NEW HORIZON
COLLEGE OF ENGINEERING

Department of Computer Engineering

Academic Year 2024-25

Scheme & Syllabus

Semester - 5 & 6 | (2022 Scheme)

BATCH: 2022-26

CREDITS: 160 (REVISED NEP)

S. No	CONTENTS	Pg. No
1.	Institution Vision, Mission, Quality policy, and Values	1
2.	Department Vision, Mission and Program Educational Objectives (PEO)	2
3.	Program Outcomes (PO) with Graduate Attributes	4
4.	Program Specific Outcomes (PSOs)	5
	SCHEME	
5	**Scheme of Fifth and Sixth Semester B. E**	**6-9**
	SYLLABUS	
6.	**Syllabus of Fifth Semester B.E**	**10-44**
	Software Engineering and Product Management	11
	Operating Systems	13
	Operating Systems Lab	15
	Web Technology	17
	Web Technology Lab	19
	Professional Elective Course-I	**21-30**
	Artificial Intelligence	21
	Object Oriented Analysis and Design	23
	Principles of Cloud Computing	25
	Human Computer Interaction	27
	Operation Research	29
	Research Methodology and IPR	31
	Critical and Creative Thinking Skills	33
	Environmental Studies	35
	Mini Project II	37
	National Service Scheme (NSS)	38
	Physical Education (PE) (Sports and Athletics)	42
	Yoga	44
7.	**Syllabus of Sixth Semester BE**	**45-83**
	Computer Networks	46
	Computer Networks Lab	48
	Machine Learning	50
	Machine Learning Lab	52
	Cyber Security	54

	Professional Elective Course-II	**56-65**
	Fundamentals Of Data Science	56
	Quantum Computing	58
	Natural Language Programming	60
	Social Network Analysis	62
	System Modelling and Simulation	64
	Project Phase-I	66
	Problem Solving Skills	67
	Ability Enhancement Course – V	**69-76**
	Swift Programming	69
	Data Visualization and Its Applications	71
	Casandra / NOSQL	73
	Introduction To Full Stack Development Tool Kit	75
	National Service Scheme (NSS)	77
	Physical Education (PE) (Sports and Athletics)	81
	Yoga	83
8	**Appendix**	**84-88**
	Appendix A: List of Assessment Patterns	84
	Appendix B: Outcome Based Education	85
	Appendix C: The Graduate Attributes of NBA	86
	Appendix D: Bloom's Taxonomy	88

NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving 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 mold 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 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.
PEO4:	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

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems in Computer Engineering.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems in Computer Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
PO3	**Design / Development of Solutions:** Design solutions for complex Engineering problems and design system components or processes of Computer Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments in Computer Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities in Computer Engineering with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Computer Engineering.
PO7	**Environment and Sustainability:** Understand the impact of the professional Engineering solutions of Computer Engineering in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
PO9	**Individual and Teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills:** Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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.

Mapping of POs with PEOs

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

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

NEW HORIZON COLLEGE OF ENGINEERING

B. E. in Computer Engineering

Scheme of Teaching and Examinations for 2022- 2026 BATCH (2022 Scheme)

V 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	HSMS	22CEE51	Software Engineering and Product Management	CEE	3	0	0	0	3	3	50	50	**100**
2	PCC	22CEE52	Operating Systems	CEE	3	0	0	0	3	3	50	50	**100**
3	PCCL	22CEL52	Operating Systems Lab	CEE	0	0	1	0	1	2	50	50	**100**
4	PCC	22CEE53	Web Technology	CEE	3	0	0	0	3	3	50	50	**100**
5	PCCL	22CEL53	Web Technology Lab	CEE	0	0	1	0	1	2	50	50	**100**
6	PEC	22CEE54X	Professional Elective Course-I	CEE	3	0	0	0	3	3	50	50	**100**
7	AEC	22RMK55	Research Methodology and IPR	CEE	1	1	0	0	2	3	50	50	**100**
8	AEC	22SDK56	Critical and Creative Thinking Skills	CEE	0	0	1	0	1	2	50	--	**50**
9	UHV	22ESK57	Environmental Studies	Any Dept	1	0	0	0	1	1	50	50	**100**
10	PROJ	22CEE58	Mini Project-II	CEE	0	0	1	0	1	0	50	50	**100**
11	NCMC	22NSS50	National Service Scheme (NSS)	NSS coordinator	0	0	0	0	0	2	50	--	**50**
		22PED50	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YOG50	Yoga	Yoga Teacher									
Total									**19**	**24**	**550**	**450**	**1000**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **NCMC:** Non-Credit Mandatory Course, **AEC**: Ability Enhancement Course, **PEC**: Professional Elective Course, **PROJ**: Mini Project work **L:** Lecture, **T**: Tutorial, **P**: Practical **S: SDA**: Self Study for Skill Development, **CIE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation

Professional Elective Course-I			
22CEE541	Artificial Intelligence	22CEE544	Human Computer Interaction
22CEE542	Object Oriented Analysis and Design	22CEE545	Operation Research
22CEE543	Principles of Cloud Computing		

22XXX51(HSMS)- This course must be pertaining to economics and management of the concerned degree program. The course syllabus should have both economics and management topics and the course title should bear the word Management.

For IT allied Branches: Software Product Management

For Core Branches: Engineering Economics and Management / Industrial Management and Entrepreneurship

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/s and 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.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses can be added to supplement the latest trend and advanced technology in the selected stream of engineering.

National Service Scheme /Physical Education/Yoga: All students must 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-hoursTutorial(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

NEW HORIZON COLLEGE OF ENGINEERING

B. E. in Computer Engineering

Scheme of Teaching and Examinations for 2022- 2026 BATCH (2022 Scheme)

VI Semester

S. #.	Course and Course Code		Course Title	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
					L	T	P	S			CIE	SEE	Total
1	PCC	22CEE61	Computer Networks	CEE	3	0	0	0	3	3	50	50	**100**
2	PCCL	22CEL61	Computer Networks Lab	CEE	0	0	1	0	1	2	50	50	**100**
3	PCC	22CEE62	Machine Learning	CEE	3	0	0	0	3	3	50	50	**100**
4	PCCL	22CEL62	Machine Learning Lab	CEE	0	0	1	0	1	2	50	50	**100**
5	PCC	22CEE63	Cyber security	CEE	2	1	0	0	3	4	50	50	**100**
6	PEC	22CEE64X	Professional Elective Course-II	CEE	3	0	0	0	3	3	50	50	**100**
7	PROJ	22CEE65	Project Phase-I	CEE	0	0	2	0	2	0	50	50	**100**
8	AEC	22SDK66	Problem Solving Skills	XX	0	0	1	0	1	2	50	--	**50**
9	AEC	22CEE67X	Ability Enhancement Course – V	CEE	0	0	1	0	1	2	50	50	**100**
10	OEC	23NHOP6XX	Industrial Open Elective Course-I	Offering Dept.	3	0	0	0	3	3	50	50	**100**
11	NCMC	22NSS60	National Service Scheme (NSS)	NSS coordinator	0	0	0	0	0	2	50	--	**50**
		22PED60	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YOG60	Yoga	Yoga Teacher									
Total									**21**	**25**	**550**	**450**	**1000**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **NCMC:** Non-Credit Mandatory Course, **AEC**: Ability Enhancement Course, **PEC**: Professional Elective Course, **OEC**: Open Elective Course, **PROJ**: Project work**, L:** Lecture, **T**: Tutorial, **P**: Practical **S: SDA**: Self Study for Skill Development, C**IE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation.

Professional Elective Course-II			
22CEE641	Fundamentals of Data Science	22CEE644	Social Network Analysis
22CEE642	Quantum Computing	22CEE645	System Modelling and Simulation
22CEE643	Natural Language Programming		

Ability Enhancement Course – V			
22CEE671	Swift Programming	22CEE673	Casandra / NoSQL
22CEE672	Data Visualization and its Applications	22CEE674	Introduction to full stack Development tool kit

Industrial Open Elective Courses-I:
Credit for OEC is 03 (L: T: P: S) can be considered as (3: 0: 0 : 0). The teaching and learning of these Courses will be based on hands-on. The Course Assessment will be based on CIE and SEE in practical mode. This Courses will be offered by Centre of Excellence to students of all the branches. Registration to Industrial open electives shall be documented and monitored on college level.

Project Phase-I: Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses can be added to supplement the latest trend and advanced technology in the selected stream of engineering.

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-hoursTutorial(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

SEMESTER V(SYLLABUS)

SOFTWARE ENGINEERING AND PRODUCT MANAGEMENT			
Course Code	**22CEE51**	**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:

22CEE51.1	Understand the phases in a software project
22CEE51.2	Apply the fundamental concepts of requirements engineering and Analysis Modelling.
22CEE51.3	Apply the various software design and coding methodologies
22CEE51.4	Analyze various testing and maintenance measures
22CEE51.5	Demonstrate various project testing activities
22CEE51.6	Evaluate various project management activities

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
22CEE51.1	3	3	1	2	1	-	-	-	-	-	-	-	2	2
22CEE51.2	2	2	1	2	1	-	-	-	-	-	-	-	1	3
22CEE51.3	2	2	3	2	2	1	-	-	-	-	-	3	2	3
22CEE51.4	2	2	3	3	3	-	-	-	-	-	-	-	2	1
22CEE51.5	1	2	1	2	3	-	-	-	-	-	-	-	2	2
22CEE51.6	1	2	1	2	2	-	-	-	-	-	2	-	1	2

MODULE-1	**INTRODUCTION**	**22CEE51.1**	**8 Hours**
Software Engineering; Software Processes: Life Cycle Models, Unified process; Agile Process Model development; Extreme Programming, Aspect-oriented software engineering and process			
Text Book	Text Book 1: Chapter 1		
MODULE-2	**REQUIREMENTS**	**22CEE51.2**	**8 Hours**
Software Requirements, Feasibility study, Requirements elicitation and analysis; Requirements Specification, validation and management			
Text Book	Text Book 1: Chapter 2, 3		
MODULE-3	**SOFTWARE DESIGN**	**22CEE51.3, 22CEE51.4**	**8 Hours**
Data Design, Architectural Design; Component Level Design, User Interface Design, Object Oriented Design, Software Design Notations.			
Self -Study	Various notations of software design		
Text Book	Text Book 2: Chapter 1, 3		
MODULE-4	**SOFTWARE CODING AND TESTING**	**22CEE51.5**	**8 Hours**
Features of Software Code, Coding Guidelines, Coding Methodology, Programming Practice, Code verification Techniques, Coding Tools, Code Documentation **Software Testing:** Software Testing basics, Test Plan, Levels of Software Testing, Testing Techniques, Debugging. Safety, Security and reliability			
Text Book	Text Book 2: Chapter 3		
MODULE-5	**CONFIGURATION MANAGEMENT**	**22CEE51.6**	**8 Hours**
Change management, Distributed Version Control Systems Project Management: Project planning; Project scheduling; Risk management, Management activities.			
Case study	Various management activities		
Text Book	Text Book 2: Chapter 4,6		

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	5	-
L3	Apply	5	5	5
L4	Analyze	10	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	20
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1. Roger S. Pressman, Bruce Maxim, "Software Engineering - A Practitioner's Approach", McGraw Hill; 8th edition, 2014, ISBN-13: 978-0078022128
2. Ian Somerville, "Software Engineering", Pearson Education, Tenth edition, ISBN-13: 978- 9332582699

Reference Books:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Wiley India, Narosa, 2009, ISBN-13: 978-8173197024
2. Hans Van Vliet: Software Engineering: Principles and Practices, Wiley India, Third edition 2010 ISBN-13: 978-8126527373
3. Richard Fairley: Software Engineering Concepts, McGraw Hill, 2018, ISBN-13: 978-0070199026

Web links and Video Lectures (e-Resources):

- https://www.tutorialspoint.com/software_engineering/index.htm
- https://www.computerscience.org/careers/software-engineer/
- https://www.javatpoint.com/software-engineering-tutorial
- https://www.guru99.com/what-is-software-engineering.html
- https://www.geeksforgeeks.org/software-engineering/

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

- Demonstration of various needs of Software Engineering
- Video demonstration of agile and scrum techniques

