



# NEW HORIZON COLLEGE OF ENGINEERING

Autonomous College, Affiliated to VTU | Approved by AICTE New Delhi & UGC  
Accredited by NAAC with 'A' Grade & Accredited by NBA



**DEPARTMENT OF ARTIFICIALINTELLIGENCE AND MACHINE  
LEARNING**

**BATCH: 2021-25 [CREDITS: 160]  
[2021 Scheme]**



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**DEPARTMENT OF ARTIFICIAL  
INTELLIGENCE AND MACHINE  
LEARNING**

**1<sup>st</sup> to 8<sup>th</sup> Semesters Scheme  
Third (3<sup>rd</sup>) and Fourth (4<sup>th</sup>) Syllabus  
Academic Year 2022-2023**

**BATCH: 2021-25**

**CREDITS: 160(NEP)  
[2021 Scheme]**

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2. Department Vision, Mission and Program Educational Objectives (PEO)
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## **SCHEME**

5. **Scheme of One to Eighth Semester B. E**

## **SYLLABUS**

### **6. Subjects for III/ IV Semester (Choice Based)**

- a) Life Skills for Engineers (AEC)
- b) Domain based AEC-1 ( Introduction to Artificial Intelligence)
- c) Entrepreneurship Development -2
- d) Aadalitha Kannada / Vyavaharika Kannada
- e) Constitution of India & Professional Ethics
- f) Environmental Science

### **7. Syllabus of Third Semester BE:**

- a) Applied Mathematics-III
- b) Introduction to Artificial Intelligence
- c) Digital Electronics for AI
- d) Digital Electronics for AI Lab
- e) Data Structures using C
- f) Data Structures using C Lab
- g) Object Oriented Programming with Java
- h) Object Oriented Programming with Java Lab
- i) Mini Project – I

### **8. Syllabus of Fourth Semester BE:**

- a) Mathematical Statistics
- b) Database Management System
- c) Database Management System Lab
- d) Data Science
- e) Data Science Lab
- f) Design and Analysis of Algorithms
- g) Design and Analysis of Algorithms Lab
- h) Summer Internship -1

### **9. Appendix**

**Appendix A** Outcome Based Education

**Appendix B** Graduate Parameters as defined by National Board of Accreditation

**Appendix C** Bloom's Taxonomy

# **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. To develop value based socially responsible professionals for the betterment of the society

## **Quality Policy**

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.

## **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 provide strong theoretical foundations and hands-on competence in Artificial Intelligence and Machine Learning, fostering research, innovation, and technical excellence in alignment with industry and national needs.

To establish sustainable academia–industry collaboration for curriculum enrichment, real-time problem solving, internships, and emerging AI technology implementation.

To develop ethically responsible, socially conscious, and environmentally aware AI professionals through holistic learning and active participation in co-curricular and professional activities.

## Program Educational Objectives (PEOs)

<b>PEO1</b>	Graduates will build successful careers in Artificial Intelligence and Machine Learning by applying strong theoretical foundations, analytical skills, and modern tools to solve complex industrial and societal problems.
<b>PEO2</b>	Graduates will pursue higher education, research, entrepreneurship, or leadership roles in emerging AI technologies through continuous learning, innovation, and industry collaboration.
<b>PEO3</b>	Graduates will demonstrate ethical responsibility, environmental awareness, and social consciousness while developing and deploying AI solutions for sustainable societal impact.

## PEO to Mission Statement Mapping

Mission Statements	PEO1	PEO2	PEO3
To provide strong theoretical foundations and hands-on competence in Artificial Intelligence and Machine Learning, fostering research, innovation, and technical excellence in alignment with industry and national needs.	✓	✓	-
To establish sustainable academia–industry collaboration for curriculum enrichment, real-time problem solving, internships, and emerging AI technology implementation	✓	✓	-
To develop ethically responsible, socially conscious, and environmentally aware AI professionals through holistic learning and active participation in co-curricular and professional activities.	-	-	✓

## Program Outcomes (POs) with Graduate Attributes

- P01** **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- P02** **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems in reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- P03** **Design / Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- P04** **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- P05** **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- P06** **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.
- P07** **Environment and Sustainability:** Understand the impact of the professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- P08** **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the Engineering practice.
- P09** **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- P010** **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.
- P011** **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.
- P012** **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.

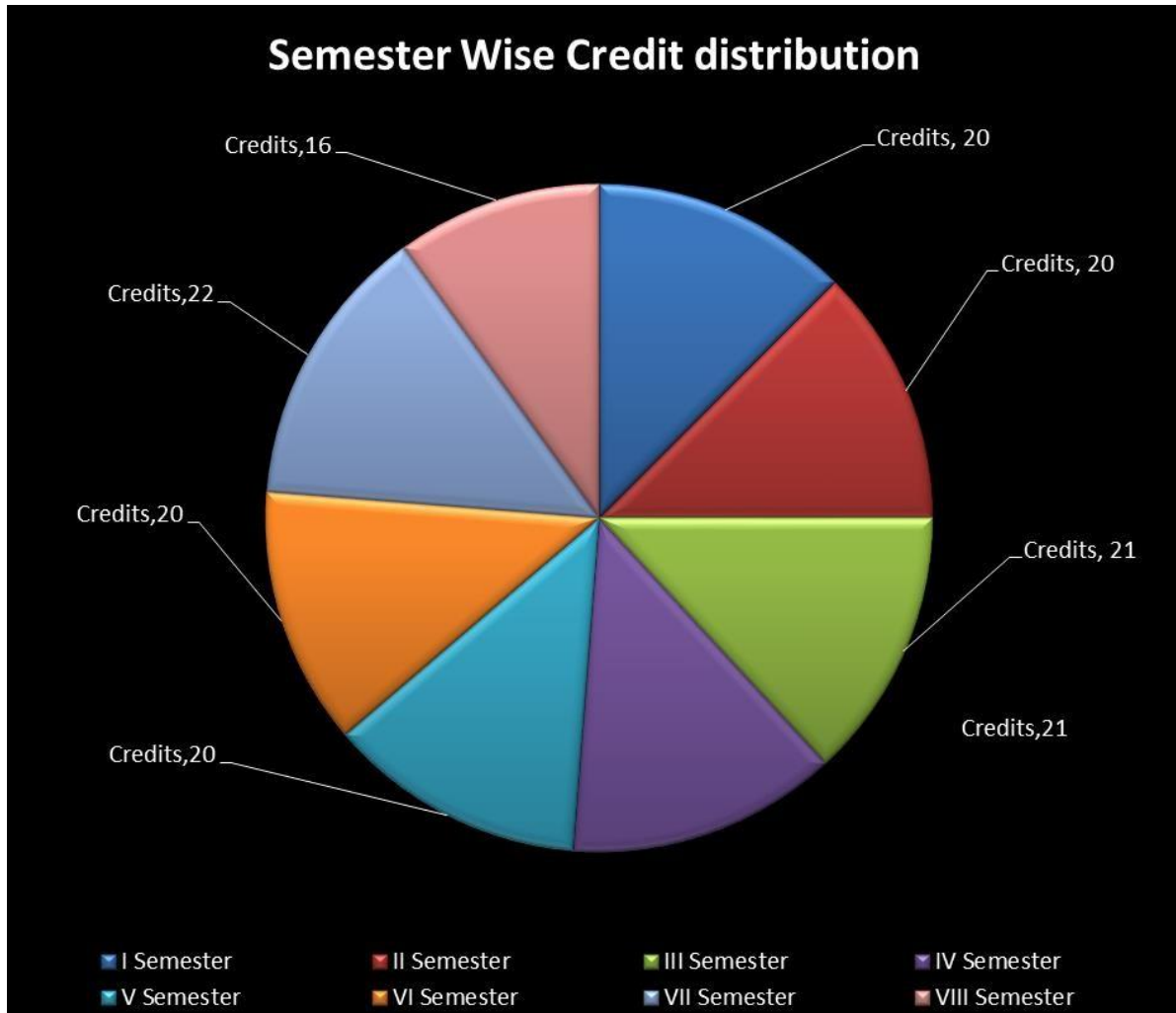
## Program Specific Outcomes (PSOs)

**A graduate of the Artificial Intelligence and Machine Learning Program will demonstrate:**

**PSO1:** Ability to design, develop, and deploy intelligent systems using machine learning algorithms, deep learning architectures, data analytics, and AI frameworks to address real-world applications.

**PSO2:** Ability to analyze large-scale data, interpret model outcomes, and implement responsible, secure, and ethical AI solutions aligned with industry standards and societal needs.

## Overall Credit Distribution Chart



## I SEMESTER – PHYSICS CYCLE

S.No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			SEE	CIE	Total
1	21MAT11A	Applied Mathematics-1	AS	3	1	0	0	4	5	50	50	100
2	21CHE12A	Engineering Chemistry	AS	2	1	0	0	3	4	50	50	100
3	21CSE13A	Problem solving using Python	CSE	2	1	0	0	3	4	50	50	100
4	21MEE14A	Computer Aided Engineering Drawing	ME	2	0	1	0	3	4	50	50	100
5	21ECE15A	Basic Electronics	ECE	2	1	0	0	3	4	50	50	100
6	21CHL12A	Engineering Chemistry Lab	AS	0	0	1	0	1	2	50	50	100
7	21CSL13A	Problem solving using Python Lab	CSE	0	0	1	0	1	2	50	50	100
8	21AEC11A	Communicative English	HSS	0	0	1	0	1	2	50	50	100
9	21AEC13A	Political Science	HSS	1	0	0	0	1	1	50	50	100
<b>Total</b>								<b>20</b>	<b>28</b>	<b>450</b>	<b>450</b>	<b>900</b>

**II SEMESTER- CHEMISTRY CYCLE**

S. No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			SEE	CIE	Total
1	21MAT21A	Applied Mathematics-2	AS	3	1	0	0	4	5	50	50	100
2	21PHY22A	Engineering Physics	AS	2	1	0	0	3	4	50	50	100
3	21MEE23A	Elements of Mechanical Engineering	ME	2	1	0	0	3	4	50	50	100
4	21CIV24A	Elements of Civil Engineering	CV	2	1	0	0	3	4	50	50	100
5	21EEE25A	Basic Electrical Engineering	EE	2	1	0	0	3	4	50	50	100
6	21PHL22A	Engineering Physics Lab	AS	0	0	1	0	1	2	50	50	100
7	21EEL25A	Basic Electrical Engineering Lab	EE	0	0	1	0	1	2	50	50	100
8	21AEC21A	Professional Writing Skills in English	HSS	0	0	1	0	1	2	50	50	100
9	21AEC22A	Entrepreneurship Development - 1	MBA	1	0	0	0	1	1	50	50	100
<b>Total</b>								<b>20</b>	<b>28</b>	<b>450</b>	<b>450</b>	<b>900</b>

