9	CO3 CO4
4	<b>Design principles</b> , representing identity, control of access and information flow, confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems	9	CO4 CO5
5	<b>Logic-based System</b> : Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, operating system security, user security, program security.	9	CO3 CO4 CO5

1.Computer Security Art and Science, 2nd Edition by Matt Bishop, 2018.

2.Security Engineering, A guide building dependable distribution systems, 3rd Edition by Ross Anderson, 2020.

### **Reference Books:**

- 1. Micki Krause, Harold F. Tipton, Handbook of Information Security Management<sup>∥</sup>, Vol 1-3 CRC Press LLC, 2004.
- 2. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposedl, Tata McGraw-Hill, 2003

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

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# HUMAN COMPUTER INTERACTION

<b>Course Code</b>	: 20AIM744A	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	COURSE OUTCOME (Student will be able to)				
20AIM744A.1	Understan	Jnderstand the principles of human computer interaction in effective dialog for HCI				
20AIM744A.2	Apply the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.					
20AIM744A.3	Analyze the importance of user feedback.					
20AIM744A.4	<b>Design</b> effe	<b>Design</b> effective HCI for individuals and persons with disabilities				
20AIM744A.5	Compare (	Cognitive and Ubiquitous computing environment.				

Mapping of	Mapping of Course Outcomes to Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM744A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM744A.2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM744A.3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
20AIM744A.4	-	-	3	-	-	-	-	-	-	-	-	2	3	-
20AIM744A.5	-	-	-	3	-	-	-	-	-	-	-	2	3	-
Correlationlevels:1-Slight (Low) 2-Moderate (Medium)3-Substantial (High)														

Module No	Module Contents	Hours	Cos
1	INTRODUCTION The Human – Input-output channels – Human Memory – Thinking – emotions – Psychology & design of interactive systems; Computer – Text entry devices- Positioning, Pointing & drawing – Display devices for Virtual reality, 3D; Interaction – models – Frameworks & HCI, Ergonomics – Interaction styles – WIMP Interfaces – context; paradigms for Interaction	9	CO1 CO2
2	SOFTWARE PROCESS & DESIGN RULES Interaction design basics – user focus – scenarios – navigation – screen design & layout; HCI in software process – life cycle – Usability engineering – Interactive design &prototyping Design rules – Principles for usability – standards – guidelines – golden rules – HCI patterns.	9	CO2 CO4
3	IMPLEMENTATION & USER SUPPORT Implementation support – Windowing system elements – using tool kits – user interface management; Evaluation techniques – goals – expert analysis – choosing a method; universal design principles – multimodal interaction; user support – requirements – Approaches – adaptive help systems – designing user support system	9	CO3 CO4

4	COGNITIVE, COMMUNICATION & COLLABORATIVE MODELS Cognitive models – Goal & task hierarchies – Linguistic models – Physical & device models – architectures; communication & collaboration models – Face-to-face communication –conversation – text based – group working; Task analysis – difference between other techniques – task decomposition – Knowledge based analysis – ER based techniques –uses	9	CO4 CO5
5	UBIQUITOUS COMPUTING, HYPERTEXT, WWW Ubiquitous computing application research – virtual & augmented reality – information & data visualization; understanding hypertext – finding things – Web Technology & issues – Static Web content – Dynamic Web content; Groupware systems – Computer mediated communication – DSS – Frameworks for groupware.	9	CO3 CO5

- 1. Alan Dix, Janet Finlay, Gregory D.Abowd, Russell Beale, "Human Computer Interaction", Third Edition, Pearson Education, 2004.
- 2. Brian Fling, -Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009

### **Reference Books:**

1. John M.Carrol, "Human Computer Interaction in the New Millenium", Pearson Education, 2002

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

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# **QUANTUM COMPUTING**

<b>Course Code</b>	:	20A	IM7	51A		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#	COURSE	COURSEOUTCOME (Student will be able to)					
20AIM751A.1	Understa	nd the basics principles of quantum computing.					
<b>20AIM751A</b> .2	Apply the	<b>pply</b> the different quantum algorithm to solve real world computing problems.					
<b>20AIM751A</b> .3	<b>Analyze</b> t	<b>Analyze</b> the different computation models.					
<b>20AIM751A</b> .4	Design the	Design the circuits using quantum computation environments and its frameworks.					
20AIM751A.5	Interpret security m	the performance of computing system with different operations and easures.					

Mapping of	Mapping of Course Outcomes to Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM751A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>20AIM751A</b> .2	3	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>20AIM751A</b> .3	-	3	-	-	-	-	-	-	-	-	-	2	3	2
<b>20AIM751A</b> .4	-	-	3	-	-	-	-	-	-	-	-	2	3	2
<b>20AIM751A</b> .5	-	-	-	3	-	-	-	-	-	-	-	2	3	2
Corre	elatior	ılevel	s:1-Sli	ght(L	ow)	2-1	Mode	ate(N	lediur	n)3-Su	ıbstant	ial(Hig	gh)	

Module No	Module Contents	Hours	COs
1	QUANTUMCOMPUTINGBASICCONCEPTS:Complex Numbers - Linear Algebra - Matrices and Operators- Global Perspectives Postulates of Quantum Mechanics –Quantum Bits - Representations of Qubits – Super positions.	9	CO1 CO2
2	<b>QUANTUM GATES AND CIRCUITS:</b> Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development-Solovay-Kitaev theorem, Deutsch-Jozsa algorithm, factoring, Quantum error correction.	9	CO1, CO2
3	<b>QUANTUM ALGORITHMS</b> : Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm	9	CO2 CO3
4	<b>QUANTUM INFORMATION THEORY</b> : Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels	9	CO3 CO4
5	<b>QUANTUM CRYPTOGRAPHY:</b> Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91.	9	CO4 CO5

- 1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020).
- 2. 2. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010.
- 3. 3. Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "Quantum Computing for Everyone".

