



NEW HORIZON
COLLEGE OF ENGINEERING

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

Department of Computer Engineering



Scheme and Syllabus

3rd & 4th Semesters

BATCH: 2022-26 | CREDITS: 160 | (2022 Scheme)

Academic Year 2023-24

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NEW HORIZON COLLEGE OF ENGINEERING

VISION

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

MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.
- To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation.
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

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

VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

DEPARTMENT OF COMPUTER ENGINEERING

VISION

To produce engineers, researchers and technologists with managerial skills of highest competence who would be able to solve the challenges of society.

MISSION

- ❖ To impart high quality professional training, practical experience and value education in the Computer Engineering.
- ❖ To pursue creative research in Computer Engineering in order to serve the engineering community and society.
- ❖ To prepare and encourage a student for Lifelong learning to meet career and ethical challenges through active participation in co-curricular and extracurricular activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO1:	To prepare globally competent graduates having strong fundamentals of Computer Engineering domain knowledge, updated with modern technology to provide effective solutions for engineering problems.
PEO2:	To acuminate graduates with ability to adapt and develop projects towards the latest technological era of the Computing and IT sector with a high degree of innovative ideas.
PEO3:	To produce committed and motivated graduates with research attitude, investigative approach, and multidisciplinary thinking for implementation of strategic tasks.
PEO 4:	To shape the graduates with strong managerial and communication skills to work and learn continuously and effectively as individuals as well as in teams.

PEO TO MISSION STATEMENT MAPPING

Mission Statements	PEO1	PEO2	PEO3	PEO4
To impart high quality professional training, practical experience and value education in the Computer Engineering.	3	2	2	2
To pursue creative research in Computer Engineering in order to serve the engineering community and society.	3	2	2	2
To prepare and encourage a student for Lifelong learning to meet career and ethical challenges through active participation in co-curricular and extracurricular activities.	2	2	3	3

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

PROGRAM OUTCOMES (POS) WITH GRADUATE ATTRIBUTES

P01	Engineering knowledge: Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems in Computer Engineering.
P02	Problem analysis: Identify, formulate, review research literature, and analyze complex Engineering problems in Computer Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
P03	Design / Development of Solutions: Design solutions for complex Engineering problems and design system components or processes of Computer Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
P04	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments in Computer Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
P05	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities in Computer Engineering with an understanding of the limitations.
P06	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Computer Engineering.
P07	Environment and Sustainability: Understand the impact of the professional Engineering solutions of Computer Engineering in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
P08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
P09	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
P010	Communication Skills: Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

P011	Project Management and Finance: Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
P012	Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Mapping of POs with PEOs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
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

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: The ability to apply the knowledge of core science, engineering mathematics and engineering fundamentals to design and develop the computing systems.

PSO2: The ability to provide effective and efficient real time solutions to problems in computer engineering using acquired knowledge in various domains.

NEW HORIZON COLLEGE OF ENGINEERING
B. E. in Computer Engineering
Scheme of Teaching and Examinations for 2022- 2026 BATCH (2022 Scheme)

III Semester														
S. No	Course and Course Code		Course Title	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks			
					L	T	P	S			CIE	SEE	TOTAL	
1	BSC	22MAC31	Mathematical Foundation for Computing Sciences	CEE	3	0	0	0	3	3	50	50	100	
2	PCC	22CEE32	Digital Logic Design	CEE	3	0	0	0	3	3	50	50	100	
3	PCCL	22CEL32	Digital Logic Design Lab	CEE	0	0	1	0	1	2	50	50	100	
4	PCCL	22CEE33	Advanced Data Structures	CEE	3	0	0	0	3	3	50	50	100	
5	PCCL	22CEL33	Advanced Data Structures Lab	CEE	0	0	1	0	1	2	50	50	100	
6	ESC	22CEE34X	Programming Language Course	CEE	2	0	1	0	3	3	50	50	100	
7	AEC	22CEE35X	Ability Enhancement Course - III	CEE	0	0	1	0	1	2	50	50	100	
8	BSC	22BIK36	Bio Inspired Design & Innovation	CEE	3	0	0	0	3	3	50	50	100	
9	UHV	22SCK37	Social Connect and Responsibility	Any Dept.	0	0	1	0	1	2	50	--	50	
10	NCMC	22NSS30	National Service Scheme	NSS	0	0	0	0	0	2	50	--	50	
		22PED30	Physical Education (Sports and Athletics)	PED										
		22YOG30	Yoga	Yoga Teacher										
Total									19	25	500	400	900	
11		22DMAT31	Basic Applied Mathematics-I	BS	0	0	0	0	0	0	2	50	--	50

BSC: Basic Science Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, L: Lecture, T: Tutorial, P: Practical S: SDA: Self Study for Skill Development, K: This letter in the course code indicates common to all the stream of engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

22DMAT31*: This non-credit mandatory course to be offered with only CIE and no SEE to Lateral entry students.

Programming Language Course (PLC)			
22CEE341	Linux System Programming	22CEE343	Python for Data Analytics
22CEE342	PHP Programming	22CEE344	Perl Programming

Ability Enhancement Course - III

22CEE351	Advance Office Automation	22CEE353	Ruby Programming
22CEE352	GoLang Programming	22CEE354	Haskell Programming

National Service Scheme /Physical Education / Yoga: All students have to register for anyone of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Credit Definition: Hour Lecture (L) per week =1Credit 2 hours Tutorial(T) per week =1Credit Hours Practical/Drawing(P) per week=1Credit 2-hous Self Study for Skill Development (SDA) per week = 1 Credit	03-Credits courses are to be designed for 40 hours in Teaching-Learning Session 02-Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 15 hours of Teaching-Learning Sessions
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NEW HORIZON COLLEGE OF ENGINEERING
B. E. in Information Computer Engineering
Scheme of Teaching and Examinations for 2022- 2026 BATCH (2022 Scheme)

IV Semester														
S. No	Course Code and Course		Course Title	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks			
					L	T	P	S			CIE	SEE	TOTAL	
1	BSC	22MAC41	Discrete Mathematics and Graph Theory	CEE	3	0	0	0	3	3	50	50	100	
2	PCC	22CEE42	Object Oriented Programming using Java	CEE	3	0	0	0	3	3	50	50	100	
3	PCCL	22CEL42	Object Oriented Programming using Java Lab	CEE	0	0	1	0	1	2	50	50	100	
4	PCC	22CEE43	Design and Analysis of Algorithm Using C	CEE	3	0	0	0	3	3	50	50	100	
5	PCCL	22CEL43	Design and Analysis of Algorithm Using C Lab	CEE	0	0	1	0	2	2	50	50	100	
6	PCC	22CEE44	Data Base Management Systems	CEE	3	0	0	0	3	3	50	50	100	
7	PCC	22CEL44	Data Base Management Systems Lab	CEE	0	0	1	0	2	2	50	50	100	
8	ESC	22CEE45X	Programming Language Course	CEE	2	0	1	0	3	3	50	50	100	
9	AEC	22CEE46X	Ability Enhancement Course – IV	CEE	0	0	1	0	1	2	50	50	50	
10	UHV	22UHK47	Universal Human Values and Life Skills	Any Dept	0	0	1	0	1	2	50	--	50	
11	PROJ	22CEE48	Mini Project	CEE	0	0	1	0	1	2	50	50	100	
12	NCMC	22NSS40	National Service Scheme (NSS)	NSS	0	0	0	0	0	2	50	--	50	
		22PED40	Physical Education (PE) (Sports and Athletics)	PED										
		22YOG40	Yoga	Yoga Teacher										
Total									19	25	500	400	900	
13	NCMC	22DMAT31	Basic Applied Mathematics-II	BS	0	0	0	0	0	0	2	50	--	50

BSC: Basic Science Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, L: Lecture, T: Tutorial, P: Practical S: SDA: Self Study for Skill Development, K: This letter in the course code indicates common to all the stream of engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

22DMAT41*: This non-credit mandatory course to be offered with only CIE and no SEE to Lateral entry students.

Programming Language Course (PLC)			
22CEE451	C# and .NET	22CEE453	Elastic Search
22CEE452	Programming for UI and UX design	22CEE454	Introduction to R Programming

Ability Enhancement Course - III			
22CEE461	Micro Controller and Embedded Systems	22CEE463	App development using Kotlin
22CEE462	Digital Systems Modelling Using Verilog	22CEE464	Cloud based collaborative tools

Mini-project work: Mini Project is a laboratory-oriented/ hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/sand recommendations of the mentor. A student can do mini project as

- (i) A group of 2 if mini project work is single discipline (applicable to all IT allied branches)
- (ii) A Group of 2-4 if mini project work is single discipline (applicable to all Core Branches)
- (iii) A Group of 2 -4 students if the Mini Project work is a multidisciplinary (Applicable to all Branches)

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the percentage ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batch mates

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Credit Definition:

1-hour Lecture (L) per week=1Credit
 2-hours Tutorial(T) per week=1Credit
 2-hours Practical / Drawing (P) per week=1Credit
 2-hous Self Study for Skill Development (SDA) per week = 1 Credit

03-Credits courses are to be designed for 40 hours in Teaching-Learning Session
 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
 01-Credit courses are to be designed for 15 hours of Teaching-Learning Sessions

SEMSTER III (SYLLABUS)

MATHEMATICAL FOUNDATION FOR COMPUTING SCIENCES
(Common to AIM, CEE, CSE, CDS, ISE)

Course Code	22MAC31	CIE Marks	50										
L: T: P: S	3:0:0:0	SEE Marks	50										
Hrs. / Week	3	Total Marks	100										
Credits	03	Exam Hours	03										
Course outcomes: At the end of the course, the student will be able to:													
22MAC31.1	Use appropriate numerical methods to solve algebraic equations and transcendental equations.												
22MAC31.2	Solve initial value problems using appropriate numerical methods and also Evaluate definite integrals numerically.												
22MAC31.3	Demonstrate the idea of Linear Dependence and Independence of sets in the vector space.												
22MAC31.4	Gain ability to use probability distributions to analyze and solve real time problems												
22MAC31.5	Justify the concept of sampling distribution to solve the engineering problems.												
22MAC31.6	Use the large/small samples to analyse the data to make decision about the hypothesis.												
Mapping of Course Outcomes to Program Outcomes:													
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	
22MAC31.1	3	3	-	-	-	-	-	-	-	-	-	-	
22MAC31.2	3	3	-	-	-	-	-	-	-	-	-	-	
22MAC31.3	3	3	-	-	-	-	-	-	-	-	-	-	
22MAC31.4	3	3	-	-	-	-	-	-	-	-	-	-	
22MAC31.5	3	3	-	-	-	-	-	-	-	-	-	-	
22MAC31.6	3	3	-	-	-	-	-	-	-	-	-	-	
MODULE-1 NUMERICAL METHODS-1												22MAC31.1	8 Hours
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, Lagrange's formula and Lagrange's inverse interpolation for unequal intervals (without proofs)-Problems.													
Case Study	Case study on Numerical Analysis.												
Text Book	Text Book 1: 28.2, 28.3, 29.6, 29.10, 29.11, 29.13, Text Book 2: 19.2, 19.3.												
MODULE-2 NUMERICAL METHODS-2												22MAC31.2	8 Hours
Numerical solution of ordinary differential equations of first order and of first degree: Taylor's series method, Modified Euler's method and Runge-Kutta method of Fourth-Order-Problems. Milne's predictor and corrector Methods-Problems. Numerical integration: Simpson's 1/3 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.												
Text Book	Text Book 1: 32.3, 32.5, 32.7, 32.9, 30.7, 30.8, 30.10, Text Book 2: 19.5, 21.1.												
MODULE-3 VECTOR SPACES												22MAC31.3	8 Hours
Vector Space definition and examples, Subspaces and Spanning sets, Linear Dependence and Independence, Linear Independence and Spanning Sets, Bases: Orthogonal and Orthonormal bases and Dimension.													
Text Book	Text Book 3: 4.1, 4.2, 4.3, 4.4, 4.5.												
MODULE-4 PROBABILITY AND JOINT PROBABILITY DISTRIBUTIONS												22MAC31.4	8 Hours
Random variables (discrete and continuous), probability density functions, moment generating function. Discrete Probability distributions: Binomial and Poisson Distributions-Problems. Continuous Probability distribution: Normal Distributions-Problems.													
Concept of joint Probability-Joint probability distribution, Discrete and Independent random variables. Expectation, Covariance, Correlation coefficient.													
Case Study	Case study on Distributions.												
Text Book	Text Book 1: 26.8, 26.9, 26.10, 26.11, 26.12, 26.14, 26.15, 26.16.												
MODULE-5 SAMPLING THEORY												22MAC31.5 22MAC31.6	8 Hours
Sampling, Sampling distributions, test of hypothesis of large samples for means and proportions, Inferences for variance and proportion. Central limit theorem (without proof), confidence limits for means, Student's t-distribution, F-distribution and Chi-square distribution for test of goodness of fit for small samples.													
Case Study	Case Studies on sampling theory and significant measures of scores.												
Text Book	Text Book 1: 27.2, 27.3, 27.4, 27.5, 27.6, 27.7, 27.8, 27.9, 27.10, 27.11, 27.12, 27.14, 27.15, 27.16, 27.19.												

CIE Assessment Pattern (50 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	5	-
L2	Understand	5	5	-
L3	Apply	10	5	10
L4	Analyze	2.5	-	-
L5	Evaluate	2.5	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:**Text Books:**

- 1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232.
- 3) David C Lay, Linear Algebra and its applications, Addison-Wesley Publishers, Fourth Edition, 2012, ISBN: 9780321385178.

Reference Books:

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

Web links and Video Lectures (e-Resources):

- 1) https://youtu.be/IgoJV4g_0LM?si=JO1_bkIvMR8xlCOV
- 2) <https://youtu.be/mIFwzg11uO4?si=Xd13dh0eNlmIswPS>
- 3) https://youtu.be/74g5_3TC-tQ?si=yB2PHVGr4hxlIqPo
- 4) <https://youtu.be/QQFIWwDA9NM?si=3wJrtlm1NdPSbXmB>
- 5) <https://youtu.be/5817fLmsTGE?si=Y7ORyV2ETSCxZRAZ>
- 6) <https://youtu.be/q3xj16shDuw?si=ewdlKAC8UEc6oRQV>
- 7) <https://youtu.be/89Z0tOvHjNU?si=3jT-oriJZaC1kSzx>
- 8) <https://youtu.be/dOr0NKyD31Q?si=dMBU-BXGdGL6jIZy>
- 9) <https://youtu.be/BR1nN8DW2Vg?si=melzz97SqhK3wr-->
- 10) https://youtu.be/ugd4k3dC_8Y?si=xF5U2gjIgp0woDQt
- 11) https://youtu.be/z0Ry_3_qhDw?si=6IG2a65BZgdbaKsn
- 12) https://youtu.be/36cAE1Ovpq4?si=jfR8gkFmMOckWNZ_
- 13) <https://youtu.be/vFz2FG65HBc?si=SCHi3Y1XuHWg-pPT>
- 14) <https://youtu.be/2Dsz1IZBJ3Y?si=8ATLUE-mkJSMewO3>

Activity-Based Learning (Suggested Activities in Class)/Practical Based Learning:

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - Organizing Group wise discussions on related topics
 - Seminars

DIGITAL LOGIC DESIGN															
Course Code	22CEE32										CIE Marks	50			
L: T: P: S	3:0:0:0										SEE Marks	50			
Hrs / Week	3										Total Marks	100			
Credits	03										Exam Hours	03			
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE32.1	Describe the basic principles of the digital circuits and their significance.														
22CEE32.2	Apply the Knowledge of minimization techniques to digital circuits														
22CEE32.3	Analyze different types of combinational and sequential circuits based on the given application with the given specifications														
22CEE32.4	Design efficient combinational and sequential logic circuit implementations from functional description of digital systems														
22CEE32.5	Demonstrate the function of digital circuits using Verilog HDL code.														
22CEE32.6	Examine the concepts of state transition for the analysis of combinational and sequential Circuits.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE32.1	-	-	-	-	-	-	-	-	-	-	-	-	3	2	
22CEE32.2	3	-	-	-	-	-	-	-	-	-	-	-	3	2	
22CEE32.3	-	3	-	-	-	-	-	-	-	-	-	-	3	2	
22CEE32.4	-	-	3	-	-	-	-	-	-	-	-	-	3	2	
22CEE32.5	3	-	-	-	-	-	-	-	-	-	-	-	3	2	
22CEE32.6	-	-	-	2	-	-	-	-	-	-	-	-	3	2	
MODULE-1 SIMPLIFICATION OF BOOLEAN EXPRESSION															
											22CEE32.1	8 Hours			
											22CEE32.2				
Introduction, Boolean Expression-canonical forms & its conversion, Three & four Variable Karnaugh Maps - with and without don't care terms, Quine- McCluskey minimization technique- with and without don't care terms, Reduced prime implicants Tables.															
Text Book			Text Book 1: Chapter 3. Text Book 2: Chapter 3.												
MODULE-2 COMBINATIONAL LOGIC CIRCUITS															
											22CEE32.1	8 Hours			
											22CEE32.3				
											22CEE32.4				
Introduction, Adders, Subtractors, Carry Look Ahead Adder, Parallel Adder, Magnitude Comparator, Priority Encoders, Decoders, Multiplexers, Demultiplexers, Read Only memories (ROM)															
Applications			Explore the different combinational circuits and its applications.												
Text Book			Text Book 1: Chapter 4, 6. Text Book 2: Chapter 4.												
MODULE-3 SEQUENTIAL LOGIC CIRCUITS															
											22CEE32.1	8 Hours			
											22CEE32.3				
											22CEE32.4				
The Basic Flip-flop circuit, Triggering of Flip-flops, types of Flip- flop, Conversion of Flip-flops, Types of Shift Registers, Universal shift register.															
Text Book			Text Book 1: Chapter 8, Chapter 9. Text Book 2: Chapter 5, Chapter 6, Chapter 7												
MODULE-4 DESIGN OF SEQUENTIAL CIRCUITS															
											22CEE32.1	8 Hours			
											22CEE32.4				
Binary ripple counters, synchronous binary counters, Design of a synchronous mod- n counter using clocked T, JK, D and SR flip-flops, Mealy and Moore Models, Design Procedure, Design with State diagram.															
Applications			Explore the different sequential circuits and its applications.												
Text Book			Text Book 1: Chapter 10, Chapter 11. Text Book 2: Chapter 9												
MODULE-5 INTRODUCTION TO VERILOG HDL															
											22CEE32.1	8 Hours			
											22CEE32.5				
Basic Concepts, data types, Compiler directives. Modules and Ports, Module definition, port declaration, connecting ports, Different types of modelling style, Implementation of combinational circuits, Implementation of sequential circuits.															
Text Book			Text Book 1:3.11, 4.14, 6.12, 8.13, 9.8, 10.9. Text Book 2: 3.11, 4.12, 5.6, 6.6, 8.9												

CIE Assessment Pattern (50 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	5
L2	Understand	10	-	5
L3	Apply	10	7.5	-
L4	Analyze	-	7.5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:**Text Books:**

1. Albert Paul Malvino, Donald P Leach and Goutam Saha, Digital Principles and Applications, McGraw Hill, 8th Edition, Special Indian Edition, 2017, ISBN: 978-9339203405.
2. M. Morris Mano and Michael D. Ciletti, Digital Design with an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson Education, 6th Edition 2018, ISBN: 978-0-13-277420-8

Reference Books:

1. Thomas L Floyd, Digital Fundamentals, Pearson Education India, 11th edition, 2018, ISBN: 9789332584600
2. R. D. Sudhakar Samuel, An Illustrative Approach to Logic Design, Pearson Education India, 2010, ISBN: 978-8131732304.