OPERATING SYSTEMS														
Course Code	**22CEE52**						**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														
22CEE52.1	Provide an overview of the computer system and elucidate the services offered by an operating system													
22CEE52.2	Elaborate on different Inter-Process Communication mechanisms and delve into the intricacies of CPU scheduling algorithms.													
22CEE52.3	Implement both software and hardware solutions to address the critical-section problem													
22CEE52.4	Examine multiple mechanisms for managing deadlock situations													
22CEE52.5	Assess various approaches to memory management													
22CEE52.6	Examine the structure of file systems and the organization of secondary storage devices													
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**
22CEE52.1	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
22CEE52.2	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
22CEE52.3	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
22CEE52.4	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
22CEE52.5	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
22CEE52.6	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
MODULE-1	**INTRODUCTION TO OPERATING SYSTEMS**									**22CEE52.1**			**8 Hours**	
Basics of Operating Systems: Definition, System Calls – Types. Operating System Structure: Layered Structure, Microkernel, Modules, Hybrid Systems – Mac OS X, iOS, Android.														
Self-study	Investigate the Challenges of designing an operating system from different viewpoints.													
Text Book	Text Book 1: 1.1, 1.4, 2.1, 2.3, 2.8.2,2.8.3,2.8.4,2.8.5													
MODULE-2	**PROCESS MANAGEMENT AND CPU SCHEDULING**									**22CEE52.2**			**8 Hours**	
Process: The Processes, Process States, PCB; Process Scheduling, Context Switch; Inter-Process Communication – Shared Memory System, Message Passing System. CPU Scheduling - Basic Concepts, CPU Scheduler – Preemptive Scheduling, Scheduling Algorithms – FCFS, SJF, Round-Robin, Priority.														
Self-study	Investigate the various scheduling algorithms used in cloud based operating systems.													
Text Book	Text Book 1: 3.1-3.4,5.1-5.3													
MODULE-3	**SYNCHRONIZING PROCESSES AND MANAGING DEADLOCKS IN OPERATING SYSTEMS**									**22CEE52.3**			**8 Hours**	
Process Synchronization: The Critical Section Problem; Peterson's Solution; Semaphores – Semaphore Usage, Semaphore Implementation, Deadlock and Starvation; Classical Problems of Synchronization – The Reader-Writer Problem, Dining-Philosopher Problem. Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery														
Self-study	Explore the need for synchronization in various kernel data structures													
Text Book	Text Book 1: 6.1-6.4,6.6 ,7.1,8.1-8.8													
MODULE-4	**MEMORY MANAGEMENT AND VIRTUAL MEMORY IN OPERATING SYSTEMS**									**22CEE52.4**			**8 Hours**	
Memory Management – Swapping, Logical versus Physical Address Space, Contiguous Allocation, Paging - Basic Method, Segmentation – Basic Method, Segmentation Hardware. Virtual Memory: Demand Paging; Page Replacement – Basics, Algorithms - FIFO, Optimal, LRU, Thrashing – Causes of Thrashing.														
Self-study	Scrutinize the Different types of Optimization techniques in managing virtual memory													
Text Book	Text Book 1: 9.1-9.5,10.1-10.4,10.6													
MODULE-5	**FILE SYSTEMS AND MASS STORAGE STRUCTURES IN OPERATING ENVIRONMENTS**									**22CEE52.5, 22CEE52.6**			**8 Hours**	
File-System Interface: File Structure, Access methods – Sequential Access, Direct Access, Other Access Methods Implementation: Directory Implementation – Linear List, Hash Table, Allocation Methods – Contiguous Allocation, Linked Allocation, Indexed Allocation, Disk Structure, Disk Scheduling –FCFS, SSTF, SCAN, CSCAN, LOOK														
Self-study	Survey on how the various optimization techniques can be applied with the file a directory system implementation.													
Text Book	Text Book 1:13.1,13.2,14.3-14.5,11.2													

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	-	5
L3	Apply	5	5	5
L4	Analyze	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. Abraham Silberschatz, Greg Gagne and Peter B. Galvin. "Operating System Concepts", Wiley, 10th Edition 2018, ISBN-10: 812650962
2. Harvey M. Deitel , Paul J. Deitel , David R. Choffnes. "Operating Systems", Pearson, 3rd Edition 2003, ISBN-13:978-0131828278

Reference Books:

1. D. M. Dhamdhere. ''Operating Systems: A Concept-Based Approach'',Tata McGraw Hill, 3rd. Edition 2017,ISBN: 9780071264365
2. William Stallings. ''Operating Systems: Internals and Design Principles'',Prentice Hall, 7th Edition, 2013,ISBN:9780132309981
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice, 4thEdition, PHI(EEE), ISBN 9788120348363, 2014.

Web links and Video Lectures (e-Resources)

- **https://nptel.ac.in/courses/106105214**
- **https://nptel.ac.in/courses/106108101**
- **Operating System Tutorial - GeeksforGeeks**
- **https://www.tutorialspoint.com/operating_system/index.htm**

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

- Demonstration of various CPU Scheduling algorithms.
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare the model for various paging techniques.
- Flipped classroom methodology

OPERATING SYSTEMS LAB			
Course Code	**22CEL52**	**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:

22CEL52.1	Perform UNIX System Calls and implement CPU Scheduling algorithms.
22CEL52.2	Devise solutions for process synchronization, deadlock avoidance, and prevention in a specified scenario.
22CEL52.3	Evaluate different methods of memory allocation and page replacement strategies.
22CEL52.4	Implement disk scheduling algorithms based on a provided process description.

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
22CEL52.1	3	3	3	3	3	-	-	-	-	-	-	3	3	-
22CEL52.2	3	3	3	3	3	-	-	-	-	-	-	3	3	-
22CEL52.3	3	3	3	3	3	-	-	-	-	-	-	3	3	-
22CEL52.4	3	3	3	3	3	-	-	-	-	-	-	3	3	-

Pgm. No.	List of Programs	Hours	COs
	Prerequisite Experiments / Programs / Demo		
	Proficiency in programming languages like C or C++ is essential for operating system development since many OS components are typically written in these languages.	2	NA
	PART-A		
1	Compose a program utilizing the following system calls: • opendir, readdir, closedir • fork, exec, getpid .	2	22CEL52.1
2	Develop a program to model non-preemptive SJF CPU scheduling algorithms.	2	22CEL52.1
3	Create a program to simulate the round-robin scheduling algorithm.	2	22CEL52.1
4	Develop a program that demonstrates Shared Memory and Inter Process Communication	2	22CEL52.2
5	Create a program that simulates the Producer-Consumer problem using semaphores.	2	22CEL52.2
6	Implement a program to depict the Dining Philosopher's problem concept.	2	22CEL52.2
	PART-B		
7	Develop a program for simulating the Banker's Algorithm to prevent deadlock.	2	22CEL52.2
8	Create a program to simulate the Banker's Algorithm for deadlock prevention.	2	22CEL52.2
9	Implement a program to emulate first-fit contiguous memory allocation.	2	22CEL52.3
10	Develop a program for simulating paging table implementation and determining the actual physical address in memory.	2	22CEL52.3
11	Create a program to execute the FIFO page replacement algorithm.	2	22CEL52.3
12	Implement a program for simulating the SCAN disk scheduling algorithm.	2	22CEL52.4

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

- **Memory management: https://naim30.github.io/OS-virtual-lab/**
- **CPU scheduling algorithm: http://ebootathon.com/labs/beta/csit/OS/exp2/**

CIE Assessment Pattern (50 Marks – Lab)

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

SEE Assessment Pattern (50 Marks – Lab)

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

Suggested Learning Resources:

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons, Inc., 10th Edition, 2018, ISBN :978-1-118-06333-0.
2. Neil Matthew, Richard Stones- Beginning Linux® Programming, Third Edition 2004, Wiley Publishing, Inc ISBN: 0-7645-4497-7

WEB TECHNOLOGY			
Course Code	**22CEE53**	**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

22CEE53.1	Develop static web pages using HTML tags.
22CEE53.2	Create static web pages using different levels of styles and selector forms in CSS.
22CEE53.3	Create dynamic web pages using JavaScript for the real time applications.
22CEE53.4	Create dynamic documents using java script and develop server-side programs using servlets for business and personal requirements.
22CEE53.5	Develop server-side programs using PHP, MySQL and file with the help of advanced tools.
22CEE53.6	Design and develop a web-based project/program incorporating different web technologies.

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
22CEE53.1	3	3	3	-	3	-	-	-	3	-	-	-	3	-
22CEE53.2	3	3	3	-	3	-	-	-	3	-	-	-	3	-
22CEE53.3	3	-	3	-	3	-	-	-	3	-	-	-	3	-
22CEE53.4	3	-	3	2	3	-	-	-	3	-	-	-	3	-
22CEE53.5	3	-	3	-	3	-	-	-	3	-	-	-	3	-
22CEE53.6	3	3	3	2	3	-	-	-	3	1	1	1	3	-

MODULE-1	**Fundamentals of Web, HTML**	**22CEE53.1**	**8 Hours**

Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.
Introduction to HTML: Basic syntax, Standard structure, Basic text mark- up, Images, Hypertext Links. Lists, Tables, Forms.

Case study	Design the following static web pages 1. Login Page 2. Class Timetable
Text Book	Text Book: 1 chapter 1.1,1.2,1.4,1.6,1.7,1.8,1.14

MODULE-2	**Cascading Style Sheets**	**22CEE53.2**	**8 Hours**

Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Colour, Alignment of text, The box model.

Case Study	Control the repetition of the image with the background-repeat property.
Text Book	Text Book 1: chapter 2.1,2.3,2.3,2.4

MODULE-3	**JavaScript**	**22CEE53.3**	**8 Hours**

JavaScript Overview: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.
JavaScript with HTML Documents (I): The JavaScript execution environment, The Document Object Model, Element access in JavaScript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements

Text Book	Text Book 2: chapter 3.1,3.3,3.3,3.4,3.6

MODULE-4	**Dynamic Documents with JavaScript (II)**	**22CEE53.4**	**8 Hours**

Introduction to dynamic documents, positioning elements, moving elements, Element visibility, changing colors and fonts, Dynamic content, stacking elements, Locating the mouse cursor, reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

Text Book	Text Book 2: chapter 4.1,4.2,4.3,4.4

MODULE-5	**Introduction to Servlets**	**22CEE53.5, 22CEE53.6**	**8 Hours**

Life cycle of a servlet. The Servlet API, PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking. Using PHP with MySQL: Database access with PHP and MySQL.

Self-study	Difference between PHP program and Node js.
Text Book	Text Book 2: chapter 5.1,5.2,5.3,5.4

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	5	-
L3	Apply	5	5	5
L4	Analyze	5	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. Robert W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson education,2012, ISBN-9780136076636.
2. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, Mc- Graw Hill, 2017, ISBN-0072253576.

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 3rd Edition, Pearson education,2004, ISBN-0131450913, ISBN-9780131450912.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India,2009,2017, ISBN-0470017759, ISBN-9780470017753.
3. Steven Holzener, PHP – The Complete Reference, 1st Edition, Mc-Graw Hill, 2008, ISBN-9780071508544.

Web links and Video Lectures (e-Resources)

- **https://www.coursera.org/specializations/codio-web-tech-security**
- **https://onlinecourses.swayam2.ac.in/nou24_cs09/preview**

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

- For active participation of students, instruct the students to prepare their portfolio.
- seminars on web development.

WEB TECHNOLOGY LAB

Course Code	**22CEL53**	**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:

22CEL53.1	Apply the basic concepts of HTML and CSS.
22CEL53.2	Understand the basic skills in analyzing the usability of a website using HTML
22CEL53.3	Apply the open-source technologies such as HTML, CSS, JavaScript and Bootstrap framework.
22CEL53.4	Analyze an application based upon the concepts of HTML, CSS, JavaScript and Bootstrap framework.