### THIRD SEMESTER-SCHEME

III SEMESTER												
S.No	CourseCode	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21AIM31A	Mathematical Foundation for Computing Sciences	AS	3	0	0	0	3	4	50	50	100
2	21AIM322A*	Introduction to Artificial Intelligence	AI&ML	1	0	1	0	2	3	50	50	100
3	21HSS332A/ 21HSS333A	Aadalitha Kannada / Vyavaharikha Kannada	HSS	1	0	0	0	1	1	50	50	100
4	21HSS342A	Environmental Science	HSS	1	0	0	0	1	1	50	50	100
5	21AIM35A	Digital Electronics for AI	AI&ML	3	0	0	0	3	4	50	50	100
6	21AIL35A	Digital Electronics for AI Lab	AI&ML	0	0	1	0	1	2	50	50	100
7	21AIM36A	Data Structures using C	AI&ML	3	0	0	0	3	4	50	50	100
8	21AIL36A	Data Structures using C Lab	AI&ML	0	0	1	0	1	2	50	50	100
9	21AIM37A	Object-Oriented Programming with Java	AI&ML	3	0	0	0	3	4	50	50	100
10	21AIL37A	Object-Oriented Programming with Java Lab	AI&ML	0	0	1	0	1	2	50	50	100
11	21AIM38A	Mini Project-1	AI&ML	0	0	2	0	2	4	50	50	100
<b>Total</b>								<b>21</b>	<b>31</b>	<b>550</b>	<b>550</b>	<b>1100</b>

## LATERAL ENTRY STUDENTS

LATERAL ENTRY STUDENTS												
S.No	CourseCode	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21DMAT31A	Basic Applied Mathematics -1	AS	0	0	0	0	0	2	50	50	100
2	21DAEC40A	Communicative English	HSS	0	0	0	0	0	2	50	50	100
3	21DMAT41A	Basic Applied Mathematics - 2	AS	0	0	0	0	0	2	50	50	100
4	21HSS341A/441A	Constitution of India & Professional Ethics	HSS	Mandatory course			0	0	2	50	50	100

## FOURTH SEMESTER-SCHEME

IV SEMESTER												
S.No	CourseCode	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21AIM41A	Discrete Mathematics and Statistics	AS	3	0	0	0	3	4	50	50	100
2	21HSS421A*	Life Skills for Engineers	HSS	1	0	1	0	2	3	50	50	100
3	21HSS431A	Entrepreneurship Development -2	HSS	1	0	0	0	1	1	50	50	100
4	21HSS441A	Constitution of India & Professional Ethics	HSS	1	0	0	0	1	1	50	50	100
5	21AIM45A	Database Management System	AI&ML	3	0	0	0	3	4	50	50	100
6	21AIL45A	Database Management system Lab	AI&ML	0	0	1	0	1	2	50	50	100
7	21AIM46A	Data Science	AI&ML	3	0	0	0	3	4	50	50	100
8	21AIL46A	Data Science Lab	AI&ML	0	0	1	0	1	2	50	50	100
9	21AIM47A	Design and Analysis of Algorithms	AI&ML	3	0	0	0	3	4	50	50	100
10	21AIL47A	Design and Analysis of Algorithms lab	AI&ML	0	0	1	0	1	2	50	50	100
11	21AIM48A	Summer Internship - I	AI&ML	0	0	0	2	2	0	50	50	100
<b>Total</b>								<b>21</b>	<b>27</b>	<b>550</b>	<b>550</b>	<b>1100</b>

# Verticals of Electives

## AI& ML

- Information Storage and Retrieval
- Data Visualization
- Speech Synthesis & Recognition
- Natural Language Processing
- Augmented & Virtual Reality
- Social Network Analysis

## AI IoT and Robotics

- Introduction to sensor and IOT
- Embedded Systems
- Introduction to Robotics
- Pattern Recognition & Image Processing
- Human Computer Interaction
- Streaming Analytics

## AI Computer Science

- Theory of Computation
- Operating System
- Software Engineering
- Compiler Design
- Advance Java
- Software Testing

## Networks & Security

- Parallel Processing
- Cryptography and Network Security
- Computer Networks
- Block chain Technologies
- Information Security
- Cyber Security, Forensics and Law

## FIFTH SEMESTER-SCHEME

S. No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21AIM51A	Machine Learning	AI&ML	3	0	0	0	3	4	50	50	100
2	21AIL51A	Machine Learning lab	AI&ML	0	0	1	0	1	2	50	50	100
3	21AIM52A	Big Data Technologies	AI&ML	3	0	0	0	3	4	50	50	100
4	21AIL52A	Big Data Technologies Lab	AI&ML	0	0	1	0	1	2	50	50	100
5	21AIM53A	Professional Elective Course-1	AI&ML	3	0	0	0	3	4	50	50	100
6	21AIM54A	Professional Elective Course-2	AI&ML	3	0	0	0	3	4	50	50	100
7	21AEC55A	Research Methodology and Intellectual Property Rights	AI&ML	2	0	0	0	2	2	50	50	100
8	21AIM56A*	Domain Based AEC –II (Cloud Computing)	AI&ML	1	0	1	0	2	3	50	50	100
9	21HSS57A/ 67A	Physical Education	HSS	0	0	0	0	0	2	50	50	100
10	21AIM58A	Mini Project-2	AI&ML	0	0	2	0	2	4	50	50	100
<b>Total</b>								<b>20</b>	<b>31</b>	<b>500 / 450</b>	<b>500 / 450</b>	<b>1000 / 900</b>

Professional Elective Courses-1		Professional Elective Course- 2	
1	Information Storage and Retrieval	1	Data Visualization
2	Introduction to sensor and IOT	2	Embedded Systems
3	Theory of Computation	3	Operating System
4	Parallel Processing	4	Cryptography and Network Security

### SIXTH SEMESTER-SCHEME

S. No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21AIM61A	Deep Learning Techniques	AI&ML	3	0	0	0	3	4	50	50	100
2	21AIL61A	Deep Learning Lab	AI&ML	0	0	1	0	1	2	50	50	100
3	21AIM62A	Advance Artificial Intelligence	AI&ML	3	0	0	0	3	4	50	50	100
4	21AIL62A	Artificial Intelligence Lab	AI&ML	0	0	1	0	1	2	50	50	100
5	21AIM63A	Professional Elective Course-3	AI&ML	3	0	0	0	3	4	50	50	100
6	21AIM64A	Professional Elective Course-4	AI&ML	3	0	0	0	3	4	50	50	100
7	21NHOP6XXA	Open Elective -1	AI&ML	2	0	1	0	3	4	50	50	100
8	21AIM66A	Summer Internship - II	AI&ML	0	0	0	3	3	0	50	50	100
9	21HSS57A/ 67A	Physical Education	P.Ed/HSS	0	0	0	0	0	2	50	50	100
<b>Total</b>								<b>20</b>	<b>26</b>	<b>400/ 450</b>	<b>400/ 450</b>	<b>800/ 900</b>

Professional Elective Courses - 3		Professional Elective Course - 4	
1	Speech Synthesis & Recognition	1	Natural Language Processing
2	Introduction to Robotics	2	Pattern Recognition & Image Processing
3	Software Engineering	3	Compiler Design
4	Computer Networks	4	Block chain Technologies

## SEVENTH SEMESTER-SCHEME

S. No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			SEE	CIE	Total
1	21AIM71A	Professional Elective Course-5	AI&ML	3	0	0	0	3	4	50	50	100
2	21AIM72A	Professional Elective Course-6	AI&ML	3	0	0	0	3	4	50	50	100
3	21NHOP73XXA	Open Elective-2	AI&ML	2	0	1	0	3	4	50	50	100
4	21NHOP74XXA	Open Elective - 3	AI&ML	2	0	1	0	3	4	50	50	100
5	21AIM75A	Project Work	AI&ML	0	0	10	0	10	20	50	50	100
<b>Total</b>								<b>22</b>	<b>36</b>	<b>250</b>	<b>250</b>	<b>500</b>

Professional Elective Courses-5		Professional Elective Course- 6	
1	Augmented & Virtual Reality	1	Social Network Analysis
2	Human Computer Interaction	2	Streaming Analytics
3	Advance Java	3	Software Testing
4	Information Security	4	Cyber Security, Forensics and Law

**Open Elective Course List**

1	Big Data Analytics using HP Vertica-1
2	VM Ware Virtualization Essentials-1
3	Big Data Analytics using HP Vertica-2
4	VM Ware Virtualization Essentials-2
5	SAP
6	Schneider-Industrial Automation
7	Cisco-Routing and Switching-1
8	CISCO-Routing and switching-2
9	IIOT Embedded Systems
10	Block chain
11	Product Life Cycle Management
12	Network Security and Cryptography
13	Physical Design

## EIGHT SEMESTER-SCHEMES

S. No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			SEE	CIE	Total
1	21AIM81A	Technical Seminar	AI&ML	1	0	0	0	1	2	50	50	100
2	21AIM82A	Research/ Industry Internship	AI&ML	0	0	0	15	15	-	50	50	100
<b>Total</b>								<b>16</b>	<b>2</b>	<b>100</b>	<b>100</b>	<b>200</b>