Web links and Video Lectures (e-Resources):

- <https://archive.nptel.ac.in/courses/108/105/108105113/>
- https://onlinecourses.nptel.ac.in/noc21_ee39/preview
- <https://www.coursera.org/learn/digital-systems>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Seminars

DIGITAL LOGIC DESIGN LABORATORY															
Course Code	22CEL32								CIE Marks	50					
L: T: P: S	0:0:1:0								SEE Marks	50					
Hrs / Week	2								Total Marks	100					
Credits	01								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEL32.1	Develop the truth table for the given problem statement and verify using logic gates.														
22CEL32.2	Analyze the function of given synchronous circuits.														
22CEL32.3	Develop the Combinational Circuits for the given specification.														
22CEL32.4	Build and simulate logic circuits using Verilog HDL.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEL32.1	-	-	3	-	-	-	-	-	-	-	-	-	3	2	
22CEL32.2	-	3	-	-	-	-	-	-	-	-	-	-	3	2	
22CEL32.3	-	-	3	-	-	-	-	-	-	-	-	-	3	2	
22CEL32.4	3	-	3	-	-	-	-	-	-	-	-	-	3	2	
Exp. No. / Pgm. No.															
List of Experiments / Programs															
Hours															
COs															
Prerequisite Experiments															
	• Verification of truth Table of Logic Gates											2	NA		
PART-A															
1	Verify (a) Demorgan's Theorem for 2 variables. (b) Realize the given Boolean expressions using universal gates.											2	22CEL32.1 22CEL32.3		
2	Design and verify truth table of (a) Full Adder using basic logic gates. (b) Full Adder using Verilog Code.											2	22CEL32.1 22CEL32.3 22CEL32.4		
3	Design and verify truth table of a) Full subtractor using basic logic gate. b) Full Subtractor using Verilog Code											2	22CEL32.1 22CEL32.3 22CEL32.4		
4	a) Verify the truth table of 8:1 multiplexer using IC. b) Realize the given Boolean function using Multiplexer.											2	22CEL32.1 22CEL32.3		
5	Perform n bit addition / subtraction using 4-bit full adder IC.											2	22CEL32.1 22CEL32.3		
6	Simulate and verify the 4-bit full adder using Verilog code.											2	22CEL32.4		
PART-B															
7	Verify the truth table of IC7474											2	22CEL32.2 22ECL36.2		
8	Simulate the function of D FF using Verilog Code.											2	22CEL32.2 22CEL32.4		
9	Realize the function of shift registers using IC7474											2	22CEL32.2		
10	Realize the shift registers using Verilog											2	22CEL32.2 22CEL32.4		
11	Simulate and verify the working of Johnson counter using VERILOG code.											2	22CEL32.2 22CEL32.4		
12	Simulate and verify the working of Ring counter using VERILOG code.											2	22CEL32.2 22CEL32.4		

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

- Simulation of half and full adder using logic sim (<https://www.youtube.com/watch?v=0Up2YfMYTQA>)
- Simulation of 8:1 Mux using logic sim (<https://www.youtube.com/watch?v=DJhwWMixTRU>)

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	5
L3	Apply	5	10
L4	Analyze	10	10
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	10
L4	Analyze	20
L5	Evaluate	15
L6	Create	-

Suggested Learning Resources:

Reference Books:

- 1) Joseph Cavanagh, "Verilog HDL Design Examples", Publisher: CRC Press, Taylor & Francis group, 2018, ISBN- 9781138099951.

ADVANCED DATA STRUCTURES															
Course Code	22CEE33								CIE Marks	50					
L: T: P: S	3:0:0:0								SEE Marks	50					
Hrs / Week	3								Total Marks	100					
Credits	03								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE33.1	Describe the fundamentals of data structure.														
22CEE33.2	Apply the concept of Dynamic Memory allocation.														
22CEE33.3	Analyze the concepts of Linked Lists for problem solving.														
22CEE33.4	Investigate various representations of Trees for problem solving.														
22CEE33.5	Evaluate the Elementary Graph Operations to optimize and solve network communication problems.														
22CEE33.6	Develop algorithms to solve problems using fundamental data structures.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE33.1	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEE33.2	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEE33.3	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEE33.4	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEE33.5	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEE33.6	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
MODULE-1	Introduction to Data Structures Revisited								22CEE33.1 22CEE33.2 22CEE33.6				8 Hours		
Arrays, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays, Strings, Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues.															
Text Book	Text Book 1- chapter 2 & 3														
Self-study	Applications of Dynamic Arrays.														
MODULE-2	Linked Lists								22CEE33.2 22CEE33.3 22CEE33.6				8 Hours		
Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List Operations, Equivalence Classes, Sparse Matrices, Doubly Linked Lists.															
Text Book	Text Book 1 - - chapter 4														
Case Study	Josephus Problem														
MODULE-3	Trees								22CEE33.4 22CEE33.6				8 Hours		
Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps, Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees. Optimal Binary Search Trees, AVL Trees, RED-BLACK Trees															
Text Book	Text Book 1: Chapter 5, Chapter 10 – 10.1, 10.2, 10.3														
Self - study	Splay Trees														
MODULE-4	Graphs and Hashing								22CEE33.5 22CEE33.6				8 Hours		
Graphs: The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure, Activity Networks Hashing: Introduction, Static Hashing, Dynamic Hashing, Bloom Filters.															
Text Book	Text Book 1: Chapter 6 & 8														
Case - Study	Graphs in Computer Network Communication														
MODULE-5	Priority Queues								22CEE33.4 22CEE33.6				8 Hours		
Single and Double – Ended Priority Queues, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps, Symmetric Min-Max Heaps, Interval Heaps.															
Text Book	Text Book 1: Chapter 9														
Case - study	Choosing appropriate Priority Queue for a given Problem														

CIE Assessment Pattern (50 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	-	-
L3	Apply	5	5	5
L4	Analyze	5	5	5
L5	Evaluate	5	5	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	--

Suggested Learning Resources:**Text Books:**

- 1) Horowitz, Sahni and Anderson-Freed, "Fundamentals of Data Structures in C", Universities Press, Second Edition, ISBN: 9788173716058
- 2) Richard F Gilberg and Behrouz A Forouzan, "Data Structures – A Pseudo code Approach with C", Cengage Learning, Second edition, Fifth Indian Reprint, 2015, ISBN: 9788131503140

Reference Books:

- 1) Aaron M Tenenbaum, Yedidyah Langsam and Moshe J Augenstein, "Data Structures Using C", Pearson India Education Services Pvt. Ltd., ISBN: 9789332543546

Web links and Video Lectures (e-Resources):

- https://onlinecourses.swayam2.ac.in/cec19_cs04/preview
- <https://www.iitgoa.ac.in/~sreejithav/20Aug/cs220.html>
- <https://www.youtube.com/watch?v=WprjBK0p6rw>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Organizing Group wise discussions on applications of data structures and algorithms
 - Seminars

ADVANCED DATA STRUCTURES LAB															
Course Code	22CEL33										CIE Marks	50			
L:T:P:S	0:0:1:0										SEE Marks	50			
Hrs / Week	2										Total Marks	100			
Credits	01										Exam Hours	03			
Course outcomes:															
At the end of the course, the student will be able to:															
22CEL33.1	Apply Data structure techniques to solve the problem														
22CEL33.2	Analyse the primitive operations of linear Data Structures														
22CEL33.3	Evaluate the primitive operations of nonlinear data structures														
22CEL33.4	Modify the Program to improve the efficiency of Non-linear Data Structures														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEL33.1	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEL33.2	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEL33.3	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEL33.4	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
Pgm. No.	List of Programs											Hours	COs		
PART-A															
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.											2	22CEL33.1 22CEL33.2 22CEL33.4		
2	Develop a program to convert INFIX notation to POSTFIX											2	22CEL33.1 22CEL33.2		
3	Develop a program to Evaluate POSTFIX Expressions											2	22CEL33.1 22CEL33.2		
4	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											2	22CEL33.1 22CEL33.3 22CEL33.4		
5	Develop a program for adding two polynomials using Linked List											2	22CEL33.1 22CEL33.3 22CEL33.4		
6	Develop a C program for solving Josephus problem using Linked List											2	22CEL33.1 22CEL33.3 22CEL33.4		
PART-B															
7	Develop a program to perform insertion, deletion and traversal of a binary search tree											2	22CEL33.1 22CEL33.3 22CEL33.4		
8	Develop a program to perform insertion, deletion and traversal of AVL Trees											2	22CEL33.1 22CEL33.3 22CEL33.4		
9	Develop a program to implement BFS traversal of graph												22CEL33.1 22CEL33.3 22CEL33.4		
10	Develop a program to implement Single Source Shortest Path using Bellman Ford Algorithm.											2	22CEL33.1 22CEL33.3 22CEL33.4		

11	Develop a program to implement Primitive operation of Hashing	2	22CEL33.1 22CEL33.3 22CEL33.4
12	Develop a program to implement Binomial Heap	2	22CEL33.1 22CEL33.3 22CEL33.4

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

- <https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html>
- <https://cse01-iiith.vlabs.ac.in/List%20of%20experiments.html>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	5
L3	Apply	5	10
L4	Analyze	10	10
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	10
L4	Analyze	20
L5	Evaluate	15
L6	Create	-

Suggested Learning Resources:

Web links and e-learning resources:

- 1) <https://www.emertxe.com/embedded-systems/data-structures/ds-projects/https://www.youtube.com/watch?v=MJd8KrbxYv4>

LINUX SYSTEM PROGRAMMING														
Course Code	22CEE341							CIE Marks			50			
L: T: P: S	2:0:1:0							SEE Marks			50			
Hrs / Week	2+2							Total Marks			100			
Credits	03							Exam Hours			03			
Course outcomes:														
At the end of the course, the student will be able to:														
22CEE341.1	Ability to write shell programming using Linux Commands (Utilities).													
22CEE341.2	Apply the Knowledge of Linux Utilities to create File systems and Directories and how to operate on them.													
22CEE341.3	Understand the Linux commands to search and solve regular expression (RegEx)													
22CEE341.4	Create Child process by using System calls													
22CEE341.5	Analyze the process concepts and Inter process communication in Linux													
22CEE341.6	Develop programs using Linux and shell (bash) to solve problems related to IT industry.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CEE341.1	3	3	3	-	-	-	-	-	-	-	-	2	3	3
22CEE341.2	3	3	3	-	-	-	-	-	-	-	-	2	3	3
22CEE341.3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
22CEE341.4	3	3	3	-	-	-	-	-	-	-	-	2	3	3
22CEE341.5	3	3	3	-	-	-	-	-	-	-	-	2	3	3
22CEE341.6	3	3	3	-	-	-	-	-	-	-	-	2	3	3
MODULE-1 BASICS OF LINUX AND SHELL PROGRAMMING 22CEE341.1 8 Hours														
Introduction to Linux -Features of Linux Operating System, Shell – Types of Shells, Process, Basic Utility Commands - cd, echo, Pipeline, chmod, Running your first shell program														
Laboratory Component:														
1. Write a Shell Script that accepts a file name, starting and ending line numbers as arguments and displays all lines between the given line numbers.														
2. Write a shell script that deletes all lines containing the specified word in one or more files supplied as arguments to it.														
3. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.														
Text Book	Text Book 1 - Chapter 1, 2													
MODULE-2 FILES ND DIRECTORY 22CEE341.2 8 Hours														
Introduction to LINUX file system, inode, File Types, File Attributes, Application program Interface to Files, LINUX kernel support for files														
Linux Commands for navigating in the file system, creation deletion, copying, renaming, df, du, mount commands														
Laboratory Component: Write a shell script to list all of the directory files in a directory														
1. Write a shell script to find factorial of a given number														
2. write an awk script to count number of lines in a file that does not contain vowel AND to find the no of characters, words and lines in a file														
Text Book	Text Book 1 – Chapter 3													
MODULE-3 REGULAR EXPRESSIONS 22CEE341.3 8 Hours														
Commands like ls, cat, cd, cp, mv, rm, mkdir, and rmdir etc.														
Filtering using sort, tr, uniq, nl, grep – searching for a pattern, grep options, regular expressions, egrep and fgrep														
Laboratory Component:														
1. Implement in c language the following Unix commands using system calls a) cat b) ls c) mv														
2. Write a C program that takes one or more file/directory names as command line input and reports following information a) File Type b) Number of Links c) Time of last Access d) Read, write and execute permissions														
3. Write a C program to list every file in directory, its inode number and file name														
Text Book	Text Book 1													

MODULE-4	CHILD PROCESS	22CEE341.4	8 Hours	
Child Process – Creation, termination- Zombie process, Orphan Process, running jobs in background, nohup, job execution with low priority-nice, schedule execution of one or more command at specified time-at and batch,run jobs periodically- cron introduction to fork, vfork, exit, wait, waitpid, exec and sleep system calls				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Write a C program to create child process and allow parent process to display “parent” and the child to display “child” on the screen 2. Write a C program to create zombie process 3. Write a C program to illustrate how an orphan process is created 				
Text Book	Text Book 1 – Chapter 11			
MODULE-5	INTER PROCESS COMMUNICATION	22CEE341A.5 22CEE341A.6	8 Hours	
Inter Process Communication in Linux -Named pipes, shared memory, message queue, signal, producer – consumer problem, client server UNIX sockets				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Write a C program that illustrate communication between two unrelated process using named pipes 2. Write a C program that receives a message from message queue and display them 3. Write a C program to allow cooperating process to lock a resource for exclusive use (using semaphore) 4. Write a C program that illustrate the suspending and resuming process using signal 53-56 5. Write a C program that implements Producer-Consumer system with two process using semaphore 6. Write client server programs using c for interaction between server and client process using Unix Domain sockets 				
Text Book	Text Book 2 – Chapter 9			
CIE Assessment Pattern (50 Marks – Theory and Lab)				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	5	-	-
L2	Understand	5	-	5
L3	Apply	5	-	5
L4	Analyze	5	5	5
L5	Evaluate	5	-	5
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks – Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	10		
L4	Analyze	10		
L5	Evaluate	10		
L6	Create	--		
Suggested Learning Resources:				
Text Books:				
<ol style="list-style-type: none"> 1) Beginning Linux Programming, Neil Mathew, Richard Stones, 4th Edition, Wiley Publishing Inc. ISBN 9780470147627 2) UNIX and SHELL Programming , Richard F Gilberg and Behrouz A Forouzan, 15th impression, 2015, Cengage Learning, ISBN 978-0534951597 				
Web links and Video Lectures (e-Resources):				
<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=ebHX9c75H8I • https://www.youtube.com/watch?v=bz0ZCUv5rYo • https://archive.nptel.ac.in/courses/117/106/117106113/ • https://www.udemy.com/course/bash-scripting-course/ 				
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning				
<ul style="list-style-type: none"> • Video demonstration of latest trends in programming • Contents related activities (Activity-based discussions) <ul style="list-style-type: none"> ➤ For active participation of students, instruct the students to prepare Flowcharts and Handout 				

PHP PROGRAMMING															
Course Code	22CEE342					CIE Marks	50								
L:T:P:S	2:0:1:0					SEE Marks	50								
Hrs / Week	2+2					Total Marks	100								
Credits	03					Exam Hours	03								
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE342.1	Analyse PHP scripts and determine their behaviour.														
22CEE342.2	Construct PHP scripts to create dynamic web content.														
22CEE342.3	Create PHP scripts capable of inserting and modifying data in a MySQL database.														
22CEE342.4	Design web pages with the ability to retrieve and present data from a MySQL database														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE342.1	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
22CEE342.2	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
22CEE342.3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
22CEE342.4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
MODULE-1	INTRODUCTION OF WEB & PHP					22CEE342.1			8 Hours						
Introduction of Web & PHP: What is PHP?, The history of PHP, Why choose PHP, Installation overview, First Steps, Embedding PHP code on a page, Outputting dynamic text, The operational trail, Inserting code comments															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Write a Program in PHP to print sum of two numbers. 2. Write a Program in PHP to print even number. 3. Write a Program in PHP to print odd number 															
Text Book		Text Book 2, part1-chapter 1, chapter2													
MODULE-2	EXPLORING DATA TYPES					22CEE342.1			8 Hours						
Variables, Strings, String functions, Numbers part one: Integers, Numbers part two: Floating points, Arrays, Associative arrays, Array functions, Booleans, NULL and empty, Type juggling and casting, Constants															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Write a Program in PHP to display reverse of a number. 2. Write a Program in PHP to display Fibonacci series 3. Write a program in PHP to display reverse of a string 															
Text Book		Text Book 2, part1-chapter2, chapter 5, chapter4													
MODULE-3	CONTROL STRUCTURES					22CEE342.1, 22CEE342.2, 22CEE342.3			8 Hours						
Control Structures: Logical Expressions, If Statements, Else and elseif statements, Logical operators, Switch statements Control Structures: Loops, While-loops, Forloops, Foreach loops, Continue, Break, Understanding array pointers															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Write a program in PHP to search a specified string. 2. Write a program in PHP to check perfect number. 3. Write a program in PHP to swap two numbers. 															
Self-study / Case Study / Applications		STUDY WORKING WITH FILES AND DIRECTORIES													
Text Book		Text Book 2, chapter3													
MODULE-4	USER DEFINED FUNCTIONS AND DEBUGGING					22CEE342.2			8 Hours						
User-Defined Functions: Defining functions, Function arguments, returning values from a function, Multiple return values, Scope and global variables, setting default argument values, debugging: Common problems, Warnings and errors, Debugging and troubleshooting															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Write a program to return value from a function 2. Write a program to set default argument value. 3. Write a code to show debugging in PHP. 															

Self-study / Case Study / Applications	USING PHP TO ACCESS MYSQL		
Text Book	Text Book 2, chapter-5		
MODULE-5	BUILDING WEB PAGES IN PHP	22CEE342.1, 22CEE342.2, 22CEE342.3, 22CEE342.4	8 Hours

Links and URLs, Using GET values, Encoding GET values, Encoding for HTML, Including and requiring files, Modifying headers, Page redirection, Output buffering

Laboratory Component:

1. Write a program to perform PHP form validation.
2. Write a program to create student registration form.
3. Write a program to create a login page.

Self-study / Case Study / Applications	Working with Forms and Form Data
Text Book	Text Book 2, chapter8

CIE Assessment Pattern (50 Marks - Theory and Lab)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember		-	-
L2	Understand	5	5	-
L3	Apply	5	-	10
L4	Analyze	10	-	10
L5	Evaluate	5	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	--

Suggested Learning Resources:

Text Books:

- 1) Alan Forbes, "The Joy of PHP Programming: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL", PUBLISHER: PLUM ISLAND, FIFTH EDITION, ISBN: 9780596902817
- 2) Vikram Vaswani, "PHP: A Beginner's Guide", PUBLISHER: McGraw-Hill Education, FIFTH EDITION, ISBN: 97058602817.

Reference Books:

- 1) Kevin Tatroe, Peter MacIntyre & Rasmus Lerdorf Foreword by Michael Bourque, "Programming PHP: Creating Dynamic Web Pages", PUBLISHER: O'Reilly, THIRD EDITION, ISBN9781596002816.
- 2) Laura Thompson and Luke Welling, "PHP and MySQL Web Development" PUBLISHER: Addison Wesley, FIFTH EDITION, ISBN 978059617817.

