NEW HORIZON
COLLEGE OF ENGINEERING

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Academic Year 2021-2022

Scheme and Syllabus

Third and Fourth Semesters

B.E. Scheme and Syllabus

2020-2024 Batch (175 Credits)

SCHEME OF THIRD SEMESTER
Academic Batch: 2020-24
Academic Year: 2021-22

Sl. No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	20CSE31A	Applied Mathematics-III	BS	2	1	0	0	3	4	50	50	100
2	**20HSS322A**	Life skills for Engineers	HSS	3	0	0	0	3	3	50	50	100
3	20HSS323A	Environmental Science and Awareness	HSS	0	0	0	0	0	2	25	25	50
4	19CSE33	Digital Electronics	CSE	3	0	0	0	3	3	50	50	100
5	19CSE34	Data Structures using C	CSE	3	0	0	0	3	3	50	50	100
6	19CSE35	UNIX System Programming	CSE	3	0	0	0	3	3	50	50	100
7	19CSL36	Digital Electronics Lab	CSE	0	0	2	0	2	4	25	25	50
8	19CSL37	Data Structures using C Lab	CSE	0	0	2	0	2	4	25	25	50
9	19CSL38	UNIX System Programming Lab	CSE	0	0	2	0	2	4	25	25	50
10	19CSE39	Mini Project in C	CSE	0	0	2	0	2	4	25	25	50
Lateral Entry												
11	19HSS171	Essential English	HSS	0	0	0	0	0	2	25	25	50
12	20DMAT31A	Basic Applied Mathematics-I	BS	0	0	0	0	0	2	25	25	50
Total								**23**	**34**	**350**	**350**	**700**

SCHEME OF FOURTH SEMESTER
Academic Batch: 2020-24
Academic Year: 2021-22

S. No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1	20CSE41A	Discrete Mathematics and Graph Theory	BS	2	1	0	0	3	4	50	50	100
2	20HSS421	Economics For Engineers	HSS	2	0	0	0	2	2	25	25	50
3	20HSS424/ 20HSS425	Aadalitha Kannada/ Vyavaharika Kannada	HSS	1	0	0	0	1	1	25	25	50
4	19CSE43	Object Oriented Programming with Java	CSE	3	1	0	0	4	5	50	50	100
5	19CSE44	ARM Processor	CSE	3	0	0	0	3	3	50	50	100
6	19CSE45	Computer Organization	CSE	4	0	0	0	4	4	50	50	100
7	19CSL46	Object Oriented Programming with Java Lab	CSE	0	0	2	0	2	4	25	25	50
8	19CSL47	ARM Processor Lab	CSE	0	0	2	0	2	4	25	25	50
9	19CSE48	Mini Project in Java	CSE	0	0	2	0	2	4	25	25	50
Lateral Entry												
10	19HSS272	Constitution of India and Professional Ethics	HSS	0	0	0	0	0	2	25	25	50
11	20DMAT41A	Basic Applied Mathematics-II	BS	0	0	0	0	0	2	25	25	50
Total								**23**	**31**	**325**	**325**	**650**

THIRD SEMESTER

APPLIED MATHEMATICS – III

Course Code: 20CSE31A | **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 of first degree: Modified Euler's method and Runge-Kutta method of fourth-order-Problems. Milne's predictor and corrector methods-Problems. Numerical integration: Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddle's rule (without proofs)-Problems. **Applications:** Application of numerical integration to velocity of a particle and volume of solids.	**9**	**CO2**
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 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	-

LIFE SKILLS FOR ENGINEERS

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

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

CO1	Apply "SMART GOALS" framework to set personal and professional goals
CO2	Develop critical and creative thinking skills and practice leadership.
CO3	Demonstrate and understand personal and professional responsibility
CO4	Apply the concepts of personality development and grooming in corporate life
CO5	Understand self and work with groups
CO6	Articulate and convey ideas and thoughts with clarity and focus

Mapping of Course Outcomes to Program Outcomes:

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

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

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

REFERENCE BOOKS:

1. The 7 – Habits of Highly Effective People, Stephen R Covey, Neha Publishers.
2. Seven Habits of Highly Effective Teens, Convey Sean, New York, Fireside Publishers, 1998.
3. Emotional Intelligence, Daniel Coleman, Bantam Book, 2006.
4. How to win friends and influence people Dale Carnegie
5. 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: 20HSS323A **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	Explain the concepts of environment, ecosystem and biodiversity.
CO2	Analyze the use of natural resources for sustainability.
CO3	Understand the control measures of Environmental pollution, the role of Government and NGO in solving Socio-Environmental issues.
CO4	Apply the Environmental ethics, acts and amendments in protecting Environment and human health.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	-	-	-	-	-	-
CO2	-	-	-	-	-	3	3	-	-	-	-	3	3	-
CO3	-	-	-	-	-	3	3	3	-	3	-	3	3	-
CO4	-	-	-	-	-	3	3	3	-	3	-	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- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10th Edition. ISBN: 10: 0534424082.
4. Elements of Environmental Science and Engineering by P. Meenakshi, Prentice Hall of India Pvt. Ltd, 2005 Edition. ISBN: 8120327748, 9788120327740.

CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quiz**
Marks (Out of 25)	**15**	**5**	**5**
Remember	2	0	0
Understand	5	0	2
Apply	4	2	3
Analyze	4	3	0
Evaluate	0	0	0
Create	0	0	0

SEE – Semester End Examination (25 Marks)

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

Percentage Evaluation of Various Blooms' levels (50 Marks)

Bloom's Category	**CIE**	**SEE**	**Total**	**%**
Remember	2	5	7	**14**
Understand	7	10	17	**34**
Apply	9	5	14	**28**
Analyze	7	5	12	**24**
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**25**	**25**	**50**	**100**

