NEW HORIZON COLLEGE OF ENGINEERING

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

The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka
Awarded Outstanding Technical Education Institute in Karnataka-2016
Ring Road, Bellandur Post, Near Marathalli, Bangalore -560 103, INDIA

Academic Year 2021-22

ISE – Information Science & Engineering

Third and Fourth Semester

Scheme and Syllabus

CONTENTS

VISION

To evolve as a centre of academic excellence and advanced research in information science and engineering discipline and to endeavour the computational competence of students for their dream career achievement and enhancing the managerial and technical skills.

MISSION

To inculcate students with profound understanding of fundamentals related to discipline, attitudes, skills and their application in solving real world problems, with an inclination towards societal issues and research.

Program Education objectives (PEOs)

PEO1	To excel in their professional career with expertise in providing solutions to Information Technology problems.
PEO2	To pursue higher studies with profound knowledge enriched with academia and industrial skill sets.
PEO3	To exhibit adaptive and agile skills in the core area of Information Science & Engineering to meet the technical and managerial challenges.
PEO4	To demonstrate interpersonal skills, professional ethics to work in a team to make a positive impact on society.

PEO to Mission Statement Mapping

Mission Statements	PEO1	PEO2	PEO3	PEO4
To prepare the students with academic and industry exposure by empowering and equipping them with necessary domain knowledge.	3	2	2	2
To prepare the students for global career in information technology with relevant technical and soft skills.	3	2	2	2
To encourage students to participate in co-curricular and extracurricular activities leading to the enhancement of their social and professional skills.	2	2	3	3

Correlation: 3- High, 2-Medium, 1-Low

Program Specific Outcomes(PSO's)

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking or efficient design of computer based systems of varying complexity.

PSO2: The ability to apply standard practices and strategies in software project development using innovative ideas and open ended programming environment with skills in teams and professional ethics to deliver a quality product for business success.

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	Program Outcomes (POs)
1	Engineering Knowledge	**PO1:** The basic knowledge of Mathematics, Science and Engineering.
2	Problem analysis	**PO2:** An Ability to analyze, formulate and solve engineering problems.
3	Design and Development of Solutions	**PO3:** An Ability to design system, component or product and develop interfaces among subsystems of computing.
4	Investigation of Problem	**PO4:** An Ability to identify, formulate and analyze complex engineering problem and research literature through core subjects of Computer Science.
5	Modern Tool usage	**PO5:** An Ability to use modern engineering tools and equipments for computing practice.
6	Engineer and society	**PO6:** An Ability to assess societal, health, cultural, safety and legal issues in context of professional practice in Computer Science & Engineering.
7	Environment and sustainability	**PO7:** The broad education to understand the impact of engineering solution in a global, economic, environmental and societal context.
8	Ethics	**PO8:** An understanding of professional and ethical responsibility.
9	Individual & team work	**PO9:** An Ability to work both as individual and team player in achieving a common goal.
10	Communication	**PO10:** To communicate effectively both in written and oral formats with wide range of audiences.
11	Lifelong learning	**PO11:** Knowledge of contemporary issues, Management and Finance.
12	Project management and finance	**PO12:** An Ability to recognize the need and thereby to engage in independent and life-long learning for continued professional and career advancement.

Mapping of POs with PEOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	2	3	-	-	-	3	-	3	-
PEO2	3	3	3	2	3	-	-	-	3	-	3	-
PEO3	3	3	3	2	3	-	-	-	3	-	3	-
PEO4	3	3	3	2	3	-	-	-	3	-	3	-

Correlation: 3- High, 2-Medium, 1-Low

New Horizon College of Engineering
Department of Information Science and Engineering
Third Semester B.E Program–Scheme AY: 2021-22

Sl. No.	Course Code	Course Name	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1.	20ISE31A	Applied Mathematics-III	MAT	2	1	0	0	3	4	50	50	100
2.	20HSS321	Economics for Engineers	HSS	2	0	0	0	2	2	25	25	50
3.	20HSS324 20HSS325	Aadalitha Kannada / Vyavaharika Kannada	HSS	1	0	0	0	1	2	25	25	50
4.	20ISE33A	Digital Logic Design	ISE	3	0	0	0	3	3	50	50	100
5.	20ISE34A	Data Structures using C	ISE	3	0	0	0	3	3	50	50	100
6.	20ISE35A	Computer Organization	ISE	3	0	0	0	3	3	50	50	100
7.	20ISE36A	Python Programming	ISE	3	0	0	0	3	3	50	50	100
8.	20ISL37A	Digital Logic Design Lab	ISE	0	0	1	0	1	2	25	25	50
9.	20ISL38A	Data Structures Using C Lab	ISE	0	0	1.5	0	1.5	3	25	25	50
10.	20ISL39A	Python Programming Lab	ISE	0	0	1.5	0	1.5	3	25	25	50
11.	20ISE391A	Mini Project	ISE	0	0	2	0	2	4	25	25	50
12	*20DMAT31A	Basic Applied Mathematics-1	BSH	0	0	0	0	0	2	25	25	50
13	*19HSS171	Essential English	BSH	0	0	0	0	0	2	25	25	50
Total								**24**	**32**	**400**	**400**	**800**

***** 20DMAT31A, 19HSS171: **Applicable to Lateral Entry students only**

New Horizon College of Engineering
Department of Information Science and Engineering
Fourth Semester B.E Program-Scheme AY: 2021-22

Sl. No.	Course Code	Course Name	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1.	20ISE41A	Discrete Mathematics And Graph Theory	MAT	2	1	0	0	3	4	50	50	100
2.	20HSS322A/ 20HSS422A	Life Skills for Engineers	HSS	3	0	0	0	3	3	50	50	100
3.	20HSS423	Environmental Sciences and Awareness	CIV	0	0	0	0	0	2	50	50	100
4.	20ISE43A	Database Management Systems	ISE	3	0	0	0	3	3	50	50	100
5.	20ISE44A	Oops with Java	ISE	3	0	0	0	3	3	50	50	100
6.	20ISE45A	Operating Systems	ISE	3	0	0	0	3	3	50	50	100
7.	20ISL46A	Database Management Systems Lab	ISE	0	0	2	0	2	4	25	25	50
8.	20ISL47A	Oops with Java lab	ISE	0	0	1.5	0	1.5	3	25	25	50
9.	20ISL48A	Operating Systems lab	ISE	0	0	1.5	0	1.5	3	25	25	50
10.	20ISE49A	Mini Project	ISE	0	0	2	0	2	4	25	25	50
Total								**22**	**32**	**400**	**400**	**800**
1.	20DMAT41A	Basic Applied Mathematics-II	BS	0	0	0	0	0	2	25	25	50
2.	19HSS172	Constitution of India and Professional Ethics	HSS	0	0	0	0	0	2	25	25	50

20DMAT41A, 19HSS172 - **Only for Lateral Entry Students**

APPLIED MATHEMATICS – III

Course Code: 20ISE31A **Credits: 03**
L:T:P:S : 2:1:0:0 **CIE Marks : 50**
Exam Hours: 03 **SEE Marks : 50**