### **Reference Books:**

- 1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
- 2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

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

\* Assessments are to be selected from the assessment list attached to page 163.

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

# SOFTWARE TESTING

<b>Course Code</b>	:	20AIM752A	Credits:	3
L:T:P:S:	:	3: 0: 0: 0	<b>CIE Marks:</b>	50
Exam Hours:	:	3	SEE Marks:	50

Course Outcom	es: At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME (Student will be able to)
20AIM752A.1	<b>Understand</b> the fundamentals of software testing.
20AIM752A.2	Apply various testing activities in effective manner.
20AIM752A.3	Analyze the design of test cases for different testing techniques.
20AIM752A.4	<b>Design</b> test strategies and plans, deign test case, prioritize and execute them.
20AIM752A.5	<b>Compute</b> test coverage and yield according to a variety of criteria using modern testing
	tool.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM752A.1	2	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM752A.2	3	-	-	-	-	-	-	-	-	-	-	3	3	-
20AIM752A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	-
20AIM752A.4	-	-	3	-	-	-	-	-	-	-	-	3	3	-
20AIM752A.5	-	-	-	3	3	-	-	-	-	-	-	3	3	-
Correlationlevels:1-Slight(Low) 2-Moderate(Medium)3-Substantial(High)														

Module No	Module Contents	Hours	COs
1	<b>Testing as an Engineering Activity</b> – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design – Defect Examples- Developer/Tester Support of Developing a Defect Repository.	9	CO1 CO2
2	<b>Test case Design Strategies</b> – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing – Requirements based testing – Using White Box Approach to Test design.	9	CO2 CO3
3	The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests	9	CO3 CO4

4	<b>People and organizational issues in testing</b> – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- The Technical Training Program.	9	CO4 CO5
5	<b>Software test automation</b> – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.	9	CO3 CO4 CO5

- 1. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing Principles and Practicesl, Pearson Education, 2006.
- Ron Patton, —Software Testingl, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com

#### **Reference Books:**

1.Ilene Burnstein, —Practical Software Testing, Springer International Edition, 200

2. Edward Kit, Software Testing in the Real World – Improving the Process, Pearson Education, 1995.

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

Bloom's Category	Tests(25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

\* Assessments are to be selected from the assessment list attached to page 163.

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

# SOCIAL NETWORK ANALYSIS

<b>Course Code</b>	:	20A	IM753	A							(	Credits	:	3
L:T:P:S:	:	3:	0:	0: 0:							(	CIE Ma	arks:	50
Exam Hours:	:	3									S	SEE Ma	arks:	50
Course Outcomes:At the end of the Course, the Student will be able to:														
CO#	COU	JRSE	OUTC	COME	E (Stuc	lent w	vill be	able t	0)					
20AIM753A.1	20AIM753A.1 Understand the various concepts in social media and also learnt social media in an												a in an	
	ethica	ıl mar	nner.											
20AIM753A.2	Appl	y grap	oh theo	ory co	ncept	s to so	ocial r	nodel	netw	orks.				
20AIM753A.3	Analy	yze tł	ne soci	al net	work	s to di	aw in	sights	s on th	ne inter	action	s betw	een/wi	thin
	social	grou	ps.											
20AIM753A.4	Desig	<b>n</b> the	struct	ure of	a soc	ial ne	twork	and i	denti	fy the i	nfluen	tial ent	tities.	
20AIM753A.5	Inter	pret t	he fun	dame	ntal p	rincip	les fo	r anal	yzing	social	media	ı marke	eting a	nd its
	impoi	tance			1	1							U	
Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM753A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-

20AIM753A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM753A.2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM753A.3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
20AIM753A.4	-	-	3	-	-	-	-	-	-	-	-	2	3	-
20AIM753A.5	-	-	-	3	-	-	-	-	-	-	-	2	3	-
Corre	Correlationlevels:1-Slight(Low) 2-Moderate(Medium)3-Substantial(High)													