DIGITAL ELECTRONICS

Course Code : 19CSE33 | **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

CO	COURSE OUTCOME
19CSE33.1	Analyze the operation and understand the working of various electronic components and electronic circuits.
19CSE33.2	Implement Boolean function using karnaugh maps and Quine Mc-Clusky method.
19CSE33.3	Design and Analyze modular combinatorial logic circuits.
19CSE33.4	Develop Bi-stable elements like flip-flop and use its functionality to understand the sequential circuits and its applications.
19CSE33.5	Design and apply the concepts of state and state transition for the analysis of sequential circuits.
19CSE33.6	Construct Verilog code to implement the combinational and sequential circuits.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19CSE33.1	2	2		-	3	-	-	-	-	-	-	-	-	-
19CSE33.2	2	-	3	3	-	-	-	-	-	-	-	-	3	-
19CSE33.3	2	2	3	3	-	-	-	-	-	-	-	-	3	-
19CSE33.4	2	2	3	3	-	-	-	-	-	-	-	-	3	-
19CSE33.5	2	2	3	3	-	-	-	-	-	-	-	-	3	-
19CSE33.6	2	-	3	3	3	-	-	-	-	-	-	3	3	-

Module No	Module Contents	Hours	COs
1	**Analog devices for Digital Electronics:** BJT vs FETs, EMOS FET, CMOS, Diode as Clipper and Clamper, Bistable Multivibrators, IC Multivibrators: A stable and Monostable, Types of Oscillator, Crystal Oscillator	9	CO1
2	**Simplification of Boolean Functions:** Review of Boolean algebra, logic gates, canonical forms, Three Variable K – Maps, Four Variable K – Maps, Quine- McCluskey minimization technique, Reduced prime implicants Tables, Map Entered Variables, Introduction to HDL.	9	CO2, CO5, CO6
3	**Combinational Logic Circuits:** Introduction, Adders, Subtractors, Carry Look Ahead Adder, Parallel Adder, Magnitude Comparator, Priority Encoders, Decoders, Multiplexers, Read Only memories (ROM), Programmable Logic Arrays (PLAs), Verilog implementation of combinational circuits.	9	CO3, CO5, CO6
4	**Sequential Logic Circuits :**The Basic Flip-flop circuit, Clocked Flip-flops, Triggering of Flip-flops, types of Flip-flop, Master Slave Flip-Flops, Conversion of Flip-flops, types of Shift Registers, applications of shift register, Verilog implementation of Flip-flop and Shift registers.	9	CO4, CO5, CO6
5	**Analysis of Sequential Circuit:** Binary ripple counters, synchronous binary counters, Design of a synchronous mod-n counter using clocked	9	CO4, CO5,

	T, JK , D and SR flip-flops, Verilog implementation of counters, Mealy and Moore Models, State Reduction and Assignment, Design Procedur Design with State Equations, Verilog implementation of Moore and Meal		**CO6**

Text Book(s):

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

Reference Book(s):

1. Digital Design: with an Introduction to Verilog HDL, M Morris Mano and Michael DCiletti, 5th Edition, 2013, Pearson Education
2. Digital Logic Applications and principles- John Yarbrough, 2006, Pearson Education
3. Digital Principles and Design- Donald Givone , 2017, Tata McGraw Hill

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes	Co-Curricular
Marks (Out of 50)	**25**	**15**	**10**	-
L1: Remember	05	-	-	-
L2: Understand	05	-	-	-
L3: Apply	10	05	05	-
L4: Analyze	05	05	05	-
L5: Evaluate	-	05	-	-
L6: Create	-	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	05
L2: Understand	10
L3: Apply	20
L4: Analyze	10
L5: Evaluate	05
L6: Create	-

DATA STRUCTURES USING C

Course Code : 19CSE34 | **Credits : 3**
L: T: P:S: 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 3 | **SEE Marks : 50**

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

CO #	COURSE OUTCOME
19CSE34.1	Analyze the concept of array data structures, its applications and dynamic memory management.
19CSE34.2	Compare and analyze different sorting techniques and apply them in organizing the data.
19CSE34.3	Analyze the concepts of stacks and queues in problem solving.
19CSE34.4	Analyze the primitive operations of various types of linked lists and its applications.
19CSE34.5	Solve problems involving Trees and Heaps.
19CSE34.6	Design application using Graph data structure.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19CSE34.1	3	3	-	-	-	-	-	-	-	-	-	3	3	3
19CSE34.2	3	3	-	-	3	-	-	-	3	-	-	3	3	3
19CSE34.3	3	3	-	-	3	-	-	-	3	-	-	3	3	3
19CSE34.4	3	-	3	3	3	-	-	-	3	-	-	3	3	3
19CSE34.5	3	3	-	-	3	-	-	-	-	-	-	3	3	3
19CSE34.6	3	3	3	3	-	-	-	-	-	-	-	-	3	3

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

Module No	Module Contents	Hours	COs
1	**Introduction to Data Structures:** Arrays and Pointers revisited, Sparse matrix, transpose of a sparse matrix, dynamic memory management. Introduction to Data Structures, Classification of Data Structures, Abstract Data Types, Insertion sort, Quick sort, Shell sort, Radix sort.	**9**	**CO1, CO2, CO6**
2	**Stacks & Queues: Stacks:** Definition, Stack representation, Primitive operations on stack, array representation of stacks. **Applications of stacks:** Recursion, Fibonacci series, Tower of Hanoiproblem, Conversion of expressions, Evaluation of postfix expression, Iteration v/s recursion **Queues:** Definition, Queue representation, Primitive operations on queue, array representation of queues, Circular queue, Priority queue ,Double ended queue, Applications of queues.	**9**	**CO3,CO6**

3	**Linked Lists:** Dynamic memory allocation revisited – malloc, calloc, realloc, free, Introduction to linked list, Representation of linked list in memory, primitive operations on linked list, searching a linked list, circular linked list, doubly linked list, header linked list. **Applications of linked list:** Josephus problem, addition of two long integers, addition of two polynomials, Linked representation of stack, Linked representation of queue.	**9**	**CO4,CO6**
4	**Trees-I:** Introduction, Binary tree – strictly binary tree, complete binary tree, representing binary tree in memory, traversing a binary tree, binary Search tree, insertion and deletion in binary search tree, threaded binary tree. Expression trees, construction of an expression tree from prefix and postfix, Heap tree, creation of heap tree, insertion in heap, Deletion from heap.	**9**	**CO5,CO6**
5	**Trees-II & Graphs:** AVL Trees, Rotations in AVL tree, Insertion and deletion in an AVL tree, Huffman's algorithm. **Introduction to Graph**, Graph theory terminologies, sequential representation of a graph, adjacency matrix and path matrix, Warshall's algorithm, Linked representation of a graph, Operations on a graph, Traversing a graph, Topological sorting	**9**	**CO5,CO6**