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
22CEL53.1	3	3	3	2	-	-	-	-	-	-	-	2	3	3
22CEL53.2	3	3	3	2	2	-	-	-	-	-	-	2	3	3
22CEL53.3	3	3	3	2	2	-	-	-	-	-	-	2	3	3
22CEL53.4	3	3	3	2	-	-	-	-	-	-	-	2	3	3

Pgm. No.	List of Programs	Hours	COs
	Prerequisite Programs / Demo		
	❖ Text editor-VS code installation. ❖ HTML basics, HTML tags, HTML elements, HTML headings, HTML styles, HTML attributes.	--	NA
	PART-A		
1	Design a Timetable Webpage using the HTML '<table>' tag ensures it spans the full width of the page.	2	22CEL53.1
2	Create a biodata form using HTML and CSS by using different input types.	2	22CEL53.1
3	Insert an image, video (YouTube video), running message and create a link such that clicking on it takes the user to another page.	2	22CEL53.1
4	Design a responsive event form using the HTML and CSS.	2	22CEL53.1
5	Implement 3 different ways of adding CSS to HTML documents. ❖ Inline - by using the style attribute inside HTML elements ❖ Internal - by using a <style> element in the <head> section ❖ External - by using a <link> element to link to an external CSS file.	2	22CEL53.2
6	Create a HTML document containing a nested list showing a content page of any book.	2	22CEL53.2
	PART-B		
7	Design a countdown timer using JavaScript	2	22CEL53.2
8	Create a dynamic search and highlight project using HTML, CSS and JavaScript	2	22CEL53.2
9	A program to fetch and display API data in table format	2	22CEL53.3
10	A JavaScript program to differentiate for each(), map(),filter(),reduce()	2	22CEL53.3
11	Develop a program to count the characters and words using JavaScript	2	22CEL53.4
12	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient	2	22CEL53.4

PART-C

- **Library Management system** **https://youtu.be/VU6kdE7Eo_c?si=Tv4f1AG0qpOaB0Ea**
- **Registration Form Validation.** **https://youtu.be/PAUxi3f9HB0?si=weDbk4pbE2V0q_GO**

CIE Assessment Pattern (50 Marks – Lab)

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

SEE Assessment Pattern (50 Marks – Lab)

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

Suggested Learning Resources:

Reference Books:

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4th Edition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014 (ISBN:978- 9351108078)

ARTIFICIAL INTELLIGENCE			
Course Code	**22CEE541**	**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:

22CEE541.1	Understand the characteristics of AI that make it useful for real-world problems
22CEE541.2	Apply strong familiarity with several important AI techniques, including search, knowledge representation, planning, and constraint management
22CEE541.3	Analyze the modern view of AI as the study of agents that receive precepts from the environment and perform actions.
22CEE541.4	Illustrate AI facing major challenges and the complexity of typical problems within the field.
22CEE541.5	Investigate the techniques presented and apply them to real-world problems.
22CEE541.6	Develop strategies for acquiring Knowledge on Logical Analysis.

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
22CEE541.1	2	2	-	-	-	-	-	-	-	-	-	-	3	3
22CEE541.2	2	2	-	-	1	-	-	-	-	-	-	-	3	2
22CEE541.3	2	2	-	-	1	-	-	-	-	-	-	-	3	3
22CEE541.4	2	2	-	-	-	-	-	-	-	-	-	-	3	3
22CEE541.5	-	2	-	-	-	-	-	-	-	-	-	-	3	3
22CEE541.6	2	2	-	-	-	-	-	-	-	-	-	-	3	3

MODULE-1	**INTRODUCTION TO AI**	**22CEE541.1, 22CEE541.2, 22CEE541.3**	**8 Hours**
Introduction– Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.			
Self-study	Introduction to cognitive computing		
Text Book	Text Book 1 - chapter 1 & 2, Text Book 2- chapter 1		
MODULE-2	**SEARCHING ALGORITHMS**	**22CEE541.1, 22CEE541.2, 22CEE541.3**	**8 Hours**
Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Informed search strategies: generate and test search, Best first search, Beam search algorithm, Hill climbing, A* algorithm, A* admissible, AO* algorithm.			
Text Book	Text Book 1 - chapter 3 & 4		
MODULE-3	**CLASSICAL AND ADVERSARIAL SEARCH**	**22CEE541.1, 22CEE541.3, 22CEE541.4**	**8 Hours**
Beyond Classical Search, Local Search Algorithms and Optimization Problems: Hill-climbing search Simulated annealing, Local beam search, Genetic algorithms, Adversarial Search: Study of minimax algorithm. Alpha-- Beta Pruning, Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Satisfaction Algorithm			
Text Book	Text Book 1 - chapter 4 & 5		
MODULE-4	**QUANTIFYING UNCERTAINTY**	**22CEE541.1, 22CEE541.3, 22CEE541.4**	**8 Hours**
Representing vagueness: Fuzzy sets and fuzzy logic, Study of fuzzy logic and Decision trees, Implementation aspects of Decision trees. Learning from Examples: Forms of Learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning.			
Self-study	Experiential based learning and resolution		
Text Book	Text Book 1 – chapter 13 & 14		
MODULE-5	**LOGICAL AGENTS**	**22CEE541.1, 22CEE541.5, 22CEE541.6**	**8 Hours**
Logical Agents: Knowledge representation structures: Frames, semantic net, Scripts, Logic: Propositional Logic, Neural Networks, First Order Logic Natural language processing and Expert system.			
Text Book	Text Book 1 - chapter 8 & 10		

CIE Assessment Pattern (50 Marks – Theory)

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

Suggested Learning Resources:

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021, ISBN-10-9356063575.
2. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013, ISBN-13-978-1259029981.

Reference Books:

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education,2007, ISBN-13-978-8120307773.
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008, ISBN-13-978-0070087705.
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006, ISBN-10-8131715051.

Web links and Video Lectures (e-Resources)

- http://nptel.ac.in/
- https://www.coursera.org/courses?query=artificial%20intelligence
- https://www.udemy.com/topic/artificial-intelligence/
- https://www.simplilearn.com/artificial-intelligence-masters-program-training-course

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

- Seminars
- Contents related activities
- Case Studies

OBJECT ORIENTED ANALYSIS AND DESIGN			
Course Code	**22CEE542**	**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

22CEE542.1	**Describe the concepts and explain projects using OO concepts.**
22CEE542.2	Apply the knowledge of UML in design diagrams.
22CEE542.3	Analyze and make use of various concepts and types of design patterns.
22CEE542.4	Examine use case modeling and domain modeling to various domains.
22CEE542.5	Demonstrate appropriate design patterns.
22CEE542.6	Evaluate code from design and compare various testing techniques

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
22CEE542.1	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
22CEE542.2	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
22CEE542.3	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**2**
22CEE542.4	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
22CEE542.5	**3**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**
22CEE542.6	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**

MODULE-1	**ADVANCED OBJECT AND CLASS CONCEPTS**	**22CEE542.1, 22CEE542.2, 22CEE542.3**	**8 Hours**

What is Object orientation? A sample class model, Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; and Packages. State Modeling: Events, States, Transitions and Conditions, State Diagrams, State Diagram Behavior.

Case Study	Investigate the Challenges of OOAD and compare them with traditional areas of science and engineering.
Text Book	Text Book-1: Chapter 4, 5

MODULE-2	**USECASE MODELLING AND DETAILED REQUIREMENTS**	**22CEE542.1, 22CEE542.2, 22CEE542.3**	**8 Hours**

Overview; Detailed object-oriented Requirements definitions; System Processes- A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour state chart Diagram; Integrated Object-oriented Models

Case Study	Investigate real-world applications of OOAD.
Text Book	Text Book-2: Chapter- 6: Page 210 to 250

MODULE-3	**PROCESS OVERVIEW, SYSTEM CONCEPTION, AND DOMAIN ANALYSIS**	**22CEE542.3, 22CEE542.4**	**8 Hours**

Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis.

Self-study	Explore the Development stages.
Text Book	Text Book-1: Chapter- 10,11,and 12

MODULE-4	**USE CASE REALIZATION**	**22CEE542.1, 22CEE542.3, 22CEE542.4**	**8 Hours**

The Design Discipline within up iterations: Object Oriented Design-The Bridge between Requirements and Implementation; Design Classes and Design within Class Diagrams; Interaction Diagrams-Realizing Use Case and defining methods; Designing with Communication Diagrams; Updating the Design Class Diagram; Package Diagrams-Structuring the Major Components; Implementation Issues for Three-Layer Design.

Self-study	Scrutinize the Different goals of Use Case Realization.
Text Book	Text Book-2: Chapter 8: page 292 to 346

MODULE-5	**DESIGN PATTERNS**	**22CEE36.6**	**8 Hours**

CONTENT	
Case Study	Survey on applications and case studies of the design patterns in OOAD.
Text Book	**Text Book-3: Ch-1: 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, Ch-3, Ch-4.**

CIE Assessment Pattern (50 Marks – Theory)

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

Suggested Learning Resources:

Text Books:

1. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2011, ISBN-10 8131764621.
2. Satzinger, Jackson, and Burd: Object-Oriented Analysis & Design with the Unified Process, Cengage Learning, 2005, ISBN-10 8131502694.
3. Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides: Design Patterns -Elements of Reusable Object-Oriented Software, Pearson Education,2015, ISBN-10 9332555400.

Reference Books:

1. Grady Booch et. al.: Object-Oriented Analysis and Design with Applications,3rd Edition, Pearson Education,2007.
2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michel Stal: Pattern – Oriented Software Architecture. A system of patterns, Volume 1, John Wiley and Sons.2007.
3. Booch, Jacobson, Rambaugh: Object-Oriented Analysis and Design with Applications, 3rd edition, Pearson, Reprint 2013

Web links and Video Lectures (e-Resources)

- https://onlinecourses.nptel.ac.in/noc19_cs48/preview
- http://nitttrc.edu.in/nptel/courses/video/106105153/L35.html

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

PRINCIPLES OF CLOUD COMPUTING			
Course Code	**22CEE543**	**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

22CEE543 .1	Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
22CEE543 .2	Apply a suitable model to capture the business needs by interpreting different service delivery and deployment models.
22CEE543 .3	Analyze the importance of Virtualization using hypervisors
22CEE543 .4	Infer architectural style, workflow of real-world applications and to implement the cloud applications using map reduce programming models.
22CEE543 .5	Design a cloud framework with appropriate resource management policies and mechanisms.
22CEE543 .6	Compare operation and economic models of various trending cloud platforms prevailing in the 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
22CEE543 .1	3	-	-	-	-	3	3	-	3	3	-	3	3	3
22CEE543 .2	3	3	-	-	-	3	3	-	3	3	-	3	3	2
22CEE543 .3	3	-	-	-	-	3	3	-	3	3	-	3	3	2
22CEE543 .4	3	3	3	-	-	3	3	-	3	3	-	3	3	2
22CEE543 .5	3	3	3	-	-	3	3	-	3	3	-	3	3	3
22CEE543 .6	3	3	3	-	-	3	3	-	3	3	-	3	3	3

MODULE-1	**Foundations of cloud**	**22CEE543 .1**	**8 Hours**
Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures.			
Case Study	Survey on Cloud Migrations and its importance		
Text Book	Text Book 1: Chapter 1.1 – 1.8, Text Book 2: Chapter 1.1 – 1.3, 2.1 – 2.4		
MODULE-2	**Service Delivery and Deployment Models**	**22CEE543 .2**	**8 Hours**
Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service (SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management.			
Text Book	Text Book 2: Chapter 4.1,4.2,4.3,4.4,4.5		
MODULE-3	**Cloud Resource Virtualization**	**22CEE543.3, 22CEE543 .4**	**8 Hours**
Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations-The MapReduce Programming Model.			
Case Study	Install the Hadoop framework and create an application using Map Reduce Programming Model		
Text Book	Text Book 2: Chapter 3.1, 3.2,3.3,3.4,3.5,3.6		
MODULE-4	**Resource Management and Scheduling in Cloud**	**22CEE543 .5**	**8 Hours**
Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture-Feedback Control Based on Dynamic Thresholds - Coordination of Specialized Autonomic Performance Managers - A Utility-Based Model for Cloud-Based Web Services -Resource Bundling: Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling			
Case Study	Experiment cloud scheduling Algorithm using CloudSim/ OPNET / CloudAnalyst tool. Experiment load balancing Algorithm using CloudSim/ OPNET / CloudAnalyst tool.		
Text Book	Text Book 3: Chapter 3.1 – 3.9, 12.1, 12.2, 12.3, 12.4		
MODULE-5	**Cloud Platforms**	**22CEE543 .6**	**8 Hours**
Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models.			
Self-study	EC2 AWS – Instance Creation, Migration		
Text Book	Text Book 3: Chapter 13.1, 13.2, 13.3, 13.4, 13.5		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution	
		Test (s)	Qualitative Assessment (s)/NPTEL
		25	25
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	10	5
L4	Analyze	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. Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi, "Mastering Cloud. Computing", McGraw Hill Education, First Edition, 2017, ISBN-10: 9781259029950
2. Arshdeep Bahga, Vijay Madisetti, Cloud Computing a Hands on Approach, The Orient Blackswan, Universities Press 2014, ISBN-10 : 0996025502.

Reference Books:

1. Dan C Marinescu, "Cloud Computing Theory and Practice", Elsevier(MK) 2013, ISBN-13: 978-0124046276
2. John W Rittinghouse, James F Ransome, "Cloud Computing implementation, Management and Security", CRC Press Inc; 1st edition, 2009, ISBN-13: 978-1439806807.

Web links and Video Lectures (e-Resources):

- **https://nptel.ac.in/courses/106105183**
- **https://www.youtube.com/watch?v=-6Uoku-M6oY**
- **https://www.youtube.com/watch?v=PYFqhGDejM4**
- **https://www.cloudbus.org/cloudsim/**

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

- Cloud Computing scenario can be practiced using cloudsim
- Demonstration of Cloud based application with data center
- Video demonstration of latest trends in Cloud Computing

HUMAN COMPUTER INTERACTION			
Course Code	**22CEE544**	**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

22CEE544.1	Understand the Design effective dialog for HCI
22CEE544.2	Apply effective HCI concepts to design a system for individuals and persons with disabilities.
22CEE544.3	Assess the importance of user feedback in developing HCI
22CEE544.4	Analyze the HCI implications for designing multimedia/ ecommerce/ e-learning Websites
22CEE544.5	Design an insightful user interface.
22CEE544.6	Choose precise, advanced techniques to make HCI more user-friendly.

