



NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade. Accredited by NBA

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE
AND MACHINE LEARNING**

SCHEME AND SYLLABUS

BATCH: 2020-24

CREDITS: 175

[2018 Scheme]

Academic Year 2021 - 2022
Third and Fourth Semester Scheme and Syllabus

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INSTITUTION

Vision

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

Mission

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

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

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

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)

PEO1	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.
PEO2	Graduates will pursue higher education, research, entrepreneurship, or leadership roles in emerging AI technologies through continuous learning, innovation, and industry collaboration.
PEO3	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.

THIRD SEMESTER-SCHEME

S. No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1	20AIM31A	Applied Mathematics-III	BS	2	1	0	0	3	4	50	50	100
2	20HSS324 /20HSS325	Aadalitha Kannada / Vyavaharika Kannada	HSS	1	0	0	0	1	2	25	25	50
3	20HSS321A	Economics For Engineers	HSS	2	0	0	0	2	2	25	25	50
4	20AIM33A	Digital Electronics	AI&ML	3	0	0	0	3	3	50	50	100
5	20AIM34A	Data Structures using C	AI&ML	3	0	0	0	3	3	50	50	100
6	20AIM35A	Python Programming	AI&ML	3	0	0	0	3	3	50	50	100
7	20AIL36A	Digital Electronics Lab	AI&ML	0	0	2	0	2	4	25	25	50
8	20AIL37A	Data Structures using C Lab	AI&ML	0	0	2	0	2	4	25	25	50
9	20AIL38A	Python Programming Lab	AI&ML	0	0	2	0	2	4	25	25	50
10	20AIM39A	Mini Project - I	AI&ML	0	0	2	0	2	0	25	25	50
11	19DMAT31*	Basic Applied Mathematics-1	BS	0	0	0	0	0	2	25	25	50
12	19HSS171*	Essential English	BS	0	0	0	0	0	2	25	25	50
Total								23	29/ 33*	350/ 400*	350/ 400*	700/ 800*

*For Lateral Entry Students Only

FOURTH SEMESTER-SCHEME

S. No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1	20AIM41A	Mathematical Statistics	BS	2	1	0	0	3	4	50	50	100
2	20HSS422A	Life skills for Engineers	HSS	3	0	0	0	3	3	50	50	100
3	20HSS423A	Environmental Science and Awareness	HSS	Mandatory Course			0	0	2	25	25	50
4	20AIM43A	Introduction to Data Science	AI&ML	3	0	0	0	3	3	50	50	100
5	20AIM44A	Object Oriented Programming with Java	AI&ML	3	0	0	0	3	3	50	50	100
6	20AIM45A	Database Management System	AI&ML	3	0	0	0	3	3	50	50	100
7	20AIL47A	Object Oriented Programming with Java Lab	AI&ML	0	0	2	0	2	4	25	25	50
8	20AIL48A	Database Management System Lab	AI&ML	0	0	2	0	2	4	25	25	50
9	20AIL49A	Mini Project - II	AI&ML	0	0	2	0	2	0	25	25	50
10	19DMAT41*	Basic Applied Mathematics-2	BS	0	0	0	0	0	2	25	25	50
11	19HSS272*	Constitution of India	HSS	0	0	0	0	0	2	25	25	50
Total								21	26/ 30*	350/ 400*	350/ 400*	700/ 800*

*For Lateral Entry Students Only

APPLIED MATHEMATICS – III

Course Code : 20AIM31A
 L: T: P : 2: 1: 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
20AIM31A.1	Use appropriate numerical methods to solve algebraic equations and transcendental equations
20AIM31A.2	Solve initial value problems using appropriate numerical methods and also Evaluate definite integrals numerically
20AIM31A.3	Express the periodic functions as Fourier series expansion analytically and numerically.
20AIM31A.4	Solve the Continuous model problems using Fourier transforms. Solve the discrete model problems using Z-transforms
20AIM31A.5	Solve the discrete model problems using Fast Fourier transform
20AIM31A.6	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data

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

Module No	Module Contents	Hours	Cos
1	Numerical Methods-1: Numerical solution of algebraic and transcendental equations: Regula-falsi method and Newton-Raphson Method-Problems. Interpolation: Newton's forward and backward formulae for equal intervals, Newton divided difference and Lagrange's formulae for unequal intervals (without proofs)-Problems.	9	CO1
2	Numerical Methods 2: Numerical solution of ordinary differential equations of first order and of first degree: Modified Euler's method and Runge-Kutta method of fourth-order-Problems. Milne's predictor and corrector methods-Problems. Numerical integration: Simpson's 1/3 rd rule, Simpson's 3/8 th rule, Weddle's rule (without proofs)-Problems. Applications: Application of numerical integration to velocity of a particle and volume of solids.	9	CO2
	Fourier series: Periodic function, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period $2l$, half range series. Fourier series and half Range	9	CO3