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

CO1	Use appropriate numerical methods to solve algebraic equations and transcendental equations
CO2	Solve initial value problems using appropriate numerical methods and also Evaluate definite integrals numerically
CO3	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data and obtain the external of a functional.
CO4	Gain ability to use probability distributions to analyze and solve real time problems
CO5	Apply the concept of sampling distribution to solve engineering problems
CO6	Use the concepts to analyze 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**
CO1	3	3	3	3	3	-	3	-	-	-	3	3
CO2	3	3	3	3	3	-	3	-	-	-	3	3
CO3	3	3	3	3	3	2	3	-	-	3	3	3
CO4	3	3	3	3	3	2	-	-	-	3	3	3
CO5	3	3	3	3	3	-	-	-	-	3	3	3
CO6	3	3	3	3	3	-	-	-	-	3	3	3

Course Syllabus			
Module No.	**Contents of the Module**	**Hours**	**Co's**
1.	**Numerical Methods-1:** Numerical solution of algebraic and transcendental equations: Regula-falsi method and Newton-Raphson method-Problems. Interpolation: Newton's forward and backward 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 first degree: Modified Euler's method and Runge-Kutta method fourth-order-Problems. Milne's predictor and corrector method Problems.	**9**	**CO2**

	Numerical integration: Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rul Weddle's rule (without proofs)-Problems. **Applications:** Application of numerical integration to velocity of particle and volume of solids.		
3.	**Statistical Methods and Calculus of Variation:** Fitting of the curves of the form $y = a + bx$, $y = a + bx + cx^2$, $y = ae^{bx}$, $y = ax^b$, and $y = ab^x$ by the method of least square-Problems.Correlation and Regression Lines-Problems. Variation ofa function and a functional, Variational problems, Euler's equation and Isoperimetric problems. **Applications:**Brachistochrone problem, Minimal surface of revolution and Hanging cable.	**9**	**CO3**
4.	**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. **Joint Probability distributions:** Mathematical expectation, correlation, covariance (discrete random variables only)-Problems.	**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. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10^{th} Edition, 2014,
ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43^{rd} Edition, 2014,
ISBN: 978-81-7409-195-5.

Reference Books:

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

Assessment Pattern:

1. 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	-	-	-	-	-

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

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

ECONOMICS FOR ENGINEERS

Course Code: 20HSS321A **Credits: 02**

L: T: P:S : 2:0:0:0 **CIE 25**

Exam Hour: 02 **SEE 25**

Course Outcomes: On completion of the course, the student will be able to:

CO1	Summarize the knowledge of economics and its importance in business decision making.
CO2	Make use of economic concepts in business.
CO3	Examine the impact of market forces on business.

CO4	Interpret the role of market structure in the economic development of a country.
CO5	Evaluate the role of budgeting in business decisions.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	1	0	1	1	3	3	3	3	1	2	3
CO2	1	1	1	1	2	2	1	2	2	2	3	3
CO3	3	2	3	1	1	2	2	3	1	1	2	2
CO4	1	2	1	2	1	3	1	2	2	2	2	2
CO5	3	2	3	2	2	1	1	2	1	1	3	1

Module No.	Contents of Module	Hours
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
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
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
4	**Market structure:** Perfect Competition: Features, Determination of Price under Perfect Competition - Monopoly: Features, Pricing under Monopoly, **Oligopoly**: Features, Kinked Demand Curve, Cartel, Price Leadership – Monopolistic Competition: Features, Pricing under Monopolistic Competition, Product Differentiation.	5
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

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
2. Prasanna Chandra, Financial Mangement,TMH,2007
3. Singh Seema, Economics for Engineers, IK International,2014
4. Chopra P. N, Principle of Economics, Kalyani Publishers,2012
5. Dewett K K, Modern Economic Theory, S. Chand,2006

Assessment pattern

CIE - Continuous Internal Evaluation (25 Marks, Theory)

Bloom's Category	**Test**	**Assignment**
Marks (out of 25)	**15**	**10**
Remember	5	-
Understand	5	-
Apply	5	-
Analyze	-	5
Evaluate	-	5
Create	-	-

SEE – Semester Ending Examination (25 Marks)

Bloom's Category	**SEE Theory (25)**
Remember	5
Understand	5
Apply	5
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)

ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದ ಲೇಖಕರು

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೋ. 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 : 20HSS325/425 **Credits 01**
L: T: P:S : 1:0:0:0 **CIE Marks 25**
Exam Hours : 2 **SEE Marks 25**

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 : (25 marks Each)

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

DIGITAL LOGIC DESIGN

Course Code :20ISE33A **Credits : 03**
L:T:P:S : 3:0:0:0 **CIE Marks :50**
Exam Hours : 3 **SEE marks :50**

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

CO1	Understand the working of logic Gates and simplify Boolean function using Karnaugh maps and Quine Mc-Clusky method and implement functions with combinatorial circuits.
CO2	Analyze and design modular combinatorial logic circuits
CO3	Implementation of arithmetic logic circuits
CO4	Understand the Bi- stable elements like flip-flop and use its functionality to analyze and design the sequential circuits and its applications
CO5	Apply the concepts of state and state transition for the analysis and design of sequential circuits.
CO6	Implement the logical circuits using HDL.

Mapping of Course Outcomes to Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	1	1	1	1	1	2
CO2	3	3	3	2	1	1	1	1	1	1	1	2
CO3	3	3	3	2	1	1	1	1	1	1	1	2
CO4	3	3	3	2	1	1	1	1	1	1	1	2
CO5	3	3	3	2	1	1	1	1	1	1	1	2
CO6	3	3	3	2	1	1	1	1	1	1	1	2

Module No	Module Contents	Hours	CO's
1	**Digital Logic and Combinational Logic Circuits**: Overview of Basic Gates and Universal Logic Gates, AND-OR-Invert Gates, Positive and Negative Logic, Introduction to HDL Combinational Logic Circuits: Boolean Laws and Theorems, Sum-of-products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't Care Conditions, Product-of-sums Method, Product-of-sums Simplification, Simplification by Quine-McClusky Method.	9	CO1, CO6
2	**Data-Processing Circuits**: Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD-to-Decimal Decoders, Seven-segment Decoders, Encoders, EX-OR gates, Parity Generators and Checkers, Magnitude comparators (1 and 2 bit), Design of multiple output circuits using PLDs.HDL Implementation of Data Processing Circuits	9	CO2, CO6

3	**Combinational Circuits:**Number System , Base Conversion, Binary Addition, Binary Subtraction,Unsigned Binary Numbers, Sign-Magnitude Numbers, 2's Complement Representation, 2's Complement Arithmetic, Arithmetic Building Blocks,The Adder-Subtractor, Arithmetic Logic Unit, Binary Multiplication and Division, Code Converter , Arithmetic Circuits using HDL	9	CO3, CO6
4	**Sequential Circuits**: Latches, types of Flip-flops, Flip-flop excitation tables, Registers, type of Shift Registers, Universal shift Registers, Applications of Shift Registers –Ring Counter, Johnson Counter, Sequence generator, Verilog implementation of Flip-flops and Registers.	9	CO4, CO6
5	**Design and Analysis of Sequential Circuits**: Counters-Asynchronous and Synchronous Counters, Counter Design as Synthesis Problem, Design of Synchronous Sequential Circuits: Moore Model, Mealy Model, State Reduction Techniques, Verilog implementation of counters.	9	CO5, CO6

TEXT BOOKS:

1. Digital Principles and Applications, Donald P Leach and Albert Paul Malvino, 8th Edition, 2014, Tata McGraw Hill.
2. Digital Logic Applications and Design John M Yarbrough Cengage Learning 2011
3. Digital Principles and Design Donald D Givone McGraw Hill Education 1 st Edition, 2002
4. Logic and computer design Fundamentals M. Morries Mano and Charles Kime Pearson Learning 4 th Edition, 2014

REFERENCE BOOKS:

1. Digital Principles and design, Donald D. Givone, 2003, Tata McGraw Hill.
2. Digital Design: with an Introduction to Verilog HDL, M Morris Mano and ichael D. Ciletti, 5th Edition, 2013, Pearson Education.
3. Integrated Electronics – Analog and Digital Circuits and Systems, Jacob Millman, Christos Halkias and Chetan D Parikh, 2nd Edition, 2011, Tata McGraw Hill.