Module No	Module Contents	Hours	COs
1	<b>INTRODUCTION:</b> Understand What Social Networking is, Social Media Characteristics, what is Social Media and Why It is Important, Types of Social Media, Core Values, Challenges, Advantages and Disadvantages, Future of Social Networking, Various social networking sites-FACEBOOK, INSTAGRAM, TWITTER, LINKEDIN - Why and	9	CO1 CO2
2	<b>BUILDING A NETWORK:</b> Networks as Graphs – Actors, Ties, Networks, Multiplex Networks, Weighted Ties, Group, Geodesic Distance, Graph Connectivity, Degree of an Actor –Indegree and Outdegree, Types of nodes– Carrier, Transmitter, Receiver, Isolate, Representation of Social Network Data – Socio matrix and Edge List, Matrix Permutation and Blocks, Network Relationships Reciprocity, Transitivity, Popularity Structural Equivalence, Clique, Star.	9	CO2 CO3
3	<b>STRENGTH OF WEAKTIES &amp; HOMOPHILY:</b> Granovetter's strength of weakties, Triads, Clustering Coefficient and Neighborhood Overlap, Structure of Weak Ties, Bridges and Local Bridges, Embeddedness, Structural Holes, Social Capital, Tie Strength, Social Media and Passive Engagement, Strong And Weak Relationship, Introduction to Homophily, Selection and Social Influence, Foci Closure and Membership Closure	9	CO3 CO4
4	<b>NETWORK PROPERTIES:</b> Network Density, Properties of Nodes–Degree Centrality, Closeness Centrality, Betweenness Centrality, Centrality of a Network - Network Degree Centrality, Network Closeness Centrality, Network Betweenness Centrality, Pagerank centrality	9	CO4 CO5
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5	<b>SOCIAL MEDIA ANALYSIS:</b> Four Dimension of Analysis, Criteria of Effectiveness, Metrics, Social Network Analysis, Semantic Analysis, Online Sentiment Analysis, Tools, Social Media Management, Centrality Measures, Opinion Mining, Feature Based Sentiment Analysis.	9	CO3 CO4 CO5

#### **Textbook:**

- 1) Robert A Hanneman, Department of Sociology, University of California, Riverside, "Introduction to Social Network methods".
- Christina Falci, Department of Sociology, University of Nebraska, Lincoln, "Social Network Analysis"
- 3) Matthew Ganis & Avinash Kohirkar, "Social Media Analytics"
- 4) BobbiJ Carothers, American Evaluation Association, Denver, Colorado,
   "NetworkAnalysisfromStarttofinish:Techniques,ToolsandTipsforEvaluatingyourNetwork"
- 5) Matthew Denny, Institute for Social Science Research, University of Massachusetts, AMHERST, "Social Network Analysis"
- 6) Timothy Baldwin, University of Melbourne, "Semantic Analysis of Social Media".
- 7) The Social Media Analytics Compass: what and How to measure http://www.razorsocial.com/social-media analytics-tools/
- 8) https://www.youtube.com/watch?v=P33xa4l4GTM
- 9) Overview of SNAhttps://www.youtube.com/watch?v=fgr\_g1q2ikA
- 10) https://www.meaningcloud.com/solutions/media-analysis
- 11) https://www.enotes.com/homework-help/what-hypotheses-social-media-intimate-relationship-488912

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

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

\* Assessments are to be selected from the assessment list attached to page 163.

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

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

## **CYBER SECURITY**

Course Code	: 20AIM754A	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#	COURSE OUT COME (Student will be able to)					
20AIM754A.1	Understand the basics of cyber security.					
<b>20AIM754A</b> .2	Apply intrusion prevention techniques to prevent intrusion.					
<b>20AIM754A</b> .3	<b>4A</b> .3 <b>Identify</b> various types of attacks and learn the tools to launch the attacks					
<b>20AIM754A</b> .4	AIM754A.4 Develop solution for cyber security attacks in various ways.					
<b>20AIM754A</b> .5	Interpret a	in intrusion technique and evaluate its performance in order to detect intrusion.				

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM754A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM754A</b> .2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM754A</b> .3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
<b>20AIM754A</b> .4	-	-	3	-	-	-	-	-	-	-	-	2	3	-
20AIM754A.5	-	-	-	3	-	-	-	-	-	-	-	2	3	-
Correlationlevels:1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)														

Module No	Module Contents	Hours	COs
1	<b>INTRODUCTION:</b> Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.	9	CO1 CO3
2	<b>ATTACKS AND COUNTER MEASURES: OSWAP;</b> Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Counter measures.	9	CO1 CO2 CO3
3	<b>RECONNAISSANCE:</b> Harvester – Who is – Net craft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.	9	CO2, CO3

4	<b>INTRUSION DETECTION:</b> Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort	9	CO3, CO4 CO5
5	<b>INTRUSION PREVENTION:</b> Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products	9	CO4 CO5

#### **Text Books:**

- 1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011.
- 2. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers 2007
- 3. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015.

## **Reference Books**:

- 1) Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021.
- 2) Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011.
- 3) David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones &Bartlett Learning Publishers, 2013.