3	Fourier series of periodic square wave, half wave rectifier, full wave rectifier, Saw-tooth wave with graphical representation, practical harmonic analysis.		
4	Fourier Transforms: Infinite Fourier transforms, Fourier Sine and Cosine transforms, Inverse Fourier transform. Z - Transform: Definition, Z-transforms of some standard functions, properties, damping rule, shifting rule(without proof), initial and final value theorems, inverse Z- transforms. Applications: Solving difference equations using Z-transform.	9	CO4
5	Discrete Fourier Transform and Fast Fourier Transform: Definition of N-Point DFT, problems for 4-points and inverse DFT for four points only. FFT algorithm to compute the Fourier transforms 4-point only. Statistical Methods: Fitting of the curves of the form $y = a + b x$, $y = a + b x + c x^2$, $y = a e^{bx}$, $y = a x^b$, and $y = a b^x$ by the method of least square, Correlation and Regression, Regression coefficients, line of regression –Problems.	9	CO5, CO6

Text Books:

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

Reference Books:

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

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50Marks)

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

ಆಡಳಿತ ಕನ್ನಡ
(Kannada for administration)

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

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) : 25 ಅಂಕಗಳು
 ಸೆಮಿಸ್ಟರ್ ಪರೀಕ್ಷೆ (Semester End Examination) : 25 ಅಂಕಗಳು

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

**Vyavaharika Kannada
(Kannada for use)**

Course Code : 20HSS325
L: T: P : 2: 0
Exam Hours: : 2

Credits: 1
CIE Marks: 25
SEE Marks: 25

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

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

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

Text Books:

1. Vyavaharika Kannada by Dr. L. Thimmesha, Prof. V. Keshavamurthy, published by: VTU, Belagavi
- CIE- Continuous Internal Evaluation (25 Marks)**

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

ECONOMICS FOR ENGINEERS

Course Code : 21HSS321A
 L: T: P : 2: 0: 0
 Exam Hours: : 2

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIM421.1	Summarize the knowledge of economics and its importance in business decision making.
20AIM421.2	Make use of economic concepts in business.
20AIM421.3	Examine the impact of market forces on business.
20AIM421.4	Interpret the role of market structure in the economic development of a country.
20AIM421.5	Evaluate the role of budgeting in business decisions.

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM421.1	0	1	0	1	1	3	3	3	3	1	2	3		
20AIM421.2	1	1	1	1	2	2	1	2	2	2	3	3		
20AIM421.3	3	2	3	1	1	2	2	3	1	1	2	2		
20AIM421.4	1	2	1	2	1	3	1	2	2	2	2	2		
20AIM421.5	3	2	3	2	2	1	1	2	1	1	3	1		

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

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

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

Text Books:

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

Reference Books:

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

CIE- Continuous Internal Evaluation (25 Marks)

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

SEE- Semester End Examination (50Marks)

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

DIGITAL ELECTRONICS FOR AI

Course Code : 20AIM33A
 L: T: P : 3: 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
20AIM33A.1	Describe the significance and basic principles of the digital circuits
20AIM33A.2	Apply the concepts of minimization techniques to realize digital circuits
20AIM33A.3	Analyse different types of combinational and sequential circuits for given specifications
20AIM33A.4	Design efficient combinational and sequential logic circuit from functional description of digital systems
20AIM33A.5	Use CAD/HDL tools to simulate and verify Digital circuits
20AIM33A.6	Construct and verify CAD/HDL tools to simulate and verify Digital circuits

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

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

	Compiler directives. Modules and Ports, Module definition, port declaration, connecting ports, Different types of modelling style, Verilog implementation of combinational circuits, Verilog implementation of sequential circuits, Verilog implementation Moore and Mealy.		CO2, CO3, CO4, CO5, CO6
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Text Books:

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

Reference Books:

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

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50Marks)

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

DATA STRUCTURES USING C

Course Code : 20AIM34A
 L: T: P : 3: 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
20AIM34A.1	Understand the fundamentals of data structure and its applications.
20AIM34A.2	Apply dynamic memory allocation techniques for designing data structure
20AIM34A.3	Analyse the concepts of sorting, linear and non-linear data structure for problem solving.
20AIM34A.4	Investigate the literature about linear data structure and submit report in a team
20AIM34A.5	Prepare an effective written documentation about nonlinear data structures
20AIM34A.6	Demonstrate different tree data structures used for machine algorithms