Web links and Video Lectures (e-Resources):

- <https://www.w3schools.com/php/>
- <https://www.tutorialspoint.com/php/index.htm>
- <https://www.javatpoint.com/php-tutorial>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- **Contents related activities (Activity-based discussions)**
 - **For active participation of students, instruct the students to prepare Flowcharts and Handouts**
 - **Organizing Group wise discussions on issues**
 - **Seminars**

PYTHON FOR DATA ANALYTICS														
Course Code	22CEE343							CIE Marks	50					
L:T:P:S	2:0:1:0							SEE Marks	50					
Hrs / Week	2+2							Total Marks	100					
Credits	03							Exam Hours	03					
Course outcomes:														
At the end of the course, the student will be able to:														
22CEE343.1	Understand about the basics and need for Data Analytics													
22CEE343.2	Outline the basics of python for performing data analysis													
22CEE343.3	Applying the preprocessing techniques, processing and data visualization to get insights from data.													
22CEE343.4	Use different python packages for mathematical, scientific applications and for web data analysis.													
22CEE343.5	Show the model for data analysis and evaluate the model performance.													
22CEE343.6	Develop programs using python and do the data analysis for various problems.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CEE343.1	3	3	3	-	3	-	-	-	-	-	-	2	3	3
22CEE343.2	3	3	3	-	3	-	-	-	-	-	-	2	3	3
22CEE343.3	3	3	3	-	3	-	-	-	-	-	-	2	3	3
22CEE343.4	3	3	3	-	3	-	-	-	-	-	-	2	3	3
22CEE343.5	3	3	3	-	3	-	-	-	-	-	-	2	3	3
22CEE343.6	3	3	3	-	3	-	-	-	-	-	-	2	3	3
MODULE-1	Python Fundamentals for Data Analysis							22CEE343.1	8 Hours					
Python data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user-defined Modules and Package, File handling in python														
Laboratory Component:														
1. Python Program to Check if a Number is Positive, Negative or 0														
2. Write a program Python Program to Check Leap Year														
3. Write a program to perform the operations (i) Open a file (ii) Read and Write & (iii) Close a file.														
Text Book	Text Book 2 - Chapter 4,5,9													
MODULE-2	Introduction to Data Understanding and Preprocessing							22CEE343.2	8 Hours					
Knowledge domains of Data Analysis, understanding structured and unstructured data, Data Analysis process, Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values														
Laboratory Component:														
1. Write a program to process an unstructured data.														
2. Generation of Dataset for classification/regression problem														
3. Program to handle missing values														
Text Book	Text Book 1 - Chapter 3, Text Book 3: Chapter 5													
MODULE-3	Data Processing and Visualization							22CEE343.3	8 Hours					
Data Formatting, Exploratory Data Analysis, Filtering and hierarchical indexing using Pandas. Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps														
Laboratory Component:														
1. Write a program in python for Filtering on Index Levels in a Pandas DataFrame														
2. Write python program for seaborn plotting functions														
3. Write a program for data visualizations using Line Charts, Bar Graphs, Histograms, Scatter Plots														
Text Book	Text Book 3: Chapter 5, 8													

MODULE-4	Mathematical and Scientific applications for Data Analysis	22CEE343.4	8 Hours	
Numpy and Scipy Package, Understanding and creating N-dimensional arrays, Basic indexing and slicing, Boolean indexing, Fancy indexing, Universal functions, Data processing using arrays, File input and output with arrays				
Laboratory Component:				
1. Write a program for multidimensional array for matrix multiplication and addition				
2. Write a program to perform Boolean and Fancy indexing.				
3. Write a program to perform reading and writing in files using Numpy				
Text Book	Text Book 3 – Chapter 1, 4			
MODULE-5	Analysing Web Data	22CEE343.5 22CEE343.6	8 Hours	
Data wrangling, Combining and merging data sets, Reshaping and pivoting, Data transformation, String Manipulation, case study for web scrapping.				
Laboratory Component:				
1. Perform essential data wrangling functions in python				
2. Perform reshaping, pivoting and handling missing values				
3. Perform scrapping and parsing text from websites				
Text Book	Text Book 3 – Chapter 7			
CIE Assessment Pattern (50 Marks - Theory and Lab)				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	-	-	-
L2	Understand	5	5	-
L3	Apply	5	-	10
L4	Analyze	10	-	10
L5	Evaluate	5	-	-
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks - Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	10		
L4	Analyze	10		
L5	Evaluate	10		
L6	Create	--		
Suggested Learning Resources:				
Text Books:				
1) David Ascher and Mark Lutz, Learning Python, Publisher O'Reilly Media.,ISBN: 9780596002817.				
2) Reema Thareja, "Python Programming using Problem Solving approach",Oxford University press,ISBN: 13: 978-0199480173				
3) Wes Mckinney "Python for Data Analysis", First edition, Publisher O'Reilly , ISBN: 9781449319793				
Reference Books:				
1. Allen Downey ,Jeffrey Elkner ,Chris Meyers,: Learning with Python, Dreamtech Press, ISBN: 9781449319793.				
2. David Taieb, "Data Analysis with Python: A Modern Approach " 1st Edition, Packt Publishing, ISBN: 9781449319793.				
Web links and Video Lectures (e-Resources):				
<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=r-uOLxNrNk8 • https://www.codecademy.com/catalog/language/python • https://www.youtube.com/watch?v=kqtD5dpm9C8 				
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning				
<ul style="list-style-type: none"> • Contents related activities (Activity-based discussions) <ul style="list-style-type: none"> ➤ For active participation of students, instruct the students to prepare Flowcharts and Handouts ➤ Organizing Group wise discussions on issues 				

PERL PROGRAMMING															
Course Code	22CEE344								CIE Marks	50					
L: T: P: S	2:0:1:0								SEE Marks	50					
Hrs / Week	2+2								Total Marks	100					
Credits	03								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE344.1	Describe about the basics of Perl Programming Language														
22CEE344.2	Understand the concepts of Loops and 'Format' template used in Perl Programming Language.														
22CEE344.3	Analyze the working of File and directories operation in Perl Programming Language.														
22CEE344.4	Examine the text with the help of Regular expressions.														
22CEE344.5	Apply Perl's advanced concepts for backend connections, scripting tool for web servers.														
22CEE344.6	Use the concepts of Perl programming language to build a software solution.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE344.1	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE344.2	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE344.3	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE344.4	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE344.5	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE344.6	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
MODULE-1	INTRODUCTION OF PERL PROGRAMMING								22CEE344.1				8 Hours		
Data Types – Scalars, Arrays, Hashes; variables & Backslash Interpolation, Commands, Perl Operators, Sub routines in Perl Programming															
Laboratory Component: (minimum 3 experiments / programs)															
1. Write a Perl Program to take two user String inputs and concatenate them with the help of a subroutine.															
2. Write a Perl Program to evaluate the arithmetic expressions.															
3. Write a Perl Program to Store the Days of the Week in Arrays and find the working days.															
Text Book	Text Book 1: Chapter 1, 2, 3,5														
MODULE-2	LOOPS AND FORMATS								22CEE344.2				8 Hours		
Loops – if, while, do while, until, for, foreach, nested loops. Format															
Laboratory Component:															
1. Write a Perl Program to Count the frequency of base G in a given DNA sequence.															
2. Write a Perl Program to print the prime numbers using while loop.															
3. Write a Perl Program to print the person eligibility for personal loan using nested loops.															
Self-study / Case Study / Applications	Create a Student's Feedback filling form with the help of PERL														
Text Book	Text Book 1: Chapter 4														
MODULE-3	FILE AND DIRECTORIES								22CEE344.3, 22CEE344.4				8 Hours		
Opening and Closing Files, reading from and writing to File, copying file, file information, working with directories.															
Laboratory Component:															
1. Read DNA sequences from 'DNase' input file and print to 'DNaseqRC' output file															
2. Print a list of all Perl programs.															
Text Book	Text Book 2: Chapter 8														
MODULE-4	REGULAR EXPRESSIONS								22CEE344.5				8 Hours		
Match Operator modifiers, regular expression modifiers, substitution operator, translation operator, \G Assertion															
Laboratory Component:															
1. For a given DNA sequence find its RNA transcript, find its reverse complement and															
2. For a given DNA sequence find its RNA transcript check if it contains a start codon															
3. Print the characters of the DNA sequence each in a new line.															
Text Book	Text Book 2: Chapter 7														

Self-study / Case Study / Applications	Create a form Validation for a course registration which should contain the following entries: USN, Name, Course, DOB, Course Slot.
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MODULE-5 **ADVANCED PERL** **22CEE344.6** **8 Hours**

Object oriented programming, Packages and Modules, Database actions, CGI programming,

Laboratory Component:

1. Connect MYSQL database with Perl and create an employee table. Select data from the employees table and display the last names, first names and extensions of employees
2. Use CGI and write a Perl script to pass information to the web server using get and post methods.
3. Create a Person class and display first name and Last name using OOP concepts using Perl.

Text Book Text Book 2: Chapter 16

CIE Assessment Pattern (50 Marks - Theory and Lab)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	15	20
L1	Remember	5	-	-
L2	Understand	5	-	-
L3	Apply	5	5	10
L4	Analyze	5	5	10
L5	Evaluate	5	5	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	--

Suggested Learning Resources:

Text Books:

- 1) Think Perl 6: How to Think Like a Computer Scientist – Allen B. Downey and Laurent Rosenfeld – O'REILLY publications – 2017 edition ISBN 9781491980552
- 2) Learning Perl: Making Easy Things Easy and Hard Things Possible - chwartz, Randal, foy, brian, Phoenix, Tom O'Reilly Media- 8th Edition ISBN: 9781491954324.

Web links and Video Lectures (e-Resources):

- http://steipe.biochemistry.utoronto.ca/abc/index.php/Perl_programming_exercises_1
- https://onlinecourses.swyam2.ac.in/aic20_sp31/preview
- <https://www.perltutorial.org/perl-dbi/>
- https://ia600805.us.archive.org/2/items/LearningPerl7thEdition/Learning_Perl_7th_Edition.pdf
- <https://greentepress.com/thinkperl6/thinkperl6.pdf>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- For active participation of students, instruct the students to prepare Flowcharts and Handouts

ADVANCE OFFICE AUTOMATION															
Course Code	22CEE351								CIE Marks	50					
L:T:P:S	0:0:1:0								SEE Marks	50					
Hrs / Week	2								Total Marks	100					
Credits	01								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE351.1	Understand the fundamentals of MS. Word														
22CEE351.2	Analyze the concepts of MS. Excel to perform accounting operations														
22CEE351.3	Develop a PowerPoint presentation from the requirements specified for a particular problem.														
22CEE351.4	Design a PowerPoint presentation by inserting background images, Slide transition														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE351.1	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
22CEE351.2	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
22CEE351.3	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
22CEE351.4	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
Prerequisite Experiments / Programs / Demo															
Pgm. No.	List of Programs											Hours	COs		
Prerequisite Experiments / Programs / Demo															
	<ul style="list-style-type: none"> Basic concepts of MS. Word, MS. PowerPoint, MS. EXCEL 											2	NA		
PART-A															
1	Create a Mathematical question paper using, at least five equations <ol style="list-style-type: none"> With fractions, exponents, summation function With at least one „m*n“ matrix Basic mathematical and geometric operators. Use proper text formatting, page color and page border. 											2	22CEE351.1		
2	Create a flowchart using, <ol style="list-style-type: none"> Proper shapes like ellipse, arrows, rectangle, and parallelogram. Use grouping to group all the parts of the flowchart into one single object. 											2	22CEE351.1		
3	Create a letter, which must be sent to multiple recipients. <ol style="list-style-type: none"> Use Mail-Merge to create the recipient list. Use exceed sheet to enter the recipient. Start the mail merge using letter and directory format. State the difference 											2	22CEE351.1		
4	Create a newsletter Features to be covered: -Newspaper columns, Images from files and clipart, Drawing tool bar and Word Art, Formatting Images, Textboxes and Paragraphs											2	22CEE351.1		
5	Create a table “Student result” with following conditions. <ol style="list-style-type: none"> The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total, average and result with manual entry. Use formulas for total and average. Find the name of the students who has secured the highest and lowest marks. Round the average to the nearest highest integer and lowest integer (use ceiling and floor function respectively). 											2	22CEE351.2		
6	Do as directed Create a notepad file as per the following fields											2	22CEE351.2		

	<table border="1"> <tr> <td>Slno</td> <td>name</td> <td>th1</td> <td>th2</td> <td>th3</td> <td>th4</td> <td>th5</td> <td>total</td> <td>%</td> <td>grade</td> </tr> </table> <p>Import this notepad file into excel sheet using „data from text“ option. Grade is calculated as, i. If %>=90, then grade A ii. If %>=80 and <90, then grade B iii. If %>=70 and <80, then grade C iv. If %>=60 and <70, then grade D v. If %<60, then grade F</p>	Slno	name	th1	th2	th3	th4	th5	total	%	grade		
Slno	name	th1	th2	th3	th4	th5	total	%	grade				

PART-B

7	<p>Create a sales table for three items purchased in past three consecutive years and perform the following operations</p> <ol style="list-style-type: none"> Draw the bar-graph to compare the sales of the three items for four years using insert option. Draw a line-graph to compare the sales of three items for four years using insert option. Draw different pie-charts for the given data using insert option. Use condition, to highlight all the cells having value >=1000 with red color (use conditional formatting). 	2	22CEE351.2
8	Create a Cricket Score Card- Features to be covered: -PivotTables, Interactive Buttons, Importing Data, Data Protection, Data Validation	2	22CEE351.2
9	<p>Create a power-point presentation with minimum 10 slides</p> <ol style="list-style-type: none"> Use word art to write the heading for each slides. Insert at least one clip-art, one picture Insert at least one audio and one video Hide at least two slides 	2	22CEE351.3, 22CEE351.4
10	<p>Create a power-point presentation with minimum 5 slides</p> <ol style="list-style-type: none"> Use custom animation option to animate the text; the text must move left to right one line at a time. Use proper transition for the slides. 	2	22CEE351.3, 22CEE351.4
11	Create a slide show presentation for a seminar.	2	22CEE351.3, 22CEE351.4
12	Use bar chart (X-axis: Semester, Y-axis: % marks) for 6 subjects.	2	22CEE351.3, 22CEE351.4

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

- <https://partner.microsoft.com/en-in/training/technical-training-webinars-virtual-labs>
- <https://www.dbamantra.com/how-to-use-microsoft-virtual-labs-for-practical-implementation/>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	5
L3	Apply	10	10
L4	Analyze	-	5
L5	Evaluate	10	10
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:**Reference Books:**

- 1) Comdex Information Technology course toolkit by Vikas Gupta, WILEY Dreamtech, 2005
- 2) Comdex 14-1in-1 Computer course Kit by Vikas Gupta, published by Dream Tech
- 3) The Complete Computer upgrade and repair book, 3rd edition by Cheryl A Schmidt, WILEY Dreamtech

GOLANG PROGRAMMING

Course Code	22CEE352	CIE Marks	50
L:T:P:S	0:0:1:0	SEE Marks	50
Hrs / Week	2	Total Marks	100
Credits	01	Exam Hours	03

Course outcomes:

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

22CEL352.1	Understand the basics of Go programming language
22CEL352.2	Analyze the control structure of Go programming language
22CEL352.3	Evaluate the concept of the array, slice array and Map data structures
22CEL352.4	Examine the concepts of functions, struct and interface in Go programming language

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CEL352.1	3	3	3	-	2	-	-	-	-	-	-	2	3	3
22CEL352.2	3	3	3	-	2	-	-	-	-	-	-	2	3	3
22CEL352.3	3	3	3	-	2	-	-	-	-	-	-	2	3	3
22CEL352.4	3	3	3	-	2	-	-	-	-	-	-	2	3	3

Pgm. No.	List of Programs	Hours	COs
PART-A			
1	Write a Program to print a message (without including whitespace or newline) given by the user in the console as input.	2	22CEL352.1 22CEL352.2
2	Write a program which uses all kinds of data types and in-built functions for manipulating them, used in golang.	2	22CEL352.1 22CEL352.2
3	Write a program to perform various arithmetic operations and display their result.	2	22CEL352.2
4	Write a program to print natural numbers using for loop	2	22CEL352.2
5	Write a program to print the day of the week using switch case with fallthrough.	2	22CEL352.1 22CEL352.2
6	Write a program to assign grades (A, B, C) based on marks obtained by a student. a) if the percentage is above 90, assign grade A b) if the percentage is above 75, assign grade B c) if the percentage is above 65, assign grade C	2	22CEL352.2
PART-B			
7	Write a Program to copy the marks value of one student to the other with the help of pointer.	2	22CEL352.2 22CEL352.3
8	Write a Program to print the highest of n numbers using function.	2	22CEL352.2
9	Write a program to create 2 slices for odd and even numbers from 1- 10 and append both the slices and display the prime numbers alone.	2	22CEL352.3
10	Write a program to create a shape structure as an interface including some functions which is implemented by shapes like rectangle, square.	2	22CEL352.4
11	Write a program to create a channel in golang to send and receive data.	2	22CEL352.4
12	Write a program to create multiple channel and select any one to communicate using select statement	2	22CEL352.4

PART-C

Beyond Syllabus Virtual Lab Content
(To be done during Lab but not to be included for CIE or SEE)

- Develop a Golang program to replace all occurrences of a word with another word in the given string.
<https://www.youtube.com/watch?v=vFqjpJfCG6Q>
- Develop a calculator program using switch cases in Golang. <https://www.youtube.com/watch?v=ca8xBxKWXsM>
- Develop bubble sort implementation in Golang. <https://www.youtube.com/watch?v=98yDJ5vao5Q>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	5
L3	Apply	5	10
L4	Analyze	10	10
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:**Web links and e- learning resources:**

- 2) <https://www.youtube.com/watch?v=YS4e4q9oBaU>
- 3) <https://www.youtube.com/watch?v=yyUHQIec83I>
- 4) <https://www.youtube.com/watch?v=8B00xg-Ujv0>

RUBY PROGRAMMING															
Course Code	22CEE353								CIE Marks	50					
L:T:P:S	0:0:1:0								SEE Marks	50					
Hrs / Week	2								Total Marks	100					
Credits	01								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEL353.1	Understand the ruby scripting language in detail.														
22CEL353.2	Conduct experiments regarding mathematical functions using ruby.														
22CEL353.3	Analyse the features of ruby scripting language over others.														
22CEL353.4	Create an effective report based on experiments														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	
22CEL353.1	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
22CEL353.2	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
22CEL353.3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
22CEL353.4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	
Pgm. No.	List of Programs											Hours	COs		
PART-A															
1	Write a ruby script to create a new string which is n copies of a given string where n is a non-negative integer											2	22CEL353.1 22CEL353.2		
2	Write a ruby script which accepts the radius of a circle from the user and compute the parameter and area											2	22CEL353.1 22CEL353.2		
3	Write a ruby script which accepts the user's first and last name and print them in reverse order with space between them											2	22CEL353.1 22CEL353.2		
4	Write a ruby script to accept a filename from the user print the extension of that.											2	22CEL353.1 22CEL353.2		
5	Write a ruby script to find the greatest of three numbers.											2	22CEL353.1 22CEL353.2		
6	Write a ruby script to find the greatest of 3 numbers.											2	22CEL353.1 22CEL353.2 22CEL353.3		
PART-B															
7	Write a ruby script to check two integers and return true if one of them is 20 otherwise return their sum.											2	22CEL353.1 22CEL353.2 22CEL353.3		
8	Write a ruby script to check 2 temperatures and return true if one is less than 0											2	22CEL353.2		
9	Write a ruby script to find the factorial of a number											2	22CEL353.3		
10	Write a ruby script to retrieve the total marks where subject name and marks of a student stored in a hash.											2	22CEL353.3		
11	Write a ruby script to copy the content of 1 string to the other.											2	22CEL353.4		
12	Write a ruby script to handle file operations.											2	22CEL353.4		
PART-C															
Beyond Syllabus Virtual Lab Content															
(To be done during Lab but not to be included for CIE or SEE)															
<ul style="list-style-type: none"> • Demonstrate Ruby/TK widget Classes <ul style="list-style-type: none"> a. https://www.tutorialspoint.com/ruby/ruby_tk_entry.htm • Demonstrate Standard Configuration Options <ul style="list-style-type: none"> a. https://www.academia.edu/37529638/MODULE_3_CONFIGURING_COMPUTER_SYSTEMS_AND_NETWORKS_Content_Standard_Performance_Standard 															

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	-
L3	Apply	10	10
L4	Analyze	5	10
L5	Evaluate	5	10
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:**Web links and e- learning resources:**

- 1) https://www.youtube.com/watch?v=t_ismWmdjY
- 2) <https://www.youtube.com/watch?v=8wZ2ZD--VTk>
- 3) <https://www.tutorialspoint.com/ruby/index.htm>

HASKELL PROGRAMMING														
Course Code	22CEE354				CIE Marks				50					
L:T:P:S	0:0:1:0				SEE Marks				50					
Hrs / Week	2				Total Marks				100					
Credits	01				Exam Hours				03					
Course outcomes:														
At the end of the course, the student will be able to:														
22CEL354.1	Understand the fundamentals of Haskell programming													
22CEL354.2	Infer the concepts of searching and sorting													
22CEL354.3	Apply the Knowledge of String.													
22CEL354.4	Design simple programs in Haskell making use of various Haskell functions.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
22CEL354.1	2	2	2	-	2	-	-	-	-	-	-	2	3	3
22CEL354.2	2	2	2	-	2	-	-	-	-	-	-	2	3	3
22CEL354.3	2	2	2	-	2	-	-	-	-	-	-	2	3	3
22CEL354.4	2	2	2	-	2	-	-	-	-	-	-	2	3	3
Pgm. No	List of Programs											Hours	COs	
Prerequisite Experiments / Programs / Demo														
	<ul style="list-style-type: none"> Basic concepts of HASKELL PROGRAMING 											-	NA	
PART-A														
1	Write a program to perform linear search using Haskell programming											2	22CEL354.1 22CEL354.2	
2	Write a program to perform Binary search using Haskell programming											2	22CEL354.1 22CEL354.2	
3	Write a Program to sort elements in lexicographical order using the function sort											2	22CEL354.1 22CEL354.2	
4	Write a Program to sort elements in lexicographical order using the custom sort											2	22CEL354.1 22CEL354.2	
5	Write a program to find the number is even or odd using mod function, even function, qout function.											2	22CEL354.1	
6	Write a program to print Fibonacci series.											2	22CEL354.1	
PART-B														
7	Write a program to reverse a string using Haskell.											2	22CEL354.3	
8	Write a program to find no is palindrome or not.											2	22CEL354.1 22CEL354.4	
9	Write a program to find number is Armstrong or not.											2	22CEL354.1, 22CEL354.4	
10	Write a program to swap two numbers using Haskell.											2	22CEL354.1, 22CEL354.4	
11	Write a program to swap two strings											2	22CEL354.3, 22CEE351.4	
12	Write a program to showcase polymorphism in Haskell.											2	22CEL354.4, 22CEL354.4	

PART-C
Beyond Syllabus Virtual Lab Content
(To be done during Lab but not to be included for CIE or SEE)

1. <https://www.haskell.org/>.
2. <https://gitlab.cecs.anu.edu.au/pages/2021-S2/courses/comp1100/labs/01/>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	5
L3	Apply	10	10
L4	Analyze	10	10
L5	Evaluate	-	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	10
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books:

- 1) Richard Bird, Introduction to Functional Programming using Haskell, second edition, Prentice-Hall International, 1998.
- 2) Graham Hutton, Programming in Haskell (2nd edition), Cambridge University Press, 2016.