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
22CEE544.1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
22CEE544.2	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
22CEE544.3	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
22CEE544.4	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
22CEE544.5	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
22CEE544.6	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**

MODULE-1	**INTRODUCTION**	**22CEE544.1**	**8 Hours**
The Human – Input-Output Channels – Human Memory – Thinking – Emotions – Psychology & Design of Interactive Systems; Computer – Text Entry Devices- Positioning, Pointing & Drawing – Display Devices for Virtual Reality, 3D; Interaction – Models – Frameworks & HCI, Ergonomics – Interaction Styles – WIMP Interfaces – Context; Paradigms for Interaction			
Self-study	Elements of WIMP interfaces		
Text Book	Text Book 1: Chapter 1-4		
MODULE-2	**SOFTWARE PROCESS & DESIGN RULES**	**22CEE544.2**	**8 Hours**
Interaction Design Basics – User Focus – Scenarios – Navigation – Screen Design & Layout; HCI In Software Process – Life Cycle – Usability Engineering – Interactive Design & Prototyping; Design Rules – Principles for Usability – Standards – Guidelines – Golden Rules – HCI Patterns.			
Text Book	Text Book 1: Chapter 5 -7		
MODULE-3	**IMPLEMENTATION & USER SUPPORT**	**22CEE544.3**	**8Hours**
Implementation Support: Windowing System Elements – Using Tool Kits – User Interface Management; Evaluation Techniques – Goals – Expert Analysis – Choosing a Method; Universal Design Principles – Multimodal Interaction; User Support – Requirements – Approaches – Adaptive Help Systems – Designing User Support System.			
Text Book	Text Book 1: Chapter 8-11		
MODULE-4	**COGNITIVE, COMMUNICATION & COLLABORATIVE MODELS**	**22CEE544.4**	**8 Hours**
Cognitive Models – Goal & Task Hierarchies – Linguistic Models – Physical & Device Models – Architectures; Communication & Collaboration Models – Face-to-Face Communication –Conversation – Text Based – Group Working; Task Analysis – Difference Between Other Techniques – Task Decomposition – Knowledge Based Analysis – ER Based Techniques –Uses.			
Self-study	Levels of linguistics		
Text Book	Text Book 1: Chapter 12-15		
MODULE-5	**UBIQUITOUS COMPUTING and AUGMENTED REALITIES**	**22CEE544.5, 22CEE544.6**	**8 Hours**
Ubiquitous Computing Application Research – Virtual and Augmented Reality -Information and data visualization-introduction about metaverse concepts.			
Self-study	Common myths about ubiquitous computing and Challenges of Ubiquitous Computing		
Text Book	Text Book 1: Chapter 20		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution	
		Test (s)	Qualitative Assessment (s)/NPTEL
		25	25
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	10	5
L4	Analyze	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. Alan Dix, Janet Finlay, Gregory D.Abowd, Russell Beale, " Human Computer Interaction", Pearson Education, Third Edition 2004,ISBN-13: 978-0-13-046109-4
2. Brian Fling," Mobile Design and Development", O'Reilly Media Inc., First Edition 2009,ISBN:978-0-596-15544-5

Reference Books:

1. John M.Carrol, "Human Computer Interaction in the New Millenium", Pearson Education, 2002, ISBN:9788131708965
2. Serengul Smith-Atakan, "Human-Computer Interaction: Basics and Practice", Cengage Learning; 1st edition (1 January 2010), ISBN-13:9788131512470
3. Gerard Jounghyun Kim," Human-Computer Interaction: Fundamentals and Practice ", Apple Academic Press Inc., 1st Edition 2015, ISBN-13:978-1482233896

Web links and Video Lectures (e-Resources)

- **https://youtu.be/WW1g3UT2zww**
- **https://youtu.be/uB9LaBIAcRs**
- **https://youtu.be/azk99gD_2Io**
- **https://www.coursera.org/learn/human-computer-interaction**

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

- Video demonstration of latest trends in HCI
- 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
- Seminar

OPERATION RESEARCH

Course Code	**22CEE545**	**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

22CEE545.1	Realize the importance of Operations Research and explain the basic concepts
22CEE545.2	Construct and Solve Linear Programming Problems for its optimal solutions by graphical method
22CEE545.3	Apply the concept of Simplex method and its extensions to Solve Linear Programming Problems for its optimal solutions
22CEE545.4	Solve specialized linear programming problems like assignment problems using various OR methods
22CEE545.5	Solve the problem of transporting the products from origins to destinations with least transportation cost
22CEE545.6	Analyze network technique namely PERT/CPM and optimal project duration and cost

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
22CEE545.1	3	3	3	3	3	1	-	-	-	-	-	1	3	2
22CEE545.2	3	3	3	3	3	1	-	-	-	-	-	1	3	2
22CEE545.3	3	3	3	3	3	1	-	-	-	-	-	1	3	2
22CEE545.4	3	3	3	3	3	1	-	-	-	-	-	1	3	2
22CEE545.5	3	3	3	3	3	1	-	-	-	-	-	1	3	2
22CEE545.6	3	3	3	3	3	1	-	-	-	-	-	1	3	2

MODULE-1	**Introduction to Linear Model**	**22CEE545.1, 2CEE545.2**	**8 Hours**
Introduction: Evolution of OR Definitions of OR Scope of OR Applications of OR Phases in OR study. Characteristics and limitations of OR, models used in OR, Linear Programming Problem (LPP), Generalized LPP Formulation of problems as L.P.P. Solutions to LPP by graphical method (Two Variables).			
Case Study	Investigate the Challenges of Linear Programming in solving real life problems.		
Text Book	Text Book 1: Chapter 1.2, 1.3, 1.4, 1.13, 1.15, 1.16		
MODULE-2	**Simplex Method – 1**	**22CEE545.3**	**8 Hours**
The essence of the simplex method; Setting up the simplex method; Types of variables, Algebra of the simplex method; the simplex method in tabular form; Tie-breaking in the simplex method, Big M method, two phase method.			
Case Study	Investigate how simple the method is for finding a maximum of an objective function.		
Text Book	Text Book 1: Chapter 2.2, 2.3, 2.4 to 2.15		
MODULE-3	**Assignment Model**	**22CEE545.4**	**8 Hours**
Introduction, Mathematical formulation of assignment problem, Hungarian method to solve assignment problems, unbalanced assignment problems, maximal assignment problem, restriction on assignments, traveling salesman problem, crew scheduling problem			
Case Study	Explore the Assignment models to schedule problems.		
Text Book	Text Book 2: Chapter 3.1, 3.3, 3.5, 3.7, 3.10		
MODULE-4	**Transportation Model**	**22CEE545.5**	**8 Hours**
Introduction, Mathematical formulation of transportation problem, definitions, initial basic feasible solution, moving towards optimality, unbalanced transportation problem, degeneracy in transportation problem.			
Case Study	Scrutinize the different transportation models to find optimal ways to achieve goals with minimum resources.		
Text Book	Text Book 1: Chapter 6.1, 6.3, 6.5, 6.7, Text Book 2: Chapter 10.1, 10.3, 10.5, 10.7		
MODULE-5	**Network Analysis**	**22CEE545.6**	**8 Hours**
Introduction to Project management, basic steps in PERT / CPM techniques, network diagram representations and rules, Time estimates and Critical Path in Network Analysis, Optimum duration and Minimum duration cost, Project Evaluation and Review Technique (PERT), Applications			
Case Study	Survey on how Network Analysis has emerged as a powerful approach towards Research.		
Text Book	Text Book 2: Chapter 12.1 to 12.10		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution	
		Test (s)	Qualitative Assessment (s)/NPTEL
		25	25
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	10	5
L4	Analyze	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. S. D. Sharma, "OPERATIONS RESEARCH – Theory, Methods & Applications", , Seventeenth Review Edition 2014, Reprint 2015, Kedarnath Ram Nath Publisher.

Reference Books:

1. Frederick S Hillier, Gerald J Lieberman, Bodhibrata Nag and Preetam Basu "Introduction to OPERATIONS RESEARCH", Ninth Edition, Tenth Reprint, 2015, TATA McGraw Hill
2. 2. Hamdy Taha, " Operations Research: An Introduction", Pearson Education Inc. (2009)

Web links and Video Lectures (e-Resources)

- **https://archive.nptel.ac.in/content/mp4/110/106/110106062/MP4/mod01lec01.mp4**
- **https://www.youtube.com/watch?v=cwxXY9Qe8ss**
- **https://youtu.be/BDBhpxRzImI**
- **https://youtu.be/Im17WchPw6g**
- **https://youtu.be/-tIfLz3Vsuk**
- **https://youtu.be/WKoZxcD_GD8**

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

- Video demonstration of the latest trends in Operation Research
- 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

RESEARCH METHODOLOGY AND IPR			
Course Code	**22RMK55**	**CIE Marks**	**50**
L: T: P: S	**2:0:0:0**	**SEE Marks**	**50**
Hours / Week	**02**	**Total Marks**	**100**
Credits	**02**	**Exam Hours**	**03**

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

22RMK55.1	Define a research problem and to formulate research questions
22RMK55.2	Demonstrate the various processing techniques of research
22RMK55.3	Choose appropriate methods to formulate research objectives
22RMK55.4	Develop advanced critical thinking skills and enhance writing skills
22RMK55.5	Understand the statutory provisions of different forms of IPRs in simple forms
22RMK55.6	Identify the significance of practice and procedure of patents

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22RMK55.1	3	3	2	2	1	-	-	-	1	2	-	-
22RMK55.2	3	3	2	2	2	-	-	-	1	2	-	-
22RMK55.3	3	3	2	2	1	-	-	-	1	2	-	-
22RMK55.4	3	2	2	-	1	-	-	-	1	2	-	-
22RMK55.5	3	3	2	1	-	-	-	1	1	2	-	-
22RMK55.6	3	3	2	1	-	-	-	1	1	2	-	-

MODULE-1	**FORMULATION OF RESEARCH PROBLEM**	**22RMK55.1, 22RMK55.2**	**6 Hours**

Research– Meaning and Objectives – Criteria of Good Research–Problems Encountered by Researchers –Types of Research–Research Approaches-Research Process–Literature Review– Significance of Literature Review–Review of Selected Literature– Research Problem– Identification and Defining the Research Problem.

Text Book	Text Book 1: Chapter 1, 2

MODULE-2	**RESEARCH DESIGN PROCEDURES**	**22RMK55.2, 22RMK55.3**	**6 Hours**

Meaning of Research Design – Need for Research design – Features of a Good Design –Concepts Related to Research Design– Different Research Designs – Basic Principles of Experimental Designs.

Case Study	To find the solution for the given research problem using different types of research methods
Text Book	Text Book 1: Chapter 3

MODULE-3	**INTERPRETATION AND REPORT WRITING**	**22RMK55.4**	**6 Hours**

Meaning and Technique of Interpretation – Precautions in interpretation – Significance of Report Writing – Different Steps in Report Writing – Layout of a Research Report– Types of Report – Mechanics of Writing a Research Report – Conclusion-Referencing in Academic Writing –Bibliography.

Text Book	Text Book 2: Chapter 14

MODULE-4	**INTRODUCTION TO IPR**	**22RMK55.5**	**6 Hours**

Introduction and Significance of Intellectual Property Rights –Types of Intellectual Property Rights–Need for IPR – Rationale for Protection of IPR–IPR in India and Abroad–Forms of IPR – Royalty – Copyright – Trademark – Patents – Industrial Designs – Trade Secrets – Geographical Indications – Application of Different Forms of IPR– Future Aspects of IPR– Some Examples of IPR.