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM34A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM34A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM34A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM34A.4	-	-	-	2	3	-	-	-	2	2	-	3	3	2
20AIM34A.5	-	-	-	-	3	-	-	-	-	3	-	3	3	2
20AIM34A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	Cos
1	Introduction to Data Structures: Arrays and Pointers revisited, Sparse matrix, transpose of a sparse matrix, dynamic memory management. Introduction to Data Structures, Classification of Data Structures, Abstract Data Types, Insertion sort, Quick sort, Shell sort, Radix sort.	9	CO1, CO2
2	Stacks & Queues: Stacks: Definition, Stack representation, Primitive operations on stack, array representation of stacks. Applications of stacks: Recursion, Fibonacci series, Tower of Hanoi problem, Conversion of expressions, Evaluation of postfix expression, Iteration v/s recursion. Queues: Definition, Queue representation, Primitive operations on queue, array representation of queues, Circular queue, Priority queue, Double ended queue, Applications of queues.	9	CO1, CO2, CO3, CO4
3	Linked Lists: Dynamic memory allocation revisited – malloc, calloc, realloc, free, Introduction to linked list, Representation of linked list in memory, primitive operations on linked list, searching a linked list, circular linked list, doubly linked list, header linked list. Applications of linked list: Josephus problem, addition of	9	CO1, CO3, CO4

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

Text Books:

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

Reference Books:

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

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50Marks)

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

PYTHON PROGRAMMING

Course Code : 20AIM35A
 L: T: P : 3: 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
20AIM35A.1	Understand the fundamentals of data structure and its applications.
20AIM35A.2	Apply dynamic memory allocation techniques for designing data structure
20AIM35A.3	Analyse the concepts of sorting, linear and non-linear data structure for problem solving.
20AIM35A.4	Investigate the literature about linear data structure and submit report in a team
20AIM35A.5	Prepare an effective written documentation about nonlinear data structures
20AIM35A.6	Demonstrate different python packages used for Data science

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM35A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM35A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM35A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM35A.4	-	-	-	2	3	-	-	-	2	2	-	3	3	2
20AIM35A.5	-	-	-	-	3	-	-	-	-	3	-	3	3	2
20AIM35A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	2
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	Cos
1	Introduction To Data, Expressions, Statements: Introduction to Python and installation, variables, expressions, statements, Numeric datatypes: Int, float, Boolean, string. Basic data types: list--- list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters. Tuple --- tuple assignment, tuple as return value, tuple methods. Sets: operations and methods. Dictionaries: operations and methods.	10	CO1, CO2
2	Control Flow Loops: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: statements break, continue.	7	CO1, CO2
3	Advanced Functions, Arrays: Functions---Function and its use, pass keyword, flow of execution, parameters and arguments, Fruitful functions: return values, parameters, local and global scope, function composition, recursion Advanced Functions: lambda, map, filter, reduce, basic data type comprehensions. Python arrays: Create an array, Access the Elements of an Array, array methods.	10	CO2, CO3

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

Text Books:

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

Reference Books:

1. Jeeva Jose & P.SojanLal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Publishers, New Delhi, 2016

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50Marks)

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

DIGITAL ELECTRONICS LAB

Course Code : 20AIL36A
 L: T: P : 0: 0: 2
 Exam Hours : 3

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIL36A.1	Apply the concepts of minimization techniques to realize the digital circuits
20AIL36A.2	Analyse different methods to realize the logic circuits
20AIL36A.3	Simulate logic circuits using HDL tool
20AIL36A.4	Demonstrate the specific application of digital electronics using suitable digital ICs/ Multisim/Xlinx/ FPGA board/- etc

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL36A.1	3	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIL36A.2	-	3	-	-	-	-	-	-	-	-	-	-	3	2
20AIL36A.3	-	-	3	-	-	-	-	-	-	-	-	-	3	2
20AIL36A.4	-	-	-	-	3	-	-	-	-	-	-	-	3	2

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

Ex. No	Experiments	Hours	COs
1.	Verify (a) Demorgan's Theorem for 2 variables. (b) The sum-of product and product-of-sum expressions using universal gates.	4	CO1, CO2, CO4
2.	Design and implement (a) Full Adder using basic logic gates. (b) Full Subtractor using basic logic gates.	4	CO1, CO2, CO4
3.	Realize the different shift registers using IC7474	4	CO2, CO4
4.	Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC. Simulate and verify its working using Verilog code	4	CO2, CO4
5.	Perform n bit addition / subtraction using 4-bit full adder IC. Simulate and verify its working using Verilog code.	4	CO2, CO4
6.	Design and implement BCD to seven-segment decoder. Simulate and verify given decoder using VERILOG code.	4	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.	Design and implement a mod-n ($n < 8$) synchronous up or down counter using J-K Flip-Flop ICs and demonstrate its working. Simulate and verify mod 8 synchronous up or down counter using VERILOG code.	4	CO3, CO4
9.	Design and implement an asynchronous counter using decade counter IC to count from 0 to n ($n \leq 9$) and demonstrate its working.		
10.	Design and implement a sequence generator (3 bits) using Moore model and JK flip flop. Simulate and verify the working using VERILOG code.	2	CO3, 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 (25 Marks)