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Category (Marks out of 50)	Tests (25 Marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	-	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	5	5	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination: Theory (50Marks)

Bloom's Category Marks (out of 50)	Marks
Remember	-
Understand	20
Apply	20
Analyze	10
Evaluate	-
Create	-

DATA STRUCTURES USING C

Course Code : 20ISE34A **Credits : 03**
L:T:P:S : 3:0:0 :0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Understand the fundamentals of data structures and their applications essential for programming/problem solving.
CO2	Analyze the operational aspects of linear data structures: stacks, queues in Problem solving.
CO3	Select an appropriate data structure for a specified application.
CO4	Understand and implement the concept of linked list data structure in Problem solving.
CO5	Analyze the operational aspects of non-linear data structures: Trees, Graphs in Problem solving.
CO6	Analyze various searching and sorting algorithms.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No.	Module Contents	Hours	CO's
1	**Basic Concepts**: Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions, Sparse Matrix.	9	CO1
2	**STACKS AND QUEUES:**Stacks, Applications of stacks: Recursion, Evaluation of Expressions, Factorial, Tower of Hanoi. Multiple Stacks. Queues: Definition, Queue representation, Primitive operations on queue, array representation of queues, Circular queue, Priority queue, Double ended queue, Applications of queues.	9	CO2, CO3
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, Linked representation of stack,Linked representation of queue.	9	CO3, CO4
4	**TREES:** Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps. Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees, Balanced Trees.	9	CO5
5	**Graphs**: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.**Sorting**-Insertion Sort, Selection Sort, **Searching** - Linear Search, Binary Search.	9	CO5 CO6

TEXT BOOKS:

1. Ellis Horowitz and SartajSahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

REFERENCE BOOKS:

1. Gilberg&Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014 .
2. ReemaThareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2 nd Ed, McGraw Hill, 2013
4. A M Tenenbaum, Data Structures using C, PHI, 1989

CIE - Continuous Internal Evaluation (50 Marks)

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

SEE – Semester End Examination (50 Marks)

Bloom's Taxonomy	Marks
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

COMPUTER ORGANIZATION

Course Code : 20ISE35A **Credits : 03**
L: T: P:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Gain the Technical knowledge of how computers are constructed out of a set of functional units and how the functional units operate, interact, and communicate
CO2	Evaluate the merits and pitfalls in computer performance measurements.
CO3	Analyze the memory hierarchy and its impact on computer cost/ performance
CO4	Gain the Technical knowledge on representation of data at the machine level and how computations are performed at the machine level.
CO5	Analyze internal structure of a processor and how the control signals are generated in sequence
CO6	Analyze the various ways in which input, output operations are performed.

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	2	-	-	-	-	-	-	1
CO2	3	1	2	1	-	-	-	-	-	-	-	2
CO3	2	3	2	2	1	1	-	-	-	-	1	3
CO4	3	3	3	1	1	-	-	-	-	-	-	3
CO5	3	1	2	1	2	-	1	-	-	-	-	3
CO6	3	3	2	3	1	-	-	1	-	-	2	3

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No.	Module Contents	Hours	CO's
1	**Introduction**: Functional Units, Basic Operational Concepts, Numbers, Arithmetic operations and characters, Memory locations and addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing modes, Stacks, Subroutines.	9	CO1, CO2
2	**Input/output organization**: Accessing I/O devices, Interrupts, Bus structure, bus operation, Arbitration	9	CO6
3	**Computer Arithmetic:** Addition subtraction of signed numbers, Design of fast adders, Multiplication of unsigned and signed numbers, Fast multiplication, Integer Division.	9	CO4
4	**Computer Memory System:** Characteristics of Memory System, The Memory hierarchy, Elements of cache design: Cache addresses,Cache size, replacement algorithms. DRAM and SRAM, types of ROM	9	CO2, CO3
5	**Basic Processing Unit:** Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, hardwired control, CISC style processors	9	CO5

TEXT BOOKS:

1. Computer Organization and Embedded systems , Carl Hamacher, ZvonksVranesic, SafeaZaky, McGraw Hill, Sixth Edition, 2012.
2. Computer Organization and Architecture, William Stallings, Pearson/PHI, Eighth edition, 2013

REFERENCE BOOKS:

1. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Elsevier, Fifth Edition, 2012.
2. Structured Computer Organization, Andrew S. Tanenbaum, PHI/Pearson, Sixth Edition 2013.
3. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication, 2013.

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50 Marks)

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

PYTHON PROGRAMMING

Course Code : 20ISE36A **Credits : 03**
L:T:P:S : 3:0:0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Understand the benefits of python programming over other languages and program using python language.
CO2	Develop high order functions, file handling modules in Python language.
CO3	Implement new data structures in python to handle real world data.
CO4	Model the real world entities as classes and objects using python object oriented programming concepts.
CO5	Apply exception handling and gain efficient testing, debugging skills in python.
CO6	Develop File Processing applications based on python programming libraries.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	2	-	-	2	-	1
CO2	3	3	3	2	2	-	2	-	-	2	-	1
CO3	3	3	3	2	2	-	2	-	-	2	-	1
CO4	3	3	3	2	2	-	2	-	-	2	-	1
CO5	3	3	3	2	2	-	2	-	-	2	-	1
CO6	3	3	3	2	2	-	2	-	-	2	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	CO's
1	**Introduction to Python:** The basic elements of Python,The first Program, Objects, Expression, Numerical Types, Variables, Keywords and Assignments, multiple Assignments, Operators and Operands, Order of operations, Decision making, Loop control structures, Input data handling	9	CO1
2	**Functions andScoping :** Functions and Scoping, Function calls, Type conversion, Type coercion, Math functions, Functions as Objects ,Composition ,Variables and parameters are local, global, Recursion, Modules, Files Handling, Directories	9	CO2
3	**Sequence Data Types:** Tuples, Set, Lists, List Comprehension, Strings, Dictionaries.	9	CO3
4	**Classes and Objects:** Encapsulation, Classes and objects, Encapsulation, Inheritance, Polymorphism.	9	CO4, CO5
5	**Exceptions and assertions:** Handling exceptions, Exceptions as a control flow mechanism, Assertions. **Applications:** Web Scrapping, Working with Excel Spreadsheets, Working with PDF & Word documents, Working with CSV and JSON data	9	CO6

TEXT BOOKS:

1. John V Guttag, "Introduction to Computation and Programming Using Python", 2015,PrenticeHall of India
2. Mark Lutz, "Learning Python", 2015, 5th Edition, O'Reilly publication,2016
3. Charles R. Severance, "Python for Everybody", Creative commons 2016.