Bloom's Category	Tests(25marks)	Assessment(s) (25 Marks) *
Remember	5	
Understand	5	5
Apply	10	10
Analyze	5	10
Evaluate	-	
Create	-	

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

\* Assessments are to be selected from the assessment list attached to page 163

## SEE-Semester End Examination (50Marks)

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

# **CLOUD COMPUTING LABORATORY**

<b>Course Code</b>	:	20AIL76A			
L:T:P:S:	:	0:	0:	2:0:	
Exam Hours:	:	3			

Credits:2CIE Marks:25SEE Marks:25

C O (								
Course Out	comes:	At the end of the Course, the Student will be able to:						
CO#	COURSE OUT COME (Student will be able to)							
20AIL76A.1	L76A.1 <b>Apply</b> the knowledge of cloud computing to Configure various virtualization tools such as Virtual Box, VMware workstation.							
20AIL76A.2	<b>Analyzo</b> cloud si	how to simulate a cloud environment to implement new scheduler's using mulation tool.						
20AIL76A.3	.3 <b>Develop</b> application with security mechanisms.							
20AIL76A.4	Design	and Implement applications on cloud.						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL76A.1	3	-	-	-	-	2	2	-	-	2	-	2	3	-
20AIL76A.2	-	3	-	-	3	3	3	-	-	3	-	3	3	-
20AIL76A.3	-	-	3	-	3	3	3	3	-	3	-	3	3	-
20AIL76A.4 3 - 3 3 3 3 3 - 3 - 3 3 -														
Correlationlevels:1-Slight(Low) 2-Moderate(Medium)3-Substantial(High)														

Exp.No	Experiment	Hours	CO
1	Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.	3	CO1 CO2
2	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.	3	CO1 CO2
3	Create hello world app and other simple web applications using python/java.	3	CO1, CO2, CO3
4	Describe a procedure to transfer the files from one virtual machine to another virtual machine.	3	CO2, CO3
5	Use GAE launcher to launch the web applications.	3	CO2, CO3, CO4

	Part B		
6	Create an AWS account and create EC2 instance for a simple application	3	CO1,CO2, CO3,CO4
7	Install Docker desktop and create a container then pull an image into container.	3	CO1,CO2, CO3,CO4
8	Write a HTML program in Visual Studio Code and execute in Docker.	3	CO1,CO2, CO3,CO4
9	Create an AWS S3 bucket and upload the content in the bucket.	3	CO1,CO2, CO3,CO4
10	Using Amazon DynamoDB, create a Dynamo table and enter the data into then query it.	3	CO1,CO2, CO3,CO4

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

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

## **SEE-Semester End Examination (25Marks)**

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

# WEB TECHNOLOGY LABORATORY

Course Code	: 20AIL77A	Credits :	2
L: T: P:S:	: 0: 0: 2: 0:	CIE Marks:	25
Exam Hours:	: 3	SEE Marks:	25

Course Outco	mes: At the end of the Course, the Student will be able to:			
CO#	COURSEOUTCOME			
20AIL77A.1	Apply the concepts of HTML5, CSS, JavaScript, XML, PHP and develop JavaScript			
	programs.			
20AIL77A.2	<b>Develop</b> XML program to display student information using CSS.			
20AIL77A.3	Analyze PHP program to keep track of the number of visitors visiting the web page,			
	Digital Clock, simple calculator, matrix addition, multiplication, transpose			
20AIL77A.4	<b>Design</b> the PHP programs to sort the student records stored in database using selection			
	sort, string manipulations			

Mapping of C	Mapping of Course Outcomes to Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL77A.1	3	-	-	-	2	2	2	-	-	2	-	2	3	-
20AIL77A.2	-	-	3	-	3	2	2	-	-	2	-	2	3	-
20AIL77A.3	-	3	-	-	2	2	2	2	-	2	-	2	3	-
20AIL77A.4	-	-	3	-	3	2	2	2	-	2	-	2	3	-
Correlation levels: 1-Slight (Low)					2-Mo	derate	(Mediu	m)	3	-Substar	ntial(Hig	h)		

Exp. No	Experiment	Hours	COs
1	<ul> <li>Design the following static web pages required for an online book store</li> <li>a) Home page: Must contain 3 frames</li> <li>b) Login page</li> <li>c) Catalogue page: Must contain all books details available in the store</li> </ul>	3	CO1 CO2 CO3 CO4
	d) Registration page:		
2	Develop and demonstrate the use of Inline, Internal, External style sheets using CSS.	3	CO1 CO2 CO3 CO4
3	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.	3	CO1 CO2 CO3 CO4
4	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.	3	CO1 CO2 CO3 CO4
5	Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.	3	CO1 CO2 CO3 CO4

6	Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.	3	CO1 CO2 CO3 CO4
7	Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.	3	CO1 CO2 CO3 CO4
8	Write a PHP program to display a digital clock which displays the current time of the server	3	CO1 CO2 CO3 CO4
9	<ul><li>Write the PHP programs to do the following:</li><li>a. Implement simple calculator operations.</li><li>b. Find the transpose of a matrix.</li><li>c. Multiplication of two matrices. d. Addition of two matrices.</li></ul>	3	CO1 CO2 CO3 CO4
10	<ul> <li>Perform a case study for any one of the following using ReactJS</li> <li>a. Social media platform</li> <li>b. Teaching learning platform</li> <li>c. E-commerce platform</li> <li>d. Enterprise Resource Management Platform</li> <li>e. Mobile Application Platform</li> </ul>	3	CO1 CO2 CO3 CO4

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

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

SEE-Semester End Examination (25Marks)