**\*Research/ Industry Internship: To be evaluated on regular basis**

**Attendance certificate Mandatory for (24 weeks) Research/ Industry Internship**

**THIRD SEMESTER-SCHEME-NEP-2021**

III SEMESTER												
S.No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21AIM31A	Mathematical Foundation for Computing Sciences	AS	3	0	0	0	3	4	50	50	100
2	21AIM322A*	Introduction to Artificial Intelligence	AI&ML	1	0	1	0	2	3	50	50	100
3	21HSS332A/ 21HSS333A	Aadalitha Kannada / Vyavaharikha Kannada	HSS	1	0	0	0	1	1	50	50	100
4	21HSS342A	Environmental Science	HSS	1	0	0	0	1	1	50	50	100
5	21AIM35A	Digital Electronics for AI	AI&ML	3	0	0	0	3	4	50	50	100
6	21AIL35A	Digital Electronics for AI Lab	AI&ML	0	0	1	0	1	2	50	50	100
7	21AIM36A	Data Structures using C	AI&ML	3	0	0	0	3	4	50	50	100
8	21AIL36A	Data Structures using C Lab	AI&ML	0	0	1	0	1	2	50	50	100
9	21AIM37A	Object-Oriented Programming with Java	AI&ML	3	0	0	0	3	4	50	50	100
10	21AIL37A	Object-Oriented Programming with Java Lab	AI&ML	0	0	1	0	1	2	50	50	100
11	21AIM38A	Mini Project-1	AI&ML	0	0	2	0	2	4	50	50	100
<b>Total</b>								<b>21</b>	<b>31</b>	<b>550</b>	<b>550</b>	<b>1100</b>

## LATERAL ENTRY STUDENTS

LATERAL ENTRY STUDENTS												
S.No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21DMAT31A	Basic Applied Mathematics -1	AS	0	0	0	0	0	2	50	50	100
2	21DAEC40A	Communicative English	HSS	0	0	0	0	0	2	50	50	100
3	21DMAT41A	Basic Applied Mathematics -2	AS	0	0	0	0	0	2	50	50	100
4	21HSS341A/441A	Constitution of India & Professional Ethics	HSS	Mandatory course			0	0	2	50	50	100

## Mathematical Foundation for Computing Sciences

**Course Code : 21AIM31A**  
**L:T:P : 3:0:0**  
**Exam Hours : 03**

**Credits : 03**  
**CIE Marks : 50**  
**SEE Marks : 50**

**Course Outcomes: At the end of the Course, the Student will be able to do the following:**

<b>CO1</b>	Use appropriate numerical methods to solve algebraic equations and transcendental equations.
<b>CO2</b>	Solve initial value problems using appropriate numerical methods and also Evaluate definite integrals numerically.
<b>CO3</b>	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.
<b>CO4</b>	Gain ability to use probability distributions to analyze and solve real time problems
<b>CO5</b>	Justify the concept of sampling distribution to solve the engineering problems.
<b>CO6</b>	Use the large/small samples to analyze the data to make decision about the hypothesis.

**Mapping of Course Outcomes to Program Outcomes:**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	3	3	3	-	3	-	-	-	3	3
<b>CO2</b>	3	3	3	3	3	-	3	-	-	-	3	3
<b>CO3</b>	3	3	3	3	3	2	3	-	-	3	3	3
<b>CO4</b>	3	3	3	3	3	2	-	-	-	3	3	3
<b>CO5</b>	3	3	3	3	3	-	-	-	-	3	3	3
<b>CO6</b>	3	3	3	3	3	-	-	-	-	3	3	3

### Course Syllabus

<b>Module No.</b>	<b>Contents of the Module</b>	<b>Hours</b>	<b>COs</b>
<b>1.</b>	<p><b>Numerical Methods-1:</b> Numerical solution of algebraic and transcendental equations: Regula-falsi method and Newton-Raphson method-Problems.</p> <p>Interpolation: Newton's forward and backward formulae for equal intervals, Newton divided difference, Lagrange's formula and Lagrange's inverse interpolation for unequal intervals (without proofs)-Problems.</p> <p>Case studies on Numerical Analysis.</p>	<b>9</b>	<b>CO1</b>

2.	<p><b>Numerical Methods 2:</b></p> <p>Numerical solution of ordinary differential equations of first order and of first degree: Taylor's series method, 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, Simpson's 3/8<sup>th</sup> rule, Weddle's ru(without proofs)-Problems.</p> <p><b>Applications:</b> Application of numerical integration to velocity of a particle and volume of solids.</p>	9	CO2
3.	<p><b>Statistical Methods:</b> Fitting of the curves of the form <math>y = a + b x</math>, <math>y = a + b x + c x^2</math>, <math>y = a e^{bx}</math>, <math>y = a x^b</math>, and <math>y = a b^x</math> by the method of least square, Correlation and Regression, Regression coefficients, line of regression-Problems and applications. Case studies on Correlation and Regressions.</p>	9	CO3
4.	<p><b>Probability distributions:</b> Random variables (discrete and continuous), probability density functions, moment generating function. Discrete Probability distributions: Binomial and Poisson Distributions-Problems. Continuous Probability distribution: Normal Distributions-Problems.</p> <p><b>Joint Probability distributions:</b> Concept of joint probability-Joint probability distribution, Discrete and Independent random variables. Expectation, Covariance, Correlation coefficient.</p> <p>Case Studies on Distributions.</p>	9	CO4
5.	<p><b>Sampling Theory:</b> Sampling, Sampling distributions, test of hypothesis of large samples for means and proportions, Inferences for variance and proportion. 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.</p> <p>Case Studies on sampling theory and significant measures of scores.</p>	9	CO5, CO6

#### Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

#### Reference Books:

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.

4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

**Assessment Pattern:**

**1. CIE- Continuous Internal Evaluation (50 Marks).**

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

**2. SEE- Semester End Examination (50Marks).**

<b>Bloom's Category</b>	<b>SEE Marks</b>
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Code : 21AIM322A\*  
 L: T: P: S : 1: 0: 1: 0  
 Exam Hours : 3

Credits: 2  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to:
CO#	COURSE OUTCOME
21AIM322.1	Describe basic knowledge representation, problem solving, and learning methods of artificial intelligence.
21AIM322.2	Compare various search techniques used to solve AI problems.
21AIM322.3	Use analytical concepts for solving logical problems using heuristics approaches.
21AIM322.4	Examine the various statistical reasoning techniques to solve AI problems.
21AIM322.5	Discuss the concepts of AI through LISP and PROLOG.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM322.1	3	-	-	-	-	-	-	-	-	-	-	3	3	-
21AIM322.2	3	3	-	-	-	-	-	-	-	-	-	3	3	-
21AIM322.3	-	3	-	-	-	-	-	-	-	-	-	3	3	3
21AIM322.4	-	3	3	-	3	-	-	-	-	-	-	3	3	3
21AIM322.5	-	-	-	-	-	-	-	-	-	-	-	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	6	CO1
2	Informed Search Strategies : Heuristic functions, Generate and Test, Hill Climbing, Best first search, A*algorithm, Constraint satisfaction	6	CO2
3	Knowledge Representation : Representations & mappings, Approaches in knowledge representation, Issues in knowledge representation, Propositional logic, Predicate logic, Procedural versus declarative knowledge	6	CO3
4	Statistical reasoning : Probability & Bayes' theorem, Bayesian networks, Semantic nets, Frames Strong slot and filler structures , Conceptual dependency	6	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	6	CO5, CO6

### Text Books:

- Artificial Intelligence By Elaine Rich, Kevin Knight, Shivashankar B Nair, Tata Mcgraw Hill, India

### Reference Books:

- Artificial Intelligence And Intelligent System BY N. P. Padhy, Oxford University Press

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

<b>Bloom's Category</b>	<b>Tests (25 marks)</b>	<b>Assignment 1 (7.5 Marks )</b>	<b>Assignment 2 (7.5Marks)</b>	<b>Quiz1 (05Marks)</b>	<b>Quiz2 (05 Marks )</b>
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	-	-	-	-	-

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

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

**ಆಡಳಿತ ಕನ್ನಡ**  
(Kannada for administration)

<b>Course Code : 21HSS332A/432A</b>	<b>Credits : 01</b>
<b>L: T: P: S : 1:0:0: 0</b>	<b>CIE Marks : 50</b>
<b>Exam Hours : 2</b>	<b>SEE Marks : 50</b>

**ಆಡಳಿತ ಕನ್ನಡ ಅಧ್ಯಯನದ ಕಲಿಕಾಂಶಗಳು**

- C01 ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಹಾಗೂ ಭಾಷಾ ರಚನೆ ನಿಯಮಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುತ್ತಾರೆ  
 C02 ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿನ ದೋಷಗಳು, ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳನ್ನು ಅರಿತುಕೊಳ್ಳುವರು  
 C03 ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಿಕೆ 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	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-

**ಪರಿವಿಡಿ (ಪಠ್ಯ ಪುಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)**

- ಅಧ್ಯಾಯ -1 ಕನ್ನಡ ಭಾಷೆ-ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ  
 ಅಧ್ಯಾಯ -2 ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ  
 ಅಧ್ಯಾಯ -3 ಲೇಖನ ಚಿಹ್ನೆಗಳು 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 ತಂತ್ರಜ್ಞಾನ  
 ಅಧ್ಯಾಯ -10 ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ /ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು

**ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದ ಲೇಖಕರು**

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೊ. ವಿ . ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ, ವಿ.ತಾ.ವಿ.ಬೆಳಗಾವಿ

**ಪರೀಕ್ಷೆಯ ವಿಧಾನ:**

- ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (Continuous Internal Evaluation) : 50 ಅಂಕಗಳು  
 ಸಮೀಕ್ಷಣ ಪರೀಕ್ಷೆ (Semester End Examination) : 50 ಅಂಕಗಳು

Blooms Category	CIE (50)	SEE (50)
Remember	25	25
Understand	25	25

## Vyavaharika Kannada (Kannada for use)

Course Code : 21HSS333A/433A	Credits 01
L: T: P: S : 1:0:0: 0	CIE Marks 50
Exam Hours : 2	SEE Marks 50

**Course Outcome:** On completion of the course student will be able to:

- CO1 Understand Kannada Language.
- CO2 Communicate in Kannada Language
- CO3 Read simple Kannada words
- CO4 Pronounce Kannada words correctly

**CO - PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-

**Syllabus**

**Chapter - 1:** Vyavaharika Kannada – Parichaya (Introducton to Vyavaharika Kannada)

**Chapter - 2:** Kannada Aksharamale haagu uchharane (Kannada Alphabets and Pronunciation)

**Chapter - 3:** Sambhashanegaagi Kananda Padagalu (Kannada Vocabulary for Communication)

**Chapter - 4:** Kannada in Conversations (Sambhashaneyalli Kannada)

**Chapter - 5:** Activities in Kannada. (Kannada Sambhashanegaagi Chatuvatikegalu)

**Text Book:**

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

**Continuous Internal Evaluation & Semester End Examination : (50 marks Each)**

Bloom's Category	CIE(50)	SEE(50)
Remember	25	25
Understand	25	25

## ENVIRONMENTAL SCIENCE

**Course Code** : 21HSS342A  
**L: T: P: S** : 1:0:0  
**ExamHours** : 02 Hrs

**Credits** : 1  
**CIE Marks** : 50  
**SEE Marks** : 50

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

<b>CO1</b>	Understand the concepts of Environment, ecosystem and biodiversity.
<b>CO2</b>	Explain the strategies for management of natural resources to achieve sustainability.
<b>CO3</b>	Analyze the control measures of Environmental pollution and global Environmental issues.
<b>CO4</b>	Apply the knowledge of Environment Impact Assessment, Technology, Environmental acts and laws in protecting Environment and human health.