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

SEE- Semester End Examination (25Marks)

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

	b. Deletion c. Display		
8.	Develop a program to traverse a tree using in-order, pre-order and post order.	4	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	2	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 (25 Marks)

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

SEE- Semester End Examination (25 Marks)

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

PYTHON PROGRAMMING LAB

Course Code : 20AIL38A
 L: T: P : 0: 0: 2
 Exam Hours : 3

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIL38A.1	Apply python programming concepts to solve the problem
20AIL38A.2	Analyse the output for a given problem
20AIL38A.3	Solve experiments using python programming language individually
20AIL38A.4	Prepare an effective report based on experiments

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL38A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL38A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL38A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIL38A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2

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

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

	D) Write a Python function that takes two lists and returns True if they are equal otherwise false		
4	A) Write a program to double a given number and add two numbers using lambda()?	4	CO1, CO2, CO3, CO4
	C) Write a program for map() function to double all the items in the list?		
	D) Write a program to find sum of the numbers for the elements of the list by using reduce ()?		
5	A) Demonstrate a python code to implement abnormal termination?	4	CO1, CO2, CO3, CO4
	B) Demonstrate a python code to print try, except and finally block statements		
	C) Write a python program to open and write “hello world” into a file?		
	D) Write a python program to write the content “hi python programming” for the existing file.		
6	A) Write a python program to get python version.	4	CO1, CO2, CO3, CO4
	B) Write a python program to open a file and check what are the access permissions acquired by that file using module?		
	C) Write a python program to display a particular month of a year using calendar module.		
	D) Write a python program to print all the months of given year.		
7	A) Write a python program to print date, time for today and now.	4	CO1, CO2, CO3, CO4
	B) Write a python program to add some days to your present date and print the date added.		
	C) Write a python program to print date, time using date and time functions		
	D) Write a python program, which accepts the radius of a circle from user and computes the area (use math module).		
8	A) Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array	4	CO1, CO2, CO3, CO4
	B) Using a numpy module create array and check the following: 1. List with type float 2. 3*4 array with all zeros 3. From tuple 4. Random values		
	C) Using a numpy module create array and check the following: 1. Reshape 3X4 array to 2X2X3 array 2. Sequence of integers from 0 to 30 with steps of 5 3. Flatten array		
9	A) Write a python program to create a package (college),sub-package (alldpt),modules(it,cse) and create admin and cabin function to module? B) Write a python program to create a package (Engg),sub-package (years),modules (sem) and create staff and student function to module?		
10	Program to develop calculator using tKinter	2	CO1, CO2, CO3, CO4

Text Books:

1. J. Jayalakshmi , D. Stalin Alex , B. Mahesh Prabhu,S. , Problem Solving and Python Programming , Chand publication,1 January 2018
2. Wesley J. Chun, Core Python Applications Programming, 3rd Edition , Pearson Education, 2016

CIE- Continuous Internal Evaluation (25 Marks)

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

SEE- Semester End Examination (25Marks)

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

MINI PROJECT - I

Course Code : 20AIL39A
 L: T: P : 0: 0: 2
 Exam Hours: : 3

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIL39A.1	Illustrate the technological needs and/ or societal needs and sustainability of the environment
20AIL39A.2	Design application using high level programming language
20AIL39A.3	Analyse and evaluate the outcome of the project
20AIL39A.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
20AIL39A.1	-	-	-	-	-	3	2	3	-	-	-	3	3	2
20AIL39A.2	-	-	3	-	3	-	-	-	-	-	-	3	3	2
20AIL39A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL39A.4	-	-	-	3	-	-	-	-	3	3	3	3	3	2

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

Each team capable of identifying a problem and carry out a mini project on the problem defined. A panel of experts will review the code developed towards the project during 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 (25 Marks)

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

SEE- Semester End Examination (25Marks)

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

MATHEMATICAL STATISTICS

Course Code : 20AIM41A
 L: T: P : 2: 1: 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
20AIM41A.1	Calculate and interpret the various measures of Dispersion, Skewness and Kurtosis.
20AIM41A.2	Solve the problems related to Combinatorics and Probability
20AIM41A.3	Gain ability to use probability distributions to analyse and solve real time problems
20AIM41A.4	Apply the stochastic process and Markov chain in prediction of future events
20AIM41A.5	Apply the concept of sampling distribution to solve engineering problems
20AIM41A.6	Use the concepts to analyse the data to make decision about the hypothesis

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM41A.1	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.2	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.3	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.4	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.5	3	3	3	2	2	-	-	-	1	1	-	1	-	-
20AIM41A.6	3	3	3	2	2	-	-	-	1	1	-	1	-	-