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

# **PROJECT PHASE 1**

Course Code	: 20AIM78A	Credits: 2
L:T:P:S:	: 0: 0: 2: 0:	CIE Marks: 25
Exam Hours:	: 3	SEE Marks: 25

<b>Course Outco</b>	mes: At the end of the Course, the Student will be able to:						
CO#	COURSE OUT COME (Student will be able to)						
20AIM78A.1	dentify a real life/engineering problem, utilize prior knowledge and conduct						
	extensive investigation, across diverse sources, in addressing the						
20AIM78A.2	Competence in applying the software engineering principles in planning,						
	formulating an innovative design/ approach and computing the requirements						
20AIM78A 3	Perform professionally—as a team member, accepting responsibility, taking						
20/11/1/0/1.5	initiative, and providing leadership necessary to ensure project success.						
20AIM78A.4	Use formal and informal communications with team members and guide, make						
	presentations and prepare technical document.						
20AIM78A.5	Provide solution within the context of legal framework addressing the societal and						
	environmental concerns and upholding ethical issues.						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM78A.1	3	3										3	3	3
20AIM78A.2		3	3		3							3	3	3
20AIM78A.3						2	2	2	3	2		2	3	3
20AIM78A.4					3	2	2	2	3	3	3	2	3	3
20AIM78A.5						3	3	3	3	2	2	2	3	3
Correlationlevels:1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)														

This course will be conducted largely as group of 2-4student members under the direct supervision of a member of academic staff. Students will be required to

1. Students should form teams to carry out the project. The size of the teams can comprise of a minimum of two students and maximum of four students.

2. Each team are free to choose their Internal Guide or will be assigned an Internal Guide by the Department Coordinator.

3. Teams can carry out their project in-house or in a reputed organization (which has to be approved by the Internal Guide). Students taking up industry projects can do so with the condition that they are allowed to demonstrate their project work on the college campus.

4. Identification of a problem which is feasible and innovative based on the current state of art technology and having relevance and social impact, considering the boundaries of societal, environmental and ethical issues. 5. Survey of literature related to the identified problem to make a feasibility study and identify the project

requirements. Prepare and submit a synopsis of your project to your respective Guides.

6. Based on the literature review, preparation of review paper and publishing it.

7. Evolve a high-level design/system level architecture and identify the various implementable modules with their input/output needs.

8. Preparation and submission of Project Phase1 technical report.

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

Marks (Out of 25)RememberUnderstandApply10AnalyzeEvaluate5	Bloom's Taxonomy	Project
RememberUnderstandApply10Analyze10Evaluate5	Marks (Out of 25)	
Understand-Apply10Analyze10Evaluate5	Remember	-
Apply10Analyze10Evaluate5	Understand	-
Analyze10Evaluate5	Apply	10
Evaluate 5	Analyze	10
	Evaluate	5
Create -	Create	-

## SEE–Semester End Examination (25 marks)

Bloom's Taxonomy	Project				
Marks (Out of 25)					
Remember	-				
Understand	-				
Apply	10				
Analyze	10				
Evaluate	5				
Create	-				

	VIII SEMESTER												
Credit Distribution											M	arks	
S.No	Course Code	Course	BOS	L	T	Р	S	Overall Credits	Contact Hours	CIE	SEE	Total	
1	20AIM81A	Reinforcement learning	AI&ML	3	0	0	0	3	4	50	50	100	
2	20AIM82A	Internship Viva	AI&ML	0	0	4	0	4	0	50	50	100	
3	20AIM83A	Project Phase - II	AI&ML	0	0	12	0	12	0	100	100	200	
	<u> </u>	19	04	200	200	400							

# **REINFORCEMENT LEARNING**

Course Code	:	20AIM81A	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#	COURSE	COURSE OUT COME (Student will be able to)					
20AIM81A.1	Understa	Understand the basic concepts of Reinforcement Learning					
20AIM81A.2	Apply mu	<b>Apply</b> multi-armed bandit algorithms to solve exploration-exploitation trade off					
	and others.						
20AIM81A 3	Analyze the Monte Carlo method's involvement in the learning process through						
20/11/10/171.5	experience	e as well as Temporal-Difference Learning.					
20AIM81A.4	Develop reinforcement learning applications using Finite MDP						
20AIM81A .5	Evaluate	Evaluate the performance of prediction problems through the principle of					
	optimality						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM81A.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM81A.2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
20AIM81A.3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
20AIM81A.4	-	-	3	-	-	-	-	-	-	-	-	2	3	-
20AIM81A .5	-	-	-	3	-	-	-	-	-	-	-	2	3	-
Correlationlevels:1-Slight (Low) 2-Moderate (Medium)3-Substantial (High)														

Module No	Module Contents	Hours	COs
1	Introduction: Reinforcement Learning-Examples, Early History of Reinforcement Learning Elements of Reinforcement Learning. Limitations and Scope - An Extended Example: Tic-Tac-Toe.	9	CO1 CO2
2	<b>MULTI-ARMED BANDITS</b> - k-armed Bandit Problem- Action-value Methods -The 10-armed Testbed -Incremental Implementation - Tracking a Non stationary Problem- Optimistic Initial Values -Upper- Confidence-Bound Action Selection- Gradient Bandit Algorithms.	9	CO2 CO3
3	<b>FINITE MARKOV DECISION PEOCESSES</b> : The Agent– Environment Interface -Goals and Rewards -Returns and Episodes - Unified Notation for Episodic and Continuing Tasks -Policies and Value Functions -Optimal Policies and Optimal Value Functions- Optimality and Approximation. <b>DYNAMIC PROGRAMMING</b> : Policy Evaluation (Prediction) - Policy Improvement - Policy Iteration -Value Iteration -Asynchronous Dynamic Programming -Generalized Policy Iteration.	9	CO3 CO4