BIO INSPIRED DESIGN AND INNOVATION												
Course Code	22BIK36							CIE Marks	50			
L:T:P:S	3:0:0:0							SEE Marks	50			
Hrs / Week	3							Total Marks	100			
Credits	03							Exam Hours	03			
Course outcomes: At the end of the course, the student will be able to:												
22BIK36.1	Verify the biomimetics principles in relation to the needs at that moment.											
22BIK36.2	Evaluate the Bio-material properties for health care applications.											
22BIK36.3	Investigate novel bioengineering initiatives by evaluating design and development principles.											
22BIK36.4	Investigate creative biobased solutions for socially vital issues with critical thought.											
22BIK36.5	Understand the bio computing optimization through research and experiential learning.											
22BIK36.6	Explain the fundamental biological ideas through pertinent industrial applications and case studies.											
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
22BIK36.1	3	3	3	3	2	-	2	-	1	-	-	2
22BIK36.2	3	3	3	3	2	-	2	-	1	-	-	2
22BIK36.3	3	3	3	3	2	-	2	-	1	-	-	2
22BIK36.4	3	3	3	3	2	-	2	-	1	-	-	2
22BIK36.5	3	3	3	3	2	-	2	-	1	-	-	2
22BIK36.6	3	3	3	3	2	-	2	-	1	-	-	2
MODULE-1	BIO-INSPIRED DESIGN AND ENGINEERING							22BIK36.1	8 Hours			
Bio-Inspired Engineering and design, History, Evolution, Basics of Biomimetics and other Disciplines, Rawling's Classifications, Need for Bio-Inspired Designs. Bio inspired Additive manufacturing techniques, (self-healing, self-assembly).												
Self-study / Case Study / Applications		Investigate the Challenges of Bio inspired design, Compare with traditional areas of science and engineering.										
Text Book		Text Book 1: 1.2, 1.3, 1.4, 1.13, 1.15, 1.16										
MODULE-2	BIO MATERIALS AND BIO HEALTHCARE DESIGN							22BIK36.2	8 Hours			
Biomaterials, Design of Forms- (Hexagonal unit cells, Intrinsic disorder, anisotropy), Design of materials- (Hierarchy, fracture tough materials, structural colours, Actuating Materials, Bio-Compatible Materials). Bio-Mechanics, Applications of Biomaterials and Bio systems in Health care design (Human Prosthetics, Parasitic Wasp-Inspired Needle, Octopus-Inspired Sucker for Tissue Grafting, Peacock-Inspired Biosensors, Gecko-Inspired Surgical Glue) Robotics, Marine and Aeronautical.												
Self-study / Case Study / Applications		Investigate Bio-Compatible alloys and polymers for human implants and health care applications.										
Text Book		Text Book 1: 2.2, 2.3, 2.4 to 2.15										
MODULE-3	BIO SUSTAINABLE DEVELOPMENT							22BIK36.3, 22BIK36.4	8 Hours			
Innovations in Energy (Termite mound inspired shopping malls), Innovations in Resource-Air (purification, filtration), Dew water collection systems, water purification, desalination, Management of spaces, designs for megastructures.												
Self-study / Case Study / Applications		Explore the Bio inspired environmental constructions and development.										
Text Book		Text Book 2: 3.1, 3.3, 3.5, 3.7, 3.10										
MODULE-4	BIO COMPUTING AND OPTIMISATION							22BIK36.5	8 Hours			
No Free Lunch Theorem, Bat Algorithm, Flower Pollination Algorithm, Genetic Algorithm- Crossover and Mutation Operations. Bio-Inspired Optimisation, Ant Colony Optimisation (ACO), Swam Intelligence- Particle Swam Optimisation (PSO).												
Self-study / Case Study / Applications		Scrutinize the Different types of Optimization techniques, genetic research.										

Text Book	Text Book 1: 6.1, 6.3, 6.5, 6.7, Text Book 2: 10.1, 10.3, 10.5, 10.7			
MODULE-5	APPLICATIONS OF BIO-INSPIRED INNOVATIONS	22BIK36.6	8 Hours	
Bioinspired innovations in- Automotive, Automation, Materials and Manufacturing, Sensors, Controllers, Communications, Healthcare, Agriculture, food production, and Sports, Environment infrastructure. Carbon Neutral Solutions (Coral Reefs, Eco-cements), Carbon Free Solutions (Lotus leaf inspired paints), eco-restorations (Eco-friendly pesticide).				
Self-study / Case Study / Applications	Survey on Bio inspired Innovations, design, applications and case studies of the same.			
Text Book	Text Book 2: 12.1 to 12.10			
CIE Assessment Pattern (50 Marks - Theory) -				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	-	-	-
L2	Understand	5	-	-
L3	Apply	10	5	5
L4	Analyze	5	5	5
L5	Evaluate	5	5	-
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks - Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	10		
L4	Analyze	10		
L5	Evaluate	10		
L6	Create	--		
Suggested Learning Resources:				
Text Books:				
1) Helena Hashemi Farzaneh, Udo Lindemann, A Practical Guide to Bio-inspired Design, Springer Vieweg, 1st edition 2019, ISBN-10 : 366257683X, ISBN-13 : 978-3662576830				
2) Torben A. Lenau, Akhlesh Lakhtakia, Biologically Inspired Design: A Primer (Synthesis Lectures on Engineering, Science, and Technology, Publisher: Morgan & Claypool Publishers, 2021, ISBN-10: 1636390471, ISBN-13: 978-1636390475				
Reference Books:				
1) French M, Invention and evolution: Design in Nature and Engineering, Publisher: Cambridge University Press, 2020				
2) Pan L., Pang S., Song T. and Gong F. eds, Bio-Inspired Computing: Theories and Applications, 15th International Conference, BIC-TA 2020, Qingdao, China, October 23-25, 2020, Revised Selected Papers (Vol. 1363). Springer Nature, 2021				
3) Wann D, Bio Logic: Designing with nature to Protect the Environment, Wiley Publisher, 1994				
Web links and Video Lectures (e-Resources):				
<ul style="list-style-type: none"> • https://onlinecourses.nptel.ac.in/noc22_ge24/preview • https://biodesign.berkeley.edu/bioinspired-design-course/ • https://www.youtube.com/watch?v=cwxXY9Qe8ss • https://www.youtube.com/watch?v=V2GvQXvjhLA • https://nsf-gov-resources.nsf.gov/2023-03/Bio-inspired%20Design%20Workshop%20Report%202232327%20October%202022%20Final.508.pdf 				
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning				
<ul style="list-style-type: none"> ➤ Presenting students with bio-inspired design challenges and asking them to come up with solutions. ➤ Create physical models or prototypes that mimic biological structures or functions. ➤ Organizing Group wise discussions on issues ➤ Seminars 				

SOCIAL CONNECT AND RESPONSIBILITY																									
Course Code	22SCK37						CIE Marks	50																	
L:T:P:S	0:0:1:0						SEE Marks	--																	
Hrs / Week	02						Total Marks	50																	
Credits	01						Exam Hours	02																	
Course outcomes: At the end of the course, the student will be able to:																									
22SCKX7.1	Communicate and connect to the surrounding																								
22SCKX7.2	Understand the needs and problems of the community and involve them in problem –solving																								
22SCKX7.3	Develop among themselves a sense of social & civic responsibility and utilize their knowledge in finding practical solutions to individual and community problems																								
22SCKX7.4	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes																								
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:																									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12													
22SCKX7.1	-	-	-	-	-	3	2	-	2	3	-	1													
22SCKX7.2	-	-	-	-	-	3	2	-	2	3	-	1													
22SCKX7.3	-	-	-	-	-	3	2	-	2	3	-	1													
22SCKX7.4	-	-	-	-	-	3	2	-	2	3	-	1													
MODULE-1	PLANTATION AND ADOPTION OF A TREE							22SCKX7.1, 22SCKX7.2		3 Hours															
Plantation of a tree that will be adopted for three years by a group of B. Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - - Objectives, Visit, case study, report, outcomes.																									
MODULE-2	HERITAGE WALK AND CRAFTS CORNER							22SCKX7.2, 22SCKX7.3		3 Hours															
Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms- Objectives, Visit, case study, report, outcomes.																									
MODULE-3	ORGANIC FARMING AND WASTE MANAGEMENT							22SCKX7.3, 22SCKX7.4		3 Hours															
Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus - Objectives, Visit, case study, report, outcomes.																									
MODULE-4	WATER CONSERVATION							22SCKX7.3, 22SCKX7.4		3 Hours															
Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices - Objectives, Visit, case study, report, outcomes.																									
MODULE-5	FOOD WALK							22SCKX7.4, 22SCKX7.1		3 Hours															
City's culinary practices, food lore, and indigenous materials of the region used in cooking - Objectives, Visit, case study, report, outcomes.																									
CIE Assessment Pattern (50 Marks – Activity based) –																									
<ul style="list-style-type: none"> Each module is evaluated as given below and 100 marks in scaled down to 50 as final marks. 																									
<table border="1"> <thead> <tr> <th>CIE component for each module</th> <th>Marks</th> </tr> </thead> <tbody> <tr> <td>Field Visit, Plan, Discussion</td> <td>10</td> </tr> <tr> <td>Commencement of activities and its progress</td> <td>20</td> </tr> <tr> <td>Case study-based Assessment Individual performance with report</td> <td>20</td> </tr> <tr> <td>Module wise study & its consolidation 5*5 = 25</td> <td>25</td> </tr> <tr> <td>Video based seminar for 10 minutes by each student at the end of semester with Report. Activities 1 to 5, 5*5 = 25</td> <td>25</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">100</td> </tr> </tbody> </table>												CIE component for each module	Marks	Field Visit, Plan, Discussion	10	Commencement of activities and its progress	20	Case study-based Assessment Individual performance with report	20	Module wise study & its consolidation 5*5 = 25	25	Video based seminar for 10 minutes by each student at the end of semester with Report. Activities 1 to 5, 5*5 = 25	25	Total	100
CIE component for each module	Marks																								
Field Visit, Plan, Discussion	10																								
Commencement of activities and its progress	20																								
Case study-based Assessment Individual performance with report	20																								
Module wise study & its consolidation 5*5 = 25	25																								
Video based seminar for 10 minutes by each student at the end of semester with Report. Activities 1 to 5, 5*5 = 25	25																								
Total	100																								
<ul style="list-style-type: none"> Implementation strategies of the project (NSS work). Individual student has to submit a final report which should be signed by NSS Officer, the HOD and Principal. 																									

- Finally, the consolidated marks sheet and the reports should be available in the department .

Activity-Based Learning / Practical Based learning

- Platform to connect to others and share the stories with others:
 - Jamming session
 - Open mic
 - Poetry
- Share the experience of Social Connect.
- Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

Pedagogy:

- The students will be divided into groups. Each group will be handled by faculty mentor.
- A total of 40 - 50 hrs engagement in the semester
- Faculty mentor will design the activities (particularly Jamming sessions, open mic and poetry)
- The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.
- The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.
- Students should present the progress of the activities as per the schedule in the prescribed practical session in the field.
- There should be positive progress in the vertical order for the benefit of society in general through activities.

Plan of Action:

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty mentor for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.
- Practice Session Description:
 - Lecture session in field to start activities
 - Students Presentation on Ideas
 - Commencement of activity and its progress
 - Execution of Activity
 - Case study-based Assessment, Individual performance
 - Sector/ Team wise study and its consolidation
 - Video based seminar for 10 minutes by each student at the end of semester with Report.

Sl No	Topic	Groupsize	Location	Activity execution	Reporting	Evaluation of the Topic
1.	Plantation and adoption of a tree	May be individual or team (3-5)	Farmers land/ parks / Villages / roadside/ community area / College campus	Site selection / Proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus
2.	Heritage walk and crafts corner	May be individual or team (3-5)	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations /Government Schemes	Site selection /Proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus

			officers/ campus			
3.	Organic farming and waste management	May be individual or team (3-5)	Farmers land / parks /Villages visits / roadside/ communityarea / College campus	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus
4.	Water conservation : Conservation techniques	May be individual or team (3-5)	Villages/ City Areas /Grama panchayat/ public associations/ Government Schemes officers / campus	site selection / proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus
5.	Food walk: Practices in society	May be individual or team (3-5)	Villages/ City Areas /Grama panchayat/ public associations/ Government Schemes officers/ campus	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus

BASIC APPLIED MATHEMATICS-I
(Common to all Branches)

Course Code	22DMAT31	CIE Marks	50
L:T:P:S	0:0:0:0	SEE Marks	--
Hrs. / Week	2	Total Marks	50
Credits	00	Exam Hours	--

Course outcomes:

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

22DMAT31.1	Know the principles of engineering mathematics through calculus
22DMAT31.2	Determine the power series expansion of a function
22DMAT31.3	Find the definite integrals with standard limits and also develop the ability to solve different types of differential equations
22DMAT31.4	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
22DMAT31.1	3	3	-	-	-	-	-	-	-	-	-	-
22DMAT31.2	3	3	-	-	-	-	-	-	-	-	-	-
22DMAT31.3	3	3	-	-	-	-	-	-	-	-	-	-
22DMAT31.4	3	3	-	-	-	-	-	-	-	-	-	-

MODULE-1 DIFFERENTIAL CALCULUS

22DMAT31.1 **8 Hours**
22DMAT31.2

Polar Curves-Problems on angle between the radius vector and tangent, Angle between two Curves-Problems, Pedal equation for polar Curves-Problems. Maclaurin's theorem for function of one variable (statement only)-Problems.

Text Book Text Book 1: 4.4, 4.7, 4.8, Text Book 2: 15.4

MODULE-2 PARTIAL DIFFERENTIATION

22DMAT31.1 **8 Hours**

Definition and Simple problems, Euler's theorem for Homogeneous function (NO Derivation and NO extended theorem Problems, Jacobians of order two - definition and problems.

Text Book Text Book 1: 5.4, 5.7,

MODULE-3 INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

22DMAT31.3 **8 Hours**

Problems on evaluation of $\sin nx$ and $\cos nx$ integrals with standard limits (0 to $\pi/2$). Solution of first order and first-degree differential equations-Variable separable, Linear and Exact differential equations.

Text Book Text Book 1: 6.2, 11.6, 11.9, 11.11, Text Book 2: 1.3, 1.4, 1.5

MODULE-4 LINEAR ALGEBRA-1

22DMAT31.4 **8 Hours**

Problems on rank of a matrix by elementary transformations, Solution of system of linear equations by Gauss elimination method-Problems.

Text Book Text Book 1: 2.7, 28.6, Text Book 2: 7.3, 7.4

MODULE-5 LINEAR ALGEBRA-2

22DMAT31.4 **8 Hours**

Linear transformation, Eigen values and Eigen Vectors of square matrix-Problems.

Text Book Text Book 1: 2.11, 2.13, Text Book 2: 7.9, 8.1.

CIE Assessment Pattern (50 X 2=100 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	5	-
L2	Understand	5	5	-
L3	Apply	10	5	10
L4	Analyze	2.5	-	-
L5	Evaluate	2.5	-	-
L6	Create	-	-	-

Suggested Learning Resources:

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232.

Reference Books:

- 1) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited,

Fourth Edition, 2017, ISBN: 9780070634190.

3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.

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

Web links and Video Lectures (e-Resources):

- 1) https://youtu.be/IUV0_Nj4d1s?si=eO3s7keCbCO1_jcz
- 2) <https://youtu.be/VzUcs7aiqgg?si=YLtTUGr4Xp88KGY3>
- 3) <https://youtu.be/LDBnS4c7YbA?si=udUOdJ-u0ZxFmBAW>
- 4) https://youtu.be/palSdK9P-ns?si=7A8_VSxEI4IGvksB
- 5) <https://youtu.be/Bw5yEqwMjQU?si=jzbnklZmVev1w8K2S>
- 6) https://youtu.be/LBqdGn1r_fQ?si=DWcAliFnosT7zikY
- 7) <https://youtu.be/N5YCGOyTSuU?si=Wsf75V5fkUpfVVxr>
- 8) <https://youtu.be/gd1FYn86P0c?si=7drzBEqVFSv6sQeZ>
- 9) <https://youtu.be/cSj82GG6MX4?si=4QN1DFXEqaJoUBn7>
- 10) <https://youtu.be/0c3yq9btr3A?si=jloz8eu5TgV7mh8G>
- 11) <https://youtu.be/PhfbEr2btGQ?si=HVk1uk65oHph0t8G>

Activity-Based Learning (Suggested Activities in Class)/Practical Based Learning:

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - Organizing Group wise discussions on related topics
 - Seminars

SEMESTER IV
(SYLLABUS)

DISCRETE MATHEMATICS AND GRAPH THEORY (Common to AIM, CEE, CSE, CDS, ISE)												
Course Code	22MAC41						CIE Marks				50	
L:T:P:S	3:0:0:0						SEE Marks				50	
Hrs. / Week	3						Total Marks				100	
Credits	03						Exam Hours				03	
Course outcomes: At the end of the course, the student will be able to:												
22MAC41.1	Explain the counting techniques and combinatorics by using the context of discrete probability.											
22MAC41.2	Illustrate the principle of Inclusion and Exclusion											
22MAC41.3	Apply Pigeon hole principle to solve real life problems.											
22MAC41.4	Solve the engineering problems involving relations and functions.											
22MAC41.5	Analyze the computer science problems by using graph theory techniques.											
22MAC41.6	Justify the arguments with propositional and predicate logic and from truth tables.											
Mapping of Course Outcomes to Program Outcomes:												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
22MAC41.1	3	3	-	-	-	-	-	-	-	-	-	-
22MAC41.2	3	3	-	-	-	-	-	-	-	-	-	-
22MAC41.3	3	3	-	-	-	-	-	-	-	-	-	-
22MAC41.4	3	3	-	-	-	-	-	-	-	-	-	-
22MAC41.5	3	3	-	-	-	-	-	-	-	-	-	-
22MAC41.6	3	3	-	-	-	-	-	-	-	-	-	-
MODULE-1	MATHEMATICAL LOGIC										22MAC41.1	8 Hours
Basic Connectives and Truth Tables, Tautology and Contradiction, Logic Equivalence, The Laws of Logic, Converse, Inverse and Contra positive, Logical Implication, Rules of Inference.												
Case Study	Case studies on roles of logic in specification of computation.											
Text Book	Text Book 1: 2.1, 2.2, 2.3.											
MODULE-2	PRINCIPLES OF COUNTING										22MAC41.2	8 Hours
Catalan Numbers, Ramsey Numbers, Stirling Numbers and Bell Numbers, The principle of Inclusion and Exclusion, Generalizations of the principle, Derangements, Rook-Polynomials, Arrangements with Forbidden Positions.												
Text Book	Text Book 1: 1.5, 8.1, 8.2, 8.3, 8.4, 8.5.											
MODULE-3	RELATIONS AND FUNCTIONS										22MAC41.3	8 Hours
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.												
Text Book	Text Book 1: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 7.4.											
MODULE-4	GRAPH THEORY										22MAC41.4	8 Hours
Graphs-Definitions and examples, Sub graphs, Walks, Paths, Circuits, Connectedness, Components, graph isomorphism, Euler graphs, Hamiltonian paths and cycles.												
Case Study	Case studies on Network Analysis.											
Text Book	Text Book 1: 11.1, 11.2, 11.3, 11.5. Text Book 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9.											
MODULE-5	TREES, CONNECTIVITY AND PLANARITY										22MAC41.5 22MAC41.6	8 Hours
Trees, Properties of trees, Rooted and binary trees. Spanning trees, cut sets, Properties of cut set, all cut sets, Fundamental circuits Network flows: Kruskal's algorithm, Planar graphs, Dual of planar graphs, Different representation of a planar graph.												
Case Study	Case studies on Social Network Analysis.											
Text Book	Text Book 1: 11.4, 12.1, 12.2, 12.3, 13.2, Text Book 2: 3.1, 3.5, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.2, 5.6, 5.7.											
CIE Assessment Pattern (50 Marks – Theory)												
RBT Levels		Marks Distribution										
		Test (s)	Qualitative Assessment (s)	MCQ's								
		25	15	10								
L1	Remember	5	5	-								
L2	Understand	5	5	-								
L3	Apply	10	5	10								
L4	Analyze	2.5	-	-								
L5	Evaluate	2.5	-	-								
L6	Create	-	-	-								

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:**Text Books:**

- 1) Ralph P. Grimaldi, Discrete and Combinatorial Mathematics-an applied introduction, Pearson Education, Fifth Edition, 2019, ISBN: 9789353433055.
- 2) Narsingh Deo, Graph Theory with Application to Engineering and Computer Science, Dover Publications Inc., First Edition, 2016, ISBN: 978-0486807935.