Text Books:

1. " Data Structures with C ", SEYMOUR LIPSCHUTZ, Special Indian Edition, Thirteenth reprint 2015, McGraw Hill Education
2. " Data Structures using C ", Aaron M. Tanenbaum, YedidyahLangsam& Moshe J Augenstein, Thirteenth Impression 2014, Pearson Education

Reference Books:

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

Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	**Tests**	**Assignments**	**Quizzes**
Marks (Out of 50)	25	15	10
Remember	5	-	-
Understand	5	-	5
Apply	10	7.5	5
Analyze	5	-	-
Evaluate	-	-	-
Create	-	7.5	-

SEE – Semester End Examination: Theory (50 Marks)

Bloom's Taxonomy	**Tests**
Marks (Out of 50)	
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

UNIX SYSTEM PROGRAMMING

Course Code : 19CSE35 **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

CO #	COURSE OUTCOMES
19CSE35A.1	Analyze the fundamental concepts of UNIX Operating system and POSIX standards
19CSE35A.2	Analyze the basic set of commands and utilities in UNIX systems.
19CSE35A.3	Apply the important concepts of UNIX APIs in the UNIX environment for the development of solutions
19CSE35A.4	Analyze the mechanism of process creation, process APIs and filter commands.
19CSE35A.5	Develop, Debug and execute shell scripts effectively for various real life applications.
19CSE35A.6	Formulate awk commands for the benefit of society.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19CSE35A.1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
19CSE35A.2	3	3	-	-	-	-	-	-	-	3	-	-	3	-
19CSE35A.3	3	3	-	3	-	-	-	-	-	3	-	-	3	-
19CSE35A.4	3	3	2	3	-	-	-	-	-	-	-	-	3	-
19CSE35A.5	3	3	2	-	-	-	-	-	-	3	-	-	3	-
19CSE35A.6	3	3	-	3	-	-	-	-	-	3	-	-	3	-

Module No	Module Contents	Hours	COs
1	**Getting Started & Understanding UNIX Commands:** Operating System, UNIX Operating System, UNIX architecture, Features of UNIX, The POSIX Standards UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics	**7**	**CO1**
2	**General Purpose Utilities:** passwd, who, tty, lock, sty, script, clear an tput, uname, date, cal, calendar, bc **File System and Attributes :** File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, File Attributes- ls, ls –l, file permissions, chmod, directory permissions, umask, file ownership, chown and chgrp, file modification and access times, touch, find, Inodes in UNIX , Application Program Interface to Files, UNIX kernel support for files, Directory files, Hard and Symbolic Links.	**9**	**CO2**
3	**UNIX APIs:** General File APIs , File and Record locking, Directory File APIs, Device File APIs, FIFO File APIs	**10**	**CO3**

4	**UNIX Processes**: UNIX kernel support for processes, Process APIs- fork, vfork, _exit, wait, waitpid, exec, pipe- Process status, running jobs in background, nice, signals, kill, at and batch, cron **Simple filters and Regular Expressions:** more, wc, od, pr, cmp, diff, comm, head, tail, cut, paste, sort, tr, uniq, nlgrep – searching for a pattern, grep options, regular expressions, egrep and fgrep	**9**	**CO4**
5	**Shell Programming and AWK:** Shell variables, shell scripts, read, positional parameters, exit status, logical operators, exit, if conditions, test and [], case, expr, sleep and wait, while and for.AWK preliminaries, splitting line into fields, printf – formatting output, comparison operators, number processing, variables, reading program from a file, BEGIN and END section, positional parameters, getline, built in variables, arrays, functions, control flow, looping	**9**	**CO5, CO6**

Text Book(s):

3. Your UNIX – The ultimate Guide , SUMITABHA DAS, TATA McGraw Hill Edition, 23rd reprint 2012, McGraw Hill
4. UNIX System Programming Using C++, Terrence Chan, Prentice-Hall of India Private Limited

Reference Book(s):

1. UNIX – Concepts & Applications, SUMITABHA DAS, TATA McGraw Hill Edition, Fourth edition, 26th reprint 2015, McGraw Hill
2. Advanced Programming in the UNIX Environment, W Richard Stevens and Stephen A Rago, Addison Wesley Publications, Third Edition
3. UNIX and SHELL Programming , Richard F Gilberg and Behrouz A Forouzan, 15th impression, 2015, Cengage Learning

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	**Tests**	**Assignments**	**Quizzes**	**Co-Curricular**
Marks (Out of 50)	**25**	**10**	**5**	**10**
L1: Remember	-	-	-	-
L2: Understand	5	-	-	-
L3: Apply	5	5	2.5-	-
L4: Analyze	10	5	2.5	5
L5: Evaluate	5	-	-	5
L6: Create	-	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Marks (Out of 50)**
L1: Remember	10
L2: Understand	10
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	-

DIGITAL ELECTRONICS LAB

Course Code : 19CSL36 **Credits : 02**
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

19CSL36.1	Understand, design and implement operation of electronic device circuitry.
19CSL36.2	Simplify various logical circuits using Karnaugh maps.
19CSL36.3	Design and implement modular combinatorial logic circuits.
19CSL36.4	Design and implement sequential circuits, logic circuits using Verilog.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSL36.1	3	3	3	3	-	-	2	-	-	2	-	2
19CSL36.2	3	3	3	3	-	-	2	-	3	2	-	2
19CSL36.3	3	3	3	3	-	-	2	-	3	2	-	2
19CSL36.4	3	3	3	3	-	-	2	-	3	2	-	2