REFERENCE BOOKS:

1. Wesley J. Chun, "Core Python Programming", ,2nd Edition, Prentice Hall,2013

2. Allen Downey, Jeffrey Elkner and Chris Meyers, "How to think like a Computer Scientist,Learning with Python",Green Tea Press, 2014
3. "The Python Tutorial", http://docs.python.org/release/3.0.1/tutorial/
4. Automate the Boring Stuff with Python, https://automatetheboringstuff.com/

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50 Marks)

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

DIGITAL LOGIC DESIGN - LABORATORY

Course Code : 20ISL37A **Credits : 1**
L:T:P:S : 0:0:1:0 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Analyze and design modular combinatorial logic circuits.
CO2	Realize the Flip flops and verify the truth table
CO3	Design of sequential circuits
CO4	Implement the logical circuits using HDL.

Mapping of Course Outcomes to Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	1	1	1	1	1	1	2
CO2	3	3	3	2	3	1	1	1	1	1	1	2

CO3	3	3	3	2	3	1	1	1	1	1	1	2
CO4	3	3	3	2	3	1	1	1	1	1	1	2

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

Experiment No.	Experiment
PART-A	
1	Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
2	Perform n bit addition / subtraction using 4 bit full adder IC.
3	Realize JK, D and T Flip-Flops and verify its truth table
4	Design and implement Ring counter and Johnson counter using 4-bit shift register and demonstrate its working.
5	Design and implement a mod-n (n<8) synchronous up or down counter using J-K Flip-Flop ICs and demonstrate its working.
PART-B	
6	Simulate and verify the working of 8:1 multiplexer using Verilog code.
7	Simulate and verify the working of n bit adder/subtractor using Verilog code.
8	Simulate and verify the working of the JK,D and T Flip flop using Verilog code.
9	Simulate and verify the working of Ring and Johnson Counter using Verilog code.
10	Simulate and verify mod 8 synchronous up or down counter using Verilog code.

Note:
For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as ‘0’

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 Taxonomy	Tests
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

DATA STRUCTURES USING C - LABORATORY

Course Code : 20ISL38A **Credits : 1.5**
L:T:P:S : 0:0:1.5:0 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Analyze the operational aspects of linear data structures: stacks, queues in Problem solving.
CO2	Implement the concept of linked list data structure in Problem solving.
CO3	Analyze the operational aspects of non-linear data structures: Trees, Graphs in Problem solving.
CO4	Apply various searching and sorting algorithms.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

Experiment No.	Experiment
	PART-A
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position (POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR. Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Design, Develop and Implement a Program in C to create a structure to store the name, account number and balance of customers (more than 10) and store their information. 1 - Write a function to print the names of all the customers having balance lessthan$200. . 2 - Write a function to add $100 in the balance of all the customers having more than $1000 in their balance and then print the incremented value of their balance.
4	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
5	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both

	parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
6	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Postfix expression with single digit operands and operators: +, -, *, /, %, ^. b. Solving Tower of Hanoi problem with n disks.
PART-B	
7	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
8	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
9	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
10	Using circular representation for a polynomial, design, develop, and execute a program in C to accept two polynomials, add them, and then print the resulting polynomial.
11	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
12	Demonstrate binary search algorithm using any one of the sorting techniques.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

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 Taxonomy	Tests
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

PYTHON PROGRAMMING LABORATORY

Course Code : 20ISL39A **Credits : 1.5**
L:T:P:S : 0:0:1.5:0 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Develop high order functions, file handling modules in Python language.
CO2	Implement new data structures in python to handle real world data.
CO3	Model the real world entities as classes and objects using python object oriented programming concepts.
CO4	Develop File Processing applications based on python programming libraries.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

Experiment No.	Experiment
	PART-A
1	a. Design and Implement a Python program to accept 3 digits from the user and print all possible combination from digits. b. Create a Python program to take two command line inputs and compute the GCD and LCM of these two numbers.
2	a. Create a Python program to find the sum of natural numbers up to n using recursive function b. Design and Develop a Python Program to Create a Dictionary with Key as First Character and Value as Words Starting with that Character.
3	a. A list rotation consists of taking the last element and moving it to the front. Forinstance, if we rotate the list [1,2,3,4,5], we get [5,1,2,3,4]. If we rotate it again, we get [4,5,1,2,3]. Write a Python function *rotatelist(ls,k)* that takes a list ls and a positive integer k and returns the list ls after k rotations. If k is not positive, your functionshould return ls unchanged. Note that your function should not change ls itself, and should return the rotated list. Here are some examples to show how your function shouldwork. >>>rotatelist([1,2,3,4,5],1) #output is [5, 1, 2, 3, 4] >>>rotatelist([1,2,3,4,5],3) #output is [3, 4, 5, 1, 2] >>>rotatelist([1,2,3,4,5],12) #output is [4, 5, 1, 2, 3] b. Design and implement a python code that accepts two string from user and displays the characters which are present in both the strings. Use Set sequence type to achieve the same.
4	a. Implement a Python program to count the numbers of characters in the string and store them in a dictionary data structure b. Develop a Python program print to first 10 lines and last 10 lines in a file.
5	a. Design a python program to compute the number of characters, words and lines in a file.Also Print the most frequent words read from the file. **b.** Apply import,from, * and other module related concepts to create a module called "calc" consists of 4 function that should return sum, division, multiplication and subtraction. Create another module caller "user",import the calc module and illustrate the use of all the functions of calc module.
6	Design & Implement the program in python to demonstrate sending Email and Text messages over the web.
	PART-B

7	Design and Develop a Python Program to Append, Delete and Display Elements of a List Using Classes and Objects.
8	Design and Implement a Python Program to perform addition, subtraction, multiplication of two complex numbers using binary operators overloading.
9	Demonstrate the concept of Method Resolution order in multiple inheritance Python Program.
10	Create a Python Program to take care of Number Format Exception if user enters values other than integer for calculating average marks of 2 students. The name of the students and marks in 3 subjects are taken from the user while executing the program. • In the same Program create your own Exception classes to take care of Negative values and values out of range (i.e. other than in the range of 0-100) • Include finally to output the statement "Program terminated".
11.	Design & Implement the program in python to Manipulate images
12	Design & Implement the program in python to handle the events in an Application

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
  - Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

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 Taxonomy	Marks
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

MINI PROJECT

Course Code	**: 20ISE391A**	**Credits**	**: 2**
L:T:P:S	**: 0:0:2:0**	**CIE Marks**	**: 25**
Exam Hours	**: 3**	**SEE Marks**	**: 25**

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

CO1	Analyze the Real world problem through survey of existing problems
CO2	Design the modules for solving the problems identified
CO3	Implement the design modules with suitable programming language
CO4	Test the working modules at different levels

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

Use C,C++,Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application.

Note :

- Every student should do mini project in a team consists of maximum 2 members in the areas suggested by the department expert committee
- Minimum 2 reviews will be conducted by the department expert committee to know the progress of the mini project work
- In each review student should give presentation on the work carried out and show the relevant models/output
- A mini project report should be submitted to the department at the end of the mini project work
- Plagiarism check for the report : Similarity index of the report should not exceed more than 30%.