4	MONTE CARLO METHODS: Monte Carlo Prediction - Monte Carlo Estimation of Action Values -Monte Carlo Control - Monte Carlo Control without Exploring Starts -Off-policy Prediction via Importance Sampling -Incremental Implementation - Off-policy Monte Carlo Control. TEMPORAL-DIFFERENCE LEARNING: TD Prediction - Advantages of TD Prediction Methods - Optimality of TD (0)- Sarsa: On-policy TD Control -Q-learning: Off-policy TD Control	9	CO4 CO5
5	APPROXIMATE SOLUTION METHODS: Policy Gradient-Policy Approximation and its Advantages - The Policy Gradient Theorem - REINFORCE: Monte Carlo Policy Gradient -REINFORCE with Baseline -Actor–Critic Methods - Policy Gradient for Continuing Problems - Policy Parameterization for Continuous Actions.	9	CO3 CO4 CO5

#### **Text Books:**

1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, second edition The MIT Press Cambridge, Massachusetts London, England.

#### **Reference Books:**

1. Dimitri Bertsekas and John Tsitsiklis, "Neuro-dynamic programming", Athena Scientific, 1997.

2. Csaba Szepesvari, "Algorithms for Reinforcement Learning", Morgan and Claypool, 2010.

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

Bloom's Category	Tests (25marks)	Assessment(s) (25 Marks) *				
Remember	5					
Understand	5	5				
Apply	10	10				
Analyze	5	10				
Evaluate	-					
Create	-					

\* Assessments are to be selected from the assessment list attached to page 163.

## SEE-Semester End Examination (50Marks)

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

#### **INTERNSHIP**

<b>Course Code</b>	: 20A	IM82A	Credits:	4
L:T:P:S:	: 0:	0: 4: 0;	: CIE Marks:	50
Exam Hours:	: 3		SEE Marks:	50

#### **Objectives**

 Students will be competent to connect with reputable industry, laboratory, or research institutes to gain Practical knowledge on software development and design, product design and development, analytics, Business processes and insights, industry practices, and other related aspects, as well as develop Problem- solving skills.

2. Students acquire technical, interpersonal, and teamwork abilities to fulfil the demands of business,

academia, and other organizations in the important areas of automation and digitalization.

Course Outco	mes:	At the end of the Course, the Student will be able to:						
CO#	COURSE	OUTCOME (Student will be able to)						
20AIM82A.1	Apply dor	nain knowledge for problem solving.						
20AIM82A.2	Analyze s	Analyze solutions to complex business problems						
20AIM82A.3	<b>Design</b> so	<b>Design</b> solutions for the target platform.						
20AIM82A.4	Make efficient use of time and accomplish the assigned work within the time frame.							
20AIM82A.5	Build tech	nical reports and presentations.						

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM82A.1	3	-	-	-	-	3	3	-	3	-	-	3	3	2
20AIM82A.2	-	-	3	-	3	-	3	3	3	-	3	3	3	2
20AIM82A.3	-	3	-	-	-	-	-	-	-	-	3	3	3	2
20AIM82A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
20AIM82A.5	-	3	I	-	-	-	I	-	-	3	I	3	3	2
Correlationlevels:1-Slight (Low) 2-Moderate (Medium)3-Substantial (High)														

## **Description:**

The student shall identify a suitable industry or laboratory in the field of software development, artificial intelligence or any IT-related industry to carry out an internship. During the internship period, students' progress and work in industry will be reviewed by a panel of experts. At the completion of an internship, students will submit a report, which will be evaluated by duly appointed examiners. The report of the internship will undergo a plagiarism check to avoid repetition.

# **Evaluation Stages:**

Activity	Evaluation Attribute
Review-I	1. A brief introduction about the company with an assigned
	domain, project or modules, and other necessary details.
	2. Submit the offer letter received from the company.
Review-II	1. Show progress during the internship period using a
	PowerPoint presentation.
	1. Show a demo of the work carried out or completed with
	the necessary details.
Review-III	
	2. Submit the final report in the prescribed format with an internship completion certificate.