E. No	Experiment	Hours	COs
1	To plot the Characteristics of a BJT and FET	**6**	**CO1**
2	Design and implement clipper and clamper (positive and negative for both) using diodes.	**4**	**CO1**
3	Design and implement an A stable Multivibrator circuit using 555 timer for a given frequency and duty cycle.	**4**	**CO1**
4	Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC. Simulate and verify its working using Verilog code	**4**	**CO2, CO5**
5	Perform n bit addition / subtraction using 4 bit full adder IC. Simulate and verify its working using Verilog code.	**4**	**CO3, CO5**
6	Design and implement BCD to seven segment decoder. Simulate and verify given decoder using VERILOG code.	**4**	**CO2, CO3, CO5**
7	Design and implement Ring counter and Johnson counter using 4-bit shift register and demonstrate its working. Simulate and verify the working using VERILOG code.	**4**	**CO4, CO5**
8	Design and implement a mod-n (n<8) synchronous up or down counter using J-K Flip-Flop ICs and demonstrate its working. Simulate and verify mod 8 synchronous up or down counter using VERILOG code.	**6**	**CO2, CO4, CO5**
9	Design and implement an asynchronous counter using decade counter IC to count from 0 to n (n<=9) and demonstrate its working.	**4**	**CO4**
10	Design and implement a sequence generator (3 bits) using Moore model and JK flip flop. Simulate and verify the working using VERILOG code.	**5**	**CO2, CO4, CO5**

Reference Material(s):

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

CIE – Continuous Internal Evaluation: LAB (25 Marks)

Blooms Taxonomy	Tests
Marks (Out of 25)	**25**
L1: Remember	-
L2: Understand	05
L3: Apply	05
L4: Analyze	10
L5: Evaluate	05
L6: Create	-

SEE – Semester End Examination: LAB (25 Marks)

Blooms Taxonomy	Marks (Out of 25)
L1: Remember	-
L2: Understand	05
L3: Apply	05
L4: Analyze	10
L5: Evaluate	05
L6: Create	-

DATA STRUCTURES PROGRAMMING LAB USING C

Course Code :19CSL37	**Credits : 02**
L: P: T : S : 0:2:0 :0	**CIE Marks : 25**
Exam Hours : 3	**SEE Marks : 25**

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

19CSL37.1	Implement sparse matrix and sorting algorithms using arrays.
19CSL37.2	Implement primitive operations on linear data structures like stack, queue, linked lists.
19CSL37.3	Implement primitive operations on non-linear data structures using Tree.
19CSL37.4	Implement primitive operations on non-linear data structures using 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	-	-	3
CO2	3	-	3	-	3	-	-	-	3	-	-	3
CO3	3	-	3	-	3	-	-	-	3	-	-	3
CO4	3	-	3	-	3	-	-	-	3	-	-	3

Exp. No	Experiment	Cos	Hours
1	Write a program to check whether the given matrix is sparse or not and represent the matrix in sparse representation and determine the transpose of sparse representation.	**CO1**	**2**
2	Write a C program to sort numbers using insertion sort	**CO1**	**2**
3	Write a C program to sort numbers using shell sort	**CO1**	**2**
4	Write a program to sort the numbers using quick sort with recursion.	**CO1**	**3**
5	a. Write a program to demonstrate Tower of Hanoi problem b. Write a program for Ackermann's function	**CO2**	**3**
6	Develop a program for STACK that performs following primitive operations: push, pop and display	**CO2**	**3**
7	Develop a program to convert INFIX notation to POSTFIX	**CO2**	**3**
8	Develop a program for evaluation of POSTFIX notation.	**CO2**	**3**
9	Develop a program for QUEUE that performs following primitive operations: insert, delete and display	**CO2**	**3**
10	Develop a program for CIRCULAR QUEUE that performs following primitive operations: insert, delete and display	**CO2**	**3**
11	Write a menu driven program to perform the following primitive operations on single linked list A. Create a list with one node B. Insertion at front, rear ,after any given node C .Deletion at front,, rear ,after any given node D. Display	**CO2**	**3**
12	Develop a program for adding two polynomials	**CO2**	**3**

13	Write a Menu driven program to perform the following primitive operations in double linked list A .Insertion B. Deletion C. Display	**CO2**	**3**
14	Develop a program to traverse a tree using in-order, pre-order and post-order.	**CO3**	**3**
15	Develop a program to perform insertion, deletion and traversal of a binary search tree	**CO3**	**3**
16	Develop a program to implement BFS and DFS traversal of graph	**CO4**	**3**

CIE – Continuous Internal Evaluation: Theory (25 Marks)

Blooms Taxonomy	**Tests**
Marks (Out of 25)	**25**
L1: Remember	-
L2: Understand	-
L3: Apply	25
L4: Analyze	-
L5: Evaluate	-
L6: Create	-

SEE – Semester End Examination: Theory (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
L1: Remember	-
L2: Understand	-
L3: Apply	25
L4: Analyze	-
L5: Evaluate	-
L6: Create	-

UNIX SYSTEM PROGRAMMING LAB

Course Code : 19CSL38 **Credits: 02**
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

19CSL38.1	Execute various UNIX commands on a standard UNIX operating system.
19CSL38.2	Apply and change the ownership and file permissions using advanced UNIX commands.
19CSL38.3	Execute C / C++ programs on UNIX making use of UNIX APIs.
19CSL38.4	Understand and work on UNIX system calls, shell programming and AWK on UNIX.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSL38.1	3	3	-	-	-	-	-	-	-	-	-	-
19CSL38.2	3	3	3	-	-	-	-	-	-	3	3	-
19CSL38.3	3	3	3	-	-	-	-	-	-	3	3	-
19CSL38.4	3	3	3	-	-	-	-	-	-	3	3	-