**Mapping of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	-	-	-	-	-	3	3	-	-	-	-	-	-	-
<b>CO2</b>	-	-	-	-	-	3	3	-	-	-	-	3	1	-
<b>CO3</b>	-	-	-	-	-	3	3	3	-	3	-	3	1	-
<b>CO4</b>	-	-	-	-	1	3	3	3	-	3	-	3	1	1

**Correlation levels:** 1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)

Module No.	Content of Module	Hours	COs
1	<b>Introduction to Environment, Ecosystem and Biodiversity:</b> Environment: Definition, Components of Environment; Ecosystem: Types & Structure of Ecosystem, Energy flow in the ecosystem; Biodiversity: Types, Hot-spots, Threats and Conservation of biodiversity.	3	CO1
2	<b>Natural Resources:</b> Advanced Energy resources (Hydrogen, Solar, OTEC, Tidal and Wind), merits and demerits, Water resources – cloud seeding, Mineral resources, Forest resources. Strategies of management, concept of Sustainability.	3	CO2
3	<b>Environmental Pollution:</b> Definition, Causes, effects and control measures of Air Pollution, Water Pollution, soil Pollution and Noise pollution. Solid wastes and its management. Role of society, NGO and Govt. agencies in Prevention of pollution.	3	CO3
4	<b>Global Environmental issues, Environment acts and amendments:</b> Fluoride problem in drinking water, Acid Rain, Ozone layer depletion, Global warming and climate change. National forest policy, Environmental laws and acts. International agreements and protocols.	3	CO3 CO4
5	<b>Human Population and Environment Impact Assessment:</b> Population growth & explosion, Population pyramids. Negative impact of agriculture and urbanization, Role of Technology in protecting environment and Human Health. Environment Impact Assessment.	3	CO4

#### Text Books:

1. Environmental studies by Benny Joseph, Tata McGraw Hill Education Private Limited, 2009, ISBN: 9870070648135.
2. “Environmental Studies: Basic Concepts” by Ahluwalia, V. K. The Energy and Resources Institute (TERI) Publication, 2nd edition, 2016. ISBN: 817993571X, 9788179935712.
3. “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. Handbook of Environmental Engineering by Rao Surampalli, Tian C. Zhang, Satinder Kaur Brar, Krishnamoorthy Hegde, Rama Pulicharla, Mausam Verma; McGraw Hill Professional, 2018. ISBN: 125986023X, 9781259860232
2. Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
3. Environmental Science- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10<sup>th</sup> Edition. ISBN: 10: 0534424082.

4. Elements of Environmental Science and Engineering by P. Meenakshi, Prentice Hall of India Pvt. Ltd, 2005 Edition. ISBN: 8120327748, 9788120327740.

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

Bloom's Category	Tests	Assignments	Seminar
<b>Marks (Out of 50)</b>	<b>25</b>	<b>15</b>	<b>10</b>
Remember	5	-	-
Understand	15	-	-
Apply	5	8	5
Analyze	-	7	5
Evaluate	-	-	-
Create	-	-	-

**SEE – Semester End Examination (50 Marks):**

Bloom's Category	Tests
Remember	10
Understand	30
Apply	10
Analyze	-
Evaluate	-
Create	-

**Percentage Evaluation of Various Blooms' levels:**

Bloom's Category	CIE	SEE	Total	%
Remember	5	10	15	15
Understand	15	30	45	45
Apply	18	10	28	28
Analyze	12	-	12	12
Evaluate	-	-	-	-
Create	-	-	-	-

## DIGITAL ELECTRONICS FOR AI

Course Code : 21AIM35A  
 L: T: P: S : 3: 0: 0: 0  
 Exam Hours : 3

Credits: 3  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM35A.1	Describe the significance and basic principles of the digital circuits
21AIM35A.2	Apply the concepts of minimization techniques to realize digital circuits
21AIM35A.3	Analyze different types of combinational and sequential circuits for given specifications
21AIM35A.4	Use CAD/HDL tools to simulate and verify Digital circuits
21AIM35A.5	Use the concepts of GPUs using CUDA programming

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM35A.1	-	-	-	-	-	-	-	-	-	-	-	-	3	-
21AIM35A.2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
21AIM35A.3	-	3	-	-	-	-	-	-	-	-	-	-	3	-
21AIM35A.4	-	-	3	-	-	-	-	-	-	-	-	-	3	-
21AIM35A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	-
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
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
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	CO1, CO2, CO3
4	<b>Introduction to HDL:</b> Basic Concepts, data types, Compiler directives. Modules and Ports, Module definition, port declaration, connecting ports, Different types of modelling style, Verilog implementation of combinational circuits, Verilog implementation of sequential circuits	9	CO1, CO2, CO3, CO4
5	<b>Processing Units:</b> CPU and its parts, parallel processing, Multi core processor- Architecture, Graphical Processing Units(GPU), Difference between CPU and GPU, Using GPU for AI Applications, Basics of CUDA programming	9	CO5

**Text Books:**

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, , 1<sup>st</sup> 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)**

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

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

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

## DIGITAL ELECTRONICS FOR AILAB

**Course Code** : 21AIL35A  
**L: T: P: S** : 0: 0: 1: 0  
**ExamHours** : 3

**Credits**: 1  
**CIE Marks**: 50  
**SEE Marks**: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIL35A.1	Apply the concepts of minimization techniques to realize the digital circuits
21AIL35A.2	Analyse different methods to realize the logic circuits
21AIL35A.3	Simulate logic circuits using HDL tool
21AIL35A.4	Demonstrate the use of GPU's using CUDA Programming

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIL35A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	2
21AIL35A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	2
21AIL35A.3	-	-	3	-	-	-	-	-	-	-	-	-	3	2
21AIL35A.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.	3	CO1
2.	Design and implement (a) Full Adder using basic logic gates. (b) Full Subtractor using basic logic gates.	3	CO1
3.	Realize the different shift registers using IC7474	3	CO2
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	3	CO2, CO4
5.	Perform n bit addition / subtraction using 4-bit full adder IC. Simulate and verify its working using Verilog code.	3	CO2, CO4
6.	Design and implement BCD to seven-segment decoder. Simulate and verify given decoder using VERILOG code.	3	CO3, CO4
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.		
8.	Write a Cuda C/C++ program to demonstrate the computation running in GPU	3	CO4

**Text Books:**

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 (50 Marks)**

<b>Bloom's Category</b>	<b>Tests (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

<b>Bloom's Category</b>	<b>Questions (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## DATA STRUCTURES USING C

Course Code : 21AIM36A  
 L:T:P:S : 3:0: 0: 0  
 ExamHours: : 3

Credits: 3  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM36A.1	Understand the fundamentals of C programming, data structure and its applications.
21AIM36A.2	Analyse the concepts of linear and non-linear data structure for problem solving.
21AIM36A.3	Apply dynamic memory allocation techniques for designing data structure
21AIM36A.4	Investigate the literature about linear data structure and submit report in a team
21AIM36A.5	Make an effective written documentation about nonlinear data structure

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM36A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM36A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
21AIM36A.3	3	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM36A.4	-	-	-	3	3	-	-	-	2	2	-	3	3	2
21AIM36A.5	-	-	-	-	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 C:</b> Basics of C programming, Data types, Variables, Operators, Control structures- Decision making statements, Selection statements, Iteration statements, Jump statements, Functions, Arrays ,Pointers and structure.	9	CO1
2	<b>Introduction to Data Structures:</b> Classification of Data Structures, Sparse matrix, transpose of a sparse matrix, Dynamic memory management. Introduction to Data Structures, Abstract Data Types. Sorting: Insertion sort, Shell sort, Radix sort.	9	CO1, CO2
3	<b>Stacks &amp; Queues: Stacks:</b> Definition, Stack representation, Primitive operations on stack, array representation of stacks. <b>Applications of stacks:</b> Recursion, Fibonacci series, Tower of Hanoi problem, Conversion of expressions, Evaluation of postfix expression. <b>Queues:</b> Definition, Queue representation, Primitive operations on queue, array representation of queues, Circular queue, Double ended queue, Applications of queues	9	CO1, CO3,
4	<b>Linked Lists:</b> Dynamic memory allocation revisited – malloc, calloc, realloc, free, Introduction to linked list, Representation of linked list in memory, primitive operations on linked list, circular linked list, doubly linked list. <b>Applications of linked list:</b> Josephus problem, Linked representation of stack, Linked representation of queue.	9	CO1, CO3, CO4
5	<b>Trees:</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, Heap tree, creation of heap tree, insertion in heap, Deletion from heap. <b>Introduction to Graph:</b> Graph theory terminologies, sequential representation of a graph, adjacency matrix, Linked representation of a graph, Graph traversal -BFS, DFS.	9	CO1, CO3, CO5

**Text Books:**

1. Brian W. Kernighan and Dennis M. Ritchie: The C Programming Language, 2nd Edition, PHI, 2012.
2. Seymour Lipschutz, Data Structures with C Special Indian Edition, Thirteenth reprint 2015, McGrawHill Education
3. Aaron M. Tanenbaum, Yediyah 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.

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

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

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

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

## DATA STRUCTURES USING C LAB

**Course Code** : 21AIL36A  
**L: T: P: S** : 0: 0: 1: 0  
**ExamHours:** : 3

**Credits:** 1  
**CIE Marks:** 50  
**SEE Marks:** 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIL36A.1	Apply Data structure techniques to solve the problem
21AIL36A.2	Analyze the output for a given problem
21AIL36A.3	Conduct experiments as individual by using C programming language
21AIL36A.4	Make 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
21AIL36A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
21AIL36A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
21AIL36A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIL36A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2

Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)

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

8.	Develop a program to traverse a tree using in-order, pre-order and post order.	3	CO1, CO2, CO3, CO4
9.	Develop a program to perform insertion, deletion and traversal of a binary search tree		
10.	Develop a program to implement BFS and DFS traversal of graph	3	CO1, CO2, CO3, CO4

**Text Books:**

1. Seymour Lipschutz, Data Structures with C Special Indian Edition, Thirteenth reprint 2015, McGrawHill Education.
2. Aaron M. Tanenbaum, Yedidyah Langsam & Moshe J. Augenstein, Data Structures using C, Thirteenth Impression 2014, Pearson Education.