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

BASIC APPLIED MATHEMATICS-I

Course Code: 20DMAT31A **Credits : 00**
L:T:P:S : 0:0:0:0 **CIE Marks : 25**
Exam Hours : 02 **SEE Marks : 25**

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

Module No.	Contents of the Module	Hours	CO's
1.	**Differential Calculus:** Polar Curves-Problems on angle between the radius vector and tangent, Angle between two curves-Problems, Pedal equation for polar curves-Problems. Macluren's theorems for function of one variable (statement only)-Problems.	**5**	**CO1, CO2**
2.	**Partial differentiation:** Definition and Simple problems, Euler's theorem for Homogeneous function (NO Derivation and NO extended theorem)-Problems, Partial differentiation of composite functions (chain rule)-Problems, Jacobians of order two - definition and problems.	**5**	**CO1**
3.	**Integral Calculusand Differential Equations:** Problems on reduction formulae for functions $\sin^n x$, $\cos^n x$, $\tan^n x$,Problems on evaluation of these integrals with standard limits (0 to $\pi/2$). Solution of first order and first-degreedifferential equations-Variable separable, Linear and Exact differential equations.	**5**	**CO3**
4.	**Linear Algebra-1:**Problems on rank of a matrix by elementary transformations, consistency of a system of linear equations and solution(homogeneous and non-homogeneous)-Problems. Solution of system of linear equations by Gausselimination method-Problems.	**5**	**CO4**
5.	**Linear Algebra-2:** Linear transformation, Eigen values and Eigen vectors, diagonalization of a square matrix-Problems.	**5**	**CO4**

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. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd.,
9th Edition, 2014, ISBN: 978-81-318-0832-0.

Assessment Pattern:

1. CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (20 Marks)	Assignment (5 Marks)
Remember	5	-
Understand	5	5
Apply	5	-
Analyze	2.5	-
Evaluate	2.5	-
Create	-	-

2. SEE- Semester End Examination (25 Marks)

Bloom's Category	SEE Marks
Remember	5
Understand	10
Apply	5
Analyze	2.5
Evaluate	2.5
Create	-

FOURTH SEMESTER

(SYLLABUS)

DISCRETE MATHEMATICS AND GRAPH THEORY

Course Code : 20ISE41A **Credits: 03**
L: T: P: S : 2:1:0:0 **CIE Marks: 50**
Exam Hours : 03 **SEE Marks: 50**

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

CO1	Verify the correctness of an argument using propositional and predicate logic and truth tables.
CO2	Demonstrate the ability to solve problems using counting techniques and combinatory in the context of discrete probability.
CO3	Solve problems involving relations and functions.
CO4	Apply Pigeon hole principle to solve real life problems
CO5	Ability to represent and apply graph theory in solving computer science problems.
CO6	Illustrate the fundamental concepts of trees, connectivity and planarity graphs

Mapping of Course Outcomes to Program Outcomes:

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

Course Syllabus			
Module No.	**Contents of the Module**	**Hours**	**COs**
1.	**Mathematical Logic:** Basic Connectives and Truth Tables, Tautology and Contradiction, Logic Equivalence, The Laws of Logic, NAND and NOR connectives, Logical Implication, Rules of Inference, Quantifiers Definition and the use of Quantifiers in logical implication.	**9**	**CO1**
2.	Properties of the Integers: The Well Ordering Principle, Mathematical Induction, Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations, The Binomial Theorem.	**9**	**CO2**
3.	**Relations and Functions**: Cartesian Products and Relations, One-to-One and onto functions. The Pigeon hole Principle, Function Composition and Inverse Functions. Properties of Relations, Equivalence Relations and Partitions.	**9**	**CO3 ,CO 4**

4.	**Graph Theory:** Graphs-Definitions and examples, Sub graphs, Walks, Paths, Circuits, Connectedness, Components, graph isomorphism, Euler graphs, Hamiltonian paths and cycles. Trees, Properties of trees, Rooted and binary trees.	**9**	**CO5**
5.	**Trees,Connectivity and Planarity**:Spanning trees, Fundamental circuits, spanning trees in a weighted graph, cut sets, Properties of cut set, all cut sets, Fundamental circuits and cut sets, Connectivity and reparability, Network flows, 1-Isomorphism,2-Isomorphism, Planar graphs, Dual of planar graphs, Different representation of a planar graph.	**9**	**CO6**

Text Books:

1.Ralph P. Grimaldi, Discrete and Combinatorial Mathematics,5th Edition, Pearson Education, 2004.

2. Narsingh Deo, Graph Theory: With Application to Engineering and Computer Science, Prentice Hall
of India**,** 2003.

Reference Books:

1.Basavaraj S.Anami and Venakanna S.Madalli, Discrete Mathematics – A Concept based approach,
Universities Press, 2016.

2.Kenneth H. Rosen, Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007.

3.D.S. Malik and M.K. Sen, Discrete Mathematical Structures: Theory and Applications, Thomson,
2004.

4.Thomas Koshy, Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008.

Assessment Pattern:

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	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

LIFE SKILLS FOR ENGINEERS

Course Code	**20HSS322A/422A**	**Credits**	**: 03**
L: P: T:S	**: 3:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**:** 3	**SEE Marks**	**: 50**

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

CO1	Relate "SMART GOALS" to personal and professional life
CO2	Articulate and communicate ideas and thoughts with clarity and focus
CO3	Develop critical and creative thinking skills for problem solving and decision making for leadership.
CO4	Analyze the importance of the concepts of personality development and grooming in corporate life
CO5	Determine personal and professional responsibility by using ownership task bar

Mapping of Course Outcomes to Program Outcomes:

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

Module No.	Module Contents	Hours
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
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
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 in industry, being proactive and positive. Interpersonal skills - Knowing others, working well with others. Communication – Structured articulation	9
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
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

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. BHAGAVDGITA 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
Analyze	-	-	5	-

Evaluate	-	-	-	
Create	5	10	10	5

SEE- Semester End Examination (50 Marks)

NOTE: Being a Life skills course we felt it would be suitable to do the final assessment through a structured group discussion which will provide an opportunity to test students in all levels of Bloom's Taxonomy.

Bloom's Category	Group Discussion
Remember	**5**
Understand	**10**
Apply	**10**
Analyse	**10**
Evaluate	**5**
Create	**10**

ENVIRONMENTAL SCIENCE AND AWARENESS

Course Code : 20HSS423 **Credits :** 0

L : T : P:S : 0:0:0:0 **CIE Marks :** 25

Exam Hours : 02 Hrs **SEE Marks :** 25

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

CO1	Understand the concepts of environment, ecosystem, biodiversity and its interdependence on human life.
CO2	Develop an insight on types of natural resources and the concept of sustainable development.
CO3	Understand the different control measures of pollution and importance of waste management.
CO4	Think and apply technology as a solution for environment related concerns, keeping in view the different environmental acts and amendments.