Exp. No	Experiment	Hours
1	Execution of various general purpose utility commands	**4**
2	Execution of various file/directory handling commands	**4**
3	Write a C/C++ POSIX compliant program to check the following limits: (i) No. of clock ticks (ii) Max. no. of child processes (iii) Max. path length (iv) Max. no. of characters in a file name (v) Max. no. of open files/ process	**3**
4	Write a C/C++ program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.	**2**
5	Write a C / C++ program to emulate the unixln command.	**4**
6	Write a C/C++ program that creates a zombie and then calls system to execute the ps command to verify that the process is zombie.	**4**
7	Write a C/C++ program to implement the system function.	**4**
8	Execution of various filter commands	**4**
9a **b**	Write a shell script to accept a file and check if it is executable. If not make it executable Write a shell script which will accept a filename and starting and ending line numbers and displays these lines from given file	**4**
10a **b**	Write a shell script which displays a list of all the files in the current directory to which you have read, write and execute permissions. A shell script receives even number of filenames as arguments. Suppose four files are supplied as arguments then the first file should get copied into second, third file into fourth and so on. If odd number of filenames is supplied then no copying should take place and an error message should be displayed.	**4**
11a	Write a shell script which gets executed the moment the user logs in. It should display the message, " Good Morning", " Good Afternoon", " Good Evening",	**4**

b	depending upon the time at which the user logs in. Write a shell script which accepts any number of arguments and prints them in reverse order. Ex: If file name is test then $sh test A B C should produce C B A.	
12a **b**	Write scripts to demonstrate built in variables available in AWK Write scripts to demonstrate built in functions available in AWK	**4**

Reference Material(s):

1. Your UNIX – The ultimate Guide , SUMITABHA DAS, TATA McGraw Hill Edition, 23rd reprint 2012, McGraw Hill
2. UNIX System Programming Using C++, Terrence Chan, Prentice-Hall of India Private Limited
3. Advanced Programming in the UNIX Environment, W Richard Stevens and Stephen A Rago, Addison Wesley Publications, Third Edition

CIE – Continuous Internal Evaluation: Theory (25 Marks)

Blooms Taxonomy	**Tests**
Marks (Out of 25)	**25**
L1: Remember	-
L2: Understand	-
L3: Apply	25
L4: Analyze	-
L5: Evaluate	-
L6: Create	-

SEE – Semester End Examination: LAB (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
L1: Remember	-
L2: Understand	-
L3: Apply	25
L4: Analyze	-
L5: Evaluate	-
L6: Create	-

MINI PROJECT in C

Course Code : 19CSE39 **Credits: 02**

L:T:P:S	**: 0:0:2:0**	**CIE Marks:**	**25**
Exam Hours	**: 03**	**SEE Marks:**	**25**

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

CO #	COURSE OUTCOME
19CSE39.1	Apply the knowledge on the operations of various data structures.
19CSE39.2	Compare and contrast different sorting techniques and its applications.
19CSE39.3	Write and analyze algorithm for the problem statement.
19CSE39.4	Implement operations like searching, insertion, and deletion, traversing mechanism etc. on one or more data structures.
19CSE39.5	Create a software solution for real time application using one or more data structures.
19CSE39.6	Demonstrate their communication skill effectively with technical presentation.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19CSE39.1	3	-	-	-	2	-	-	3	3	3	-	-	-	-
19CSE39.2	3	3	3	2	2	-	-	3	3	3	-	-	3	3
19CSE39.3	3	3	3	-	2	-	-	3	3	3	-	3	3	3
19CSE39.4	3	3	3	2	2	-	-	3	3	3	-	3	3	3
19CSE39.5	3	3	3	2	2	-	-	3	3	3	-	3	3	3
19CSE39.6	3	-	-	-	-	-	-	3	3	3	-	-	-	-

The student shall be capable of identifying a problem related to the field of Computer Science and carry out a mini project on the problem defined. Each student is expected to do the mini project individually. The code developed towards the project will be reviewed by a panel of experts during the course of the semester. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project the student will submit a project report, which will be evaluated by duly appointed examiner(s).

Sample Mini project includes:

1) Tic-Tac-Toe Game
2) Quiz Game
3) Library Management
4) Telecom Billing Management system
5) Numerical Method Applications

CIE - Continuous Internal Evaluation (25 Marks)

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

SEE – Semester End Examination (25 marks)

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

FOURTH SEMESTER

DISCRETE MATHEMATICS AND GRAPH THEORY

Course Code: : 20CSE41A | **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	Explain the counting techniques and combinatorics by using the context of discrete probability.
CO2	Illustrate the fundamental concepts of trees, connectivity and planarity graphs.
CO3	Apply Pigeon hole principle to solve real life problems.
CO4	Solve the engineering problems involving relations and functions.
CO5	Analyze the computer science problems by using graph theory techniques.
CO6	Justify the arguments with propositional and predicate logic and from truth tables.

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
CO2	3	3	3	3	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	-	-	3	-	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	-	-	2	3	-	3
CO6	3	3	3	3	-	-	-	-	2	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**	**CO6**
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**	**CO1**
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, CO4**
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 separability, Network flows, 1-Isomorphism,2-Isomorphism, Planar graphs, Dual of planar graphs, Different representation of a planar graph.	**9**	**CO2**

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 VenakannaS.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	-

ECONOMICS FOR ENGINEERS

Course Code: 20HSS421A **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	Co
1	Introduction to Economics: Role of Engineer as an Economist, Types and problem of economies, Basics of economics (GDP, National income, inflation, business cycle, fiscal and monetary policies, balance of payment).	**4**	**CO1, CO4**
2	Basic concepts of Microeconomics: concept of Demand & Elasticity of Demand. Concept of Supply & Elasticity of Supply, Meaning of Production and factors of production, Production Possibility Curve, Law of variable proportions and returns to scale. Relevance of Depreciation towards industry, Depreciation computing methods.	**4**	**CO2, CO3**
3	Concepts of cost of production: different types of cost; accounting cost, sunk cost, marginal cost and opportunity cost. Break even analysis, Make or Buy decision. Cost estimation, Elements of cost as Direct Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads.	**4**	**CO3**
4	**Market structure:** Perfect Competition: Features, Determination of Price under Perfect Competition - Monopoly: Features, Pricing under Monopoly, **Oligopoly**: Features, Kinked Demand Curve, Cartel, Price Leadership – Monopolistic Competition: Features, Pricing under Monopolistic Competition, Product Differentiation.	**5**	**CO1, CO4**
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**	**CO3, CO5**