Text Book	Text Book 2: Chapter 1 and 2

MODULE-5	**BASICS OF PATENTS**	**22RMK55.5, 22RMK55.6**	**6 Hours**

Patents and its Basics – Patentable and Non-Patentable Inventions–Patent Application Process (National and International level) – Searching a Patent-Drafting and Filing a Patent –Types of Patent Applications–Patent Documents–Specification and Claims–Assignment, Licensing, Infringement–Different Layers of International Patent System–Some Examples of Patent – forms requirement for patent application with charges

Case Study	Analyze different domains of filed patents
Text Book	Text Book 2: Chapter 1 and 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	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. Kothari, C.R.,Research Methodology: Methods and Techniques, New Age International, 2018, ISBN-13: 978-8122436235
2. Ramakrishna Chintakunta, A Text book of Intellectual Property rights, Blue Hill Publication, ASIN: B09T6YDB5N, 2022

Reference Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K, An Introduction to Research Methodology, RBSA Publishers. 2015, ISBN-13:978-8176111652
2. Ranjith Kumar, Research methodology, Saga publications,4th edition, 2014, ISBN-13- 978-9351501336
3. Sinha, S.C. and Dhiman, A.K., Research Methodology, EssEss Publications. 2 volumes, 2012. ISBN : 81-7000-324-5, 81-7000-334-2
4. Asha Vijay Durafe, Dhanashree K. Toradmalle , Intellectual Property Rights, Dreamtech Press,2020, ISBN:9390395917

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=GSeeyJVD0JU
- https://www.youtube.com/watch?v=nv7MOoHMM2k
- https://www.youtube.com/watch?v=BGSgZ1J8-yQ

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

- Video Sessions
- Organizing Group Wise Discussions
- Seminars

CRITICAL AND CREATIVE THINKING SKILLS			
Course Code	**22SDK56**	**CIE Marks**	**50**
L:T:P:S	**0:0:1:0**	**SEE Marks**	**-**
Hrs / Week	**2**	**Total Marks**	**50**
Credits	**1**	**Exam Hours**	**01**

Course outcomes:

Upon successful completion of this course, the student will be able to:

22SDK56.1	Demonstrate proficiency in solving quantitative aptitude problems using fundamental concepts
22SDK56.2	Apply advanced quantitative techniques to address and solve complex real-world problems.
22SDK56.3	Develop and enhance logical reasoning skills essential for problem-solving in various competitive examinations.
22SDK56.4	Cultivate critical and creative thinking skills necessary for analytical reasoning and problem-solving.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22SDK56.1	3	3	-	-	2	-	-	-	-	-	-	2
22SDK56.2	3	3	-	-	2	-	-	-	-	-	-	2
22SDK56.3	3	3	-	-	2	-	-	-	-	-	-	2
22SDK56.4	3	3	-	-	2	-	-	-	-	-	-	2

MODULE-1	**CRITICAL THINKING THROUGH QUANTITATIVE ANALYSIS**	**22SDK56.1 22SDK56.2**	**6 Hours**

Number systems: LCM and HCF of numbers, Squaring and Cubing Techniques, Multiplication Tricks, Divisibility rules, Digit sum method, Speed Math, Simplifications, Approximations.

Percentages: Conversion of Fraction to Percentage Table, Percentage Change, Net percentage change/Effective percentage change, Successive Percentage, Concept of more/less percentage, Percentage of percentage, Product constancy, Increased/decreased by P%, Percentage Changes in Numerator and Denominator, Successive Percentage.

Averages: Basic concept, Consecutive Numbers, Non-Consecutive Numbers, Equation Concept, True/False concept, Including/Excluding concept, Replacement concept, Average Speed concept.

MODULE-2	**NUMERICAL TECHNIQUES FOR PROBLEM SOLVING**	**22SDK56.1 22SDK56.2**	**6 Hours**

Profit and Loss: Basic concept, Profit Percentage, Loss Percentage, Profit/Loss Percentage, Overall Profit/Loss, Dishonest shopkeeper, More/less loss concept.

Discounts: Successive discounts, Buy X and Get Y Free, Profit after allowing discount, True Discount, Difference between percentage profit and percentage discount.

Ratio and Proportion: Concept Explanation, Duplicate Ratio, Triplicate Ratio, Direct Proportion, Indirect Proportion, Double rule of three or compound proportion, Ratio in investment, Ratio in partnership, Ratio in averages, Ratio in profit and loss, Ratio in interest rates.

Time and Work: Unit work, Combined work, Individual efficiency, Group efficiencies, Time taken by an individual or a group, Work done by an individual or a group, Total work done, Chain Rule Concept, Pipes and Cisterns, 4 Rules of Pipes and Cistern.

MODULE-3	**ADVANCED QUANTITATIVE TECHNIQUES**	**22SDK56.1 22SDK56.2**	**6 HOURS**

Algebra: Simple Arithmetic Operations, Linear equation is one, Two and three variables, Methods of solving linear equations, Methods of solving quadratic equations, Surds and indices, Logarithms.

Series and Progressions: Arithmetic Sequences, Geometric Sequences, Harmonic Sequences, Fibonacci Numbers.

Geometry: Concepts of Angles, Different polygons like triangles, rectangle, square, right-angle triangle, Pythagorean Theorem, Perimeter and Area of Triangle, Rectangle, and circles.

Statistics: Mean, Median, Mode, Standard Deviation, Variance.

MODULE-4	**ANALYTICAL REASONING AND CREATIVE PROBLEM SOLVING**	**22SDK56.3**	**6 Hours**

		22SDK56.4	

Number Series - Missing numbers, Incomplete series - Odd-even series, primes, Fibonacci series, Arithmetic progression, Geometric progression, Harmonic progression, Squares and cubes, Operations on digits, Exponential series, Increasing multiplication, Hybrid series.

Alphabetical Series- Missing alphabets, incomplete letter series - series of words, series of letters, arrangement of words/letters, letters marked with corresponding numbers sequence, positions of letters, ranking of the word in dictionary; Mixed Series - Missing numbers and words/letters, complete the series.

Analogies: Alphabet Classification, Word Classification, Number Classification.

Coding and Decoding: Coding based on order, Letter to Letter Mapping, Letter to number mapping, Letter to digit mapping, Re-ordering sequences; Word sequencing, Match the word to code, Symbol Coding.

MODULE-5	PROBLEM SOLVING THROUGH LOGICAL ANALYSIS	22SDK56.3 22SDK56.4	6 Hours

Directions: Eight Directions, Distance, Displacement, Starting and ending points, Referential directions, Directions of shadows, Axis based problems, Actual and conditional directions.

Seating Arrangements: Linear arrangement, Square Arrangement, Rectangular Arrangement, Circular arrangement, Vertical arrangement, Seating arrangement in a photograph, Tabular arrangement, Hexagonal Seating Arrangement, Complex arrangement, Miscellaneous arrangements.

Blood Relations: Relations defined, Generation Verticals, Family Tree, Single Person Blood Relations, Mixed/Chain Blood Relations, Symbol based Blood Relation.

CIE Assessment Pattern (50 Marks – Theory)

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

ENVIRONMENTAL STUDIES

Course Code	**22ESK57**	**CIE Marks**	**50**
L:T:P:S	**1:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**1**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**02**

Course outcomes:

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

22ESK57.1	Understand the concepts of Environment, ecosystem and biodiversity.
22ESK57.2	Explain the strategies for management of natural resources to achieve sustainability
22ESK57.3	Analyze the control measures of Environmental pollution and global Environmental issues.
22ESK57.4	Apply the knowledge of Environment Impact Assessment, Technology, Environmental acts and laws in protecting Environment and human health.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22ESK57.1	-	-	-	-	-	3	3	-	-	-		-
22ESK57.2	-	-	-	-	-	3	3	-	-	-	-	3
22ESK57.3	-	-	-	-	-	3	3	3	-	3	-	3
22ESK57.4	-	-	-	-	1	3	3	3	-	3	-	3

MODULE 1	**INTRODUCTION TO ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY**	**22ESK57.1**	**3hrs**

Environment: Definition, Components of Environment; Ecosystem: Types & Structure of Ecosystem, Energy flow in the ecosystem; Biodiversity: Types, Hot-spots, Threats and Conservation of biodiversity.

Text Book	Text Book 1: Chapter 1 , 3 & 4

MODULE 2	**NATURAL RESOURCES**	**22ESK57.2**	**3hrs**

Advanced Energy resources (Hydrogen, Solar, OTEC, Tidal and Wind), merits and demerits, Water resources – cloud seeding, Mineral resources, Forest resources. Strategies of management, concept of sustainability.

Text Book	Text Book 1: Chapter 2

MODULE 3	**ENVIRONMENTAL POLLUTION**	**22ESK57.3**	**3hrs**

Definition, Causes, effects and control measures of Air Pollution, Water Pollution, soil Pollution and Noise pollution. Solid wastes and its management. Role of society, NGO and Govt. agencies in prevention of pollution

Text Book	Text Book 1: Chapter 5,6, Text Book 2: Chapter. 5

MODULE 4	**GLOBAL ENVIRONMENTAL ISSUES, ENVIRONMENT ACTS AND AMENDMENTS**	**22ESK57.3**	**3hrs**

Fluoride problem in drinking water, Acid Rain, Ozone layer depletion, Global warming and climate change. National forest policy, Environmental laws and acts. International agreements and protocols.

Text Book	Text Book 1: Chapter 6, Text Book 2: Chapter 6

MODULE 5	**HUMAN POPULATION AND ENVIRONMENT IMPACT ASSESSMENT**	**22ESK57.4**	**3hrs**

Population growth & explosion, Population pyramids. Negative impact of agriculture and urbanization, Role of Technology in protecting environment and human health. Environment Impact Assessment.

Text Book	Text Book 1: Chapter 7

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	10	5	5
L3	Apply	10	5	5
L4	Analyze		5	-
L5	Evaluate		-	-
L6	Create		-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	15
L2	Understand	15
L3	Apply	20

L4	**Analyze**	**--**
L5	**Evaluate**	**--**
L6	**Create**	**--**

Suggested Learning Resources:

Text Books:

1. Environmental studies by Benny Joseph, Tata McGraw Hill Education Private Limited, 2009, ISBN: 9870070648135.
2. "Environmental Studies: Basic Concepts" by Ahluwalia, V. K. The Energy and Resources Institute (TERI) Publication, 2nd edition, 2016. ISBN: 817993571X, 9788179935712.

Reference Books:

1. Handbook of Environmental Engineering by Rao Surampalli, Tian C. Zhang, Satinder Kaur Brar, Krishnamoorthy Hegde, Rama Pulicharla, Mausam Verma; McGraw Hill Professional, 2018. ISBN: 125986023X, 9781259860232
2. Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
3. Elements of Environmental Science and Engineering by P. Meenakshi, Prentice Hall of India Pvt. Ltd, 2005 Edition. ISBN: 8120327748, 9788120327740

Web links and Video Lectures (e-Resources):

- **https://archive.nptel.ac.in/courses/120/108/120108004/**
- **https://archive.nptel.ac.in/courses/103/107/103107215/**

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

- Visit to any company to study the initiative taken for environmental impact.
- Case study based learning on engineering approaches for pollution prevention.
- Video/ model / charts based learning
- Activities/awareness program for preventing environmental pollution

MINI PROJECT-II

Course Code	**22CEE58**	**CIE Marks**	**50**
L:T:P:S	**0:0:1:0**	**SEE Marks**	**50**
Hrs / Week	**2**	**Total Marks**	**100**
Credits	**1**	**Exam Hours**	**03**

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

22CEE58.1	Analyze the real-world problem through survey of existing problems
22CEE58.2	Design the modules for solving the problems identified
22CEE58.3	Implement the design modules with suitable programming language
22CEE58.4	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
22CEE58.1	3	2	3	2	3	-	1	1	3	-	-	2	3	2
22CEE58.2	3	2	3	2	1	-	1	1	3	-	-	3	3	2
22CEE58.3	3	2	3	2	2	-	1	1	3	-	-	3	3	2
22CEE58.4	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. Thecode 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

NATIONAL SERVICE SCHEME (NSS)			
Course Code	**22NSS50**	**CIE Marks**	**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:

22NSS50.1	Understand the importance of his / her responsibilities towards society.
22NSS50.2	Analyse the environmental and societal problems/issues and will be able to design solutions for the same.
22NSS50.3	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.
22NSS50.4	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
22NSS50.1	-	-	-	-	-	3	-	-	2	-	-	1
22NSS50.2	-	-	-	-	-	3	3	-	2	-	-	1
22NSS50.3	-	-	-	-	-	3	3	-	2	-	-	1
22NSS50.4	-	-	-	-	-	3	3	-	2	-	-	1

Semester/ Course Code	CONTENT	COs	HOURS
5TH 22NSS50	1. Developing Sustainable Water management system for rural areas and implementationapproaches. 2. 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 developmentprograms etc. 3. Spreading public awareness under rural outreach programs. (minimum 5 programs).	22NSS50.1, 22NSS50.2, 22NSS50.3, 22NSS50.4	30 HRS

CIE Assessment Pattern (50 Marks – Activity based) –

CIE component for every semester	Marks
Presentation – 1 Selection of topic, PHASE - 1	10
Commencement of activity and its progress - PHASE – 2	10
Case study-based Assessment Individual performance	10
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 NSSofficer 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 contributionin 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. (minimum5 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 andhelping 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	**22PED50**	**CIE Marks**	**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:

22PED50.1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
22PED50.2	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle
22PED50.3	Perform in the selected sports or athletics of student's choice and participate in the competition at regional/state / national / international levels.
22PED50.4	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
22PED50.1	-	-	-	-	-	2	-	3	3	-	-	2
22PED50.2	-	-	-	-	-	2	-	3	3	-	-	2
22PED50.3	-	-	-	-	-	2	-	3	3	-	-	2
22PED50.4	-	-	-	-	-	2	-	3	3	-	-	2

Semester	CONTENT	COs	HOURS
5TH 22PED50	**Fitness Components:** Meaning and Importance, Fit India Movement, Definition of fitness, Components of fitness, Benefits of fitness, Types of fitness and Fitness tips. **Practical Components:** Speed, Strength, Endurance, Flexibility, and Agility **Athletics**: 1. Track -Sprints: • Starting Techniques: Standing start and Crouch start (its variations) use of Starting Block. • Acceleration with proper running techniques. • Finishing technique: Run Through, Forward Lunging and Shoulder Shrug. 2. Jumps- Long Jump: Approach Run, Take-off, Flight in the air (Hang Style/Hitch Kick)and Landing 3. Throws- Shot Put: Holding the Shot, Placement, Initial Stance, Glide, Delivery Stance and Recovery (Perry O'Brien Technique) **Handball OR Ball Badminton** **Handball:** A. Fundamental Skills 1. Catching, Throwing and Ball control, 2. Goal Throws: Jumpshot, Centershot, Diveshot, Reverseshot. 3. Dribbling: High and low. 4. Attack and counter attack, simple counter attack, counter attack from two wings and center. 5. Blocking, Goal Keeping and Defensive skills. 6. Game practice with application of Rules and Regulations. B. Rules and their interpretations and duties of officials **Ball badminton:** A. Fundamental Skills 1. Basic Knowledge: Various parts of the Racket and Grip. 2. Service: Short service, Long service, Long-high service. 3. Shots: Overhead shot, Defensive clearshot, Attacking clearshot, Dropshot, Netshot, Smash. 4. Game practice with application of Rules and Regulations. B. Rules and their interpretation and duties of officials.	22PED50.1, 22PED50.2, 22PED50.3, 22PED50.4	Total 30 Hrs/ Semester 2 Hrs/week

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	**22YOG50**	**CIE Marks**	**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:

22YOG50.1	Use Yogasana practices in an effective manner
22YOG50.2	Become familiar with an authentic foundation of Yogic practices
22YOG50.3	Practice different Yogic methods such as Suryanamaskara, Pranayama and some of the Shat Kriyas
22YOG50.4	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
22YOG50.1	-	-	-	-	-	3	-	-	-	-	-	1
22YOG50.2	-	-	-	-	-	3	-	-	-	-	-	1
22YOG50.3	-	-	-	-	-	3	-	-	-	-	-	1
22YOG50.4	-	-	-	-	-	3	-	-	-	-	-	1

Semester / Course Code	CONTENT	COs	HOURS
6TH 22YOG50	**Kapalabhati:** Revision of Kapalabhati – 80 strokes/min3rounds **Brief introduction and importance of:** **Different types of Asanas**: 1. Sitting: Bakasana, Hanumanasana, Ekapada Rajakapotasana 2. Standing: Parivritta Trikonasana, Utkatasana, Parshvakonasana 3. Supine line: Setubandhasana, Shavasanaa (Relaxation posture) 4. Balancing: Sheershasana **Patanjali's AshtangaYoga**: Dhyana (Meditation), Samadhi **Pranayama:** Bhastrika, Bhramari, Ujjai **Shat Kriyas:** Jalaneti and sutraneti, Sheetkarma Kapalabhati	22YOG50.1, 22YOG50.2, 22YOG50.3, 22YOG50.4	Total 32 Hrs/ Semester 2 Hrs/week

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)

CIE	Marks
Avg of Test 1 and Test 2	25
Demonstration of Yogasana	25
Total	**50**

Suggested Learning Resources:
Reference Books:

1. Swami Kuvulyananda: Asma (Kavalyadhama, Lonavala)
2. Tiwari, O P: Asana Why and How
3. Ajitkumar: Yoga Pravesha (Kannada)
4. Swami Satyananda Saraswati: Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger)
5. Swami Satyananda Saraswati: Surya Namaskar (Bihar School of yoga, Munger)
6. Nagendra H R: The art and science of Pranayama
7. Tiruka: Shatkriyegalu (Kannada)
8. Iyengar B K S: Yoga Pradipika (Kannada)
9. Iyengar B K S: Light on Yoga (English)

Web links and Video Lectures (e-Resources):

- https://youtu.be/KB-TYlgd1wE
- **https://youtu.be/aa-TG0Wg1Ls**

SEMESTER VI(SYLLABUS)

COMPUTER NETWORKS			
Course Code	**22CEE61**	**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

22CEE61.1	Describe the components of data communications
22CEE61.2	Apply the concepts of Physical and Data Link Layer Functionalities
22CEE61.3	Analyze the concepts of Network routing algorithms
22CEE61.4	Investigate the role of Transport Layer Functionalities
22CEE61.5	Investigate, prepare and submit the importance of network security requirements in real time
22CEE61.6	Develop the working of real time application protocols

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
22CEE61.1	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
22CEE61.2	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
22CEE61.3	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
22CEE61.4	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
22CEE61.5	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
22CEE61.6	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**

MODULE-1	**Fundamental Concepts – 1**	**22CEE61.1**	**8 Hours**

Packet-Switched Networks, Foundation of Networking Protocols - 5-Layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing,
Networking Devices - Multiplexers, Switching and Routing Devices, LANs and Basic Topologies.

Self-study	Equal-Sized Packets Model: ATM, Router Structure
Text Book	Text Book 1: Chapter 1, 2.1, 2.2, 2.3, 3.1, 3.3, 5.1

MODULE-2	**Datalink and Network Layer**	**22CEE61.2** **22CEE61.3**	**8 Hours**

Data Links and Transmission - Data Links, Wired Links and Transmission, Methods of Channel Access on Links, Error Detection and Correction, Link-Level Flow Control.
Routing and Internetworking - Network-Layer Routing, Least-Cost-Path Algorithms, Congestion Control at Network Layer

Case Study	Operations performed in Data Link Layer
Text Book	Text Book 1: Chapter 4, 7.1, 7.2, 7.6

MODULE-3	**Transport Layer and Network Standards**	**22CEE61.4**	**8 Hours**

Transport and End-to-End Protocols - Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control. Contention-Access MAC, IEEE 802.11 Wireless Standard

Applications	Simulate a 5 node wired networks using suitable tool
Text Book	Text Book 1: Chapter 8, 5.5, 6.3

MODULE-4	**Applications and Network Management**	**22CEE61.6**	**8 Hours**

Application-Layer Overview, Domain Name System (DNS), Remote Login Protocols, Electronic Mail (E-mail), File Transfer and FTP, World Wide Web (WWW) and HTTP, Network Management.

Case Study	Analyze a college website
Text Book	Text Book 1: Chapter 9

MODULE-5	**Network Security**	**22CEE61.5**	**8 Hours**

Overview of Network Security, Overview of Security Methods, Secret-Key Encryption Protocols, Public-Key Encryption Protocols, Authentication, Authentication and Digital Signature, Security of IP and Wireless Networks, Firewalls.

Self-study	Study Any 5 Security Algorithms and analyze the Pros and Cons.
Text Book	Text Book 1: Chapter 10

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	5	–
L3	Apply	5	5	5
L4	Analyze	5	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. Nadir F Mir, Computer & Communication Networks, Pearson Education, edition, 2014, India, ISBN: 978-0- 13-381474-3.

Reference Books:

1. Behrouz A. Forouzan: Data Communication and Networking, 5th Edition Tata McGraw-Hill, 2013, ISBN: 978-1259064753
2. Alberto Leon Garcia & Indra Widjaja, Communication Networks — Fundamental Concepts & key architectures, , 2nd Edition, Tata McGraw-Hill, 2004, India, ISBN: N 0-07-119848-2
3. W. Stallings, Data& Computer Communication Prentice-Hall, 9th edition, 2014, ISBN: 978-9332518865
4. A.S. Tanenbaum, Computer networks, Prentice-Hall, 5th edition, 2014, ISBN: 978-0-13-212695-3

Web links and Video Lectures (e-Resources)

- https://nptel.ac.in/courses/106105183
- https://www.youtube.com/watch?v=-6Uoku-M6oY
- https://www.youtube.com/watch?v=PYFqhGDejM4

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

- Demonstration of various commands used in networks.
- Video demonstration of latest trends in networks
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to work with packet tracer
  - Organizing Group wise discussions on issues in network connectivity

COMPUTER NETWORKS LAB			
Course Code	**22CEL61**	**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:

22CEL61.1	Apply the Primitive operations of Data Link Layer
22CEL61.2	Implement Socket programming interface for client server programming
22CEL61.3	Analyze the different protocols across various OSI model
22CEL61.4	Design and develop efficient security, congestion control algorithms

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
22CEL61.1	3	3	3	3	-	-	-	-	-	-	-	2	3	3
22CEL61.2	3	3	3	3	-	-	-	-	-	-	-	2	3	3
22CEL61.3	3	3	3	3	-	-	-	-	-	-	-	2	3	3
22CEL61.4	3	3	3	3	-	-	-	-	-	-	-	2	3	3

Pgm. No.	List of Programs	Hours	COs
	Prerequisite Programs / Demo		
	❖ Basic concept of C programming Language ❖ Basic concepts of TCL scripting and Network Simulator 2 tool	2	NA
	PART-A		
1	Write a program for error detecting code using CRC-CCITT (16-bits)	2	22CEL61.1
2	Develop a program to implement frame sorting technique using buffers	2	22CEL61.1
3	Using TCP/IP sockets, write a client-server program to send the file name from the client to the server and send back the contents of the requested file if present from server to the client.	2	22CEL61.2
4	Write a Program for hamming code generation for error detection/correction	2	22CEL61.4
5	Write a program for a simple RSA algorithm to encrypt and decrypt the data.	2	22CEL61.4
6	Write a program for congestion control using Leaky bucket algorithm	2	22CEL61.4
	PART-B		
7	Simulate a four-node point –to- point network with links connected as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agents between n0-n3 and UDP agents between n1-n3. Apply relevant applications and determine the number of packets sent by TCP/UDP.	2	22CEL61.3
8	Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and determine collision across different nodes	2	22CEL61.3
9	Simulate an Ethernet Lan using n nodes (6-10), change the error rate and data rate and compare the throughput.	2	22CEL61.3
10	Simulate the different types of internet traffic such as FTP and TELNET over a network and analyze the throughput.	2	22CEL61.3
11	Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source/destination.	2	22CEL61.3
12	Simulate simple ESS and transmitting nodes in wireless LAN by simulation and determine the performance with respect to transmission of packets.	2	22CEL61.3

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

❖ Demo on Cisco Packet tracer - https://www.netacad.com/courses/packet-tracer

CIE Assessment Pattern (50 Marks – Lab)

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

Suggested Learning Resources:

Reference Books:

1. W. Stallings, Data & Computer Communication Prentice-Hall, 9th edition, 2014, ISBN: 978-9332518865
2. A.S. Tanenbaum, Computer networks, Prentice-Hall, 5th edition, 2014, ISBN: 978-0-13-212695-3

MACHINE LEARNING			
Course Code	**22CEE62**	**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:

22CEE62.1	Determine the problems for machine learning and gather Knowledge based on machine learning.
22CEE62.2	Apply Classification concepts for solving machine learning problems.
22CEE62.3	Implementation of association rule mining in data mining
22CEE62.4	Illustrate Artificial Neural Networks (ANN's) .
22CEE62.5	Evaluating Mathematical Models for Machine Learning algorithms.
22CEE62.6	Illustrate Convolution Neural Networks and implementation for solving machine learning 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
22CEE62.1	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
22CEE62.2	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
22CEE62.3	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
22CEE62.4	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
22CEE62.5	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
22CEE62.6	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

MODULE-1	**INTRODUCTION TO ML**	**22CEE62.1**	**8 Hours**
Introduction: Introduction to Machine Learning, Supervised Learning, Unsupervised Learning and Reinforcement Learning, Goals and Challenges of machine learning, Regression and its types, Prescriptive Analytics: Linear Programming model building.			
Text Book	Text Book1 - Chapter 1, 4, 6 Text Book3 - Chapter 11		
MODULE-2	**DECISION TREES AND SVM**	**22CEE62.2**	**8 Hours**
Introduction to Decision trees, Chi-Square Automatic Interaction Detectors (CHAID), Classification and Regression Tree (CART), C4.5 algorithm. Support Vector Machine: Kernel Function and Kernel SVM.			
Text Book	Text Book 1 - Chapter 3 & 4		
MODULE-3	**ASSOCIATION RULE MINING AND CORRELATIONS**	**22CEE62.3**	**8 Hours**
Introduction to Data mining, Association Rule Mining: Apriori, FP – Growth, Correlations: Basic Concepts and Methods, Pattern Mining in Multilevel, Multidimensional Space, Sequential Pattern Mining.			
Text Book	Text Book1 - Chapter 9, Text Book3 - Chapter 3,		
MODULE-4	**ARTIFICIAL NEURAL NETWORKS**	**22CEE62.4 22CEE62.5**	**8 Hours**
Artificial Neural Networks: Introduction, Neural Network representation, Appropriate Problems, McCulloch-Pitts neuron model, Perceptron, Back Propagation algorithm, Introduction to deep learning.			
Case study	Case Study - Feed Forward Back Propagation and Cascade Forward Back Propagation Algorithms - using Dataset (patient and healthy people – all gender with different age)		
Text Book	Text Book4 - Chapter 1		
MODULE-5	**CONVOLUTIONAL NEURAL NETWORKS(CNN)**	**22CEE62.6**	**8 Hours**
Convolutional Neural Networks (CNN): Convolutional, Pooling and Soft-Max Layers, Training CNNs, activation functions, initialization, Batch Normalization.			
Case Study	A case study on aggregate mining for concrete production – using CNN or Convolutional Neural Networks for object recognition on mobile devices.		
Text Book	Text Book4 - Chapter 12		

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	--	5
L3	Apply	5	5	5
L4	Analyze	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. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley, First Edition, 2020, ISBN 978-81-265-7990-7.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, Indian Edition, 2017, ISBN 9780072299144.
3. EthemAlpaydin, "Introduction to Machine Learning", MIT press, Second Edition, 2010, ISBN 9780262043793.
4. Dipanjan Sarkar, Raghav Bali, Tushar Sharma, "Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems", A Press, First Edition, 2018, ISBN 978-1-4842-3206-4.