Reference Books:

- 1) Basavaraj S. Anami and Venakanna S. Madalli, Discrete Mathematics – A Concept based approach, Universities Press, 2016, ISBN: 9788173719998.
- 2) Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, McGraw Hill Education, Seventh Edition, 2017, ISBN: 9780070681880.
- 3) D.S. Malik and M.K. Sen, Discrete Mathematical Structures: Theory and Applications, Thomson, 2004. ISBN: 9780619212858.
- 4) Thomas Koshy, Discrete Mathematics with Applications, Elsevier, First Edition 2005, ISBN: 9788181478870.

Web links and Video Lectures (e-Resources):

- 1) <https://youtu.be/O4Qf0SQKkZw?si=1r9joVe2-rP04fCH>
- 2) https://youtu.be/Hbyj6vEi7fY?si=_GaCjUHBndV2MArP
- 3) https://youtu.be/7hLvm_4DNqs?si=viYHH_fZDZQ9Fmdw
- 4) https://youtu.be/7hLvm_4DNqs?si=viYHH_fZDZQ9Fmdw
- 5) https://youtu.be/6Z_eengdMVE?si=-ZlPy2xl18oMUwFR
- 6) <https://youtu.be/fwSiTaCs8KM?si=wpZcCEG-pNDuIPkS>
- 7) <https://youtu.be/iHC1ZdLdKjw?si=tuN-6pLqhMWPn4Mb>
- 8) https://youtu.be/auvGQCoYdu4?si=3ELSyG5g-475AN1_
- 9) https://youtu.be/GLHWih_RB38?si=FuoNQAzNR2IlypU0
- 10) <https://youtu.be/hrumNRQwTV8?si=8o3hB1BbFD-MCNXS>
- 11) <https://youtu.be/sWsXBY19o8I?si=ALqpIllzrAafEVDg>

Activity-Based Learning (Suggested Activities in Class)/Practical Based Learning:

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - Organizing Group wise discussions on related topics
 - Seminars

OBJECT ORIENTED PROGRAMMING USING JAVA															
Course Code	22CEE42				CIE Marks				50						
L:T:P:S	3:0:0:0				SEE Marks				50						
Hrs / Week	3				Total Marks				100						
Credits	03				Exam Hours				03						
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE42.1	Describe the concepts of object-oriented programming.														
22CEE42.2	Apply OOP's concept to implement a given problem using Java.														
22CEE42.3	Analyze and ensure the flow of a program through appropriate exception handling techniques.														
22CEE42.4	Investigate and apply the concept of Multithreading in concurrent programming available in literature and submit report in a team														
22CEE42.5	Solve the real-world problems using Object Oriented concepts and collection framework in Java.														
22CEE42.6	Construct GUI applications using JAVA swing/applet package.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE42.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE42.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE42.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE42.4	-	-	3	-	3	-	-	-	-	-	-	3	3	2	
22CEE42.5	-	-	3	-	3	-	-	-	-	-	-	3	3	2	
22CEE42.6	-	-	-	2	3	-	-	-	-	-	-	3	3	2	
MODULE-1	Introduction to Java									22CEE42.1 22CEE42.2, 22CEE42.6			8 Hours		
Basics of Java programming - Dissecting the "Hello, World" Program, Compiling and Running a Java Program, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Math class, Arrays in java															
Self-study / Case Study / Applications			Object-oriented Refactoring of Java Programs using Graph Transformation.												
Text Book			Text book 1: Ch 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6												
MODULE-2	Objects and Classes									22CEE42.1, 22CEE42.2, 22CEE42.6			8 Hours		
Working with Objects, Implementing Classes, Object Construction, Static Variables and Methods, Constructors, Overloading, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, this reference, nested classes															
Self-study / Case Study / Applications			Produce a program by functional decomposition.												
Text Book			Text book 2: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5												
MODULE-3	Inheritance and Polymorphism									22CEE42.1, 22CEE42.2			8 Hours		
Inheritance and types, Super and sub class, Overriding, Polymorphism, Dynamic binding, Casting objects, Instance of operator, Abstract class, Interface, Package, Object class.															
Self-study / Case Study / Applications			categorized into groups that share similar characteristics.												
Text Book			Text book 2: Ch:6 Ch: 8 Ch:9 Ch:10												

MODULE-4	Exception Handling & Thread	22CEE42.1, 22CEE42.2, 22CEE42.3, 22CEE42.4, 22CEE42.6	8 Hours	
Exception Types, Uncaught Exceptions, using try and catch, Multi catch clauses, Nested try statements, throw, throws, finally, Java's Built- in Exceptions. The java Thread Model, the main Thread, creating a Thread, creating multiple Threads, Thread Priorities, Synchronization, inter thread Communication, Suspending, Resuming and Stopping Threads, using Multithreading				
Self-study / Case Study / Applications	Understanding the issues involved error handling			
Text Book	Text Book 1 , Text Book 2			
MODULE-5	I/O basics	22CEE42.1, 22CEE42.2, 22CEE42.5	8 Hours	
Reading input, writing output, Reading and Writing files. Collections Overview, The Collection Interfaces- The List Interface, The Set Interface, The Queue Interface, The Collection Classes – Array List Class, Linked List Class, Tree set Class				
Text Book	Text Book 1, Text Book 2			
CIE Assessment Pattern (50 Marks - Theory) -				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	-	-
L3	Apply	10	7.5	5
L4	Analyze	5	7.5	5
L5	Evaluate	-	-	-
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks - Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	20		
L4	Analyze	10		
L5	Evaluate	-		
L6	Create	-		

Suggested Learning Resources:**Text Books:**

1. Herbert Schildt, Java™: The Complete Reference, McGraw-Hill Education, 11th edition, 2018, ISBN: 978-1260440232.
2. Cay S. Horstmann, Core Java SE9 for the Impatient, Addison Wesley, 2nd Edition, 2018, ISBN: 9780134694849.

Reference Books:

1. Ken Kousen, Modern Java Recipes, O'Reilly Media Inc, 2017, ISBN: 9781491973172.
2. Cay S. Horstmann, Core Java™ Volume I - Fundamentals, Pearson education India, 10th edition, 2015, ISBN: 9780134177335.
3. Rogers Cedenhead and Laura Lemay, SAMS teach yourself Java2 in 21 days, Pearson Education, Professional Reference Edition, 3rd Edition, 2004, ISBN-13: 9780672326288.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc22_cs47/preview
- https://www.youtube.com/watch?v=6T_HgnjoYwM
- <https://www.youtube.com/watch?v=-HafzawNIUo>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations using real objects.
- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Organizing Group wise discussions on issues
 - Seminars

OBJECT ORIENTED PROGRAMMING USING JAVA LAB															
Course Code	22CEL42								CIE Marks	50					
L:T:P:S	0:0:1:0								SEE Marks	50					
Hrs / Week	2								Total Marks	100					
Credits	01								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEL42.1	Apply OOP concepts with basic Java constructs to solve the given problem.														
22CEL42.2	Analyze the output for the programs in Java.														
22CEL42.3	Conduct experiments as individual by using modern tools like JDK														
22CEL42.4	Make an effective report based on experiments														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	
22CEL42.1	3	-	-	-	2	-	-	-	2	-	-	-	3	2	
22CEL42.2	3	2	2	-	2	-	-	-	2	-	-	-	3	2	
22CEL42.3	3	2	2	-	2	-	-	-	2	-	-	-	3	2	
22CEL42.4	3	2	2	-	2	-	-	-	2	-	-	-	3	2	
Pgm. No.	List of Programs											Hours	COs		
Prerequisite Programs / Demo															
	<ul style="list-style-type: none"> Basics of Arrays and String in C Programming Basics of Algorithm and Flowcharts. 											2	NA		
PART-A															
1	Write a Java Program to demonstrate math class and arrays.											2	22CEL42.1		
2	Write a Java Program to define a class, describe its constructor.											2	22CEL42.1		
3	Write a Java program to demonstrate String class, String Buffer.											2	22CEL42.1		
4	Write a Java program to demonstrate nested classes and array of objects.											2	22CEL42.1		
5	Write a Java Program to implement inheritance and method overriding.											2	22CEL42.2		
6	Write a program to demonstrate use of implementing interfaces.											2	22CEL42.2		
PART-B															
7	Write a program to demonstrate use of extending interfaces.											2	22CEL42.2		
8	Write a program to implement the concept to of Exception using pre-defined.											2	22CEL42.2		
9	Write a program to demonstrate File I/O Operations.											2	22CEL42.3		
10	Write a program to demonstrate Array List Class.											2	22CEL42.3		
11	Write a program to demonstrate Tree Set Class											2	22CEL42.4		
12	Write a Java program to implement the concept of importing classes from user defined package.											2	22CEL42.4		

PART-C
Beyond Syllabus Virtual Lab Content

1. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	5	10
L3	Apply	5	10
L4	Analyze	5	5
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	15
L3	Apply	15
L4	Analyze	10
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books:

1. Ken Kousen, Modern Java Recipes, O'Reilly Media Inc, 2017, ISBN: 9781491973172
2. Cay S. Horstmann, Core Java™ Volume I - Fundamentals, Pearson education India, 10th edition, 2015, ISBN: 9780134177335
3. Rogers Cedenhead and Laura Lemay, SAMS teach yourself Java2 in 21 days, Pearson Education, Professional Reference Edition, 3rd Edition, 2004, ISBN-13: 9780672326288

DESIGN AND ANALYSIS OF ALGORITHMS															
Course Code	22CEE43							CIE Marks	50						
L:T:P:S	3:0:0:0							SEE Marks	50						
Hrs / Week	3							Total Marks	100						
Credits	03							Exam Hours	03						
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE43.1	Apply asymptotic notations to represent the performance of different algorithms.														
22CEE43.2	Evaluate appropriate design techniques by analysing and evaluating algorithm to propose solution														
22CEE43.3	Analyse the efficiency of algorithms using time and space complexity theory														
22CEE43.4	Design algorithms for various computing problems.														
22CEE43.5	Investigate P, NP & NP-complete classes to analyse the limitations of an algorithm and submit a report as a team.														
22CEE43.6	Evaluate Backtracking and Branch & Bound technique to assess an algorithm and formulate solution.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	
22CEE43.1	3	3	3	2	-	-	-	-	-	-	-	3	3	2	
22CEE43.2	3	3	3	2	-	-	-	-	-	-	-	3	3	2	
22CEE43.3	3	3	3	2	-	-	-	-	-	-	-	3	3	2	
22CEE43.4	3	3	3	2	-	-	-	-	-	-	-	3	3	2	
22CEE43.5	3	3	3	3	-	-	-	-	-	-	-	3	3	2	
22CEE43.6	3	3	3	2	-	-	-	-	-	-	-	3	3	2	
MODULE-1 INTRODUCTION 22CEE43.1 8 Hours															
Fundamentals of Algorithms, Problem Solving- Important Problem Types, Performance Analysis: Space complexity, Time complexity- Asymptotic notations and Basic efficiency classes: Big- Oh notation (O), Omega notation (Ω), The annotation (Θ), Mathematical analysis for Recursive and Non- recursive algorithms															
Self-study / Case Study / Applications	Brute Force Algorithm Analysis – Number of iterations, Time complexity, space complexity														
Text Book	Text Book 1: Chapter 1, 2														
MODULE-2 DESIGN TECHNIQUES 22CEE43.2 8 Hours															
Divide and Conquer: General method - Recurrence equation for divide and Conquer-Analysis of quick sort and merge sort algorithm- Advantages and disadvantages of divide and conquer approach. Decrease and Conquer: General Method, Topological sorting. Transform and Conquer: General Method, Heaps and Heap Sort															
Self-study / Case Study / Applications	Application of Topological sort, Heap sort, quick sort and merge sort														
Text Book	Text Book 1: Chapter 4, 5, 6														
MODULE-3 GREEDY APPROACH AND DYNAMIC PROGRAMMING 22CEE43.3, 22CEE43.4 8 Hours															
Greedy Approach - General method, Prim's Algorithm, Kruskal's Algorithm, Single source shortest paths: Dijkstra's Algorithm, 0/1 Knapsack problem Dynamic Programming - General method, All pair shortest path problem, Longest common subsequence, Traveling salesperson problem															
Text Book	Text Book 1: Chapter 8, 9														
MODULE-4 BACKTRACKING AND BRANCH AND BOUND 22CEE43.6 8 Hours															
Backtracking: General method, N-Queens problem, Sum of subsets problem, Hamiltonian cycles. Branch and Bound: General method, Travelling Sales Person problem, Knapsack problem, LC Program and Bound solution															
Text Book	Text Book 1: Chapter 12														

MODULE-5		PROBLEM TYPES AND STRING MATCHING		22CEE43.5	8 Hours
NP Complete and NP-Hard problems: Basic concepts- non- deterministic algorithms-P, NP, NP- Complete, and NP-Hard classes					
String matching algorithm: Simple string matching, KMP String matching algorithm, Rabin-Karp Algorithm					
Text Book		Text Book 2: Chapter 32			
CIE Assessment Pattern (50 Marks – Theory)					
RBT Levels		Marks Distribution			
		Test (s)	Qualitative Assessment (s)	MCQ's	
		25	15	10	
L1	Remember	5	-	-	
L2	Understand	5	-	-	
L3	Apply	5	5	5	
L4	Analyze	5	5	5	
L5	Evaluate	5	5	-	
L6	Create	-	-	-	
SEE Assessment Pattern (50 Marks – Theory)					
RBT Levels		Exam Marks Distribution (50)			
L1	Remember	10			
L2	Understand	10			
L3	Apply	10			
L4	Analyze	10			
L5	Evaluate	10			
L6	Create	--			
Suggested Learning Resources:					
Text Books:					
1) Anany Levitin, Introduction to the Design & Analysis of Algorithms, Pearson Education India, 3rd Edition, 2012, ISBN: 9780132316811					
2) Introduction to Algorithms, 4 th Edition MIT press, Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein, ISBN - 9780262046305					
Reference Books:					
1) Thomas H Cormen, Charles E Leiserson, Ronald R Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI Learning Pvt. Ltd, 2010, ISBN: 978-8120340077					
Web links and Video Lectures (e-Resources):					
<ul style="list-style-type: none"> • https://onlinecourses.nptel.ac.in/noc19_cs47/preview • https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/ • https://online.stanford.edu/courses/soe-ycsalgorithms1-algorithms-design-and-analysis-part-1 					
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning					
<ul style="list-style-type: none"> • Video demonstration of latest algorithm applications • Contents related activities (Activity-based discussions) • For active participation of students, instruct the students to prepare Flowcharts and Handouts • Organizing Group wise discussions on issues • Seminars 					

DESIGN AND ANALYSIS OF ALGORITHM LAB															
Course Code	22CEL43										CIE Marks	50			
L:T:P:S	0:0:1:0										SEE Marks	50			
Hrs / Week	2										Total Marks	100			
Credits	01										Exam Hours	03			
Course outcomes:															
At the end of the course, the student will be able to:															
22CEL43.1	Analyse the complexities of various applications in different domains														
22CEL43.2	Analyse efficient searching algorithms to solve problems in various domains														
22CEL43.3	Evaluate different sorting techniques to solve the sorting problems efficiently														
22CEL43.4	Evaluate different Recursive Design Techniques in efficient problem solving														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	
22CEL43.1	3	3	3	2	-	-	-	-	-	-	-	2	3	3	
22CEL43.2	3	3	3	2	-	-	-	-	-	-	-	2	3	3	
22CEL43.3	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
22CEL43.4	3	3	3	3	-	-	-	-	-	-	-	2	3	3	
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
Pgm. No.	List of Programs											Hours	COs		
PART-A															
1	Develop a program to Implement a. Linear Search Algorithm b. Binary Search Algorithm. Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.2		
2	Develop a program to Implement a. Sieve of Eratosthenes to generate Prime Numbers Between Given Range b. Transitive closure using Warshall's algorithm Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.4		
3	Develop a program to implement a. Quick sort b. Selection Sort Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.3		
4	Develop a program to implement a. Insertion Sort b. Merge Sort Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.3		
5	Develop a program to implement a. Topological Sort b. Heap Sort Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.3		
6	Develop a program to obtain minimum cost spanning tree using a. Prim's Algorithm b. Kruskal's Algorithm Compute the time complexity for both the Algorithms.											2	22CEL43.1		
7	Develop a program to implement a. Travelling Salesman Problem b. Knapsack Problem Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.4		
8	Develop a program to obtain shortest path using Dijkstra's algorithm Compute the time complexity for the Algorithms.											2	22CEL43.1 22CEL43.2		
9	Develop a program to compute a. Binomial Coefficient b. Tower of Hanoi Compute the time complexity for both the Algorithms.											2	22CEL43.1 22CEL43.4		

10	Develop a program to implement String Matching using a. KMP algorithm. b. Rabin-Karp Algorithm Compute the time complexity for both the Algorithms.	2	22CEL43.1 22CEL43.4
11	Develop a program to implement Subset Sum problem using Backtracking. Compute the time complexity for the Algorithm.	2	22CEL43.1 22CEL43.4
12	Develop a program to implement N Queens problem using Backtracking. Compute the time complexity for the Algorithm.	2	22CEL43.1 22CEL43.4

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

- <https://ds1-iiith.vlabs.ac.in/exp/merge-sort/merge-sort-algorithm/concept-of-merge-sort.html>
- <https://ds1-iiith.vlabs.ac.in/exp/breadth-first-search/bfs/bfs-concept.html>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	5	5
L3	Apply	5	5
L4	Analyze	5	10
L5	Evaluate	5	10
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	20
L6	Create	-

Suggested Learning Resources:

Reference Books:

- Introduction to Algorithms, 4th Edition MIT press, Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein, ISBN - 9780262046305
- Thomas H Cormen, Charles E Leiserson, Ronald R Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI Learning Pvt. Ltd, 2010, ISBN: 978-8120340077

DATABASE MANAGEMENT SYSTEMS															
Course Code	22CEE44								CIE Marks	50					
L:T:P:S	3:0:0:0								SEE Marks	50					
Hrs / Week	3								Total Marks	100					
Credits	03								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE44.1	Describe the concepts of data base management system.														
22CEE44.2	Apply the relational database concepts for the given scenario.														
22CEE44.3	Analyze various database concepts with ER model.														
22CEE44.4	Design database for the structured data by applying normalization techniques.														
22CEE44.5	Investigate, prepare and submit document for unstructured data as a team.														
22CEE44.6	Develop in-memory database for needed applications.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	
22CEE44.1	-	-	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE44.2	3	-	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE44.3	-	3	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE44.4	-	-	3	-	3	-	-	-	-	-	-	3	3	2	
22CEE44.5	-	-	-	-	3	-	-	-	-	-	-	3	3	2	
22CEE44.6	3	-	-	-	3	-	-	-	-	-	-	2	3	2	
MODULE-1 INTRODUCTION TO DBMS 22CEE44.1 8 Hours															
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.															
Self-study / Case Study / Applications		Learn about File System, Drawback of file system, Difference between file system and DBMS													
Text Book		Text Book 1: Chapter 1,2, Text book 2: Chapter 1													
MODULE-2 ER DIAGRAMS AND RELATIONAL MODEL 22CEE44.2, 22CEE44.3 7 Hours															
ER Diagrams: Entity Types, Entity Sets, Attributes and Keys, Relationship types, Roles and Structural Constraints, Weak EntityTypes, ER Diagrams. Relational Model: Concepts, Constraints and Relational Database Schemas, Update operations, Database Design using ER to Relational Mapping															
Self-study / Case Study / Applications		Concept of relational algebra, OOPs concept in ER-Diagram.													
Text Book		Text Book 1: Chapter 4, 5, Text Book 2: Chapter 2													
MODULE-3 INTRODUCTION TO SQL 22CEE44.1 8 Hours															
Introduction to SQL: DDL and Data types, Data Constraints, Basic Queries in SQL, Insert, Delete and Update statements in SQL, More complex SQL Queries, Triggers, Introduction to Views: creation, implementation, update of views; Introduction to Assertion and Triggers, Introduction to Nested Queries; Correlated Nested Queries, Advanced SQL - Embedded & Dynamic SQL															
Self-study / Case Study / Applications		Practice SQL DCL and TCL commands.													
Text Book		Text Book 1: Chapter 6, 7													

MODULE-4	INDEXES, NORMALIZATION, TRANSACTION	22CEE44.4, 22CEE44.5	11 Hours
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Index Structures: Indexes on Sequential Files: dense, sparse index; multilevel indexing; Hash Techniques: Static Hashing and dynamic hashing.