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

Bloom's Category	Tests (50 marks)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

Bloom's Category	Questions (50 marks)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## OBJECT ORIENTED PROGRAMMING WITH JAVA

**Course Code** : 21AIM37A  
**L: T: P: S** : 3: 0: 0: 0  
**ExamHours** : 3

**Credits**: 3  
**CIE Marks**: 50  
**SEE Marks**: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM37A.1	Understand and explain the object oriented concepts.
21AIM37A.2	Apply OOP's concept to implement a given problem using Java.
21AIM37A.3	Analyze and ensure the flow of a program through appropriate exception handling techniques.
21AIM37A.4	Investigate and apply the concept of Multithreading in concurrent programming available in literature and submit report in a team
21AIM37A.5	Solve the real world problems using Object Oriented concepts and collection framework in Java.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM37A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM37A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM37A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
21AIM37A.4	-	-	3	-	3	-	-	-	2	2	-	3	3	2
21AIM37A.5	-	-	3	-	3	-	-	-	-	2	-	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
2	<b>Objects and Classes:</b> Working with Objects, Implementing Classes, Object Construction, Static Variables and Methods, Constructors, Overloading Methods, Inbuilt classes like String, Character, String Buffer, this reference, nested classes.	9	CO1, CO2
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
4	<b>Exception Handling:</b> Exception Types, Uncaught Exceptions, using try and catch, Multi catch clauses, Nested try statements, throw, throws, finally, Java's Built-in Exceptions. <b>Threads:</b> The java Thread Model, The main Thread, Creating a Thread, Creating multiple Threads, Thread Priorities, Synchronization, Inter thread Communication, Suspending, resuming and Stopping Threads, using Multithreading.	9	CO1, CO2, CO3, CO4
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

**Text Books:**

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

**Reference Books:**

1. Cay S. Horstmann, Core Java™ Volume I—Fundamentals, Pearson, 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)**

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

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

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

## OBJECT ORIENTED PROGRAMMING WITH JAVA LAB

Course Code : 21AIL37A  
 L: T: P: S : 0: 0: 1: 0  
 ExamHours : 3

Credits: 1  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIL37A.1	Apply OOP concepts with basic Java constructs to solve the given problem.
21AIL37A.2	Analyze the output for the programs in Java.
21AIL37A.3	Conduct experiments as individual by using modern tools like JDK
21AIL37A.4	Make 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
21AIL37A.1	-	-	-	-	-	-	-	-	-	-	-	-	3	2
21AIL37A.2	3	-	-	-	-	-	-	-	-	-	-	-	3	2
21AIL37A.3	-	3	-	-	-	-	-	-	3	-	-	3	3	2
21AIL37A.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 define a class, describe its constructor, overload the Constructors and instantiate its object, and use static members.	3	CO1 CO2 CO3 CO4
2.	Write a Java program to demonstrate String class, String Buffer class and its Methods		
3.	Write a Java program to demonstrate nested classes and array of objects	3	CO1 CO2 CO3 CO4
4.	Write a Java Program to implement multilevel inheritance demonstrate use of method overriding. Apply various access controls to its data members and methods		
5.	Write a program to demonstrate use of implementing and extending interfaces	3	CO1 CO2 CO3 CO4
6.	Write a Java program to implement the concept of importing classes from user defined package and creating packages Write a Java Program to demonstrate dynamic binding	3	CO1 CO2 CO3 CO4
7.	Write a program to implement the concept of threading by a. extending Thread Class b. implementing Runnable Interface	3	CO1 CO2 CO3 CO4
8.	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	3	CO1 CO2 CO3 CO4

9.	Write a program to implement the concept of Exception Handling using pre-defined and user defined exception.	3	CO1 CO2 CO3 CO4
10.	a).Write a program to demonstrate File I/O Operations b).Write a program to demonstrate Array List Class, Linked ListClass, Tree set Class	3	CO1 CO2 CO3 CO4

**Text Books:**

1. Herbert Schildt, Java™: 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 (50 Marks)**

Bloom's Category	Tests (50 marks)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

Bloom's Category	Questions (50 marks)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## MINI PROJECT - 1

**Course Code** : 21AIM38A  
**L: T: P: S** : 0: 0: 2:0  
**ExamHours** : 3

**Credits**: 2  
**CIE Marks**: 50  
**SEE Marks**: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM38A.1	Understand the technological needs and/ or societal needs and sustainability of the environment
21AIM38A.2	Analyse and evaluate the outcome of the project
21AIM38A.3	Design application using high level programming language
21AIM38A.4	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
21AIL38A.1	-	-	-	-	-	3	2	3	-	-	-	3	3	2
21AIL38A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
21AIL38A.3	-	-	3	-	3	-	-	-	-	-	-	3	3	2
21AIL38A.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).

### 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 (50 Marks)

Bloom's Category	Review (50marks)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

Bloom's Category	Review (50 marks)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## BASIC APPLIED MATHEMATICS-1

Course Code : 21DMAT31A  
L:T:P : 0:0:0  
ExamHours : 02

Credits : 00  
CIE Marks : 50  
SEE Marks : 50

**Course Outcomes: At the end of the Course, the Student will be able to do the following:**

CO1	Know the principles of engineering mathematics through calculus
CO2	Determine the power series expansion of a function
CO3	Find the definite integrals with standard limits and also develop the ability to solve different types of differential equations
CO4	Apply ideas from linear algebra in solving systems of linear equations and determine the Eigen values and Eigen vectors of a matrix

**Mapping of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	3
CO2	3	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	-	-	-	-	-	-	-	3
CO4	3	3	3	-	-	-	-	-	-	-	-	3

### Course Syllabus

Module No.	Contents of the Module	Hours	COs
1.	<b>Differential Calculus:</b> Polar Curves-Problems on angle between the radius vector and tangent, Angle between two curves-Problems, Pedal equation for polar curves-Problems. Maclaurin's theorem for function of one variable (statement only)-Problems.	5	CO1, CO2
2.	<b>Partial differentiation:</b> Definition and Simple problems, Euler's theorem ; Homogeneous function (NO Derivation and NO extended theorem)-Problem ; Jacobians of order two - definition and problems.	5	CO1
3.	<b>Integral Calculus and Differential Equations:</b> Problems on evaluation of $\sin^n x$ and $\cos^n x$ integrals with standard limits (0 to $\pi/2$ ). Solution of first order and first-degree differential equations-Variable separabl ; Linear and Exact differential equations.	5	CO3
4.	<b>Linear Algebra-1:</b> Problems on rank of a matrix by elementary Transformations, Solution of system of linear equations by Gauss eliminationmethod-Problems.	5	CO4
5.	<b>Linear Algebra-2:</b> Linear transformation, Eigen values and Eigen Vectors of a square matrix-Problems.	5	CO4

**Text Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

**Reference Books:**

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

**Assessment Pattern:****3. CIE- Continuous Internal Evaluation (50 Marks).**

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

**4. SEE- Semester End Examination (50 Marks).**

<b>Bloom's Category</b>	<b>SEE Marks</b>
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## COMMUNICATIVE ENGLISH

(Common to Physics and Chemistry cycles in the First semester and for Lateral Entry Students)

**Course Code: 21DAEC40A**  
**L: T: P: S : 1: 0: 0: 0**  
**Exam Hours :2**

**Credits : 01**  
**CIE Marks : 50**  
**SEE Marks :50**

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

<b>CO1</b>	Recognize the grammatical structures in English and identify errors in sentences
<b>CO2</b>	Demonstrate conversational skills using situational vocabulary
<b>CO3</b>	Examine the importance of sub skills of listening for effective communication
<b>CO4</b>	Analyse the importance of receptive and productive skills of communication

**Mapping of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO2</b>	-	-	-	-	-	-	-	-	3	3	-	3
<b>CO3</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO4</b>	-	-	-	-	-	-	-	-	-	3	-	3

<b>Module No.</b>	<b>Module Contents</b>	<b>Hours</b>	<b>COs</b>
1	Self-introduction – Talking about self, ambition, hobbies, likes, dislikes, talents and achievements. Asking for and Giving Information (Pair work) ( <b>SEE Task 1</b> ) Asking Questions. (WH, Aux Verbs), Helping Verbs usage chart, Question Tags. Nouns, Pronouns	5	CO1
2	Talking about Routine, Repeated activities (Frequency adverbs) Verb: Main / Assistant, Forms of Verbs, Use of Do, Does in negative and question forms <b>Verbal Ability</b> Error Detection: Subject Verb Agreement	5	CO1 CO2
3	Describing people, things, actions, process ( <b>SEE Task 2</b> ) Describing ongoing actions Situational conversations, Role plays Adjectives, Adverbs <b>Verbal Ability:</b> Sentence Correction, Sentence Completion.	5	CO1 CO2 CO4
4	<b>Listening Skills:</b> Importance of listening for effective communication Traits of a good listener Listening sub skills Listening to audio files of short stories, news, TV clips, Documentaries Gap filling exercise and Paraphrasing <b>Verbal Ability:</b> Common Errors in English 1 (Articles, Prepositions), Cloze Exercises	4	CO2 CO3 CO4

5	<p><b>Presentation Skills:</b>  <b>Nonverbal Communication (Body Language):</b> Kinesics, Oculistics, Paralanguage.  Overcoming stage fear,  Organising a speech - Preparation, Practise, Delivery</p> <p><b>Articulation of Ideas:</b>  How to generate ideas and express them? Fluency development activities like comparing, expressing opinions, agreeing &amp; disagreeing (<b>SEE Task 3</b>)  Group Discussion</p>	5	CO1
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**Text Books:**

1. Grammar Practice Activities- Penny Ur, Cambridge University Press
2. Intermediate English Grammar - Raymond Murphy Cambridge University Press