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

<b>Bloom's Taxonomy</b>	Internship
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

# SEE–Semester End Examination (50marks)

Bloom's Taxonomy	Internship
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

## **PROJRCT PHASE II**

Course Code	:	<b>20</b> A	<b>AIM</b>	[83A	
L:T:P:S:	:	0:	0:	12:	0:
Exam Hours:	:	3			

Credits:12CIE Marks:100SEE Marks:100

## Objective

- Students to gain domain knowledge and technical skills to solve potential business problems, research problems, collect requirements, design suitable software solutions, and evaluate them.
- students work as a small team and understand the processes and practises in the industry.
- Implement, test, and deploy solutions for target platforms.
- Preparing project reports and presentations

Course Outco	mes: At the end of the Course, the Student will be able to:							
CO#	COURSE OUTCOME (Student will be able to)							
20AIM83A.1	Apply the Domain knowledge, technical skill set and software engineering principles for							
	solving industry/research problems							
20AIM83A.2	Analyze the required algorithms and design modules for solution							
20AIM83A 3 Monitor, manage project schedules, resources and work assignments to ensure								
	completion							
20AIM83A / Evaluate the modules using testing methodologies and tools to prove the performance								
the implemented project.								
20AIM83A.5	Demonstrate and present the work with detailed project/technical report.							

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Monning of	Common Autoomo	a to Duoguono Autoomoo	
Viannino Al	t ourse t nucome	s in Prnoram Unichmes	2
mapping or	Course Outcome		,

Mapping of	Mapping of Course Outcomes to Frogram Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM83A.1	3	3	-	-	-	3	3	-	-	-	-	3	3	2
20AIM83A.2	3	3	3	-	3	-	-	3	-	-	-	-	3	2
20AIM83A.3	-	-	-	-	-	-	I	-	-	-	3	I	3	2
20AIM83A.4	-	-	-	3	3	-	-	-	-	-	-	-	3	2
20AIM83A.5	-	-	-	3	3	-	-	-	3	-	-	3	3	2
Correlationlevels:1-Slight (Low) 2-Moderate (Medium)3-Substantial (High)														

This course will be conducted largely as group of 2-4 student members under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student and supervisor.

## Students will be required to

- 1. Preparation of detailed design for the project (Continuation of Major Project Phase-1).
- 2. Implementation of the sub-modules and their integration.
- 3. Testing and validation.
- 4. Publish the work carried out on the project in the referred journal.
- 5. Prepare and submit the major project report

## Some of AIML application domains:

- 1) Healthcare Applications
- 2) IoT/Surveillance and security
- 3) Games Application
- 4) Computer Vision
- 5) Inter disciplinary application, etc.,

## **CIE-Continuous Internal Evaluation (100Marks)**

Bloom's Taxonomy	Project
Remember	-
Understand	20
Apply	20
Analyze	20
Evaluate	20
Create	20

## SEE–Semester End Examination (100marks)

Bloom's Taxonomy	Project
Remember	-
Understand	20
Apply	20
Analyze	20
Evaluate	20
Create	20

# **DATABASE ADMINISTRATION USING DB2**

Cou	rse Code	20N	нор	728A							C	redits:	:	3	
L: T Ever	:P:S: :	3:	0: 0:	0							C	IE Ma FF Ma	rks:	50 50	
Exal		5	<b>1</b> • • •		0.13	~		<i>a</i> , 1					11 KJ.	50	
Cou	rse Outcomes	: 	At t	he end	of the	e Coui	rse, the	Stud	lent w	ill be a	able to:				
CO#		CO	URS	E OUT	CON	<u>AE (St</u>	udent	will b	e able	<u>e to)</u>					
20NF	10P728A.1	Ap	ply th	ne know	ledge	e of SQ	L and	Lock	s in D	ata inte	egrity a	nd secu	irity in	DB2.	
ZUNF	10P/28A.2	An	alyze	the pro	cessii	ng inst	ruction	is give	en to I	DB2 vi	a DB2	SQL st	atemen	ts.	
20NH	<b>20NHOP728A.3</b> Design a solution for data base operations and its security using DB2.														
20NF	HOP728A.4	Exa	amin	e the dif	fferen	t func	tional c	perat	ions a	nd reco	overy c	oncepts	s in DB	2.	
3.7	• • • • •		0 1		D		0.1								
Ma	pping of Cou	Irse	Duto	DO2	DO4	ogran	n Out	come	S DOS	POO	<b>PO10</b>	DO11	DO12	DSO	
20N	HOP728A 1	3	FO2	FUS	F 04	FUS	FOO	FO/	FU8	F09	F010	FUII	FO12	130	1 F302
2011 20N	HOP728A.2	5	3	-	-	-	-	-	-	-	_	-	_	3	_
20N	HOP728A.3	-		3	-	3	-	-	-	-	-	-	3	3	-
20N	HOP728A.4	-	-	-	3	-	-	-	-	-	-	-	3	3	-
Cor	relation level	s: 1-	Sligh	nt (Low	) 2	2-Mod	lerate	(Med	ium)			3-S	lubstan	tial(H	High)
No	Module Conte	nts												Hrs.	COs
10	DB2-Introd	netic	<b>n</b> _ Γ	)atahasi	- Ta	hle Sr	ace- S	Simnl	e tahl	e snac	e-Sem	mentec	l table		005
1	space-Partiti	titioned table space. Database Design Logical Database Physical							9	CO1					
1	Database De	sign.	.Imn	lementi	no ai	nd Alt	ering l	,n Eo Datal	Sicar Nase F	Datao		rysicai		Í	CO2
	DR2 SOL co	nce	nts a	nd Lin	ny R	asics	- Intro	duct	ion to	SOI -	. chara	cteristi	ics of		
	SOL in DR2		2 50	I · Cres	ate St	orage	- Alter	Stor	age <b>-(</b>	<sup>¬</sup> reate	View	- Alias	- DR2		CO2
2	catalog table	s Int	rodu	ction to	n Lin	11x - R	asic co	mm	ands_	File A	CCESS	and of	her	0	CO2
	Commands	5. III	liouu			ur D		/111116	inus					9	000
	Commands														
	DB2 Locks: Locks- Lock Size-Grant- Revoke-Isolation									0	CO1				
3	Level- Data	Integ	rity-	Interac	ction	with l	DB2							9	CO2
	DESIGNIN	GA	DAT	<b>TABAS</b>	E Al	ND I'l	<b>IS SE</b>	CUR	ITY						
4	Database obj	ects	and	relation	ships	s – im	pleme	nting	and a	ltering	g datał	base de	esign –	0	CO3
4	DB2 security	ty – managing access through authorization IDs or roles – managing								9	<b>CO4</b>				
	access through	gh tru	usted	contex	ts an	id data	a defin	ition	contr	ol			0 0		
	OPERATION AND RECOVERY														
	DB2 basic operational concepts – starting and stopping DB2 – scheduling														
5	administrativ	ve tas	sks –	monito	oring	and c	ontroll	lingI	DB2 a	nd its	conne	ction –	-	9	CO3
1	managing the	e log	and	the boo	otstra	p data	ı set –	recov	vering	from	differe	ent DB	2 –		<b>CO4</b>
1	reading log r	ecor	ds.			•									