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer Series in Statistics, Second Edition, 2017, ISBN 9781280187438.
2. Simon Haykin, "Neural Networks and Learning Machines", Pearson, Third Edition, 2016, ISBN 9780133002553
3. Kevin P. Murphy , Francis Bach , "Machine Learning: A Probabilistic Perspective", Massachusets Institute of Technology, First Edition, 2012, ISBN 9780262044660.

Web links and Video Lectures (e-Resources):

- **https://www.youtube.com/watch?v=NWONeJKn6kc**
- **https://www.youtube.com/watch?v=i_LwzRVP7b**
- **https://www.youtube.com/watch?v=GwIo3gDZCVQ**
- **https://www.youtube.com/watch?v=ukzFI9rgwfU**
- **https://www.youtube.com/watch?v=f_uwKZIAeM0**

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

- Seminars
- Contents related activities
- Case Studies

MACHINE LEARNING LAB

Course Code	**22CEL62**	**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:

22CEL62.1	Demonstrate machine Learning concept using various learning algorithm.
22CEL62.2	Implement Concept Decision tree algorithm.
22CEL62.3	Model the Association Rule Mining algorithms with real world problems.
22CEL62.4	Illustrate Artificial Neural Networks and Convolutional Neural Networks to solve machine learning 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
22CEL62.1	3	3	3	2	3	-	-	-	-	-	-	1	3	2
22CEL62.2	3	3	3	2	3	-	-	-	-	-	-	1	3	3
22CEL62.3	3	3	3	2	3	-	-	-	-	-	-	1	2	2
22CEL62.4	3	3	3	2	3	-	-	-	-	-	-	1	3	3

Pgm. No.	List of Programs	Hours	COs
	Prerequisite Experiments		
-	❖ Python program to print pattern ❖ Hands on python libraries like Numpy, pandas, scikit-learn, Tensorflow, keras	2	-
	PART – A		
1	Implement and demonstrate the Principal Component Analysis for imensionality reduction. Read the training data set from a .CSV file.	2	22CEL62.1
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Document classifier using Naive Bayes.	2	21CEL63.1
3	Develop a program to demonstrate the working of the decision tree based CHAID algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	2	21CEL63.2
4	Develop a program to demonstrate the working of the Regression tree based CART algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	2	21CEL63.2
5	Develop a program to demonstrate the working of the Gradient Descent algorithm. Use an appropriate data set for building the model and apply this knowledge to predict a value for a test case.	2	21CEL63.2
6	Develop a program to construct Support Vector Machine considering a Sample Dataset.	2	21CEL63.2
	PART – B		
7	Implement a program in python to illustrate the Bias Variance Trade-off in a machine learning model	2	21CEL63.3
8	Implement and demonstrate the Association Rule Mining using Apriori Algorithm.	2	21CEL63.3
9	Implement and demonstrate the Association Rule Mining using FPGrowth Algorithm.	2	21CEL63.3 21CEL63.4
10	Build an Artificial NeuralNetwork by implementing the Back-propagation algorithm and test the same using appropriate data sets	2	21CEL63.3
11	Build a Convolutional Neural Networks and test the same using appropriate data sets.	2	21CEL63.4
12	Implement Q learning algorithm.	2	21CEL63.2

PART-C

Beyond Syllabus Virtual Lab Content

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

❖ Data clustering and kmean and MST Based - https://cse20-iiith.vlabs.ac.in/exp/mst-based/

CIE Assessment Pattern (50 Marks – Theory)

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

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	--
L2	Understand	10
L3	Apply	30
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Web links and Video Lectures (e-Resources):

- https://materialsvirtuallab.org/
- https://lakshya.vcetputtur.ac.in/#Find_S

Reference Books:

1. Dipanjan Sarkar, Raghav Bali ,Tushar Sharma, "Practical Machine Learning with Python-A Problem- Solver's Guide to Building Real-World Intelligent Systems", A Press, First Edition, 2018, ISBN 978-1-4842- 3206-4.

CYBER SECURITY			
Course Code	**22CEE63**	**CIE Marks**	**50**
L:T:P:S	**2:1:0:0**	**SEE Marks**	**50**
Hrs / Week	**4**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

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

22CEE63.1	Understand the basics of cyber security, cyber-crime and cyber law
22CEE63.2	Classify various types of attacks and learn the tools to launch the attacks.
22CEE63.3	Analyse and apply various tools to perform information gathering.
22CEE63.4	Apply intrusion techniques to detect intrusion
22CEE63.5	Apply intrusion prevention techniques to prevent intrusion
22CEE63.6	Develop self-learning and research skills to apply the concepts for the cyber world.

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
22CEE63.1	1	-	-	-	-	-	-	-	-	-	1	-	3	3
22CEE63.2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
22CEE63.3	1	3	-	-	-	-	-	-	-	-	1	-	3	3
22CEE63.4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
22CEE63.5	3	-	-	-	-	-	-	1	-	-	1	-	3	3
22CEE63.6	1	3	-	-	-	-	-	-	2	-	-	-	3	3

MODULE-1	**INTRODUCTION**	**21CEE63.1**	**8 Hours**

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

Self-study	Survey the updates in Indian Act as on today
Text Book	Text Book 1: Chapter 1.1 – 1.9

MODULE-2	**ATTACKS AND COUNTERMEASURES**	**21CEE63.1, 21CEE63.2**	**8 Hours**

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

Case Study	Identify a real time cyber-attack incident, describe the incident in detail and analyze the incident.
Text Book	Text Book 2: Chapter 3

MODULE-3	**RECONNAISSANCE**	**21CEE63.3, 21CEE63.4**	**8 Hours**

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

Self-study	Identify the state of art of tools in reconnaissance.
Text Book	Text Book 3: Chapter 2, Text Book 4: Chapter 1 & Chapter 3

MODULE-4	**INTRUSION DETECTION**	**21CEE63.4, 21CEE63.5**	**8 Hours**

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

Text Book	Text Book 5: Chapter 8.1 – 8.9

MODULE-5	**INTRUSION PREVENTION**	**21CEE63.4, 21CEE63.5, 21CEE63.6**	**8 Hours**

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

Text Book	Text Book 5: Chapter 9.1 – 9.7

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	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	-

Suggested Learning Resources:

Text Books:

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 , ISBN, 1637816431.
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011, ISBN: 978-8123167.

Reference Books:

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013, ISBN-13: 978-1284116458,
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011, ISBN-13: 978-0124116443 ...
3. Kimberly Graves, "CEH Official Certified Ethical Hacker Review Guide", Wiley Publishers, 2007, ISBN: 978-0-7821-4437-6. 2.

Web links and Video Lectures (e-Resources):

- **https://www.youtube.com/watch?v=EKdZutMkmTE**
- **https://www.youtube.com/watch?v=D4fYyu305jg**

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

- Visit to any IT industry where the practice of Cyber Security is present
- Video demonstration of latest trends in distributed systems
- 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

FUNDAMENTALS OF DATA SCIENCE			
Course Code	**22CEE641**	**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

22CEE641.1	Analyze fundamental concepts of data science
22CEE641.2	Analyze the mathematical foundations required for data science
22CEE641.3	Apply basic probability theory and regression model for predicting futuristic data.
22CEE641.4	Analyze and extract the data using inferential statistical models to draw insights for society
22CEE641.5	Evaluate different mathematical models and map-reduce method to identify the suitable model for a given application.
22CEE641.6	Interpret data using visualization techniques.

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
22CEE641.1	3	3	3	2	2	-	-	-	1	-	-	2	3	3
22CEE641.2	3	3	3	2	2	-	-	-	1	-	-	2	3	3
22CEE641.3	3	3	3	2	2	-	-	-	1	-	-	2	3	3
22CEE641.4	3	3	3	2	2	-	-	-	1	-	-	2	3	3
22CEE641.5	3	3	3	2	2	-	-	-	1	-	-	2	3	3
22CEE641.6	3	3	3	2	2	-	-	-	1	-	-	2	3	3

MODULE-1	**Introduction to Data Science**	**22CEE641.1**	**8 Hours**

Introduction to Data Science: What is Data Science? Basic Terminology, Why Data Science? The data science Venn diagram, Tools for data science, Data Science life cycle, machine learning algorithms for data science, Applications of data science. Types of data: Structured Vs unstructured data, Quantitative vs. qualitative data, Four levels of data.

Case Study	Investigate the different areas of application of data science
Text Book	Text Book 1: Chapter 1&2

MODULE-2	**Foundation for Data Science**	**22CEE641.2**	**8 Hours**

Mathematical Foundation for Data Science: Matrices, Vectors and their properties (determinants, traces, rank, nullity, etc.); Inner products; Distance measures; Projections; Notion of hyper planes; half-planes; Positive definite matrices; Eigenvalues and eigenvectors, Sampling Theory, Sampling Techniques, Correlation, Feature Selection. Dimensionality Reduction Techniques: Projections, Eigen Value Decomposition, Principal Component Analysis (PCA).

Case Study	Investigate the resources to understand of math behind data science and machine learning
Text Book	Text Book 1: Chapter 3&4

MODULE-3	**Linear Regression and Filtering**	**22CEE641.3**	**8 Hours**

Simple Linear Regression- Steps in building a regression model, Model diagnostics, Multiple Linear Regression-Developing Multiple Linear Regression, Co linearity, Residual Analysis, Detecting Influencers. Spam Filter: Linear Regression and Spam Filter, K-NN and spam Filter, Naïve Bayes Algorithm, Spam Filter using Naïve Bayes, Laplace Smoothing, Comparing Naïve Bayes to K-NN.

Self-study	Explore different spam detection methods and usage of spam filters
Text Book	Text Book 2: Chapter 6&7

MODULE-4	**Feature Generation and Selection**	**22CEE641.4**	**Hours**

Feature Generation and Feature Selection (Extracting Meaning from Data): Motivating application: user (customer) retention. Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms. Filters; Wrappers; Decision Trees; Random Forests.