**Reference Books:**

1. Grammar & Composition. S. Chand. ISBN 81-219- 2197-X.
2. Final Course of Grammar & Composition - Wren. P.C& Martin, H

**Assessment Matrix:**

**Continuous Internal Evaluation (50 Marks)**

Bloom's Category	Tests ( 25 Marks)	Student Presentation ( 25 Marks)
Remember	5	-
Understand	5	-
Apply	10	15
Analyse	5	10
Evaluate	-	-
Create	-	-

**SEE – Semester End Examination (50 Marks)**

Bloom's Category	50 Marks
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	
Create	

## BASIC APPLIED MATHEMATICS-2

Course Code : 21DMAT41A  
L:T:P : 0:0:0  
Exam Hours : 02

Credits : 00  
CIE Marks : 50  
SEE Marks : 50

**Course Outcomes: At the end of the Course, the Student will be able to do the following:**

<b>CO1</b>	Gain knowledge of basic operations of vectors
<b>CO2</b>	Use curl and divergence of a vector function in three dimensions
<b>CO3</b>	Develop the ability to solve higher order Linear differential equations
<b>CO4</b>	Know the basic concepts of Laplace transform to solve the Periodic functions and also solve initial and boundary value problems using Laplace transform method

**Mapping of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	3	3	-	-	-	-	-	-	3	3
<b>CO2</b>	3	3	3	3	-	1	-	-	-	-	3	3
<b>CO3</b>	3	3	3	3	3	-	3	-	-	3	3	3
<b>CO4</b>	3	3	3	3	3	-	3	-	-	3	3	3

### Course Syllabus

Module No.	Contents of the Module	Hours	COs
1.	<b>Vectors:</b> Definition of scalar and vector, Vector addition, Subtraction and Multiplication-Dot product, Cross product, Scalar triple product. Orthogonal Co-planar and Angle between vectors-Problems.	5	CO1
2.	<b>Vector Differentiation:</b> Vector differential operator-Gradient of a scalar function, Divergence of a vector function, Curl of a vector function-Problems. Solenoidal and irrotational vector fields-Problems.	5	CO2
3.	<b>Linear differential equations with constant coefficients:</b> Solution of initial and boundary value problems, Inverse differential operator techniques for the functions $e^{ax}$ , $\sin(ax + b)$ and $\cos(ax + b)$ .	5	CO3
4.	<b>Laplace Transform:</b> Definition and Laplace transforms of elementary functions-Problems. Properties of Laplace transforms (Shifting property-without proof), Periodic functions (without proof)-problems	5	CO4
5.	<b>Inverse Laplace Transform:</b> Inverse Laplace Transform by partial Fractions -Problems. Solution of linear differential equations using Laplace Transforms-Problems.	5	CO4

**Text Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

**Reference Books:**

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

**Assessment Pattern:****5. CIE- Continuous Internal Evaluation (50 Marks).**

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

**6. SEE- Semester End Examination (50 Marks).**

<b>Bloom's Category</b>	<b>SEE Marks</b>
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

**FOURTH SEMESTER-SCHEME-NEP 2021**

IV SEMESTER												
S.No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21AIM41A	Discrete Mathematics and Statistics	AS	3	0	0	0	3	4	50	50	100
2	21HSS421A*	Life Skills for Engineers	HSS	1	0	1	0	2	3	50	50	100
3	21HSS431A	Entrepreneurship Development -2	HSS	1	0	0	0	1	1	50	50	100
4	21HSS441A	Constitution of India & Professional Ethics	HSS	1	0	0	0	1	1	50	50	100
5	21AIM45A	Database Management System	AI&ML	3	0	0	0	3	4	50	50	100
6	21AIL45A	Database Management system Lab	AI&ML	0	0	1	0	1	2	50	50	100
7	21AIM46A	Data Science	AI&ML	3	0	0	0	3	4	50	50	100
8	21AIL46A	Data Science Lab	AI&ML	0	0	1	0	1	2	50	50	100
9	21AIM47A	Design and Analysis of Algorithms	AI&ML	3	0	0	0	3	4	50	50	100
10	21AIL47A	Design and Analysis of Algorithms Lab	AI&ML	0	0	1	0	1	2	50	50	100
11	21AIM48A	Summer Internship - I	AI&ML	0	0	0	2	2	0	50	50	100
<b>Total</b>								<b>21</b>	<b>27</b>	<b>550</b>	<b>550</b>	<b>1100</b>

## DISCRETE MATHEMATICS AND STATISTICS

Course Code : 21AIM41A  
L:T:P : 3:0:0  
Exam Hours : 03

Credits : 03  
CIE Marks : 50  
SEE Marks : 50

**Course Outcomes: At the end of the Course, the Student will be able to do the following:**

CO1	Ability to understand and construct precise mathematical proofs/algorithms
CO2	Apply the number theory concepts to cryptography domain
CO3	Interpret and calculate the various measures of Dispersion, Skewness and Kurtosis.
CO4	Solve the problems related to Probability theory.
CO5	Analyze the concepts of Stochastic process and Markov chain in the prediction of future events.

**Mapping of Course Outcomes to Program Outcomes:**

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

### Course Syllabus

Module No.	Contents of the Module	Hours	COs
1.	<b>Discrete mathematics 1:</b> Algorithms, Induction and Recursion: Algorithms–Definition, The Growth of Functions definition with simple examples. Induction and Recursion - Mathematical Induction, Well-Ordering principle, Recursive Definitions and problems, Recursive Algorithms, Program Correctness. Combinatorics: Line arrangements and some classical problems, posets and Mobius inversion.	9	CO1
2.	<b>Discrete mathematics 2:</b> Greatest Common Divisors and Prime Factorization: Greatest common divisors - The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers. Congruences: Introduction to congruences, Linear congruences, Systems of linear congruences.	9	CO2
3.	<b>Measures of Dispersion, Skewness and Kurtosis:</b> Dispersion, Measures of dispersion, Percentile, Range, Stem and leaf		

	displays, Quartile deviation, Mean deviation, Coefficient of dispersion, Coefficient of variation, Moments, Skewness, Kurtosis. Case study on Kurtosis – Data distribution applications.	9	CO3
4.	<b>Introduction to Probability:</b> Probability, Axioms of probability, Events, Probability associated with set theory, Addition rule, Conditional probability, Multiplication rule, Baye’s theorem. Case study on Baye’s theorem and applications.	9	CO4
5.	<b>Stochastic process:</b> Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states. Case study on Stochastic process applications in analysis of algorithms.	9	CO5

**Text Books:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, McGraw Hill Education, Seventh Edition, 2017, ISBN: 9780070681880.
2. Kenneth H. Rosen, Elementary number theory and its applications, Sixth Edition, 2010, Addison-Wesley, ISBN: 9780321500311.
3. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Tenth Revised Edition, 2002, ISBN: 81-7014-791-3.
4. 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:**

1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics-an applied introduction, Pearson Education, Fifth Edition, 2019, ISBN: 9789353433055.
2. Richard Johnsonbaugh, Discrete Mathematics, Pearson Education, Seventh Edition, 2014, ISBN: 978-9332535183.
3. 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.
4. 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.

**Assessment Pattern:**

**7. CIE- Continuous Internal Evaluation (50 Marks).**

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	-	-	-	-	-

**8. SEE- Semester End Examination (50Marks).**

<b>Bloom's Category</b>	<b>SEE Marks</b>
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

## LIFE SKILLS FOR ENGINEERS

Course Code : 21HSS421A\*  
 L: T: P: S : 1: 0: 1: 0  
 ExamHours : 3

Credits: 2  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM421A.1	Set personal and professional goals
21AIM421A.2	Develop critical and creative thinking skills and practise leadership.
21AIM421A.3	Demonstrate and understand personal and professional responsibility
21AIM421A.4	Apply the concepts of personality development and grooming in corporate life
21AIM421A.5	Understand self and work with groups
21AIM421A.6	Articulate 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
21AIM421A.1	-	-	-	-	-	-	-	-	3	-	3	3	-	3
21AIM421A.2	2	3	-	-	-	2	-	2	3	-	2	3	3	3
21AIM421A.3	-	-	-	-	-	2	2	3	3	-	-	3	-	3
21AIM421A.4	-	-	-	-	-	-	-	-	3	3	-	3	-	3
21AIM421A.5	-	-	-	-	-	-	-	-	3	-	3	3	-	3
21AIM421A.6	-	-	-	-	-	2	2	-	3	3	2	3	-	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

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

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

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

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

## ENTREPRENEURSHIP DEVELOPMENT- 2

Course Code : 21HSS331A / 21HSS431A

Credits : 01

L: T: P : 1:0:0

CIE Marks : 50

Exam Hours : 2

SEE Marks : 50

### Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify the problem and understand the concept of blue ocean strategy
CO2	Create Minimum viable product
CO3	Analyze customer segment, Niche and early adopters
CO4	Interpret the cost revenue Structure and feasibility of the venture
CO5	Analyze and develop financial model for venture.
CO6	Create sustainable venture through step wise process(problem solution fit, MVP and financial model).

### Mapping of Course Outcomes to Program Outcomes:

	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	3	0	0	0	3	1	2	0	0	0	1
CO2	0	3	0	0	0	3	1	2	0	0	0	0
CO3	0	3	0	0	0	3	1	2	0	0	0	0
CO4	0	3	0	3	0	3	1	2	0	0	0	3
CO5	0	3	0	3	0	3	1	2	0	0	0	3
CO6	0	3	0	3	0	3	1	2	0	0	0	3

Module No.	Contents of Module	Hours	COs
1	<b>Refining Problem and solution</b> Identify and refining the problem, Brainstorming Solutions, Problem-Solution Fit	3	CO1
2	<b>Blue ocean strategy</b> – Meaning, concept, Implementation	3	CO2
3	<b>Minimum Viable Product-</b> Meaning of MVP, ways to Build an MVP, Present Your MVP	3	CO3
4	<b>Business Model</b> - Cost Revenues and Pricing- concept, Business model- Lean Canvas – components, implementation	3	CO4
5	<b>Financing and Financial Model</b> - Bootstrapping meaning and concept and Initial Financing, Financial Model- concept and implementation	3	CO5, CO6

### Suggested Case Studies :

1. kent ro water purifier business idea case study | Business  
kent ro water purifier business idea case study | Business Idea from Children - YouTube
2. Red Bus Start up story Phanindra Sama: The RedBus journey - YouTube

### Books for reference

1. Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant – Illustrated, 10 February 2015, by Kim (Author)
2. Financial Modeling, fourth edition (The MIT Press) , Illustrated, 18 April 2014, by Simon Benninga
3. Positioning: The Battle for Your Mind, by Al Ries, Jack Trout

### INTERNAL ASSESSMENT PATTERN – 50 Marks

Assessment format	Weightage to be awarded	Comments
Quiz	20 Marks	To be administered as a part of CI
Venture Milestone	30 Marks	Student should create VM 1, VM2, VM3

- **VM1- Presentation- Forming team , Identifying problem , identifying solution (Module 1& 2)**
- **VM2- Presentation- Validate solution Identify customer segment , and early adopter, Create value proposition canvas ,(Module-3 & 4)**
- **VM3- Presentation -Create business plan using lean canvas (Module-5)**

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

Bloom's Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	5
Evaluate	5
Create	10

## CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code : 21HSS441A

L:T:P : 1:0:0

ExamHours : 02

Credits : 01

CIE Marks : 50

SEE Marks : 50

**COURSE OUTCOMES:** On completion of the course, student would be able to:

<b>CO1</b>	Gain knowledge of Indian Constitution and be able to solve the legal and societal issues.
<b>CO2</b>	Understand the powers and functions of the Union, State and Local Governments in detail.
<b>CO3</b>	Understand Electoral Process, Emergency provisions and Amendment procedure.
<b>CO4</b>	Acquire the knowledge of their Ethical Duties, Responsibilities and the decision making Ability.
<b>CO5</b>	Understand the cybercrimes and cyber laws for cyber safety measures.