#### **Text Books:**

- 1. "DB2 11 for z/OS Application Programming and SQL Guide", 2021, IBM Corp.
- 2. "DB2 11 for Z/OS Administration Guide", 2021, IBM Corp.

## **Online Resources/References:**

1. https://www.db2tutorial.com/

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

<b>Bloom's Taxonomy</b>	Test(50 Marks)
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

## SEE–Semester End Examination (50marks)

<b>Bloom's Taxonomy</b>	Questions (50 Marks)
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

## LIST OF ASSESSMENT PATTERNS:

SNO	Tasks	Blooms category/Level	Remarks
1	Assignments	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
2	Group Discussions	Apply-L3, Analyse-L4	Group
3	Case Studies/ Case Lets	Apply-L3, Analyse-L4, Evaluate-L5	Individual / Group
4	Practical Orientation on Design thinking	Analyse-L4, Create-L6	Creativity & Innovation
5	Participatory & Industry- Integrated Learning	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
6	Practical activities / Problem solving exercises	Apply-L3, Analyse-L4, Evaluate-L5	Individual / Group
7	Class Presentations	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
8	Analysis of Industry / Technical /Business Reports	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
9	Reports on Industrial Visit	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
10	Industrial / Social /Rural Projects	Analyse-L4, Create-L6	Individual / Group
11	Participation in external seminars/ workshops	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
12	Any other academic activity	Understand-L2, Apply-L3, Analyse-L4	Individual / Group
13	Online / Offline Quizzes	Understand-L2, Apply-L3	Individual

Note:

1. The choice or selection of appropriate Tasks for each Assessment Type by the course coordinator

2. Assign / fix the marks for each Assessment Type by course co-ordinator.

3.Students either submit the report for Task or not, as determined by the course coordinator.

4.Need to get final approval from the HOD/BOS Chairman once finalising the mark allocations for Tasks and Assessment types.

# **APPENDIX A**

## **Outcome Based Education**

Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead, classes, opportunities, and assessments should all help students achieve the specified outcomes.

There are three educational Outcomes as defined by the National Board of Accreditation: Program Educational Objectives: The Educational objectives of an engineering degreeprogram are the statements that describe the expected achievements of graduate in their and in particular, what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

# **Program Outcomes:** What the student would demonstrate upon graduation. Graduateattributes are separately listed in Appendix C

**Course Outcome:** The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes

## Mapping of Outcome:



#### **APPENDIX B**

#### The Graduate Attributes of NBA

- **PO1** Engineering knowledge: Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems in Computer Engineering.
- **PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems in Computer Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
- **PO3 Design / Development of Solutions:** Design solutions for complex Engineering problems and design system components or processes of Computer Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
- **PO4 Conduct Investigations of Complex Problems:** Use research based knowledge and research methods including design of experiments in Computer Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5** Modern Tool Usage: Create, select, and apply appropriate techniques, resources, andmodern Engineering and IT tools including prediction and modeling to complex Engineering activities in Computer Engineering with an understanding of the limitations.
- **PO6** The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Computer Engineering.
- **PO7** Environment and Sustainability: Understand the impact of the professional Engineering solutions of Computer Engineering in societal and Environmental contexts, demonstrate the knowledge of, and need for sustainable development.
- **PO8** Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms of the Engineering practice.
- **PO9** Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10** Communication Skills: Communicate effectively on complex Engineering activities with the Engineering community and with society, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11 Project Management and Finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.

**PO12** Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **APPENDIX C**

#### **BLOOM'S TAXONOMY**

Bloom's taxonomy is a classification system used to define and distinguish different levels ofhuman cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and otherevaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.