Database Refinement: Informal Design Guidelines for Relation Schemas;

Functional Dependencies; Normalization for Relational Databases: 1NF, 2NF, 3NF, BCNF;

Transaction Management: The ACID Properties; Characterizing Schedules Based on Recoverability and Serializability, Two-Phase Locking Techniques for Concurrency Control

Self-study / Case Study / Applications	Study Transaction and schedules, Transaction and system concepts
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Text Book	Text Book 1: Chapter 14,16,17, 20, 21
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MODULE-5	IN MEMORY DATABASE AND NOSQL DATABASE	22CEE44.6	6 Hours
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In-Memory Database: Overview of in-memory DB, Architecture and applications of in-memory database, Hands-on SQLite data types and query.

NOSQL Databases: What is NoSQL, Need of NOSQL, Features OF NOSQL, CAP Theorem, ACID v/s BASE, Advantages & Disadvantages of NOSQL, Types of NOSQL: Key-Value database- Document-based database- Column-based database- Graph based database

Text Book	Text Book 2: Chapter 24, Text Book3: Chapter 1, 4, 7
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CIE Assessment Pattern (50 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember		-	-
L2	Understand	5	5	-
L3	Apply	5	5	5
L4	Analyze	10	5	5
L5	Evaluate	5		-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	--

Suggested Learning Resources:

Text Books:

- 1) Ramez Elmasri and Shamkant B. Navathe: Fundamentals of Database Systems, Pearson Education India, 7th Edition, 2016, ISBN: 9780133971118
- 2) Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw Hill, 6th Edition, 2013, ISBN: 9789332901384
- 3) Andreas Meier and Michael Kaufmann, "SQL & NoSQL Databases Models, Languages, Consistency Options and Architectures for Big Data Management", Springer Vieweg Wiesbaden, 1st Edition, 2019, ISBN 978365824548-1

Reference Books:

- 1) C.J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006, ISBN: 9788177585568
- 2) Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw Hill, 3rd Edition, 2014, ISBN: 978-8131769591

Web links and Video Lectures (e-Resources):

- https://www.tutorialspoint.com/sqlite/sqlite_tutorial.pdf
- <https://www.comp.nus.edu.sg/~ooibc/TKDE-2015-inmemory.pdf>
- <https://phoenixnap.com/kb/in-memory-database>
- <https://devopedia.org/in-memory-database>
- <http://imexresearch.com/IMEXPresentation/InMemoryComputing.pdf>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Organizing Group wise discussions on issues
 - Seminars

DATABASE MANAGEMENT SYSTEMS LAB														
Course Code	22CEL44					CIE Marks	50							
L:T:P:S	0:0:1:0					SEE Marks	50							
Hrs / Week	2					Total Marks	100							
Credits	01					Exam Hours	03							
Course outcomes:														
At the end of the course, the student will be able to:														
22CEL44.1	Design and develop database for the given scenario.													
22CEL44.2	Analyze output of database for a given problem.													
22CEL44.3	Conduct experiments as individual by using modern tools like Oracle/MySQL/SQLite													
22CEL44.4	Examine the experiments based on No-SQL.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CEL44.1	3	-	-	-	-	-	-	-	-	-	-	3	3	2
22CEL44.2	-	3	-	-	-	-	-	-	-	-	-	3	3	2
22CEL44.3	-	-	-	-	3	-	-	-	-	-	-	3	3	2
22CEL44.4	-	-	-	-	-	-	-	-	-	-	-	3	3	2
Prerequisite Programs / Demo														
Pgm. No.	List of Programs											Hours	COs	
Prerequisite Programs / Demo														
	<ul style="list-style-type: none"> Basics of DBMS Basics of ER-DIAGRAM AND KEY Concept CREATION of TABLE INSERTING DATA IN TO TABLE 											-	NA	
PART-A														
1	Draw ER diagram and Map to schemaDiagram											2	22CEL44.1	
2	Hands on practice on SQL queries on basic operations.												22CEL44.3	
3	Queries with aggregate functions and Subqueries											2	22CEL44.3	
4	Nested Queries and correlated Queries												22CEL44.3	
5	Creating Views and Manipulations of views											2	22CEL44.3	
6	Practice on Different join operation in SQL											2	22CEL44.3	
PART-B														
7	Usage of Cursors and Triggers.											2	22CEL44.3	
8	PL/SQL.											2	22CEL44.3	
9	Library Database perform related queries											2	22CEL44.3	
10	Company Database perform related queries												22CEL44.3	
11	College Database perform related queries											2	22CEL44.4	
12	Order Database perform related queries												22CEL44.4	
PART-C														
Beyond Syllabus Virtual Lab Content														
(To be done during Lab but not to be included for CIE or SEE)														
<ul style="list-style-type: none"> http://vlabs.iitkgp.ernet.in/se/4/theory/ https://vsit.edu.in/vlab/DBMS/Broad%20Goal.html 														
CIE Assessment Pattern (50 Marks - Lab)														
RBT Levels		Test (s)		Weekly Assessment										
		20		30										
L1	Remember	-	-	-	-									
L2	Understand	5	5	5	5									
L3	Apply	5	10	10	10									
L4	Analyze	5	10	10	10									
L5	Evaluate	5	5	5	5									
L6	Create	-	-	-	-									

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	10
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:**Reference Books:**

- 1) Ivan Byroas, "SQL, PL/SQL - The Programming Language of Oracle", Publisher: BPB publications, 4th revised edition, ISBN: 9788176569644
- 2) C.J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006, ISBN: 9788177585568

C#& .NET														
Course Code	22CEE451				CIE Marks				50					
L:T:P:S	2:0:1:0				SEE Marks				50					
Hrs / Week	2+2				Total Marks				100					
Credits	03				Exam Hours				03					
Course outcomes:														
At the end of the course, the student will be able to:														
22CEE451.1	Describe C# and client-server concepts using .Net Frame Work Components.													
22CEE451.2	Understand basic of object-oriented paradigm.													
22CEE451.3	Apply delegates, event and exception handling to incorporate with ASP, Win Form, ADO.NET.													
22CEE451.4	Analyze the use of GUI depending on the problem statement.													
22CEE451.5	Investigate web based and Console based application with Database connectivity.													
22CEE451.6	Develop web app for needed application.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CEE451.1	3	3	-	-	2	-	-	-	-	-	-	2	3	3
22CEE451.2	3	3	3	-	2	-	-	-	-	-	-	2	3	3
22CEE451.3	3	3	-	-	2	-	-	-	-	-	-	2	3	3
22CEE451.4	3	3	3	-	2	-	-	-	-	-	-	2	3	3
22CEE451.5	3	3	3	-	2	-	-	-	-	-	-	2	3	3
22CEE451.6	3	3	3	-	2	-	-	-	-	-	-	2	3	3
MODULE-1 Getting started with .NET Framework 4.0 and C# 22CEE451.1 8 Hours														
Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0, .NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library														
Laboratory Component:														
<ol style="list-style-type: none"> 1. C# Program to Find Sum of Digits of a Number 2. C# Program to Check if a Number is Divisible by 2 3. C# Program to Find the Largest of Two Numbers 														
Text Book			T1: Chapter 1 – Chapter 6											
MODULE-2			Classes, Objects and Object-Oriented Programming							22CEE451.2			8 Hours	
Classes and Objects: Creating a Class, creating an Object, using this Keyword, creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method														
Laboratory Component:														
<ol style="list-style-type: none"> 1. Swapping Program in C# 2. Palindrome Program in C# 3. Factorial Number Program in C# 														
Self-study / Case Study / Applications		The Security Problem. The Performance Problem.												
Text Book		Textbook 1: Ch 7 to 10												

MODULE-3	Delegates	22CEE451.3, 22CEE451.4	8 Hours	
Creating and using Delegates, Multicasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Program for Multicasting of a Delegate 2. Declaration program of a Delegate. 3. Instantiation program of a Delegate. 				
Text Book	Textbook 1: Ch 11 to 14			
MODULE-4	Graphical User Interface with Windows Forms	22CEE451.5	8 Hours	
Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, Text Boxes and Buttons, Group Boxes and Panels, Check Boxes and RadioButtons				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Create a Windows Forms app in Visual Studio with C#. 2. Program to add a button to the form. 3. Program to add a label to the form. 				
Text Book	Text Book 2. Ch 2- Ch 5			
MODULE-5	Web App Development and Data Access using ADO.NET	22CEE451.6	8 Hours	
Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building Web-Time Application, Examining Web-Time. aspx's Code- Behind File, Understanding Master pages				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Creating Your First ADO.NET Web Application. 2. Write a program to create web form. 3. Write a Program using ADO Net to connect to the database. 				
Self-study / Case Study / Applications	Developing applications and programs that are specific to the architecture of the Microsoft platform			
Text Book	Text Book 2. Ch 06 – Ch 10			
CIE Assessment Pattern (50 Marks – Theory and Lab)				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	5	-	5
L2	Understand	5	-	5
L3	Apply	10	5	5
L4	Analyze	5	-	5
L5	Evaluate	-	-	-
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks – Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	20		
L4	Analyze	10		
L5	Evaluate	-		
L6	Create	--		

<p>Suggested Learning Resources:</p> <p>Text Books:</p> <ol style="list-style-type: none"> .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley- Dream Tech Press. (Chapters: 1,10,11,12,13,14 and 19), ISBN: 978-9350040430. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19 and 27.3),ISBN: 978-817490671. <p>Reference Books:</p> <ol style="list-style-type: none"> Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley-Appress,ISBN: 978-8132209652 Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series,ISBN: 978-8131761762 Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010. <p>Web links and Video Lectures (e-Resources):</p> <ul style="list-style-type: none"> https://www.nptelvideos.com/visualbasic_net/?pn=1
<p>Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning</p> <ul style="list-style-type: none"> Contents related activities (Activity-based discussions) <ul style="list-style-type: none"> ➤ For active participation of students, instruct the students to prepare Flowcharts and Handouts ➤ Organizing Group wise discussions on issues ➤ Seminars

PROGRAMMING FOR UI AND UX DESIGN														
Course Code	22CEE452								CIE Marks			50		
L:T:P:S	2:0:1:0								SEE Marks			50		
Hrs / Week	2+2								Total Marks			100		
Credits	03								Exam Hours			03		
Course outcomes:														
At the end of the course, the student will be able to:														
22CEE452.1	Ability to understand the goals of user interface design.													
22CEE452.2	Understanding the design processes and development methodologies in UI.													
22CEE452.3	Ability to gain Knowledge on Menus, Form Filling, Dialog boxes.													
22CEE452.4	Understanding how users interact with interfaces and designing intuitive interactions.													
22CEE452.5	Conducting tests to evaluate the usability and effectiveness of designs.													
22CEE452.6	Working effectively in multidisciplinary teams and communicating design decisions.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
22CEE452.1	3	2	3	2	3	-	-	-	-	-	-	2	3	2
22CEE452.2	3	2	3	2	3	-	-	-	-	-	-	2	3	2
22CEE452.3	3	2	3	2	3	-	-	-	-	-	-	2	3	2
22CEE452.4	3	2	3	2	3	-	-	-	-	-	-	2	3	2
22CEE452.5	3	2	3	2	3	-	-	-	-	-	-	2	3	2
22CEE452.6	3	2	3	2	3	-	-	-	-	2	2	2	3	2
MODULE-1 FOUNDATIONS OF DESIGN 22CEE452.1 8 Hours														
UI vs. UX Design – Core Stages of Design Thinking – Divergent and Convergent Thinking -Brainstorming and Game storming – Observational Empathy														
Laboratory Component: (minimum 3 experiments / programs)														
1. Designing a Responsive layout for a societal application														
2. Exploring various UI Interaction Patterns														
3. Developing an interface with proper UI Style Guides														
Text Book Text Book 2,chapter1,2														

MODULE-2	FOUNDATIONS OF UI DESIGN	22CEE452.1,22CEE452.2, 22CEE452.4	8 Hours	
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles - Branding - Style Guides				
Laboratory Component: (minimum 3 experiments / programs)				
<ol style="list-style-type: none"> 1. Developing Wireflow diagram for application using open source software 2. Developing Wireflow diagram for application using open source software 3. Hands on Design Thinking Process for a new product 				
Text Book	Text Book 3,Chapter1			
MODULE-3	FOUNDATION OF UX DESIGN	22CEE452.1,22CEE452.2, 22CEE452.4	8 Hours	
Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Brainstorming feature for proposed product 2. Defining the Look and Feel of the new Project 				
MODULE-4	WIREFRAMING, PROTOTYPING AND TESTING	22CEE452.5	8 Hours	
Sketching Principles - Sketching Red Routes - Responsive Design - Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteratio				
Laboratory Component:				
<ol style="list-style-type: none"> 4. Identify a customer problem to solve 5. Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping 6. Sketch, design with popular tool and build a prototype and perform usability testing and identify improvements 				
Text Book	Text Book 1,Chapter 9			
MODULE-5	RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE	22CEE452.3	8 Hours	
RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 6 Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture				
Laboratory Component:				
<ol style="list-style-type: none"> 7. Experiments with Non-Visual Prototyping & User Testing. 8. Analyze an existing app and defining your app's functions step-by-step 9. Create a generic prototype of any application both in Web vs. App 				
Text Book	Text Book 1,Chapter 4,6			
CIE Assessment Pattern (50 Marks - Theory and Lab)				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	-	-	-
L2	Understand	5	-	-
L3	Apply	5	5	10
L4	Analyze	10	-	10
L5	Evaluate	5	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)		
RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	--

3. Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)

Text Book	Text Book 1, Chapter1,2
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<p>Suggested Learning Resources:</p> <p>Text Books:</p> <ol style="list-style-type: none"> 1. Joel Marsh, "UX for Beginners", O'Reilly, 2022, ISBN-13 : 978-9352133031 2. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rd Edition , O'Reilly 2020, ISBN-13: 9781492051961 3. Steve Schoger, Adam Wathan "Refactoring UI", 2018 , ISBN-13978-9352139989 <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", Third Edition,2015,ISBN: 978-9332542860 2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021, ISBN:978149205531. <p>Web links and Video Lectures (e-Resources): https://careerfoundry.com/en/blog/ux-design/the-difference-between-ux-and-ui-design-a-laymans-guide/</p> <p>Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning</p> <ul style="list-style-type: none"> • Contents related activities (Activity-based discussions) <ul style="list-style-type: none"> ➤ For active participation of students, instruct the students to prepare Flowcharts and Handouts ➤ Organizing Group wise discussions on issues

ELASTIC SEARCH															
Course Code	22CEE453								CIE Marks	50					
L: T: P: S	2:0:1:0								SEE Marks	50					
Hrs / Week	2+2								Total Marks	100					
Credits	03								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE453.1	Understand the basics of Elastic Search - Analytics Engine														
22CEE453.2	Apply the concepts of DSL Queries in Elastic search														
22CEE453.3	Analyze the knowledge of working with advanced queries for recommendation systems.														
22CEE453.4	Integrate other applications and programming languages with elastic search.														
22CEE453.5	Investigate cluster concepts for web servers.														
22CEE453.6	Use the concepts of Elastic Search in real time data to extract some information.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE453.1	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE453.2	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE453.3	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE453.4	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE453.5	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
22CEE453.6	3	3	3	-	-	-	-	-	-	-	-	2	3	3	
MODULE-1 INTRODUCTION TO ELASTIC SEARCH															
												22CEE453.1	8 Hours		
Elastic Search – Introduction, Lab Environment – Docker Usage, JSON format for storing data as Documents, Adding Documents, Postman tool, Logstash and Kibana															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Create an Elastic search node and make the necessary configurations. 2. Create a Logstash Configuration and create a data view and cluster view using Logstash 3. Secure your data using Kibana 															
Text Book	Text Book 1: Chapter 1, 2, 3,5														
MODULE-2 DSL Queries - I															
												22CEE453.2	8 Hours		
Advanced search system,															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Write a leaf and compound query clause to find a field from student's database 2. Write a script query to find course opted from student's database 3. Write a regexp, prefix queries to find product features from online reviews 															
Self-study / Case Study / Applications	Create a simplified booking com version														
Text Book	Text Book 1: Chapter 4														
MODULE-3 DSL Queries - II															
												22CEE453.3, 22CEE453.4	8 Hours		
recommendation systems – How to create, extract relevant fields from the huge set of documents.															
Laboratory Component:															
<ol style="list-style-type: none"> 1. Write a geo query to Find documents with geopoints within the specified distance of a central point 2. Join 2 queries using the has child query returns parent documents whose child documents match the specified query 3. Write distance feature query, more like this query, percolate query, rank feature query, script_score query. 															
Self-study / Case Study / Applications	Create a recommendation mechanism for virtual example of cleaning houses' marketplace.														
Text Book	Text Book 2: Chapter 8														

MODULE-4	Integration with other tools	22CEE453.4	8 Hours	
Method to integrate php, python and Java libraries for integration with Elastic Search				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Ingest data with python on Elastic Search 2. Ingest data with node.js on Elastic Search service 3. Ingest data from relational database application into Elastic Search 				
Text Book	Text Book 2: Chapter 7			
MODULE-5	CLUSTERS	22CEE453.5 22CEE453.6	8 Hours	
Creating Clusters, Calculating Shard size and storage requirements, indexing documents, preserving zero downtime at re-indexing				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Add or Remove nodes in a cluster. 2. Enrol a new node in an existing cluster. 3. Create a master – eligible node in elastic search. 				
Text Book	Text Book 2: Chapter 16			
CIE Assessment Pattern (50 Marks - Theory and Lab)				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	5	-	5
L2	Understand	5	-	5
L3	Apply	10	5	5
L4	Analyze	5	-	5
L5	Evaluate	-	-	-
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks - Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	10		
L4	Analyze	10		
L5	Evaluate	10		
L6	Create	--		
Suggested Learning Resources:				
Text Books:				
<ol style="list-style-type: none"> 1. Elasticsearch: The Definitive Guide; Clinton Gormley, Zachary Tong -O'Reilly Media, Inc - 2015 ISBN - 9781449358549 2. Elasticsearch in Action: Madhusudan Konda Manning Publications – Second Edition ISBN 9781617299858 				
Web links and Video Lectures (e-Resources):				
<ul style="list-style-type: none"> • https://www.tutorialspoint.com/elasticsearch-as-you-have-never-known-it-before/index.asp • https://www.youtube.com/watch?v=s6BQ8ACfrdY • https://www.elastic.co/training/free • https://mindmajix.com/elasticsearch-training 				

INTRODUCTION TO R PROGRAMMING															
Course Code	22CEE454								CIE Marks	50					
L:T:P:S	2:0:1:0								SEE Marks	50					
Hrs / Week	2+2								Total Marks	100					
Credits	03								Exam Hours	03					
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE454.1	Explore the working of R and R Studio.														
22CEE454.2	Recall and practice programming techniques using R programming.														
22CEE454.3	Make use of Structured Data into R from various sources.														
22CEE454.4	Understand the different data Structures, data types in R.														
22CEE454.5	Develop small applications using R Programming .														
22CEE454.6	Model documentation related to small applications using R.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEE454.1	3	3	3	-	2	-	-	-	-	-	-	2	3	3	
22CEE454.2	3	-	3	-	2	-	-	-	-	-	-	2	3	3	
22CEE454.3	3	3	3	-	2	-	-	-	-	-	-	2	3	3	
22CEE454.4	3	-	3	-	2	-	-	-	-	-	-	2	3	3	
22CEE454.5	3	3	3	-	2	-	-	-	-	-	-	2	3	3	
22CEE454.6	3	3	3	-	2	-	-	-	-	-	-	2	3	3	
MODULE-1	Numeric, Arithmetic, Assignment, and Vectors								22CEE454.1	8 Hours					
R for Basic Math, Arithmetic, Variables, Functions, Vectors, Expressions and assignments Logical expressions.															
Laboratory Component:															
1. Program to perform basic math operations in R. 2. Program to perform basic math operations in R for Exponentiation. 3. Program to perform basic math operations in R for Modulo.															
Text Book		Textbook 1: Chapter 2(2.1 to 2.7)													
MODULE-2	Matrices and Arrays								22CEE454.2	8 Hours					
Defining a Matrix, Sub-setting, Matrix Operations, Conditions and Looping: if statements, looping with for, looping with while, vector-based programming															
Laboratory Component:															
1. Create an array of matrices in R. 2. Program to perform 3*3 Dimensions. 3. Program to perform transpose a matrix.															
Self-study / Case Study / Applications		The Security Problem. The Performance Problem.													
Text Book		Textbook 1: Chapter 2- 2.8, chapter 3- 3.2 to 3.5													

MODULE-3	Lists and Data Frames	22CEE454.3, 22CEE454.4	8 Hours	
Data Frames, Lists, Special values, the apply family.				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Program to create a list of data frames. 2. Program to access each of those data frames from the list. 3. Instantiation program manipulate a list. 				
Text Book	Textbook 1: Chapter 6- 6.2 to 6.4			
MODULE-4	Functions	22CEE454.5	8 Hours	
Calling functions, scoping, Arguments matching, writing functions: The function command, Arguments, specialized function				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Write a built-in function in R programming language 2. Program for user defined functions. 3. Program to Create a function to print squares of numbers in sequence. 				
Text Book	Textbook 1: Chapter 5- 5.1 to 5.6			
MODULE-5	Pointers	22CEE454.6	8 Hours	
packages, frames, de bugging, manipulation of code, compilation of the code.				
Laboratory Component:				
<ol style="list-style-type: none"> 1. Creating Your First a simple vector code. 2. Write a program to Sub setting a dataframe. 3. Write a Program passing by reference in R 				
Self-study / Case Study / Applications	Developing applications and programs that are specific to the architecture of the Microsoft platform			
Text Book	Textbook 1: Chapter 8- 8.1 to 8.8			
CIE Assessment Pattern (50 Marks – Theory and Lab)				
RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	5	-	-
L2	Understand	5	-	-
L3	Apply	5	5	10
L4	Analyze	10	-	10
L5	Evaluate	-	-	-
L6	Create	-	-	-
SEE Assessment Pattern (50 Marks – Theory)				
RBT Levels		Exam Marks Distribution (50)		
L1	Remember	5		
L2	Understand	5		
L3	Apply	20		
L4	Analyze	20		
L5	Evaluate	-		
L6	Create	--		

Suggested Learning Resources:**Text Books:**

1. Jones, O., Maillardet, R. and Robinson, A. (2014). Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC, The R Series. ISBN-10 1466569999, ISBN-13 978-1466569997.