Mapping of Course Outcomes to Program Outcomes:

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

Module No.	Content of Module	Hrs	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 prevention of pollution - Waste management – urban and industrial wastes.	04	CO3
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. 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- WorkiFng with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10 thEdition. 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 (25 Marks)

Bloom's	Tests	Assignments	Quiz

Marks (out of 50)	15	05	05
Remember	5	2	2
Understand	5	2	2
Apply	5	1	1
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

SEE – Semester End Examination (25 Marks)

Bloom's Category	Tests
Remember	10
Understand	10
Apply	5
Analyze	0
Evaluate	0
Create	0

DATABASE MANAGEMENT SYSTEMS

Course Code : 20ISE43A **Credits: 03**
L: T: P:S : 3:0:0:0 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks: 50**

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

CO1	Understand the database concepts, different database models, and database management systems and design database schema.
CO2	Develop the ER structures for real world examples using the concept of Entity Relationship models with constraints and cardinalities.
CO3	Understand the concepts of Normalization and design database which possess no anomalies.
CO4	Apply the concepts of relational database theory to manage relational database management system.
CO5	Apply the concepts of triggers, embedded and dynamic SQL.
CO6	Implement database applications in SQL.

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	1	-	-	1	-	1
CO2	3	2	3	2	-	1	-	1	-	1	-	1
CO3	3	2	3	2	-	-	-	-	-	1	-	-
CO4	3	2	3	2	-	-	1	-	-	1	-	1
CO5	3	2	3	2	2	-	1	-	1	1	-	1
CO6	3	2	3	2	2	-	1	-	1	1	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2

CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	CO's
1	**Introduction:** Introduction, An example, Characteristics of Database Approach. **Database Applications**: Need for data management, Advantages of using DBMS approach. **Data models & Database Architecture**: Data models, schemas and instances, Three-schema architecture and data independence, Centralized and client-server architectures.	9	CO1
2	**ER Diagrams**: Entity Types, Entity Sets, Attributes and Keys, Relationship types, Roles and Structural Constraints, Weak Entity Types, ER Diagrams.	9	CO2
3	**Relational Model**: ER to Relational Mapping, Constraints, Keys Dependencies. **Functional Dependencies**: Normalization First, Second, Third & Fourth Normal Forms, BCNF.	9	CO3
4	**Relational Algebra:** Update Operations, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.	9	CO4
5	**Advanced SQL & Transaction Management** : Embedded & Dynamic SQL , Stored procedures, More complex SQL Queries, Transaction concepts, Transaction state, Implementation of Atomicity & Durability, Concurrent executions, Seializability	9	CO5, CO6

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2013.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database S y s t e m s" , Sixth Edition, Pearson / Addison - Wesley, 7th Edition 2017

REFERENCES:

1. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2013.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 Marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	5

Understand	5	5	5
Apply	10	5	5
Analyze	-	5	-
Evaluate	5	-	-
Create	-	-	-

SEE – Semester End Examination (50 marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

OBJECT ORIENTED PROGRAMMING WITH JAVA

Course Code : 20ISE44A **Credits : 03**
L:P:T:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Model the real world applications using Object Oriented Programming concepts.
CO2	Identify the importance of inheritance and interface concepts
CO3	Analyze the importance of exception handling and learn the importance of string handling
CO4	Apply the concept of Multithreading in concurrent programming
CO5	Develop applications using collections framework for managing user defined types
CO6	Solve the real world problems using Object Oriented concepts and collection framework in Java.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	2	-	-	2	-	1
CO2	3	3	3	2	2	-	2	-	-	2	-	1
CO3	3	3	3	2	2	-	2	-	-	2	-	1
CO4	3	3	3	2	2	-	2	-	-	2	-	1
CO5	3	3	3	2	2	-	2	-	-	2	-	1
CO6	3	3	3	2	2	-	2	-	-	2	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2

CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	CO's
1	**Introduction to Java:** The Java Language, Java Development Kit (JDK); Java Buzzwords, Byte Code, JVM ,JRE and Java environment, Data types, variables and Arrays, Operators, Control statement, command line Arguments, Language fundamentals **Object Oriented Programming with JAVA**: Object Oriented concepts, Classes, Objects and Methods, Method Overloading, Constructor, static members, Implicit this	9	CO1
2	**Inheritance and Interfacing:** Inheritance, Method Overriding, Access specifiers, Abstract Classes, Final members, The Object Class, Interfaces, Package Fundamentals**.**	9	CO2
3	**String Manipulation:** Constructors, Length Operations, Character Extraction, Comparison, Searching, Modifying, StringBuffer, **Exception handling:** Fundamentals, Types, Using try, catch, throw, throws, finally, User Defined Exceptions.	9	CO3
4	**Multi Threading:** Thread Concept, Java Thread Model, The main method, Creating Threads, Thread Priorities, Synchronization	9	CO4
5	**Collection Framework & AWT :** Collections Overview, Collection Interfaces, Set, List, Map, Queue, Collection Classes, Type Wrappers, Accessing a collection using an Iterator,Sorting collections using utility methods equals() and hashCode contract in Java collections, overriding equals and hashCode methods in Java. Event handling, Delegation model, AWT event classes & interfaces	9	CO5 CO6

TEXT BOOKS

1. Herbert Schildt, "Java:The Complete Reference", 11th Edition, Oracle Press, Tata McGraw Hill,2011.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCES:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.

5. Java Programming and Object oriented Application Development, R. A. Johnson, Cengage Learning.
6. Y. Daniel Liang, " Introduction to JAVA Programming",7th Edition, Pearson Education,2007.

CIE- Continuous Internal Evaluation (50Marks)

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

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	-
Create	5

OPERATING SYSTEMS

Course Code : 20ISE45A **Credits: 03**
L:P:T:S : 3:0:0 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Understand the structure of operating system.
CO2	Analyze Scheduling algorithms using Preemptive and non-Preemptive strategies
CO3	Apply the concept of Deadlocks
CO4	Analyze various memory management schemes
CO5	Apply disk scheduling methods and file operations in operating system.
CO6	Ability to handle files in UNIX

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	1	1	-	-	1	-	1
CO2	3	2	2	2	1	1	1	-	-	1	-	1
CO3	3	2	2	2	1	1	1	-	-	1	-	1
CO4	3	2	2	2	1	1	1	-	-	1	-	1
CO5	3	2	2	2	1	1	1	-	-	1	-	1
CO6	3	2	2	2	1	1	1	-	-	1	-	1

Module No	Module Contents	Hours	COs
1	**OPERATING SYSTEMS OVERVIEW:** What is an operating system; history operating system concepts, system calls ; operating system structure; operating system operations; process management; memory management; storage management; protection and security; system boot, Case studies-UNIX, SOLARIS threads management, Threats to operating system, Protection and Security Methods	9	CO1
2	**PROCESS MANAGEMENT:** Process Concept, Process Scheduling, Scheduling algorithms, Preemptive strategies Non preemptive strategies, Operations on Processes, Inter process Communication; Threads Overview, Multithreading Models, process synchronization, critical section problem, semaphores, UNIX System calls.	9	CO2
3	**DEADLOCKS:** Deadlocks: system model; deadlock characterization; methods for handling deadlocks; deadlock prevention; deadlock avoidance; deadlock detection and recovery, file locking system in UNIX.	9	CO3
4	**STORAGE MANAGEMENT:** Memory management strategies ;swapping; contiguous memory allocation; paging; Page replacement, Allocation of frames; segmentation, Memory management in UNIX.	9	CO4
5	**I/O SYSTEMS:** File system storage-File concept, file system structure, Access methods, Directory structure, File-system mounting ;disk structure ;disk scheduling, sharing and protection, UNIX File I/O operations.	9	CO5, CO6

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", 10th edition, 2018, John Wiley & Sons, Inc
2. UNIX-Concepts &Applications, Sumitabhadas, McGraw Hill, TATA McGraw Hill Edition ,4th edition, 26th reprint 2015.