TEXT BOOKS:

1. RiggsJ.L,EngineeringEconomy,TMH,2012edition
1. JainT.R.,EconomicsforEngineers,VKPublications,2008 Edition
2. IMPANDEY, Financial Management,Vikas Pub.House, 2018 Edition
3. DNDwivedi, Managerial Economics, Vikas Pub.House, 2018 Edition
4. 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, FinancialMangement,TMH,2007
3. Singh Seema, Economics for Engineers, IKInternational,2014
4. Chopra P. N, Principle of Economics, KalyaniPublishers,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	-

ವ್ಯಾವಹಾರಿಕ/ ಬಳಕೆ ಕನ್ನಡ

Vyavaharika / Balake Kannada

(Kannada for usage - common to all branches)

Course code : 20HSS325/425	Credits : 01
L:T:P : 1:0:0	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

CO – PO Mapping:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-

Syllabus

Chapter -1 Abbreviations
Chapter -2 Key to Transcription
Chapter -3 Easy learning of a Kannada Language: A few tips
Chapter -4 Necessity of learning a local Langauge
Chapter -5 Tips to learn the language with easy methods.
Chapter -6 Hints for correct and polite conservation
Chapter -7 About Kannada Language (Kannada Bhashe)
Chapter -8 Eight Kannada authors who have won 'Jnanpith Award'
Chapter -9 Information about Karnataka State

Text Book:

Balake 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

ಆಡಳಿತ / ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

(ಕನ್ನಡಿಗರಿಗಾಗಿ for Kannadigas common to all branches)

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

ಸಾಂಸ್ಕೃತಿಕ 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 ಅರೆಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಿಕೆ ಪಡೆಯುವರು .

C04 ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅಸಕ್ತಿವಹಿಸಿಕೊಳ್ಳುವರು.

CO-PO Mapping :

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-

ಪರಿವಿಡಿ (ಪಠ್ಯ ಪುಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)

ಭಾಗ–1 ಲೇಖನಗಳು : ಕನ್ನಡ ನಾಡು ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು

ಭಾಗ–2 ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)

ಭಾಗ–3 ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)

ಭಾಗ–4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

ಭಾಗ–5 ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಪುಸ್ತಕದ ಲೇಖಕರು

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

ಪರೀಕ್ಷೆಯ ವಿಧಾನ:

ನಿರಂತರ ಅಂತರೀಕ ಮೌಲ್ಯ ಮಾಪನ **(Continuous Internal Evaluation)** : **25**

ಸೆಮಿಸ್ಟರ್ ಎಂಡ್ ಪರೀಕ್ಷೆ **(Semester End Examination)** : **25**

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

OBJECT ORIENTED PROGRAMMING WITH JAVA

Course Code	**: 19CSE43**	**Credits**	**: 04**
L: T: P:S	**: 3:1:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

19CSE43.1	Understand and apply basic constructs of Java for development of simple programs.
19CSE43.2	Apply OOP principles and proper program structuring to develop programs.
19CSE43.3	Implement polymorphism and inheritance for an application program.
19CSE43.4	Build applications using multithreading and handle exceptions appropriately.
19CSE43.5	Create applications using Java collections.
19CSE43.6	Design and implement programs on I/O functions.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSE43.1	3	3	-	1	1	-	2	2	3	3	3	3
19CSE43.2	3	3	-	1	1	-	2	2	3	3	3	3
19CSE43.3	3	3	-	1	1	-	2	2	3	3	3	3
19CSE43.4	3	3	-	1	1	-	2	3	3	3	3	3
19CSE43.5	3	3	-	1	1	-	2	3	3	3	3	3
19CSE43.6	3	3	-	1	1	-	2	3	3	3	3	3

Module No	Module Contents	Hours	COs
1	**Introduction to Java:** Basics of Java programming - Dissecting the "Hello, World" Program, Compiling and Running a Java Program, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.	**9**	**CO1**
2	**Objects and Classes:** Working with Objects, Implementing Classes, Object Construction, Static Variables and Methods, Constructors, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, this reference, nested classes.	**9**	**CO2**
3	**Inheritance and Polymorphism:** Inheritance and types, Super and sub class, Overriding, Polymorphism, Dynamic binding, Casting objects, Instance of operator, Abstract class, Interface, Package , Object class	**9**	**CO3**
4	**Exception Handling**: Exception Types , Uncaught Exceptions, Using try and catch, Multi catch clauses, Nested try statements, throw, throws, finally, Java's Built-in Exceptions. **Threads**: The java Thread Model, The main Thread, Creating a Thread, Creating multiple Threads, Thread Priorities, Synchronization, Interthread Communication, Suspending, resuming and Stopping Threads, using Multithreading.	**9**	**CO4**
5	**I/O basics:** Reading input, writing output, Reading and Writing files **The Collections Framework:** Collections Overview, The Collection Interfaces- The List Interface, The Set Interface, The Queue Interface,The Collection Classes – Array List Class, Linked List Class, Treeset Class	**9**	**CO5, CO6**

Text Book(s):

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

Reference Book(s):

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

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes	Co-Curricular
Marks (Out of 50)	**-**	**-**	**-**	**-**
L1: Remember	2.5	-	-	-
L2: Understand	2.5	-	-	-
L3: Apply	5	5	5	-
L4: Analyze	5	5	5	-
L5: Evaluate	5	-	-	-
L6: Create	5	5	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	5
L2: Understand	5
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	10

ARM PROCESSOR

Course Code : 19CSE44 | **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

19CSE44.1	Understand ARM family and its history.
19CSE44.2	Gain knowledge in Cortex M3 architecture.
19CSE44.3	Apply Cortex M3 instructions set to solve a problem.
19CSE44.4	Develop assembly language and embedded C language applications.
19CSE44.5	Realize the concepts of memory hierarchy.
19CSE44.6	Use exceptions and interrupt concepts to develop an application