Reference Books:

1. Michael J. Crawley, "Statistics: An Introduction using R", Second edition, Wiley, 2015. ISBN-10 1118941098, ISBN-13 978-1118941096.

Web links and Video Lectures (e-Resources):

1. Wickham, H. & Grolemund, G. (2018). for Data Science. O'Reilly: New York. Available for free at <http://r4ds.had.co.nz>
2. https://onlinecourses.nptel.ac.in/noc19_ma33/preview

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of simple projects.
- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Organizing Group wise discussions on issues
 - Seminars

Microcontroller and Embedded Systems															
Course Code	22CEE461										CIE Marks	50			
L:T:P:S	0:0:1:0										SEE Marks	50			
Hrs / Week	2										Total Marks	100			
Credits	01										Exam Hours	03			
Course outcomes:															
At the end of the course, the student will be able to:															
22CEE461.1	Demonstrate the fundamentals of Embedded Systems														
22CEE461.2	Analyze the concepts of assembly language program for data processing														
22CEE461.3	Develop embedded C program to interface the microcontroller to an external world														
22CEE461.4	Design an embedded system for control applications														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	
22CEE461.1	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
22CEE461.2	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
22CEE461.3	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
22CEE461.4	2	2	2	-	-	-	-	-	-	-	-	2	3	3	
Pgm. No.															
List of Programs															
Hours															
COs															
Prerequisite Experiments / Programs / Demo															
	<ul style="list-style-type: none"> Basic concepts of Microprocessor and Simulation of addressing modes using any Emulators 											2	NA		
PART-A															
1	Write a data transfer program for the following. a. Program for block data movement b. Exchanging of Data's c. finding largest element in an array											2	22CEE461.1		
2	Write an Arithmetic Instruction for the following a. Addition and Subtraction b. Multiplication and Division Note: The above programs can be done for either 8 or 16 bits											2	22CEE461.1		
3	Write an assembly language program for the following. a. Counters, Boolean and Logical Instructions											2	22CEE461.1		
4	A study experiment about Conditional call and Return Instructions											2	22CEE461.1		
5	Write a code conversion program for the following. 1. BCD to ASCII 2. ASCII to BCD 3. Binary to Decimal 4. Decimal to Hexa											2	22CEE461.2		
6	Programs for delay and counter operations											2	22CEE461.2		
PART-B															
7	Interfacing Experiments: Programming a AT89C51 using serial port and using On-Chip timer by controlling the modes.											2	22CEE461.2		
8	Interfacing Experiments: Programming a AT89C51 using serial port and using Mode-1 for interfacing a Stepper Motor.											2	22CEE461.2		
9	Interfacing Experiments: Programming a AT89C51 using serial port and using Mode-2 for interfacing a DC Motor.											2	22CEE461.3, 22CEE461.4		
10	Interfacing Experiments: Programming a AT89C51 for interfacing various LCD device using Keil and Proteus											2	22CEE461.3, 22CEE461.4		

11	Interfacing Experiments: Programming a AT89C51 for interfacing various input device (Keypad) using Keli and Proteus	2	22CEE461.3, 22CEE461.4
12	Interfacing Experiments: Programming a AT89C51 for DAC wave form generation either programming through Keil or by proteus.	2	22CEE461.3, 22CEE461.4

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

1. <http://ebootathon.com/labs/beta/ec/MicroprocessorAndMicrocontrollerLab/exp1/simulation.html>
2. <https://www.ietlucknow.ac.in/lab/1415>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	05
L3	Apply	10	15
L4	Analyze	05	05
L5	Evaluate	05	05
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books:

- 1) Proteus simulation tutorial though NPTEL
- 2) Keil simulator using C51 by going through the tutorial for embedded systems.

DIGITAL SYSTEM MODELLING USING VERILOG														
Course Code	22CEE462					CIE Marks					50			
L: T: P: S	0:0:1:0					SEE Marks					50			
Hrs / Week	2					Total Marks					100			
Credits	01					Exam Hours					03			
Course outcomes:														
At the end of the course, the student will be able to:														
22CEL462.1	Demonstrate the knowledge on language constructs and programming fundamentals HDL design flow of Verilog HDL.													
22CEL462.2	Develop a Verilog model for a particular digital design by selecting a suitable abstraction level.													
22CEL462.3	Construct Combinational and sequential circuits in different modelling styles using Verilog HDL.													
22CEL462.4	Analyze and verify the functionality of digital circuits/systems using test benches.													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
22CEL462.1	3	-	-	-	3	-	-	-	-	-	-	-	3	2
22CEL462.2	3	-	-	-	3	-	-	-	-	-	-	-	3	2
22CEL462.3	-	-	3	-	3	-	-	-	-	-	-	-	3	2
22CEL462.4	-	3	-	-	3	-	-	-	-	-	-	-	3	2
Prerequisite Experiments														
	Verification of Truth Table of Logic Gates using different modelling of Verilog Code											2	NA	
PART-A														
1	Verify the truth table of the given Boolean expressions / Problem Statement using Verilog code.											2	22CEL462.1 22CEL462.2 22CEL462.3	
2	Design and verify truth table of Encoder using different modelling technique of Verilog code.											2	22CEL462.1 22CEL462.2 22CEL462.3	
3	Design and verify truth table of Decoder using different modelling technique of Verilog Code.											2	22CEL462.1 22CEL462.2 22CEL462.3	
4	Simulate the code converter using Verilog Code. Verify the truth table with the help of test bench.											2	22CEL462.1 22CEL462.2 22CEL462.3	
5	Simulate and verify the 4-bit full adder using hierarchical Verilog code.											2	22CEL462.1 22CEL462.2 22CEL462.3	
6	Simulate and verify the output of comparator using Verilog code.													
PART-B														
7	Simulate the working of JK FF and verify the output using testbench.											2	22CEL462.1 22CEL462.2 22CEL462.3 22CEL462.4	
8	Write the Verilog code for universal shift register.													
9	Simulate the Up / Down synchronous counter using Verilog code and verify the output.											2	22CEL462.1 22CEL462.2 22CEL462.3 22CEL462.4	
10	Simulate the asynchronous decade counter using Verilog code and verify the output.													
11	Write the Verilog code for sequence detector.											2	22CEL462.1 22CEL462.2 22CEL462.3 22CEL462.4	
12	Simulate and verify the working of Ring counter using VERILOG code.													
PART-C														
Beyond Syllabus Virtual Lab Content														
(To be done during Lab but not to be included for CIE or SEE)														
<ul style="list-style-type: none"> Simulation of half and full adder using logic sim (https://www.youtube.com/watch?v=0Up2YfMYTQA) Simulation of 8:1 Mux using logic sim (https://www.youtube.com/watch?v=DJhwWMixTRU) 														

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	5
L3	Apply	10	10
L4	Analyze	5	10
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:**Reference Books:**

1) Joseph Cavanagh, "Verilog HDL Design Examples", Publisher: CRC Press, Taylor & Francis group, 2018, ISBN- 9781138099951.

APP DEVELOPMENT USING KOTLIN															
Course Code	22CEE463										CIE Marks	50			
L:T:P:S	0:0:1:0										SEE Marks	50			
Hrs / Week	2										Total Marks	100			
Credits	01										Exam Hours	03			
Course outcomes:															
At the end of the course, the student will be able to:															
22CEL463.1	Understand the importance of Android studio.														
22CEL463.2	Develop basic skills in analyzing the usability of an App Development using Kotlin.														
22CEL463.3	Conduct hands on experience using Android Studio for sending Messages.														
22CEL463.4	Generate an application based upon the concepts of Kotlin.														
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
22CEL463.1	3	2	-	-	3	-	-	-	-	-	-	-	3	2	
22CEL463.2	3	2	-	-	3	-	-	-	-	-	-	-	3	2	
22CEL463.3	3	2	-	-	3	-	-	-	-	-	-	-	3	2	
22CEL463.4	3	2	-	-	3	-	-	-	-	-	-	-	3	2	
Prerequisite Programs															
Pgm. No.	List of Programs											Hours	COs		
Prerequisite Programs															
	Basic of creating buttons using HTML and CSS.											2	NA		
PART-A															
1	Installation of Android studio.											2	21CEL463.1		
2	Development of Hello World Application using kotlin.											2			
3	Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.											2	21CEL463.2		
4	Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button											2	21CEL463.12		
5	Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout)											2			
6	Design an android application Send SMS using Intent using kotlin.											2	21CEL463.3		
PART-B															
7	Create a basic android application using Kotlin.											2	21CEL463.3		
8	Design Android Radio Button Using Kotlin											2			
9	Design an android application for menu using Kotlin.											2	21CEL463.3		
10	Create a user registration application that stores the user details in a database table Using Kotlin.											2	21CEL463.4		
11	Write a sample code for sending sms in Android using sms Intent to a number Using Kotlin.											2			
12	Create a code showing how to Send an Email via Intent using Kotlin.											2	21CEL463.4		

PART-C
Beyond Syllabus Virtual Lab Content
(To be done during Lab but not to be included for CIE or SEE)

1. https://onlinecourses.swayam2.ac.in/aic20_sp02/preview

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	5	10
L4	Analyze	5	10
L5	Evaluate	-	-
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	15
L4	Analyze	15
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Reference Books:

1. Kotlin in Action, Authors: Dmitry Jemerov & Svetlana Isakova, 2021. ISBN-10 1617293296 ISBN-13 978-1617293290.
2. Head First Kotlin: A Brain-Friendly Guide, Authors: Dawn Griffiths & David Griffiths, 2019. ISBN-10 9352138074, ISBN-13 978-9352138074.

CLOUD BASED COLLABORATIVE TOOLS																
Course Code	22CEE464					CIE Marks						50				
L:T:P:S	0:0:1:0					SEE Marks						50				
Hrs / Week	3					Total Marks						100				
Credits	01					Exam Hours						03				
Course outcomes:																
At the end of the course, the student will be able to:																
22CEE464.1	Understand the Basic concepts of gmail and google calender															
22CEE464.2	Analyze the working concepts of google drive and google docs															
22CEE464.3	Demonstrate the concepts of google cloud platform															
22CEE464.4	Create Custom Templates related to google workspace															
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02		
22CEE464.1	3	3	3	-	3	-	-	-	-	-	-	-	2	2		
22CEE464.2	3	3	3	-	3	-	-	-	-	-	-	-	2	2		
22CEE464.3	3	3	3	-	3	-	-	-	-	-	-	-	2	2		
22CEE464.4	3	3	3	-	3	-	-	-	-	-	-	-	2	2		
Prerequisite Programs																
	Basic of creating Google Workspace with proper internet connection.											2	NA			
PART-A																
1	Introduction to Gmail-Organize your email, Gmail integration, Gmail settings, Gmail filter.											2	22CEE464.1			
2	Create and modify an event in Google Calendar, Create an event from Gmail and view it in Calendar, share a calendar.											2				
3	Create google drive folder and upload multiple types of files to Drive, Understand Collaborator roles.											2	22CEE464.2			
4	Create and format a Google Doc, name a Google Doc, star it, Insert images in a Google Doc, and save as a PDF											2	22CEE464.2			
5	Import an Excel spreadsheet to Google Sheets and Manage data in Google Sheets (Update rows, Copy cells, Sort the data, Filter data) .											2				
6	Apply formatting to a Google Sheet, Use formulas to perform calculations using Google Sheets, Use named ranges to perform calculations, create a chart, Explore sharing options.											2	22CEE464.3			
PART-B																
7	Schedule a calender event and add a Google Meet link, Identify the Google Meet link and dial-in information.											2	22CEE464.4			
8	Add a Google Doc meeting agenda to Google Calendar and Record a Google Meet video conference.											2				
9	Create a group chat in google chat, create a space and add a thread and Use an app in a space.											2	22CEE464.4			
10	Create project in GCP, Create a VM with a custom machine type.											2	22CEE464.5			
11	Create a VM from an instance template.											2				
12	Create custom images, Instance Templates , Instance group.											2	22CEE464.5			

PART-C
Beyond Syllabus Virtual Lab Content
(To be done during Lab but not to be included for CIE or SEE)

1. <https://www.youtube.com/watch?v=aUyyKMI1wiM>
2. <https://www.youtube.com/watch?v=UQ3pzDNssyo>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Marks Distribution	
		Test (s)	Weekly Assessment
		20	30
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	5	10
L4	Analyze	5	10
L5	Evaluate	-	-
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	15
L4	Analyze	15
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Robert G Pascall, "The Google Workspace Bible", Publisher: Zetra WebWorker, March 7, 2023, ISBN-10:1801719233, ISBN-13: 978-1801719230

Reference Books:

1) Tabina Hendrick "Google Workspace for Beginners", February 9, 2022, ISBN-13 : 979-8415084333

Web links and Video Lectures (e-Resources):

- https://www.cloudskillsboost.google/journeys/23?utm_source=cgc&utm_campaign=evergreen&utm_medium=website
- <https://www.webopedia.com/definitions/google-workspace/>
- <https://cloud.google.com/compute/docs/instances/create-vm-from-instance-template>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Organizing Group wise discussions on issues
 - Seminars

UNIVERSAL HUMAN VALUES AND LIFE SKILLS												
Course Code	22UHK47					CIE Marks					50	
L:T:P:S	1:0:0:0					SEE Marks					50	
Credits	01					Exam Hours					--	
Course outcomes:												
At the end of the course, the student will be able to:												
CO1	Understand the concept and significance of life skills and universal human values.											
CO2	Develop self-awareness and self-management skills to promote personal growth.											
CO3	Apply Critical, Creative thinking and ethical decision-making skills in various contexts.											
CO4	Practice teamwork and collaboration while respecting diversity and inclusivity.											
Mapping of Course Outcomes to Program Outcomes:												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	1	3		2		2
CO2	-	-	-	-	-	1	2	1		2		2
CO3	-	-	-	-	-	3	1	3	1	2		2
CO4	-	-	-	-	-	2	2	1	3	3		3
MODULE-1 Self-Awareness and Self-Management												
Emotional Intelligence, Techniques of self-awareness: SWOT and JOHARI WINDOW Stress management and coming out of comfort zone, managing failure, Time Management to recalibrate priorities. Self-Exploration as a process of Value Education, the basic human Aspirations: Prosperity and Happiness											Hours	COs
											6	CO1 CO2
MODULE-2 Towards Yourself												
Exploring opportunities, understanding expectations and self for right fitment profession, Goal Setting - Personal and Professional, aligning Personal and Professional goals for greater achievement, Mind-Maps as a tool for Goal Setting											Hours	COs
											4	CO1 CO3
MODULE-3 Leading self to lead others												
Quality analysis of leader and self-evaluation, Critical thinking, Creative thinking and Ethical decision making, Critical thinking and Creative thinking for contribution technical world, Six thinking hats, Exploring ethical decision-making frameworks and principles											Hours	COs
											4	CO3 CO4
MODULE-4 Ownership towards Family and Society												
Responsibility, Diversity and Inclusivity: Understanding personal and social responsibility Appreciating diversity and managing inclusivity, promoting teamwork and collaboration while respecting differences											Hours	COs
											4	CO2 CO3 CO4
MODULE-5 Towards Nature and Industry												
Personal code of conduct for harmony between self and nature, resisting external pressures, negotiation and conflict resolution, assertiveness and empathy, change management											Hours	COs
											4	CO3 CO4
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 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. BHAGAVADGITA for college students, Sandeepa Guntreddy. 												

CIE Assessment Pattern (50 Marks)

RBT Levels		Marks Distribution			
		Test (s)	Assignment	Role play	Self- study
		10	10	15	15
L1	Remember				
L2	Understand	3	3		3
L3	Apply	3	3	5	3
L4	Analyze	4	4	5	5
L5	Evaluate				4
L6	Create			5	

SEE- Semester End Examination (50 Marks)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

MINI PROJECT														
Course Code	22CEE48									CIE Marks			50	
L: T: P: S	0:0:1:0									SEE Marks			50	
Hrs / Week	02									Total Marks			100	
Credits	1									Exam Hours			03	
Course outcomes: At the end of the course, the student will be able to:														
22CEE48.1	Analyze the Real-world problem through survey of existing problems													
22CEE48.2	Design the modules for solving the problems identified													
22CEE48.3	Implement the design modules with suitable programming language													
22CEE48.4	Test the working modules at different levels													
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CEE48.1	3	2	3	2	3	-	1	1	3	-	-	2	3	2
22CEE48.2	3	2	3	2	1	-	1	1	3	-	-	3	3	2
22CEE48.3	3	2	3	2	2	-	1	1	3	-	-	3	3	2
22CEE48.4	3	2	3	2	3	-	2	1	3	-	-	3	3	2
The student shall be capable of identifying a problem related to the field of Computer Engineering 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).														
CIE Assessment Pattern (50 Marks - Lab)														
RBT Levels		Synopsis Presentation- Review-0		Review-1			Final Review			Report Submission with plagiarism certificate				
		5		15			20			10				
L1	Remember	-		-			-			-				
L2	Understand	-		-			-			10				
L3	Apply	5		5			5			-				
L4	Analyze	-		5			5			-				
L5	Evaluate	-		5			-			-				
L6	Create	-		-			10			-				
SEE Assessment Pattern (50 Marks - Lab)														
RBT Levels		Exam Marks Distribution (50)												
L1	Remember	-												
L2	Understand	-												
L3	Apply	10												
L4	Analyze	10												
L5	Evaluate	15												
L6	Create	15												

BASIC APPLIED MATHEMATICS-II (Common to all Branches)												
Course Code	22DMAT41						CIE Marks			50		
L:T:P:S	0:0:0:0						SEE Marks			--		
Hrs. / Week	2						Total Marks			50		
Credits	00						Exam Hours			--		
Course outcomes: At the end of the course, the student will be able to:												
22DMAT41.1	Gain knowledge of basic operations of vectors											
22DMAT41.2	Use curl and divergence of a vector function in three dimensions											
22DMAT41.3	Develop the ability to solve higher order Linear differential equations											
22DMAT41.4	Know the basic concepts of Laplace transform to solve the Periodic functions and also solve initial and boundary value problems using Laplace transform method.											
Mapping of Course Outcomes to Program Outcomes:												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22DMAT41.1	3	3	-	-	-	-	-	-	-	-	-	-
22DMAT41.2	3	3	-	-	-	-	-	-	-	-	-	-
22DMAT41.3	3	3	-	-	-	-	-	-	-	-	-	-
22DMAT41.4	3	3	-	-	-	-	-	-	-	-	-	-
MODULE-1 VECTORS										22DMAT41.1	8 Hours	
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.												
Text Book	Text Book 1: 3.1, 3.5, 3.6, 3.9, Text Book 2: 7.1, 9.2, 9.3, 9.4.											
MODULE-2 VECTOR DIFFERENTIATION										22DMAT41.2	8 Hours	
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.												
Text Book	Text Book 1: 8.5, 8.6, 8.7, Text Book 2: 9.7, 9.8, 9.9.											
MODULE-3 LINEAR DIFFERENTIAL EQUATIONS WITH CONSTANT COEFFICIENTS										22DMAT41.3	8 Hours	
Solution of initial and boundary value problems, Inverse differential operator techniques for the functions- e^{ax} , $\sin(ax + b)$ and $\cos(ax + b)$.												
Text Book	Text Book 1: 13.3, 13.4, 13.5, 13.6,											
MODULE-4 LAPLACE TRANSFORM										22DMAT41.4	8 Hours	
Definition and Laplace transforms of elementary functions-Problems. Properties of Laplace transforms (Shifting property-without proof), Periodic functions (without proof)-problems.												
Text Book	Text Book 1: 21.3, 21.4, 21.5, Text Book 2: 6.1.											
MODULE-5 INVERSE LAPLACE TRANSFORM										22DMAT41.4	8 Hours	
Inverse Laplace Transform by partial fractions-Problems. Solution of linear differential equations using Laplace Transforms-Problems.												
Text Book	Text Book 1: 21.12, 21.15, Text Book 2: 6.4.											
CIE Assessment Pattern (50 X 2=100 Marks - Theory)												
RBT Levels		Marks Distribution										
		Test (s)	Qualitative Assessment (s)	MCQ's								
		25	15	10								
L1	Remember	5	5	-								
L2	Understand	5	5	-								
L3	Apply	10	5	10								
L4	Analyze	2.5	-	-								
L5	Evaluate	2.5	-	-								
L6	Create	-	-	-								
Suggested Learning Resources:												
Text Books:												
1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.												
2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232.												
Reference Books:												
1) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition,												

2015, ISBN: 9780273719236.