REFERENCES:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 4th Edition, 2014, Addison Wesley.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 Marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	5	5
Apply	10	10	5
Analyze	5	-	-
Evaluate	-	-	-
Create	-	-	-

SEE – Semester End Examination (50 marks)

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

DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Code : 20ISL46A **Credits: 2**
L: T: P:S : 0:0:2:0 **CIE Marks: 25**
Exam Hours : 3 **SEE Marks: 25**

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

CO1	Create a database as per the given requirements
CO2	Use SQL to retrieve and process the data in the given database.
CO3	Apply the concepts of views and triggers in DBMS using SQL.
CO4	Apply the concepts of complex queries to retrieve the data from the database

Mapping of Course Outcomes with Program Outcomes

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

Common set of operations to be carried out for all the experiments:

1. Creation of tables, insertion of values with Data Definition Commands (use constraints while creating tables) and exercises on Data Manipulation Commands.
2. Developing Queries using clauses SELECT, FROM, WHERE, GROUP BY, HAVING.
3. Developing Queries using clauses Aggregate functions COUNT, SUM, AVG, MAX and MIN.
4. Developing Queries (along with NESTED Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT Constraints. Creation and Manipulation of Views.
5. Creation of simple PL/SQL programs and usage of cursor and triggers.

List of Experiments are as follows:

PART- A

1	Consider the following relation in a **Company Database** **Department(<u>Deptno,</u>Deptname, Location, Established_date, Total_salary_paid)**
2	Consider the following relation in a **Doctor Database** **Doctor (<u>DID</u>, Docname, Hosp_No, Salary, Years_of_Experience ,Specialty)**
3	Consider the following relation in a **College Database**. **Faculty(<u>Fid,</u>Fname, Designation, Salary, Years_of_experience, Sub_name, DeptNo)**
4	Consider the following relation in **Train Database**

	Train(<u>TrainNo</u>, TrainName, Source , Destination, Regularity, Departure, Fare_per_50km)
5	Consider the following relation in **Patient Database** **Patient(<u>Pid</u>, Pname, age, gender, disease, Doc_No, Hosp_no, Fees_amount)**
6	Consider the following relation in **Employee Database** **Employee(<u>Emp_id,</u>Ename, Age, Designation, Dept, Address, Salary)**
7	Consider the following relation in **Student Database** **Student(USN, Name, Age, Department, Address, Fee)**

PART-B

8	**Class Marks Management Systems** Student (<u>USN</u>, Name, Course_code) Course (<u>code</u>, course name, sem) Student_marks (<u>USN, Code</u>, Marks)
9	**Ticket booking for stage shows** Customer (cname, <u>ticket_id</u>, mobile_no, p_id, tprice) Performances (<u>p_id</u>, pname, artist_id, date, renumeration) Artist (artist_name, <u>artist_id</u>, mobile_num, address)
10	**Hostel Accounting** Student (Sname, <u>USN</u>, Year, Dept, Mobile_No, Parent No) Room (<u>room_no</u>, block, fee, room_capacity) Student_room (sname, <u>usn, room_no</u>, mess_fee)
11	**Placement data management** Student (<u>USN</u>, name, cgpa),arrear_details (<u>USN, arrear_code</u>, sem, status) Placement_details (<u>USN, Company_name</u>, designation, Annual Package)
12	**Student club database,** Club details (<u>cname</u>, e_year, president) Student members (name, <u>usn, club_name</u>) Club_coordinators (<u>cname, cmember</u>, Designation) .
13	**Order Database** Consider the following schema for Order Database: SALESMAN (<u>Salesman_id</u>, Name, City, Commission) CUSTOMER (<u>Customer_id</u>, Cust_Name, City, Grade, Salesman_id)

	ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
14	**Library Database** BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name) PUBLISHER (Name, Address, Phone) BOOK_COPIES (Book_id, Branch_id, No-of_Copies) BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date) Card (card_no) LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Taxonomy	**Lab (25 Marks)**
Remember	-
Understand	-
Apply	10
Analyze	-
Evaluate	-
Create	15

SEE – Semester End Examination (25 marks)

Bloom's Taxonomy	**Lab**
Remember	-
Understand	-
Apply	10
Analyze	-
Evaluate	-
Create	15

OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY

Course Code : 20ISL47A | **Credits : 1.5**
L:T:P:S : 0:0:1.5:0 | **CIE Marks : 25**
Exam Hours : 3 | **SEE Marks : 25**

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

CO1	Model the real world applications using Object Oriented Programming concepts.
CO2	Identify the importance of inheritance and interface concepts
CO3	Analyze the importance of exception handling and learn the importance of string handling
CO4	Apply the concept of Multithreading in concurrent programming
CO5	Develop applications using collections framework for managing user defined types
CO6	Solve the real world problems using Object Oriented concepts and collection framework in Java.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

List of programs:

Experiment No.	Experiment
	PART-A
1	Design and Implement a Java program to print the sum of the elements of the array withthe given below condition. If the array has 6 and 7 in succeedingorders, ignore 6 and 7 and the numbers between them for the calculation of sum. Eg1) Array Elements - 10,3,6,1,2,7,9 O/P: 22 [i.e. 10+3+9]

	Eg2) Array Elements - 7,1,2,3,6 O/P:19 Eg3) Array Elements - 1,6,4,7,9 O/P:10
2	Design and Implement a Java program that displays a menu with options 1. Add 2. Sub, Based on the options chosen, read 2 numbers and perform the relevant operation. After performing the operation, the program should ask the user if he wants to continue. If the user presses y or Y, then the program should continue displaying the menu else the program should terminate. [Note: Use Scanner class, you can take help from the trainer regarding the same]
3	Design and implement an algorithm to accept an array of 5 positive integers. The algorithm must then find the smallest positive integer in the array which cannot be formed from the sum of 2 numbers in the array.
4	Develop a Java program Write a program to check if the program has received command line arguments or not. If the program has not received the values then print "No Values", else print all the values in a single line separated by ,(comma). Eg1) java Example O/P: No values Eg2) java Example Mumbai Bangalore O/P: Mumbai, Bangalore [Note: You can use length property of an array to check its length
5	Design and Develop a simple Java program to find the longest substring without repeating characters in a given String. Accept the String through Command Line argument.
6	Given a string and a non-empty word string, return a string made of each char just before and just after every appearance of the word in the string. Ignore cases where there is no char before or after the word, and a char may be included twice if it is between two words. • If inputs are "abcXY123XYijk" and "XY", output should be "c13i". • If inputs are "XY123XY" and "XY", output should be "13". If inputs are "XY1XY" and "XY", output should be "11". Develop a Java program for the same.
PART-B	
7.	Design a class that can be used by a health care professional to keep track of a patient's vital statistics. Here's what the class should do: • Construct a class called Patient • Store a String name for the patient • Store weight and height for patient as doubles • Construct a new patient using these values • Write a method called BMI which returns the patient's BMI as a