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSE44.1	3	3	3	3	-	-	2	-	-	2	-	2
19CSE44.2	3	3	3	3	-	-	2	-	3	2	-	2
19CSE44.3	3	3	3	3	-	-	2	-	3	2	-	2
19CSE44.4	3	3	3	3	-	-	2	-	3	2	-	2
19CSE44.5	3	3	3	3	3	-	2	-	3	2	-	2
19CSE44.6	3	3	3	3	3	-	2	-	3	2	-	2

Module No	Module Contents	Hours	COs
1	ARM CORTEX Processors**:** Introduction, Overview of ARM family Processor Evolution, Introduction to embedded system design, Cortex-M family processor, Architecture, Thumb-2 Technology.	**9**	**CO1**
2	**Fundamentals of Cortex-M3 architecture:** Registers, Special Registers, Operation Mode, Memory Map, Stack Memory Operations	**9**	**CO2**
3	**Instruction Sets:** Data Transfer, Branch Instructions, Barrier Instructions, other Instructions, Cortex-M3 assembly Programming, CMSIS.	**9**	**C03, C04**
4	**INTRODUCTION TO EMBEDDED C:** C-looping structures, Register allocation, Function calls, Pointer aliasing, structure arrangement, bit fields, unaligned data, inline functions and inline assembly, portability issues, Embedded Systems programming in C, Binding & Running Embedded C program in Keil IDE.	**9**	**C03, C04**
5	**Memory System, Exceptions and Interrupts:** Memory System Features Overview, Memory Maps, Memory endianness, Memory Access Attributes, Default Memory Access Permissions, Exception Types, Interrupt Management, Priorities, Exception sequence, NVIC and SCB registers for exception control, Interrupt Masking	**9**	**CO5, CO6**

Text Book(s):

1. The Definitive Guide to ARM Cortex-M3 and Cortex M4 Processor, Joseph Yiu, 3rd Edition, 2018, Newness Publication
2. The Designer's Guide to the Cortex-M Processor Family - A Tutorial Approach, Trevor Martin, 2nd Edition , 2013, Newness Publication

Reference Book(s):

1. ARM System On Chip Architecture, Steve Furber, 2nd edition, 2012, Pearson Education.
2. Embedded C, Michael J. Pont, 2007, Pearson Education

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes	Co-Curricular
Marks (Out of 50)	**25**	**10**	**05**	-
L1: Remember	-	-	-	-
L2: Understand	05	-	-	-
L3: Apply	10	05	05	-
L4: Analyze	05	05	05	-
L5: Evaluate	05	05	-	-
L6: Create	-	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	10
L2: Understand	10
L3: Apply	15
L4: Analyze	10
L5: Evaluate	05
L6: Create	-

COMPUTER ORGANIZATION

Course Code : 19CSE45 **Credits : 04**

L: T: P:S : 4:0:0:0 **CIE Marks : 50**

Exam Hours : 3 **SEE Marks : 50**

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

19CSE45.1	Examine different computer architectures, instruction sets, addressing modes and memory.
19CSE45.2	Design and evaluate circuits to perform basic computer arithmetic operations.
19CSE45.3	Analyze the cache design parameters and evaluate performance.
19CSE45.4	Interpret the working of hardwired and micro-programmed control of the CPU.
19CSE45.5	Comprehend and use internal structure of a processor system and generation of control signals.
19CSE45.6	Apply and analyze instruction pipeline concepts, memory delays and branch delays

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSE45.1	3	3	-	1	1	-	-	-	-	-	-	-
19CSE45.2	3	3	2	1	-	-	-	-	-	-	-	3
19CSE45.3	3	3	2	1	1	1	-	-	-	-	2	3
19CSE45.4	3	3	2	1	1	-	-	-	-	-	-	3
19CSE45.5	3	3	2	1	1	-	1	-	-	-	-	3
19CSE45.6	3	3	2	1	1	-	-	1	-	-	2	3

Module No	Module Contents	Hours	COs
1	**Introduction: Functional units**, Basic operational concepts, Number representation and arithmetic operations and characters, Memory locations and addresses, Memory operations, Instructions and Instruction sequence, Addressing modes, Bus Structure, Bus operation, Arbitration	**9**	**CO1**
2	Computer Arithmetic: Addition subtraction of signed numbers, Design of fast adders, Multiplication of unsigned and signed numbers, Fast multiplication, Integer Division, Floating point numbers and operations	**9**	**CO2**
3	Computer Memory System &Input / Output Organization: Characteristics of Memory System, The Memory hierarchy, Elements of cache design: Cache addresses, Cache size, Mapping function, Performance considerations – Hit-ratio and Miss penalty – Caches on the processor chip, Semiconductor main memory: Organization, DRAM and SRAM Accessing I/O devices, Interrupts	**9**	**CO3**
4	**Basic Processing Unit:** Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, control signals, hardwired control, CISC style processors	**9**	**CO4, CO5**
5	**Pipelining:** Basic Concept, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Resource Limitations, Performance Evaluation, Superscalar Operation	**9**	**CO6**

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 Book(s):

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	Assignments	Quizzes	Co-Curricular
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	10	-	-	-
Apply	10	10	-	5
Analyze	-	-	5	-
Evaluate	-	-	-	5
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

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

OBJECT ORIENTED PROGRAMMING WITH JAVA LAB

Course Code	**: 19CSL46**	**Credits**	**: 02**
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

19CSL46.1	Apply basic constructs for development of simple Java programs.
19CSL46.2	Apply OOP principles and proper program structuring to develop programs.
19CSL46.3	Implement polymorphism and inheritance for an application program.
19CSL46.4	Build applications using multithreading, swings and handle exceptions appropriately.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSL46.1	3	3	-	1	1	-	1	2	3	3	3	3
19CSL46.2	3	3	-	1	1	-	1	2	3	3	3	3
19CSL46.3	3	3	-	1	1	-	1	2	3	3	3	3
19CSL46.4	3	3	-	1	1	-	1	2	3	3	3	3