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

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

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

Text Books:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Tenth Revised Edition, 2002, ISBN: 81-7014-791-3.
2. 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. 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
2. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw-Hill Publishing Company, Limited, Third Edition, 2008, ISBN: 978-0-07-066925-3
3. Athanasios Papoulis and Unni Krishna Pillai, Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill Publishing Company Limited, Fourth Edition, 2002, ISBN: 0-07-112256-7
4. Sheldon M. Ross, Stochastic Processes, John Wiley & Sons. Inc., Second Edition, 1996, ISBN: 0-471-12062-6

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	-	-	-	-	-

SEE- Semester End Examination (50Marks)

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

LIFE SKILLS FOR ENGINEERS

Course Code : 20HSS422A
 L: T: P : 3: 0: 0
 Exam Hours: :

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
20AIM422.1	Set personal and professional goals
20AIM422.2	Develop critical and creative thinking skills and practise leadership.
20AIM422.3	Demonstrate and understand personal and professional responsibility
20AIM422.4	Apply the concepts of personality development and grooming in corporate life
20AIM422.5	Understand self and work with groups
20AIM422.6	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
20AIM422.1	-	-	-	-	-	-	-	-	3	-	3	3	-	-
20AIM422.2	-	-	-	-	-	2	-	2	3	-	2	3	-	-
20AIM422.3	-	-	-	-	-	2	2	3	3	-	-	3	-	-
20AIM422.4	-	-	-	-	-	-	-	-	3	3	-	3	-	-
20AIM422.5	-	-	-	-	-	-	-	-	3	-	3	3	-	-
20AIM422.5	-	-	-	-	-	2	2	-	3	3	2	3	-	-

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

Module No	Module Contents	Hours	Cos
1	Goal Setting: Importance of Goals: Achiever's goal - Creating SMART for personal and professional life, Right action at right time, career planning, overcoming fear and face uncertainty, Mind Mapping. Communication – Intellectual preparation/Idea generation.	6	CO1 CO6
2	You are the creator - Taking Ownership, Being Responsible and Accountable. Meaning of Ownership, Responsibility and Accountability, Practicing these philosophies in course, career. Social responsibility. Communication – Organising thought flow.	6	CO3 CO6
3	Self-Awareness and Self-Management: Emotional Intelligence, Know yourself- understanding personality, perception, techniques to understand self – Johari window and SWOT, reason for fall and opportunities to grow. Individual behaviour, attitude towards change and work, being proactive and positive. Interpersonal skills - Knowing others, working well with others. Communication – Structured articulation	9	CO5 CO6
4	Leadership, meaning, self - motivation, coming out of comfort zone, mental preparation - accepting failure and	9	CO2, CO6

	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		
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)

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

SEE- Semester End Examination (50Marks)

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

ENVIRONMENTAL SCIENCE AND AWARENESS

Course Code : 20HSS423A
 L: T: P : 0: 0: 0
 Exam Hours : 2

Credits: 0
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20HSS323A.1	Explain the concepts of environment, ecosystem and biodiversity.
20HSS323A.2	Analyze the use of natural resources for sustainability.
20HSS323A.3	Understand the control measures of Environmental pollution, the role of Government and NGO in solving Socio-Environmental issues.
20HSS323A.4	Apply the Environmental ethics, acts and amendments 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
19HSS323.1	-	-	-	-	-	3	3	-	-	-	-	-	-	-
19HSS323.2	-	-	-	-	-	3	3	-	-	-	-	3	3	-
19HSS323.3	-	-	-	-	-	3	3	3	-	3	-	3	3	-
19HSS323.4	-	-	-	-	-	3	3	3	-	3	-	3	3	-
Correlation levels: 1-Slight(Low) 2-Moderate(Medium) 3-Substantial(High)														

Module No	Module Contents	Hours	Cos
1	Introduction to Environment, Ecosystem and biodiversity: Environment - Components of Environment, Scope and importance of Environmental studies, Ecosystem: Types & Structure of Ecosystem, Energy flow in the ecosystem, Food chains – food webs & ecological pyramids. Biodiversity – Definition, Hot-spots of biodiversity, Threats to biodiversity, Conservation of biodiversity.	05	CO1
2	Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems. Role of an individual in conservation of natural resources. Water conservation, rain water harvesting. Balanced use of resources for sustainable lifestyle – strategies.	04	CO2
3	Environmental Pollution: Definition, Causes, effects and control measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise pollution, Thermal Pollution and Nuclear hazards. Role of an individual in	04	CO3

	prevention of pollution - Waste management – urban and industrial wastes.		
4	Social Issues and Environment: Environmental ethics – issues and possible solutions. Environment protection act – Air (prevention and Control of pollution) act & Water (prevention and Control of pollution) act. Role of government: Swatch Bharat Abhiyan, National Mission for Clean Ganga (NMCG), River rejuvenation, Role of Non-governmental Organizations (NGOs), Global warming and climate change.	04	CO3 CO4
5	Human Population and Environment: Population growth & explosion, Family welfare programme. Environment and human health, Human rights, Value education. Role of Technology in protecting environment and human health.	05	CO4