	double. BMI can be calculated as BMI = (Weight in Pounds / (Height in inches x Height in inches)) x 703 Next, construct a class called "Patients" and create a main method. Create a Patient object and assign some height and weight to that object. Display the BMI of that patient.
8.	Create a class in Java called "Calculator" which contains the following: 1. A static method called powerInt(int num1,int num2) that accepts two integers and returns num1 to the power of num2 (num1 power num2). 2. A static method called powerDouble(double num1,int num2) that accepts one double and one integer and returns num1 to the power of num2 (num1 power num2). 3. Call your method from another class without instantiating the class (i.e. call it like Calculator.powerInt(12,10) since your methods are defined to be static). Hint: Use Math.pow(double,double) to calculate the power.
9.	Develop a Program to take care of Number Format Exception if user enters values other than integer for calculating average marks of 2 students. The name of the students and marks in 3 subjects are taken from the user while executing the program. • In the same Program write your own Exception classes to take care of Negative values and values out of range (i.e. other than in the range of 0-100) • Include finally to output the statement "Program terminated".
10.	Create class of SalesPersons as a thread that will display fives sales persons name. Create a class as Days as other Thread that has array of seven days. Call the instance of SalesPersons in Days and start both the Threads. Suspend SalesPersons on Sunday and resume on Wednesday. Use Thread handling Apis to perform the same.
11.	Create a Student Attendance Management System using a**HashMap** Collection type. Perform the following operations: Add the key-value pair. Retrieve the value associated with a given key Check whether a particular key/value exist. replace a value associated with a given key in the HashMap
12.	Design and Develop a editor like MS-Word using Java AWT Programming.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%

Viva – Voce – 20%

- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

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 Taxonomy	Marks
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

OPERATING SYSTEMS - LAB

Course Code : 20ISL48A **Credits : 1.5**
L:T:P:S : 0:0:1.5:0 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Compare, implement and know when to apply various process scheduling algorithms
CO2	Ability to Learn and implement various operations on deadlock
CO3	Evaluate the efficiency aspect of using system resources and memory management schemes
CO4	Develop applications based on file handling in UNIX

Mapping of Course Outcomes to Program Outcomes

CO/PO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	1	1	1	-	-	-	1
CO2	3	2	2	2	3	1	1	1	-	-	-	1
CO3	3	2	2	2	3	1	1	1	-	-	-	1
CO4	3	2	2	2	3	1	1	1	-	-	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

Experiment No.	Experiment
	PART-A
1	Design, Develop and Implement Basics of UNIX commands.
2	Design, Develop and Implement a Program to implement a shell.
3	Design, Develop and Implement a program to change current working directory and display the inode details for each file in the new directory
4	Design, Develop and Implement a Parent process – Child process Relationship.
5	Design, Develop and Implement a Program that creates a child process. Parent process writes data to pipe and child process reads the data from pipe and prints it on the screen.
6	Design, Develop and Implement a Program for Process system calls.
	PART-B
7	Design, Develop and Implementation of CPU scheduling by using a) Round Robin b) FCFS
8	Design, Develop and Implement Implementation of CPU scheduling by using a) Shortest job first b) Priority
9	Design, Develop and Implement File management system calls: a). create a file b). Copy one file to another c). Linking a file d). Delete a file.
10	Write a program that demonstrates how two processes can share a variable using semaphore
11	Design, Develop and Implement an Algorithm for Dead Lock Detection
12	Design, Develop and Implement a Program by using page replacement algorithms for virtual memory management

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

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

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	5
Apply	10
Analyze	5
Evaluate	-
Create	5

MINI PROJECT

Course Code : 20ISE49A **Credits: 2**
L:T:P:S : 0:0:2:0 **CIE :25**
SEE Marks : 25 **Exam Hours : 3**

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

CO1	Analyze the Real world problem through survey of existing problems
CO2	Design the modules for solving the problems identified
CO3	Implement the design modules with suitable programming language
CO4	Test the working modules at different levels

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

Use C,C++,Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application.

Note :

- Every student should do mini project in a team of maximum 2 members in the areas suggested by the department expert committee
- Minimum 2 reviews will be conducted by the department expert committee to know the progress of the mini project work
- In each review student should give presentation on the work carried out and show the relevant models
- A mini project report should be submitted to the department at the end of the mini project work
- Plagiarism check for the report : Similarity index of the report should not exceed more than 30%

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	-
Apply	-

Analyze	-
Evaluate	25
Create	-

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

BASIC APPLIED MATHEMATICS-II

Course Code : 20DMAT41A **Credits : 00**
L:T:P:S 0:0:0:0 **CIE Marks : 25**
Exam Hours : 02 **SEE Marks : 25**

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

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

Mapping of Course Outcomes to Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	3	3	-	-	-	-	-	-	3	3
CO2	3	3	3	3	-	1	-	-	-	-	3	3
CO3	3	3	3	3	3	-	3	-	-	3	3	3
CO4	3	3	3	3	3	-	3	-	-	3	3	3

Course Syllabus

Module No.	Contents of the Module	Hours	CO's
1.	**Vectors:** 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.	**Vector Differentiation:** Velocity and Accelerations, 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.	**Linear differential equations with constant coefficients:** Solution of initial and boundary value problems, Inverse differential operator techniques for the functions-e^{ax},e^{ax} f(x), $\mathrm{Sin}\,(ax+b)$ and $\mathrm{Cos}\,(ax+b)$.	5	CO3
4.	**Laplace Transform:** Definition and Laplace transforms of elementary functions-Problems. Properties of Laplace transforms (without proof), Periodicfunctions (without proof), Heaviside function (without proof) - Problems.	5	CO4
5.	**Inverse Laplace Transform:** Inverse Laplace Transform by partial fractions, completing the square method-Problems. Solution of linear differential equations using Laplace Transforms-Problems.	5	CO4

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. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.

Assessment Pattern:

1. CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (20 Marks)	Assignment (5 Marks)
Remember	5	-
Understand	5	5
Apply	5	-
Analyze	2.5	-

Evaluate	2.5	-
Create	-	-

2. SEE- Semester End Examination (25 Marks)

Bloom's Category	SEE Marks
Remember	5
Understand	10
Apply	5
Analyze	2.5
Evaluate	2.5
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.

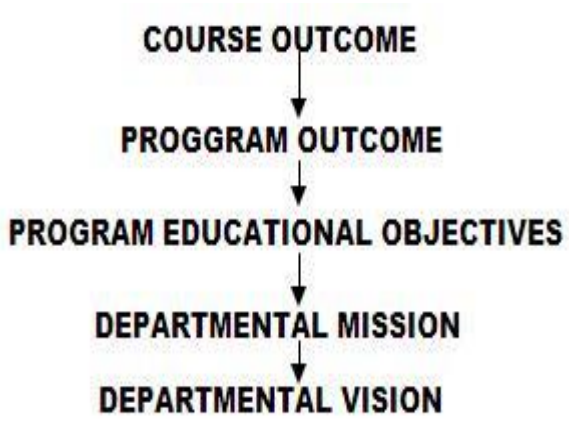
There are three educational Outcomes as defined by the National Board of Accreditation:

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 also 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 Outcomes



APPENDIX B

The Graduate Attributes of NBA

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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.

Conduct investigations of complex problems: The problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

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.

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.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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.

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.