Exp. No	Experiment	Hours	COs
1	Java Program to demonstrate overloading, math class and arrays	**3**	**CO1**
2	Write a Java Program to define a class, describe its constructor, overload the Constructors and instantiate its object, and use static members.	**3**	**CO2**
3	Write a Java program to demonstrate String class, String Buffer class and its methods	**3**	**CO2**
4	Write a Java program to demonstrate nested classes and array of objects		
5	Write a Java Program to implement inheritance and demonstrate use of method overriding	**3**	**CO3**
6	Write a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods		
7	Write a program to demonstrate use of implementing interfaces	**3**	**CO3**
8	Write a program to demonstrate use of extending interfaces		
9	Write a Java program to implement the concept of importing classes from user defined package and creating packages Write a Java Program to demonstrate dynamic binding, generic programming	**3**	**CO3**
10	Write a program to implement the concept of threading by extending Thread Class	**3**	**CO4**
11	Write a program to implement the concept of threading by implementing Runnable Interface		
12	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	**3**	**CO4**

13	Write a program to implement the concept of Exception Handling using predefined exception	**3**	**CO4**
14	Write a program to implement the concept of Exception Handling by creating user defined exceptions		
15	Write a program to demonstrate File I/O Operations	**3**	**CO5**
16	Write a program to demonstrate Array List Class, Linked List Class, Treeset Class	**3**	**CO5**

Reference Material(s):

1. Herbert Schildt, Java™: The Complete Reference, McGraw-Hill, Tenth Edition, 2018
2. Cay S. Horstmann, Core Java® SE 9 for the Impatient, Addison Wesley, Second Edition, 2018
3. Cay S. Horstmann, Core Java™ Volume I—Fundamentals, Prentice Hall, Tenth Edition, 2015
4. SAMS teach yourself Java – 2: 3rd Edition by Rogers Cedenhead and Leura Lemay Pub. Pearson Education.
5. Ken Kousen, Modern Java Recipes, O'Reilly Media, Inc., 2017

CIE – Continuous Internal Evaluation: Theory (25 Marks)

Blooms Taxonomy	**Tests**
Marks (Out of 25)	**25**
L1: Remember	-
L2: Understand	-
L3: Apply	10
L4: Analyze	5
L5: Evaluate	-
L6: Create	10

SEE – Semester End Examination: LAB (25 Marks)

Blooms Taxonomy	**Marks (Out of 50)**
L1: Remember	-
L2: Understand	-
L3: Apply	20
L4: Analyze	10
L5: Evaluate	-
L6: Create	20

ARM PROCESSOR LAB

Course Code : 19CSL47 | **Credits : 02**
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

19CSL47.1	Understand the instruction set of 32- bit microcontroller ARM Cortex M3 and the software tool required for programming in assembly and C language.
19CSL47.2	Develop assembly language programs for different problem statements.
19CSL47.3	Develop C language programs for different applications.
19CSL47.4	Perform floating-point operations, Interface external hardware with ARM Cortex M3.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSL47.1	3	3	3	1	-	-	2	-	-	2	-	2
19CSL47.2	3	3	3	1	-	-	2	-	3	2	-	2
19CSL47.3	3	3	3	1	-	-	2	-	3	2	-	2
19CSL47.4	3	3	3	1	-	-	2	-	3	2	-	2

Exp. No	Experiment	Hours	COs
1	Program to sort a given array of N elements is ascending / descending order using bubble sort.	**4**	**CO1, CO2**
2	Program to perform addition, multiplication and division operations	**4**	**CO2**
3	Program to generate Fibonacci series of N numbers	**4**	**CO2**
4	Program to compute factorial and ${}^{n}C_{r}$ using recursion	**4**	**CO2**
5	Program to find square and cube of a floating point number	**4**	**CO2, CO4**
6	Program to perform floating point addition and Subtraction	**4**	**CO2, CO4**
7	Program to display a message using Internal UART	**4**	**CO3**
8	Program to Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction	**4**	**CO3, CO5**
9	Program to Interface a DAC and generate Sinusoidal and Triangular waveforms	**4**	**CO3, CO5**
10	Program to display the given message on a 7-segment LED interface, with an appropriate delay in between	**4**	**CO3, CO5**
11	Program to Interface a 4x4 keyboard and display the key pressed on an LCD	**4**	**CO3, CO5**

Reference Material(s):

1. An Engineers Introduction to the LPC2100 series, Trevor Martin, Hitex (UK) Ltd
2. LPC 214x User manual (UM10139) :- www.nxp.com
3. LPC 17xx User manual (UM10360) :- www.nxp.com

CIE – Continuous Internal Evaluation: LAB (25 Marks)

Blooms Taxonomy	**Tests**
Marks (Out of 25)	**25**
L1: Remember	-
L2: Understand	05
L3: Apply	05
L4: Analyze	10
L5: Evaluate	05
L6: Create	-

SEE – Semester End Examination: LAB (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
L1: Remember	-
L2: Understand	05
L3: Apply	05
L4: Analyze	10
L5: Evaluate	05
L6: Create	-

MINI PROJECT in JAVA

Course Code : 19CSE48 **Credits : 02**
L: T: P: S : 0:0:2:0 **CIE Marks: 25**
Exam Hours : 03 **SEE Marks: 25**

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

19CSE48.1	Understand the technological needs and/ or societal needs.
19CSE48.2	Design and develop an algorithm by applying JAVA-programming features.
19CSE48.3	Analyze and evaluate the algorithm performance metrics.
19CSE48.4	Test, validate and communicate the identified solutions in a structured way.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19CSE48.1	3	3	3	3	3	2	2	2	2	2	2	2
19CSE48.2	3	3	3	3	3	2	2	2	2	2	2	2
19CSE48.3	3	3	3	3	3	2	2	2	2	2	2	2
19CSE48.4	3	3	3	3	3	2	2	2	2	2	2	2

The student shall be capable of identifying a problem related to the field of Computer Science and carry out a mini project on the problem defined. Each student is expected to do the mini project individually. The code developed towards the project will be reviewed by the panel of experts during the course of the semester. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project the student will submit a project report, which will be evaluated by duly appointed examiner(s).

CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category / **Marks (out of 25)**	**Mini Project**
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

SEE- Semester End Examination (25 Marks)

Blooms Category / **Marks (out of 25)**	**Tests**
Remember	-
Understand	-
Apply	15
Analyze	-
Evaluate	10
Create	-