Text Books:

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

Reference Books:

1. Digital Design: with an Introduction to Verilog HDL, M Morris Mano and Michael DCiletti, 5th Edition, 2013, Pearson Education
2. 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
3. Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
4. Environmental Science- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10th Edition, ISBN: 10: 0534424082

CIE- Continuous Internal Evaluation (25 Marks)

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

SEE- Semester End Examination (25 Marks)

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

INTRODUCTION TO DATA SCIENCE

Course Code : 20AIM43A
 L: T: P : 3: 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
20AIM43A.1	Explore predictive modeling techniques with necessary python packages
20AIM43A.2	Apply predictive modeling and descriptive statistics concepts for data preparation
20AIM43A.3	Examine and use appropriate methods for data wrangling
20AIM43A.4	Inspect and submit efficient solution for the given data source as a team.
20AIM43A.5	Prepare an effective written documentation about significance of feature selection
20AIM43A.6	Demonstrate Big data tools used for analytics

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM43A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.4	-	-	-	3	3	-	-	-	2	2	-	3	3	-
20AIM43A.5	-	-	-	-	3	-	-	-	-	-	-	3	3	-
20AIM43A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	-

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

Module No	Module Contents	Hours	COs
1	Basic Concepts: Predictive Modeling , Data preparation, Importance of Data preparation , Data Cleaning , Feature selection , Data Transform , Feature selection , Dimensionality reduction, K-fold cross validation , Data Leakage and avoidance measure Python Packages: Numpy , Matplotlib , pandas , scipy , scikit , Data frame , Loading Machine Learning data	9	CO1, CO2
2	Descriptive Statistics: Mean Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map Correlation Statistics – ANOV. Data Preparation: Need for Data Pre-processing, Data Transforms, and Rescale Data Standardize Data, Normalize Data, Binarize Data, Univariate Selection, Recursive Feature Elimination, Principal Component Analysis.	9	CO1, CO2, CO4, CO6
3	Data Cleaning: Basic data cleaning, Outlier Identification and Removal , How to Mark and Remove Missing Data , Statistical Imputation, KNN Imputation , Iterative Imputation. Feature Selection: Statistics for feature selection, Methods for categorical input, Methods for Numerical input, Select Features for Numerical Output, RFE for Feature Selection, Significance of feature	9	CO1, CO3, CO4

	selection		
4	Data Transforms: 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. Dimensionality reduction : Techniques for Dimensionality Reduction , Linear Discriminant Analysis , PCA Dimensionality Reduction , SVD Dimensionality Reduction	9	CO1, CO3, CO4, CO6
5	Other Transforms: Transform numerical to categorical , Transform Numerical and Categorical Data , Transform the Target in Regression , Save and load the transformation , case studies for Binary classification, Multi classification and regression	9	CO1, CO4, CO5, CO6

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)

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	-

OBJECT ORIENTED PROGRAMMING USING JAVA

Course Code : 20AIM44A
 L: T: P : 3: 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
20AIM44A.1	Describe the object oriented concepts of Java
20AIM44A.2	Apply OOP's concept to implement a given problem using Java.
20AIM44A.3	Analyze the flow of a program is correct according to OOP's principles
20AIM44A.4	Investigate the concept of Multithreading in concurrent programming available in literature and submit report in a team
20AIM44A.5	Prepare an effective written documentation about significance of various packages
20AIM44A.6	Demonstrate the web based applications development using java.

Mapping of Course Outcomes to Program Outcomes															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
20AIM44A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2	
20AIM44A.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2	
20AIM44A.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2	
20AIM44A.4	-	-	3	-	3	-	-	-	2	2	-	3	3	2	
20AIM44A.5	-	-	3	-	3	-	-	-	-	2	-	3	3	2	
20AIM44A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	2	

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

Module No	Module Contents	Hours	COs
1	Introduction to Java: Basics of Java programming - Dissecting the "Hello, World" Program, Compiling and Running a Java Program, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Math class, Arrays in java	9	CO1 CO2
2	Objects and Classes: Working with Objects, Implementing Classes, Object Construction, Static Variables and Methods, Constructors, Overloading Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, this reference, nested classes.	9	CO1, CO2, CO6
3	Inheritance and Polymorphism: Inheritance and types, Super and sub class, Overriding, Polymorphism, Dynamic binding, Casting objects, Instance of operator, Abstract class, Interface, Package , Object class	9	CO1, CO2, CO6
4	Exception Handling: Exception Types, Uncaught Exceptions, using try and catch, Multi catch clauses, Nested try statements, throw, throws, finally, Java's Built-in Exceptions. Threads: The java Thread Model, The main Thread,	9	CO1, CO2, CO3, CO4, CO6