**\* Mapping of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	-	-	-	-	-	1	-	3	1	-	-	3
<b>CO2</b>	-	-	-	-	-	1	-	3	1	-	-	3
<b>CO3</b>	-	-	-	-	-	1	-	3	1	-	-	3
<b>CO4</b>	-	-	-	-	-	1	-	3	1	-	-	3
<b>CO5</b>	-	-	-	-	-	1	-	3	1	-	-	3

Module No	MODULE CONTENTS	Hours	COs
1	<b>INTRODUCTION TO CONSTITUTION OF INDIA</b> Introduction to Constitution of India. The making and salient features of the constitution. The necessity of the constitution. The Role of the Constituent Assembly- Preamble to Indian. constitution. Fundamental rights and its restrictions and Limitations. Decided case studies Directive principles of state policy. Fundamental Duties and its Scope and significance in Nation building.	3	CO1
2	<b>UNION EXECUTIVE and STATE EXECUTIVE</b> President, prime minister, parliament and supreme court of India. Judicial activism and judicial review. Important parliamentary terminology. Center- state relations. Attorney General of India, Comptroller and Auditor General of India.State Executive- Governor, Chief Minister, State Legislature. High Court and Subordinate Court. Advocate General of the State.Controller and Auditor General of State. Special Provisions(Articles 370,371,371J) for some States.	3	CO2

3	<b>Amendments and Procedure, Elections and Emergency Provisions:</b> Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments – Types and Important Constitutional Amendments. Amendments-42,44,61,86,73,74,91,95,100,101,118. Emergency Provisions, types of Emergencies and its effects. <b>special provisions:</b> Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	3	CO3
4	<b>ENGINEERING ETHICS:</b> Scope & aim of engineering ethics. Responsibility of engineers, Impediments to responsibility. Clash of ethics. Risk, safety and liability of Engineers. Trust and reliability in Engineering. IPR (Intellectual Property Right). Corporate Ethics.	3	CO4
5	<b>Internet Laws, Cyber Crimes and Cyber Laws:</b> Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types and causes for Cyber Crimes, Cyber Crimes land mark Judgments in India and the Information Technology Act 2000, Cybercrimes and enforcement agencies.	3	CO5

#### Text Book

1. Durga Das Basu: “Introduction to the constitution”19th/20th Edn., or 2008, Lexis Nexis; Twentieth edition (2011)
2. Shubham Singles, Charles E.Haries :Constitution of India and Professional Ethics.Latest Edition- 2018, Cengage Learning India Private Limited (2019)
3. Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018 Reference Books

#### Reference Books

1. M.Govindarajan,Natarajan,V>S>Senthilkumar,,”Engineering Ethics”,Prentice Hall India Learning Private Limited (2013)
2. M.V.Pylee.”An Introduction to Constitution of India”.Vikas Publishing 2002.
3. Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018 Reference Books

#### Assessment Pattern

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

Bloom’s Category	Tests	Assignment
Marks (out of 50)	25	25
Remember	10	10
Understand	10	10
Apply	5	5

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

Bloom’s Category	SEE Marks (50)
Remember	20
Understand	20
Apply	10

## DATABASE MANAGAEMENT SYSTEM

**Course Code** : 21AIM45A  
**L: T: P: S** : 3: 0: 0: 0  
**Exam Hours** : 3

**Credits:** 3  
**CIE Marks:** 50  
**SEE Marks:** 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM45A.1	Illustrate the concepts of Data Base Management Systems
21AIM45A.2	Analyse the various database concepts using ER diagram
21AIM45A.3	Make use of Relational Database techniques for solving real world problems
21AIM45A.4	Construct database for the structured data by applying normalization techniques
21AIM45A.5	Design database for the unstructured data with effective documentation report as a team

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM45A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM45A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
21AIM45A.3	3	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM45A.4	3	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM45A.5	3	-	-	-	3	-	-	-	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 Databases:</b> Definition of database, DBMS; Characteristics of Database approach; Advantages of using DBMS approach; when not to use a DBMS <b>Database Concept and Architecture:</b> Data models, schemas and instances; Data Abstraction; Three-schema architecture and data independence; Components of a DBMS - Database Designer- Database Administrator - Database Users. <b>Introduction to Entity-Relationship Model:</b> 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	<b>Introduction to Logical Design and Relational Model:</b> Domains, Attributes, Tuples, and Relations; Relational Model Constraints; Relational Database Schemas; <b>SQL-1:</b> Overview of SQL language; SQL Data Definition and Data 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	10	CO1, CO3
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	<b>Index Structures:</b> Indexes on Sequential Files: dense, sparse index; multilevel indexing; Hash Based Indexing: Static Hashing and dynamic hashing. <b>Database Refinement:</b> Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normalization on Relational Data Base:1NF,2NF,3NF, BCNF; Transaction Management: The ACID Properties; Transactions and Schedules	9	CO1, CO2, CO4
5	<b>NOSQL Databases:</b> What is NoSQL, Need of NOSQL, 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. <b>Introduction to Cassandra:</b> Architecture, Gossip protocol, Snitches, Virtual Nodes, write consistency level and write process, read consistency level and read data operation, indexing, compaction, Anti-entropy, Tombstones	9	CO1, CO5

#### Text Books:

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	-	-	-

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

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

## DATABASE MAGAGEMENT SYSTEM LAB

**Course Code** : 21AIL45A  
**L: T: P: S** : 0: 0: 1: 0  
**ExamHours:** : 3

**Credits:** 1  
**CIE Marks:** 50  
**SEE Marks:** 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIL45A.1	Apply database management techniques to solve the problem
21AIL45A.2	Analyse database for the given problem
21AIL45A.3	Conduct experiments as individual by using MySQL/Oracle
21AIL45A.4	Make 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
21AIL45A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
21AIL45A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
21AIL45A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIL45A.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 relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)	3	CO1, CO2, CO3, CO4
2.	Write relational algebra queries a. Viewing all databases, Creating a Database, b. Viewing all Tables in a Database, c. Creating Tables (With and Without Constraints), d. Inserting/Updating/Deleting e. Records in a Table, Saving (Commit) and Undoing (rollback)	3	CO1, CO2, CO3, CO4
3.	Write relational algebra queries a. Altering a Table, b. Dropping/Truncating/Renaming Tables, c. Backing up / Restoring a Database.	3	CO1, CO2, CO3, CO4
4.	Consider the following database for student enrolment for course: 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 character code with 4 different values (example: Junior: JR etc) Write the following queries in SQL. No duplicates should be printed in any of the answers. i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled. iii. Find the names of all students who are enrolled in two classes	3	CO1, CO2, CO3, CO4

	<p>that meet at the same time.</p> <p>iv. Find the names of faculty members who teach in every room in which some class is taught.</p> <p>v. Find the names of faculty members for whom the combined enrolment of the courses that they teach is less than five.</p>		
5.	<p>Consider the following database that keeps track of airline flight information:</p> <p>FLIGHTS (fno: integer, from: string, to: string, distance: integer, departs: time, arrives: time, price: integer)</p> <p>AIRCRAFT (aid: integer, aname: string, cruisingrange: integer)</p> <p>CERTIFIED (eid: integer, aid: integer)</p> <p>EMPLOYEE (eid: integer, ename: string, salary: integer)</p> <p>Note that the Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft, and only pilots are certified to fly.</p> <p>Write each of the following queries in SQL.</p> <p>i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.</p> <p>ii. For each pilot who is certified for more than three aircrafts, find the eid and the maximum cruising range of the aircraft for which she or he is certified.</p> <p>iii. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.</p> <p>iv. For all aircraft with cruising range over 1000 Kms, find the name of the aircraft and the average salary of all pilots certified for this aircraft.</p> <p>v. Find the names of pilots certified for some Boeing aircraft.</p> <p>vi. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi.</p>	3	CO1, CO2, CO3, CO4
6.	<p>Consider the following relations for an Order Processing database application in a company.</p> <p>CUSTOMER (CUST #: int, cname: String, city: String)</p> <p>ORDER (order #: int, odate: date, cust #: int, ord-Amt: int)</p> <p>ITEM (item #: int, unit-price: int)</p> <p>ORDER-ITEM (order #: int, item #: int, qty: int)</p> <p>WAREHOUSE (warehouse #: int, city: String)</p> <p>SHIPMENT (order #: int, warehouse #: int, ship-date: date)</p> <p>i. Create the above tables by properly specifying the primary keys and the foreign keys and the foreign keys.</p> <p>ii. Enter at least five tuples for each relation.</p> <p>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.</p> <p>iv. List the order# for orders that were shipped from all warehouses that the company has in a specific city.</p> <p>v. Demonstrate how you delete item# 10 from the ITEM table and make that field null in the ORDER_ITEM table.</p>	3	CO1, CO2, CO3, CO4
7.	<p>The following tables are maintained by a book dealer:</p> <p>AUTHOR(author-id: int, name: String, city: String, country: String)</p> <p>PUBLISHER(publisher-id: int, name: String, city: String, country: String)</p> <p>CATALOG (book-id: int, title: String, author-id: int, publisher-id: int, category-id: int, year: int, price: int)</p> <p>CATEGORY(category-id: int, description: String)</p> <p>ORDER-DETAILS(order-no: int, book-id: int, quantity: int)</p>	3	CO1, CO2, CO3, CO4