2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.

3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.

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

Web links and Video Lectures (e-Resources):

1) <https://youtu.be/SaNDPSk1UVM?si=FRxMnRi1btCUIscK>

2) <https://youtu.be/HxrLu-qRJKc?si=pKc9XOCllBx-H4Wp>

3) https://youtu.be/ma1QmE1SH3I?si=Hoo3_cjiIds203os

4) <https://youtu.be/TKBXey91Gc4?si=JjZfQvJxdxN8I6YQ>

5) https://youtu.be/1THkFmulPXM?si=pc9VvmZ-9cQe_Wr_

6) <https://youtu.be/m7jH0jfRf2I?si=OOEWttfQhieJ9wih>

7) <https://youtu.be/qFnoRfZknBY?si=BeMrhMF3LML4hBGa>

8) <https://youtu.be/n9XP6pljtw8?si=3gU-XKgt5JIZe9LE>

Activity-Based Learning (Suggested Activities in Class)/Practical Based Learning:

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - Organizing Group wise discussions on related topics
 - Seminars

NATIONAL SERVICE SCHEME (NSS)			
Course Code	22NSS30, 22NSS40, 22NSS50, 22NSS60	CIE Marks (each Semester)	50
L:T:P:S	0:0:0:0	SEE Marks	--
Hrs / Week	2	Total Marks	50 x 4 = 200
Credits	00	Exam Hours	02

Course outcomes:

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

22NSSX0.1	Understand the importance of his / her responsibilities towards society.
22NSSX0.2	Analyse the environmental and societal problems/issues and will be able to design solutions for the same.
22NSSX0.3	Evaluate the existing system and to propose practical solutions for the same for sustainable development. Implement government or self-driven projects effectively in the field.
22NSSX0.4	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22NSSX0.1	-	-	-	-	-	3	-	-	2	-	-	1
22NSSX0.2	-	-	-	-	-	3	3	-	2	-	-	1
22NSSX0.3	-	-	-	-	-	3	3	-	2	-	-	1
22NSSX0.4	-	-	-	-	-	3	3	-	2	-	-	1

Semester/ Course Code	CONTENT	COs	HOURS
3RD 22NSS30	<ol style="list-style-type: none"> Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing Waste management–Public, Private and Govt organization, 5R's. Setting of the information imparting club for women leading to contribution in social and economic issues. 	22NSS30.1, 22NSS30.2, 22NSS30.3, 22NSS30.4	30 HRS
4TH 22NSS40	<ol style="list-style-type: none"> Water conservation techniques – Role of different stakeholders– Implementation. Preparing an actionable business proposal for enhancing the village income and approach for implementation. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education. 	22NSS40.1, 22NSS40.2, 22NSS40.3, 22NSS40.4	30 HRS
5TH 22NSS50	<ol style="list-style-type: none"> Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc. Spreading public awareness under rural outreach programs. (minimum 5 programs). 	22NSS50.1, 22NSS50.2, 22NSS50.3, 22NSS50.4	30 HRS
6TH 22NSS60	<ol style="list-style-type: none"> Organize National integration and social harmony events / workshops / seminars. (Minimum TWO programs). Govt. school Rejuvenation and helping them to achieve good infrastructure. 	22NSS60.1, 22NSS60.2, 22NSS60.3, 22NSS60.4	30 HRS

CIE Assessment Pattern (50 Marks - Activity based) -

CIE component for every semester	Marks
Presentation - 1	10
Selection of topic, PHASE - 1	
Commencement of activity and its progress	10
PHASE - 2	
Case study-based Assessment Individual	10

performance	
Sector wise study and its consolidation	10
Video based seminar for 10 minutes by each student at the end of semester with Report.	10
Total marks for the course in each semester	50

- Implementation strategies of the project (NSS work).
- The last report should be signed by NSS Officer, the HOD and principal.
- At last report should be evaluated by the NSS officer of the institute.
- Finally, the consolidated marks sheet should be sent to the university and also to be made available at LIC visit.

Suggested Learning Resources:

Reference Books:

- 1.NSS Course Manual, Published by NSS Cell, VTU Belagavi.
- 2.Government of Karnataka, NSS cell, activities reports and its manual.
- 3.Government of India, NSS cell, Activities reports and its manual.

Pre-requisites to take this Course:

- 1.Students should have a service-oriented mindset and social concern.
2. Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.
3. Students should be ready to sacrifice some of the time and wishes to achieve service-oriented targets on time.

Pedagogy:

- In every semester from 3rd semester to 6th semester, each student should do activities according to the scheme and syllabus.
- At the end of every semester student performance has to be evaluated by the NSS officer for the assigned activity progress and its completion.
- At last, in 6th semester consolidated report of all activities from 3rd to 6th semester, compiled report should be submitted as per the instructions.
- State the need for NSS activities and its present relevance in the society and provide real-life examples.
- Support and guide the students for self-planned activities.
- NSS coordinator will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
- Encourage the students for group work to improve their creative and analytical skills.

Plan of Action:

- Student/s in individual or in a group Should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department.
- At the end of every semester, activity report should be submitted for evaluation.
- Practice Session Description:
 - Lecture session by NSS Officer
 - Students Presentation on Topics
 - Presentation - 1, Selection of topic, PHASE - 1
 - Commencement of activity and its progress - PHASE - 2
 - Execution of Activity
 - Case study-based Assessment, Individual performance
 - Sector/ Team wise study and its consolidation
 - Video based seminar for 10 minutes by each student at the end of semester with Report.

Sl No	Topic	Groupsize	Location	Activity execution	Reporting	Evaluation of the Topic
1.	Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	May be individual or team	Farmers land/Villages/ roadside / Community area / College campus	Site selection /proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
2.	Waste management- Public, Private and Govt organization, 5 R's.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
3.	Setting of the information imparting club for women leading to contribution in social and economic issues.	May be individual or team	Women empowerment groups/ Consulting NGOs & Govt Teams / College campus	Group selection/proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
4.	Water conservation techniques – Role of different stakeholders- Implementation.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	site selection / proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
5.	Preparing an actionable business proposal for enhancing the village income and approach for implementation.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	Group selection/proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
6.	Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.	May be individual or team	Local government / private/ aided schools/ Government Schemes officers	School selection/proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer

7.	Developing Sustainable Water management system for rural areas and implementation approaches.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	site selection/ proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
8.	Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	Group selection/ proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
9.	Spreading public awareness under rural outreach programs. (minimum 5 programs)	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	Group selection/ proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
10.	Organize National integration and social harmony events / workshops / seminars. (Minimum 02 programs).	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	Place selection/ proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
11.	Govt. school Rejuvenation and helping them to achieve good infrastructure.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/ Government Schemes officers/ campus	Place selection/ proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer

PHYSICAL EDUCATION (PE) (SPORTS AND ATHLETICS)												
Course Code	22PED307, 22PED40						CIE Marks (each semester)			50		
L:T:P:S	0:0:0:0						SEE Marks			--		
Hrs / Week	2						Total Marks			50 x 2= 100		
Credits	00						Exam Hours			02		
Course outcomes: At the end of the course, the student will be able to:												
22PEDX0.1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness											
22PEDX0.2	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle											
22PEDX0.3	Perform in the selected sports or athletics of student's choice and participate in the competition at regional/state / national / international levels.											
22PEDX0.4	Understand the roles and responsibilities of organization and administration of sports and games											
Mapping of Course Outcomes to Program Outcomes:												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22PEDX0.1	-	-	-	-	-	2	-	3	3	-	-	2
22PEDX0.2	-	-	-	-	-	2	-	3	3	-	-	2
22PEDX0.3	-	-	-	-	-	2	-	3	3	-	-	2
22PEDX0.4	-	-	-	-	-	2	-	3	3	-	-	2
Semester	CONTENT								COs		HOURS	
3RD 22PED30	Module 1: Orientation A. Lifestyle, B. Fitness C. Food & Nutrition D. Health & Wellness E. Pre-Fitness test.								22PED30.1, 22PED30.2		5 HRS	
	Module 2: General Fitness & Components of Fitness A. Warming up (Free Hand exercises) B. Strength – Push-up / Pull-ups C. Speed – 30 Mtr Dash D. Agility – Shuttle Run E. Flexibility – Sit and Reach F. Cardiovascular Endurance – Harvard step Test								22PED30.2, 22PED30.3		15 HRS	
	Module 3: Recreational Activities A. Postural deformities. B. Stress management. C. Aerobics. D. Traditional Games.								22PED30.3, 22PED30.4		10 HRS	
4TH 22PED40	Module 1: Ethics and Moral Values A. Ethics in Sports B. Moral Values in Sports and Games								22PED40.1, 22PED40.2		5 HRS	
	Module 2: Specific Games (Anyone to be selected by the student) A. Volleyball – Attack, Block, Service, Upper Hand Pass and Lower hand Pass. B. Throwball – Service, Receive, Spin attack, Net Drop & Jump throw. C. Kabaddi – Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus. D. Kho-Kho – Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up. E. Table Tennis – Service (Fore Hand & Back Hand), Receive (Fore Hand & Back Hand), Smash. F. Athletics (Track / Field Events) – Any event as per availability of Ground.								22PED40.3		20 HRS	

CIE Assessment Pattern (50 Marks - Practical) -

CIE to be evaluated every semester end based on practical demonstration of Sports and Athletics activities learnt in the semester.

CIE	Marks
Participation of student in all the modules	10
Quizzes - 2, each of 7.5 marks	15
Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	25
Total	50

Suggested Learning Resources:**Reference Books:**

1. Saha, A.K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.
3. Petipus, et.al., Athlete's Guide to Career Planning, Human Kinetics.
4. Dharma, P.N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi.
5. Jain, R. Play and Learn Cricket, Khel Sahitya Kendra, New Delhi.
6. Vivek Thani, Coaching Cricket, Khel Sahitya Kendra, New Delhi.
7. Saha, A.K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
8. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata
9. Naveen Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
10. Dubey H.C., Basketball, Discovery Publishing House, New Delhi.
11. Rachana Jain, Teach Yourself Basketball, Sports Publication.
12. Jack Nagle, Power Pattern Offences for Winning basketball, Parker Publishing Co., New York.
13. Renu Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
14. SallyKus, Coaching Volleyball Successfully, Human Kinetics.

YOGA												
Course Code	22YOG30, 22YOG40, 22YOG50, 22YOG60						CIE Marks (each Semester)	50				
L: T: P: S	0:0:0:0						SEE Marks	--				
Hrs / Week	2						Total Marks	50 x 4 = 200				
Credits	00						Exam Hours	02				
Course outcomes: At the end of the course, the student will be able to:												
22YOGX0.1	Use Yogasana practices in an effective manner											
22YOGX0.2	Become familiar with an authentic foundation of Yogic practices											
22YOGX0.3	Practice different Yogic methods such as Suryanamaskara, Pranayama and some of the Shat Kriyas											
22YOGX0.4	Use the teachings of Patanjali in daily life .											
Mapping of Course Outcomes to Program Outcomes:												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22YOGX0.1	-	-	-	-	-	3	-	-	-	-	-	1
22YOGX0.2	-	-	-	-	-	3	-	-	-	-	-	1
22YOGX0.3	-	-	-	-	-	3	-	-	-	-	-	1
22YOGX0.4	-	-	-	-	-	3	-	-	-	-	-	1
Semester / Course Code												
CONTENT												
COs												
HOURS												
3rd 22YOG30	Introduction of Yoga: Aim and Objectives of yoga, Prayer: Yoga, its origin, history and development. Yoga, its meaning, definitions. Different schools of yoga, importance of prayer Brief introduction of yogic practices for common man: Yogic practices for common man to promote positive health Rules and regulations: Rules to be followed during yogic practices by practitioner Misconceptions of yoga: Yoga its misconceptions, Difference between yogic and non-yogic practices. Suryanamaskara: 1. Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar. 2. Suryanamaskar 12 count, 2 rounds Different types of Asanas: 1. Sitting: Padmasana, Vajrasana, Sukhasana 2. Standing: Vrikshana, Trikonasana, Ardhakati Chakrasana 3. Prone line: Bhujangasana, Shalabhasana 4. Supine line: Utthitadvipadasana, Ardhalasana, Halasana						22YOG30.1, 22YOG30.2, 22YOG30.3, 22YOG30.4			Total 32 Hrs/ Semester 2 Hrs/week		
4TH 22YOG40	Suryanamaskara: Suryanamaskar 12 count, 4 rounds Brief introduction and importance of: Kapalabhati: Revision of Kapalabhati - 40 strokes/min 3 rounds Different types of Asanas: 1. Sitting: Paschimottanasana, Ardha Ushtrasana, Vakrasana, Aakarna Dhanurasana 2. Standing: Parshva Chakrasana, Urdhva Hastothanasana, Hastapadasana 3. Prone line: Dhanurasana 4. Supine line: Karna Peedasana, Sarvangasana, Chakraasana Patanjali's Ashtanga Yoga: Asana, Pranayama Pranayama: Chandra Bhedana, Nadishodhana, Surya Bheda						22YOG40.1, 22YOG40.2, 22YOG40.3, 22YOG40.4			Total 32 Hrs/ Semester 2 Hrs/week		
5TH 22YOG50	Kapalabhati: Revision of Kapalabhati - 60 strokes/min 3 rounds Brief introduction and importance of: Different types of Asanas: 1. Sitting: Yogamudra in Padmasana, Vibhakta Paschimottanasana, Yogamudra in Vajrasana 2. Standing: Parivritta Trikonasana, Utkatasana,						22YOG50.1, 22YOG50.2, 22YOG50.3, 22YOG50.4			Total 32 Hrs/ Semester 2 Hrs/week		

	<p>Parshvakonasana</p> <p>3. Prone line: Padangushtha Dhanurasana, Poorna Bhujangasana / Rajakapotasana</p> <p>4. Supine line: Navasana/Noukasana, Pavanamuktasana, Sarvangasana</p> <p>Patanjali's Ashtanga Yoga: Pratyahara, Dharana</p> <p>Pranayama: Ujjayi, Sheetal, Sheektari</p>										
<p>6TH 22YOG60</p>	<p>Kapalabhati: Revision of Kapalabhati – 80 strokes/min3rounds</p> <p>Brief introduction and importance of:</p> <p>Different types of Asanas:</p> <ol style="list-style-type: none"> Sitting: Bakasana, Hanumanasana, Ekapada Rajakapotasana Standing: Parivritta Trikonasana, Utkatasana, Parshvakonasana Supine line: Setubandhasana, Shavasana (Relaxation posture) Balancing: Sheershasana <p>Patanjali's Ashtanga Yoga: Dhyana (Meditation), Samadhi</p> <p>Pranayama: Bhastrika, Bhramari, Ujjai</p> <p>Shat Kriyas: Jalaneti and sutraneti, Sheetkarma Kapalabhati</p>	<p>22YOG60.1, 22YOG60.2, 22YOG60.3, 22YOG60.4</p>	<p>Total 32 Hrs/ Semester 2 Hrs/week</p>								
<p>CIE Assessment Pattern (50 Marks – Practical) – CIE to be evaluated every semester based on practical demonstration of Yogasana learnt in the semester and internal tests (objective type)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">CIE</th> <th style="text-align: center;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Avg of Test 1 and Test 2</td> <td style="text-align: center;">25</td> </tr> <tr> <td style="text-align: center;">Demonstration of Yogasana</td> <td style="text-align: center;">25</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">50</td> </tr> </tbody> </table>				CIE	Marks	Avg of Test 1 and Test 2	25	Demonstration of Yogasana	25	Total	50
CIE	Marks										
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Demonstration of Yogasana	25										
Total	50										
<p>Suggested Learning Resources:</p> <p>Reference Books:</p> <ol style="list-style-type: none"> Swami Kuvulyananda: Asma (Kavalyadhama, Lonavala) Tiwari, O P: Asana Why and How Ajitkumar: Yoga Pravesha (Kannada) Swami Satyananda Saraswati: Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger) Swami Satyananda Saraswati: Surya Namaskar (Bihar School of yoga, Munger) Nagendra H R: The art and science of Pranayama Tiruka: Shatkriyegalu (Kannada) Iyengar B K S: Yoga Pradipika (Kannada) Iyengar B K S: Light on Yoga (English) 											
<p>Web links and Video Lectures (e-Resources):</p> <ul style="list-style-type: none"> https://youtu.be/KB-TYlgd1wE https://youtu.be/aa-TG0Wg1Ls 											

APPENDIX A

1. Assignment
2. Group Discussions
3. Case Studies
4. Practical Orientation on Design Thinking , Creativity & Innovation
5. Participatory & Industry-Integrated Learning
6. Practical activities/Problem Solving exercises
7. Class Presentations
8. Analysis of Industry/Technical/Business Reports
9. Reports on Industrial Visits
10. Industrial/Social/Rural Projects
11. Participation in external Seminars/Workshop
12. Online/Offline Quizzes

APPENDIX B

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 C

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 straight forward 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.

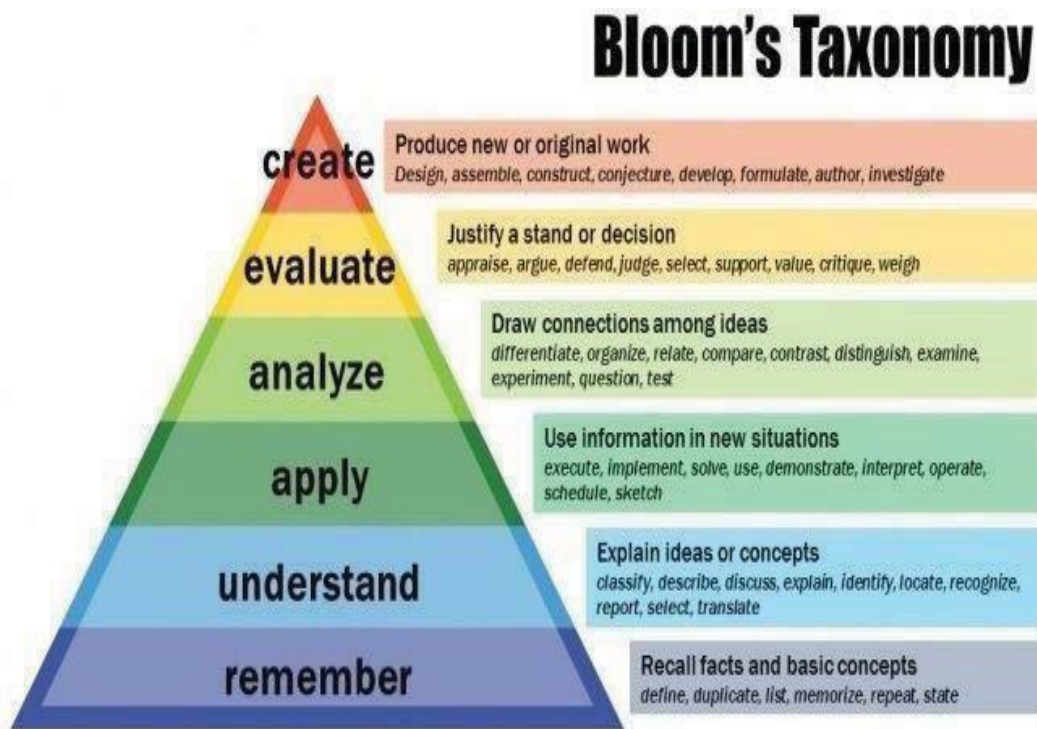
Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

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 D

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.



www.newhorizonindia.edu

Ring Road, Bellandur Post, Near Marathahalli
Bengaluru, India pin-560103

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