	Creating a Thread, Creating multiple Threads, Thread Priorities, Synchronization, Inter thread Communication, Suspending, resuming and Stopping Threads, using Multithreading.		
5	I/O basics: Reading input, writing output, Reading and Writing files The Collections Framework: Collections Overview, The Collection Interfaces- The List Interface, The Set Interface, The Queue Interface, The Collection Classes – Array List Class, Linked List Class, Tree set Class	9	CO1, CO2, CO5, CO6

Text Books:

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

Reference Books:

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

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50Marks)

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

DATABASE MANAGAEMENT SYSTEM

Course Code : 20AIM45A
 L: T: P : 3: 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
20AIM45A.1	Describe the concepts of DataBase Management Systems
20AIM45A.2	Analyse the various database concepts using ER diagram
20AIM45A.3	Make use of Relational Database techniques for solving real world problems
20AIM45A.4	Construct database for the structured data by applying normalization techniques
20AIM45A.5	Design database for the unstructured data with effective documentation report as a team
20AIM45A.6	Demonstrate the databases used for big data

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIM45A.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.2	-	3	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.3	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.4	3	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIM45A.5	3	-	-	-	3	-	-	-	3	3	-	3	3	2
20AIM45A.6	3	-	-	-	3	-	-	-	-	-	-	3	3	2

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

Module No	Module Contents	Hours	COs
1	Introduction to Databases: Definition of database, DBMS; Characteristics of Database approach; Advantages of using DBMS approach; when not to use a DBMS Database Concept and Architecture: Data models, schemas and instances; Data Abstraction; Three-schema architecture and data independence; Components of a DBMS - Database Designer- Database Administrator - Database Users. Introduction to Entity-Relationship Model: Entity Types, Attributes and Keys; Relationship types, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two; Reduction of an E-R schema to relational Tables	10	CO1, CO2
2	Introduction to Logical Design and Relational Model: Domains, Attributes, Tuples, and Relations; Relational Model Constraints; Relational Database Schemas; SQL-1: 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	10	CO1, CO3

	Joins; Logical connectives - AND, OR and NOT; Addition basic operations ; Set operations; Aggregate function; Comparisons Involving NULL and Three-Valued Logic; SQL modification language; Select, Delete, Update clause		
3	SQL -2: Introduction to Nested Queries; Correlated Nested Queries; Introduction to Views: creation, implementation, update of views; Introduction to Assertion and Trigger	7	CO1, CO2, CO3
4	Index Structures: Indexes on Sequential Files: dense, sparse index; multilevel indexing; Hash Based Indexing: Static Hashing and dynamic hashing. Database Refinement: 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	NOSQL Databases: 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. Introduction to Cassandra: 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, CO6

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	-

OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Course Code : 20AIL46A
 L: T: P : 0: 0: 2
 Exam Hours: : 3

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIL46A.1	Apply OOP concepts with basic Java constructs to solve the given problem.
20AIL46A.2	Analyze the output for the programs in Java.
20AIL46A.3	Conduct experiments as individual by using modern tools like JDK
20AIL46A.4	Prepare an effective report based on experiments

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL46A.1	-	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIL46A.2	3	-	-	-	-	-	-	-	-	-	-	-	3	2
20AIL46A.3	-	3	-	-	-	-	-	-	3	-	-	3	3	2
20AIL46A.4	-	-	-	-	-	-	-	-	3	3	-	-	3	2

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

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

	extending Thread Class		
11.	Write a program to implement the concept of threading by implementing Runnable Interface	4	CO1 CO2 CO3 CO4
12.	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints .If the value is odd, the third thread will print the value of cube of the number		
13.	Write a program to implement the concept to of Exception Handling using pre-defined exception	4	CO1 CO2 CO3 CO4
14.	Write a program to implement the concept of Exception Handling by creating user defined exceptions		
15.	a) Write a program to demonstrate File I/O Operations b) Write a program to demonstrate Array List Class, Linked List Class, Tree set Class	2	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 (25 Marks)

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

SEE- Semester End Examination (25Marks)

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

DATABASE MAGAGEMENT SYSTEM LAB

Course Code : 20AIL47A
 L: T: P : 0: 0: 2
 Exam Hours : 3

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

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

Mapping of Course Outcomes to Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20AIL47A.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
20AIL47A.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL47A.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
20AIL47A.4	-	-	-	-	-	-	-	-	-	3	-	3	3	2

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

Ex. No	Experiments	Hours	COs
1.	Draw E-R diagram and convert entities and 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	3	CO1, CO2, CO3, CO4