	<p>i. Create the above tables by properly specifying the primary keys and the foreign keys.</p> <p>ii. Enter at least five tuples for each relation.</p> <p>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.</p> <p>iv. Find the author of the book, which has maximum sales.</p> <p>v. Demonstrate how you increase the price of books published by a specific publisher by 10%.</p>		
8.	<p>Consider the following database of student enrollment in courses and books adopted for each course.</p> <p>STUDENT (regno: String, name: String, major: String, bdate: date)</p> <p>COURSE (course #: int, cname: String, dept: String)</p> <p>ENROLL (regno: String, cname: String, sem: int, marks: int)</p> <p>BOOK_ADOPTION (course #: int, sem: int, book-ISBN: int)</p> <p>TEXT(book-ISBN:int, book-title:String, publisher:String, author:String)</p> <p>i. Create the above tables by properly specifying the primary keys and the foreign keys.</p> <p>ii. Enter at least five tuples for each relation.</p> <p>iii. Demonstrate how you add a new textbook to the database and make this book be adopted by some department.</p> <p>iv. Produce a list of textbooks (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'AIML' department that use more than two books.</p> <p>v. List any department that has all its adopted books published by a specific publisher.</p>	3	CO1, CO2, CO3, CO4
9.	<p>Consider the schema for Movie Database:</p> <p>ACTOR(Act_id, Act_Name, Act_Gender)</p> <p>DIRECTOR(Dir_id, Dir_Name, Dir_Phone)</p> <p>MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)</p> <p>MOVIE_CAST(Act_id, Mov_id, Role)</p> <p>RATING(Mov_id, Rev_Stars)</p> <p>Write SQL queries to</p> <p>i. List the titles of all movies directed by 'Hitchcock'.</p> <p>ii. Find the movie names where one or more actors acted in two or more movies.</p> <p>iii. List all actors who acted in a movie before 2000 and in a movie after 2015 (use JOIN operation).</p> <p>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.</p> <p>v. Update rating of all movies directed by 'Steven Spielberg' to 5.</p>	3	CO1, CO2, CO3, CO4
10.	<p>Implement aggregation and indexing with suitable example using MongoDB and also Map reduces operation with suitable example using MongoDB.</p>	3	CO1, CO2, CO3, CO4

**Text Books:**

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

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

<b>Bloom's Category</b>	<b>Tests (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

<b>Bloom's Category</b>	<b>Questions (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## DATA SCIENCE

Course Code : 21AIM46A  
 L: T: P: S : 3: 0: 0: 0  
 Exam Hours : 3

Credits: 3  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM46A.1	Explore predictive modeling techniques with necessary python packages
21AIM46A.2	Apply descriptive statistics concepts for data preparation
21AIM46A.3	Examine and use appropriate methods for data wrangling
21AIM46A.4	Inspect and provide efficient solution for the given data sources as a team.
21AIM46A.5	Illustrate different types of conversion techniques for the Machine Learning model

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM46A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	-
21AIM46A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	-
21AIM46A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	-
21AIM46A.4	-	-	-	3	3	-	-	-	2	2	-	3	3	-
21AIM46A.5	-	-	-	-	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 Modelling, Data preparation, Importance of Data preparation, Data Cleaning, Feature selection Data Transform, 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
2	<b>Descriptive Statistics:</b> Mean Standard Deviation, Skewness , 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
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	9	CO1, CO3, CO4
5	<b>Other Transforms:</b> Transform numerical to categorical,	9	CO1,

	Transform Numerical and Categorical Data, Transform the Target in Regression, Save and load the transformation, case studies for Binary classification, Multi classification and regression		<b>CO4, CO5</b>
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**Text Books:**

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:**

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

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

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

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

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

## DATA SCIENCE LAB

**Course Code** : 21AIL46A  
**L: T: P: S** : 0: 0: 1: 0  
**ExamHours** : 3

**Credits**: 1  
**CIE Marks**: 50  
**SEE Marks**: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIL46A.1	Apply Data Science techniques to solve the problem
21AIL46A.2	Reading and writing different types of datasets
21AIL46A.3	Applying visualizations, finding correlation, covariance, applying regression model.
21AIL46A.4	Performing Classification and Clustering techniques.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIL46A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
21AIL46A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
21AIL46A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIL46A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Ex. No	Experiments	Hours	COs
	Recall the following python Libraries commands for data science. a. Numpy b. Pandas c. Matplot d. Scipy	<b>3</b>	<b>CO1</b>
1.	Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. a. Reading Excel data sheet using Python Pandas. b. Reading XML dataset using Python Pandas. c. Reading JSON data using Python Pandas	<b>3</b>	<b>CO1, CO2, CO3, CO4</b>
2.	a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data. d. Plot the Heat Map	<b>3</b>	<b>CO1, CO2, CO3, CO4</b>
3.	a. Implement K-fold cross validation techniques b. Implement the program to avoid Data leakage with Naïve Data preparation	<b>3</b>	<b>CO1, CO2, CO3, CO4</b>
4.	Perform the following methods in order to remove outliers a. Standard Deviation Method b. Interquartile Range Method c. Automatic outlier Detection	<b>3</b>	<b>CO1, CO2, CO3, CO4</b>

5.	Apply the following on IRIS dataset a. Find the correlation matrix. b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data. c. Analysis of covariance: variance (ANOVA)	3	CO1, CO2, CO3, CO4
6.	Implement the following for breast_cancer (Hint : from sklearn.datasets import load_breast_cancer) a. Load data set b. Convert into Data frame c. Apply Scaler method d. Fit the Scaler Data into PCA e. Plot the visualization diagram for PCA	3	CO1, CO2, CO3, CO4
7.	Apply the following imputation methods for horse-colic dataset. a. Statistical Imputation b. KNN Imputation c. Iterative Imputation	3	CO1, CO2, CO3, CO4
8.	Implement the following Encoding methods. a. Ordinal Encoding b. One Hot Encoding c. Dummy Variable Encoding Data Set: breast-cancer.csv	3	CO1, CO2, CO3, CO4
9.	Implement the following Transform methods a. Uniform Discretization Transform b. k-Means Discretization Transform Data Set: sonar.csv	3	CO1, CO2, CO3, CO4
10.	Implement Binary classification, Multi classification and regression.	3	CO1, CO2, CO3, CO4
11.	a. Case study on Big Mart Sales Prediction ML Project – Learn about Unsupervised Machine Learning Algorithms b. Case Study on Healthcare (Pfizer) c. Case study on Boston House Pricing Prediction Project	3	CO1, CO2, CO3, CO4

**Text Books:**

1. Yanchang Zhao, “R and Data Mining: Examples and Case Studies”, Elsevier, 1st Edition, 2012

**Web References:**

1. <http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/>
2. <http://www.ats.ucla.edu/stat/r/dae/rreg.htm>
3. <http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html>
4. <http://www.ats.ucla.edu/stat/r/data/binary.csv>

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

<b>Bloom's Category</b>	<b>Tests (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

<b>Bloom's Category</b>	<b>Questions (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## DESIGN AND ANALYSIS OF ALGORITHMS

Course Code : 21AIM47A  
 L: T: P: S : 3: 0: 0: 0  
 Exam Hours : 3

Credits: 3  
 CIE Marks: 50  
 SEE Marks: 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIM47A.1	Use the potential method to provide an amortized analysis of previously unseen data structure, given the potential function.
21AIM47A.2	Explain why competitive analysis is an appropriate measure for online algorithms.
21AIM47A.3	Explain the use of randomization in the design of an algorithm for a problem where a deterministic algorithm is unknown or much more difficult.
21AIM47A.4	Design and implement a dynamic programming solution to a problem
21AIM47A.5	To introduce the concept of NP-Complete problems and different techniques to deal with them

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21AIM47A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
21AIM47A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
21AIM47A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIM47A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
21AIM47A.5	-	-	-	-	3	-	-	-	-	-	-	-	3	3

Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)

Module No	Module Contents	Hours	COs
1	<b>INTRODUCTION TO ALGORITHMS &amp; GROWTH OF FUNCTIONS</b> Introduction to Algorithms, Role of algorithms in computing, Fundamentals of Algorithmic problem solving, Fundamentals of Analysis of Algorithms, Analysis Framework, Asymptotic notations, Standard notations and common functions, Important problem types – Searching, sorting, string processing, graph problems.	9	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 Path algorithm – Dijkstra's, Huffman Trees, Knapsack problems, Travelling Salesman problem <b>DYNAMIC PROGRAMMING:</b> Introduction, Computing Binomial Coefficients, Transitive closure - Warshall's and Floyds algorithm	9	CO3

<b>4</b>	<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	<b>9</b>	<b>CO4</b>
<b>5</b>	<b>BACKTRACKING, BRANCH AND BOUND</b> <b>BACKTRACKING:</b> Introduction, N Queens problem, subset sum problem, <b>BRANCH &amp; BOUND:</b> Introduction, Travelling Salesman problem, Knapsack problem, Assignment problem , NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP-Complete problems.	<b>9</b>	<b>CO5</b>

**Text Book:**

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 (50 Marks)**

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 Examination (50Marks)**

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

## DESIGN AND ANALYSIS OF ALGORITHM LAB

**Course Code** : 21AIL47A  
**L: T: P: S** : 0: 0: 1: 0  
**ExamHours:** : 3

**Credits:** 1  
**CIE Marks:** 50  
**SEE Marks:** 50

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
21AIL47A.1	Analyze the complexities of various applications in different domains
21AIL47A.2	Implement efficient algorithms to solve problems in various domains
21AIL47A.3	Use suitable design technique to develop efficient algorithms
21AIL47A.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
21AIL47A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
21AIL47A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
21AIL47A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
21AIL47A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

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

### Text Book:

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 (50 Marks)**

<b>Bloom's Category</b>	<b>Tests (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

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

<b>Bloom's Category</b>	<b>Questions (50 marks)</b>
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	5
Create	15

## 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 degree program are the statements that describe the expected achievements of graduate in their career 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. Graduate attributes 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, 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.

## APPENDIX C

### BLOOM'S TAXONOMY

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