	<p>etc)</p> <p>Write the following queries in SQL. No duplicates should be printed in any of the answers.</p> <ol style="list-style-type: none"> 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 that meet at the same time. iv. Find the names of faculty members who teach in every room in which some class is taught. v. Find the names of faculty members for whom the combined enrolment of the courses that they teach is less than five. vi. Find the names of students who are not enrolled in any class. vii. For each age value that appears in Students, find the level value that appears most often. For example, if there are more FR, level students aged 18 than SR, JR, or SO students aged 18, you should print the pair (18, FR). 		
5.	<p>Consider the following database that keeps track of airline flight information:</p> <p>FLIGHTS (flno: 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> <ol style="list-style-type: none"> i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000. 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. iii. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt. 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. v. Find the names of pilots certified for some Boeing aircraft. vi. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi. vii. A customer wants to travel from Madison to New York with no more than two changes of flight. List the choice of departure times from Madison if the customer wants to arrive in New York by 6 p.m. 	3	CO1, CO2, CO3, CO4

	viii. Print the name and salary of every non-pilot whose salary is more than the average salary for pilots.		
6.	<p>Consider the following relations for an Order Processing database application in a company.</p> <p>CUSTOMER (CUST #: int, cname: String, city: String) ORDER (order #: int, odate: date, cust #: int, ord-Amt: int) ITEM (item #: int, unit-price: int) ORDER-ITEM (order #: int, item #: int, qty: int) WAREHOUSE (warehouse #: int, city: String) SHIPMENT (order #: int, warehouse #: int, ship-date: date)</p> <p>i. Create the above tables by properly specifying the primary keys and the foreign keys and the foreign keys. ii. Enter at least five tuples for each relation. iii. Produce a listing: CUSTNAME, #of orders, AVG_ORDER_AMT, where the middle column is the total numbers of orders by the customer and the last column is the average order amount for that customer. iv. List the order# for orders that were shipped from all warehouses that the company has in a specific city. v. Demonstrate how you delete item# 10 from the ITEM table and make that field null in the ORDER ITEM table.</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) PUBLISHER(publisher-id: int, name: String, city: String, country: String) CATALOG (book-id: int, title: String, author-id: int, publisher-id: int, category-id: int, year: int, price: int) CATEGORY(category-id: int, description: String) ORDER-DETAILS(order-no: int, book-id: int, quantity: int)</p> <p>i. Create the above tables by properly specifying the primary keys and the foreign keys. ii. Enter at least five tuples for each relation. iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books in the catalog and the year of publication is after 2000. iv. Find the author of the book, which has maximum sales. v. Demonstrate how you increase the price of books published by a specific publisher by 10%.</p>	3	CO1, CO2, CO3, CO4
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) COURSE (course #: int, cname: String, dept: String) ENROLL (regno: String, cname: String, sem: int, marks: int) BOOK_ADOPTION (course #: int, sem: int, book-ISBN: int)</p>	3	CO1, CO2, CO3, CO4

	<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>		
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>Consider the schema for College Database:</p> <p>STUDENT(USN, SName, Address, Phone, Gender)</p> <p>SEMSEC(SSID, Sem, Sec)</p> <p>CLASS(USN, SSID)</p> <p>SUBJECT(Subcode, Title, Sem, Credits)</p> <p>IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)</p> <p>Write SQL queries to</p> <p>i. List all the student details studying in fourth semester 'C' section.</p> <p>ii. Compute the total number of male and female students in each semester and in each section.</p> <p>iii. Create a view of Test1 marks of student USN '1NH20AI101' in all subjects.</p> <p>iv. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.</p> <p>v. Categorize students based on the following criterion:</p>	3	CO1, CO2, CO3, CO4

	If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA < 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C-section students.		
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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 (25 Marks)

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

SEE- Semester End Examination (25Marks)

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

MINI PROJECT - II

Course Code : 20AIL48A
 L: T: P : 0: 0: 2
 Exam Hours: : 3

Credits: 2
 CIE Marks: 25
 SEE Marks: 25

Course Outcomes:	At the end of the Course, the Student will be able to
CO#	COURSE OUTCOME
20AIL48A.1	Illustrate the technological needs and/ or societal needs and sustainability of the environment
20AIL48A.2	Design application using high level language
20AIL48A.3	Analyse and evaluate the outcome of the project
20AIL48A.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
20AIL48A.1	-	-	-	-	-	3	2	3	-	-	-	3	3	2
20AIL48A.2	-	-	3	-	3	-	-	-	-	-	-	3	3	2
20AIL48A.3	-	3	-	-	-	-	-	-	-	-	-	3	3	2
20AIL48A.4	-	-	-	3	-	-	-	-	3	3	3	3	3	2

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

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

CIE- Continuous Internal Evaluation (25 Marks)

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

SEE- Semester End Examination (25Marks)

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

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.