Self-study	Scrutinize the feature selection process in data science.
Text Book	Text Book 1: Chapter 9&10

MODULE-5	**Map Reduce**	**22CEE641.5, 22CEE641.6**	**8 Hours**

Data Engineering, Map reduce, Word Frequency Problem, Map Reduce Solution, Other Examples of Map Reduce, Pregel-An Introduction. Data Visualization: Basic principles, ideas and tools for data visualization. Mining Social Network Graphs: Social networks as graphs, clustering of graphs, Direct discovery of communities in graphs, Partitioning 2 of graphs

Case Study	Survey on Map Reduce to find a feasible solution
Text Book	Text Book 2: Chapter 11&12

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution	
		Test (s)	NPTEL
		25	25
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	10	5
L4	Analyze	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. Doing Data Science: Straight Talk from the Front line", " CathyO' Neil, Rachel Schutt, " O' Reilly Media, 2013, ISBN-13. 978-1449358655.
2. Joel Grus, "Data Science from Scratch", 2nd edition, O'Reilly Publications/Shroff Publishers and Distributors Pvt. Ltd., 2019. ISBN-13: 978-9352138326

Reference Books:

1. "Data Science from Scratch First Principles with Python", " Joel Grus" O' Reilly Media, 2015, ISBN 13: 9781491901427
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015, ISBN 13: 9781491901427
3. G. Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA,2016, ISBN 978-0-9802327-7-6

Web links and Video Lectures (e-Resources)

- Using Python: https://www.python.org
- R Programming: https://www.r-project.org/
- Python for Natural Language Processing: https://www.nltk.org/book/
- Data set: https://bit.ly/2Lm75Ly
- Data set: https://archive.ics.uci.edu/ml/datasets.html
- Data set: www.kaggle.com/ruiromanini/mtcars
- Pycharm : https://www.jetbrains.com/pycharm/

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

- Real-world problem solving - Applying the machine learning techniques and developing models

QUANTUM COMPUTING

Course Code	**22CEE642**	**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

22CEE642.1	Understand the basics of quantum computing**.**
22CEE642.2	Understand the background of Quantum Mechanics.
22CEE642.3	Analyze the computation models.
22CEE642.4	Model the circuits using quantum computation. environments and frameworks.
22CEE642.5	Understand the quantum operations such as noise and error–correction.
22CEE642.6	Simulate and analyze the characteristics of Quantum Computing Systems.

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
22CEE642.1	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**
22CEE642.2	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**
22CEE642.3	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**3**
22CEE642.4	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**3**
22CEE642.5	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**
22CEE642.6	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**

MODULE-1	**QUANTUM COMPUTING BASIC CONCEPTS**	**22CEE642.1**	**8 Hours**
Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits - Superpositions			
Case Study	Shor's Algorithm for Factoring Large Numbers		
Text Book	Text Book1: Chapter 1,2		
MODULE-2	**QUANTUM GATES AND CIRCUITS**	**22CEE642.2**	**8 Hours**
Unitary Transformations, Quantum Gates, Unitary Transformations as Quantum Circuits, Reversible Classical Computations to Quantum Computations, Language for Quantum Implementations.			
Text Book	Text Book1: Chapter 3,4,5		
MODULE-3	**QUANTUM ALGORITHMS**	**22CEE642.3**	**8 Hours**
Computing with Superpositions, Quantum Subroutines, Quantum Fourier Transformations, Shor's Algorithm and Generalizations, Grover's Algorithm and Generalizations			
Text Book	Text Book1: Chapter 8,9		
MODULE-4	**QUANTUM INFORMATION THEORY**	**22CEE642.4**	**8 Hours**
Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels			
Text Book	Text Book2: Chapter 5,6		
MODULE-5	**QUANTUM CRYPTOGRAPHY**	**22CEE642.5**	**8 Hours**
Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91			
Case Study	Quantum Cryptography in Real-World Applications		
Text Book	Text Book2: Chapter 7,8		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		**Marks Distribution**	
		Test (s)	**NPTEL**
		25	**25**
L1	**Remember**	**5**	**5**
L2	**Understand**	**5**	**5**
L3	**Apply**	**10**	**5**
L4	**Analyze**	**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	20
L4	Analyze	10
L5	Evaluate	—
L6	Create	--

Suggested Learning Resources:

Text Books:

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020)., ISBN-13: 978-0521387071
2. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010, ISBN: 9781107002173.

Reference Books:

1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013, ISBN-10: 9780521199568
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007, ISBN-13: 978-0521876582.

Web links and Video Lectures (e-Resources)

- **https://learning.quantum.ibm.com/course/basics-of-quantum-information/single-systems**
- **https://learning.quantum.ibm.com/course/basics-of-quantum-information/quantum-circuits**
- **https://learning.quantum.ibm.com/course/basics-of-quantum-information/entanglement-in-action**

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

- Video demonstration of quantum techniques
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare the model for various quantum techniques.

NATURAL LANGUAGE PROCESSING			
Course Code	**22CEE643**	**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

22CEE643.1	Describe the concepts of Basic NLP and its techniques.
22CEE643.2	Apply the concepts of n-gram modeling for the given scenario.
22CEE643.3	Analyze various Context free grammar in representing structure.
22CEE643.4	Design natural language computing by applying techniques of AI
22CEE643.5	Illustrate the concept of supervised/unsupervised machine learning for NLP.
22CEE643.6	Develop programming skill in PROLOG 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	PSO1	PSO2
22CEE643.1	2	3	3	2	2	-	-	-	-	-	-	-	3	2
22CEE643.2	1	2	2	1	2	-	-	-	-	-	-	-	3	3
22CEE643.3	1	1	-	1	1	-	-	-	-	-	-	-	3	2
22CEE643.4	1	1	1	1	1	-	-	-	-	-	-	-	3	2
22CEE643.5	2	1	2	3	1	-	-	-	-	-	-	-	3	2
22CEE643.6	1	2	3	3	2	-	-	-	-	-	-	-	3	3

MODULE-1	**Origins and challenges of NLP**	**22CEE643.1**	**8 Hours**

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance algorithm.

Case Study	Emerging trends and technologies that have the potential to address current challenges in NLP
Text Book	Text Book 1: Chapter 1

MODULE-2	**UNSMOOTHED N-GRAMS**	**22CEE643.2**	**8 Hours**

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

Applications	Report on various n-gram models and some applications where it is used
Text Book	Text Book 1: Chapter 3

MODULE-3	**CONTEXT-FREE GRAMMARS**	**22CEE643.3**	**8 Hours**

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing– Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

Applications	Applications of various types of parsing and feature structures
Text Book	Text Book 1: Chapter 17

MODULE-4	**REQUIREMENTS FOR REPRESENTATION**	**22CEE643.4**	**8 Hours**

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

Case Study	Identify some emerging techniques or models for representing linguistic phenomena beyond words and sentences in NLP
Text Book	Text Book 1: Chapter 19

MODULE-5	**DISCOURSE SEGMENTATION**	**22CEE643.5**	**8 Hours**

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Case Study	Investigate how discourse segmentation is used in conversational agents or chatbots to improve dialogue understanding and generation.
Text Book	Text Book 1: Chapter 26, 27

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution	
		Test (s)	NPTEL
		25	25
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	10	5
L4	Analyze	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. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014. ISBN:978- 9332518414.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O Reilly Media, 2009. ISBN: 9780596516499

Reference Books:

1. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015, ISBN:9781783284672
2. Richard M Reese, —Natural Language Processing with Java", O Reilly Media, 2015, ISBN: 9781784391799.
3. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010, ISBN:9781498798105.
4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval", Oxford University Press, 2008, ISBN: 978-0195692327

Web links and Video Lectures (e-Resources)

- **https://onlinecourses.nptel.ac.in/noc19_cs56/preview**
- **https://www.youtube.com/watch?v=CMrHM8a3hqw**

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

- Case study
- Organizing Group wise discussions on issues
- Seminars

SOCIAL NETWORK ANALYSIS			
Course Code	**22CEE644**	**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

22CEE644.1	Understand the foundational concepts and history of social network analysis, including network theory, sociometry, and the entry of social physicists in the field**.**
22CEE644.2	Analyze and interpret social networks using sociograms and matrices, identifying cliques and communities within the network.
22CEE644.3	Examine the dynamics of balance and group interactions within social networks and explore the concepts of informal organization and community relations.
22CEE644.4	Apply formal models of community and kinship to analyze social networks, and recognize the role of formal methods in social network analysis
22CEE644.5	Analyze practical knowledge of data collection techniques for social network analysis, including observation, document analysis, and using computer programs for network analysis.
22CEE644.6	Apply precise data analysis techniques to tackle real-world challenges.

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**
22CEE644.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-
22CEE644.2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
22CEE644.3	3	3	-	-	-	-	-		-	-	-	2	3	-
22CEE644.4	3	3	3	-	-	-	-	-	-	-	-	2	3	-
22CEE644.5	3	3	3	3	2	-	-	-	-	-	-	2	3	-
22CEE644.6	3	3	-	-	3	-	-	-	-	-	-	3	3	-

MODULE-1	**SOCIAL NETWORKING ESSENTIALS**	**22CEE644.1**	**8 Hours**

Understand What Social Networking is, Social Media Characteristics, What is Social Media and Why It is Important, Types of Social Media, Core Values, Challenges, Advantages and Disadvantages, Future of Social Networking, Various social networking sites-FACEBOOK, INSTAGRAM, TWITTER, LINKEDIN - Why and how they matter, Key Features, Marketing - What You Need to Know.

Case Study	Select a popular social networking site (e.g., Facebook, Instagram, Twitter) and conduct an analysis of its core features, advantages, and disadvantages.
Text Book	Text Book1: Chapter 1,2

MODULE-2	**GRAPHICAL REPRESENTATION AND NETWORK ANALYSIS FUNDAMENTALS**	**22CEE644.2**	**8 Hours**

Networks as Graphs – Actors, Ties, Networks, Multiplex Networks, Weighted Ties, Group, Geodesic Distance, Graph Connectivity, Degree of an Actor –Indegree and Out degree, Types of nodes– Carrier, Transmitter, Receiver, Isolate, Representation of Social Network Data – Socio matrix and Edge List, Matrix Permutation and Blocks, Network Relationships & Reciprocity, Transitivity, Popularity Structural Equivalence, Clique, Star

Case Study	Analyzing Social Networks in a Corporate Environment.
Text Book	Text Book1: Chapter 4

MODULE-3	**NETWORK STRUCTURES AND SOCIAL DYNAMICS ANALYSIS**	**22CEE644.3**	**8 Hours**

The language of network analysis, joining up the lines, The flow of information and resources, Density of connections, Density in egonets, Problems in density measures, Popularity, Mediation and Exclusion, Local and overall centrality, Mediation and betweenness, Centrality boosts centrality, Centralization and graph centers, The absolute Centre of a graph, Bank centrality in corporate networks

Case Study	Analyze Social Dynamics in a Student Club Network - To analyze the social dynamics within a student club network, identify the key influencers and understand the flow of information and interactions.
Text Book	Text Book1: Chapter 5,6

MODULE-4	**NETWORK ANALYSIS METRICS**	**22CEE644.4**	**8 Hours**

Network Density, Properties of Nodes–Degree Centrality, Closeness Centrality, Betweenness Centrality, Centrality of a Network - Network Degree Centrality, Network Closeness Centrality, Network Betweenness Centrality, Page rank centrality.

Case Study	Social Network Analysis of a Company's Employees
Text Book	Text Book1: Chapter 6

MODULE-5	**SOCIAL MEDIA ANALYSIS**	**22CEE644.5, 22CEE644.6**	**8Hours**

Structural change and unintended consequences, Small-world networks, modelling social change, Testing explanations, Visualizing and Modelling, Taking space seriously, Using multi-dimensional scaling, Principal components and factors,

Non-metric methods, How many dimensions, Worth a thousand words, Elites, communities and influence, Business elites and bank power.	
Case Study	Social Media Analysis for Marketing Strategy
Text Book	Text Book1: Chapter 7, 8

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution	
		Test (s)	NPTEL
		25	25
L1	Remember	5	5
L2	Understand	5	5
L3	Apply	10	5
L4	Analyze	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. **Matthew Ganis & Avinash Kohirkar, "Social Media Analytics", 2015, Pearson, ISBN: 9780133892949.**

Reference Books:

1. **Guandong Xu, Yanchun Zhang and Lin Li, —Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.**
2. **James M Cook, University of Maine at Augusta "What is a Social Network"**

Web links and Video Lectures (e-Resources)

- **https://archive.nptel.ac.in/courses/106/106/106106239/**
- **https://www.geeksforgeeks.org/types-of-social-networks-analysis/**

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

- Hands on sessions for developing static and dynamic web pages
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students in group to Analysis the web pages
  - Organizing Group wise discussions on issues.
  - Seminars

SYSTEM MODELING AND SIMULATION			
Course Code	**22CEE645**	**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:

22CEE645.1	Understand simulation needs, and to implement and test a variety of simulation models
22CEE645.2	Illustrate real world situations related to systems development decisions
22CEE645.3	Apply the simulation methods and select the suitable technique on the problems.
22CEE645.4	Examine random number generation variates and apply them to develop simulation models
22CEE645.5	Evaluate model prediction based upon new input and validate the output data.
22CEE645.6	Test validity of the model for various case studies like inventory, traffic flow networks, etc.

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
22CEE645.1	1	-	-	-	-	-	-	-	-	-	-	-	3	2
22CEE645.2	3	-	-	-	-	-	-	-	-	-	-	-	3	2
22CEE645.3	2	-	-	-	-	-	-	-	-	-	-	-	3	2
22CEE645.4	1	3	-	-	-	-	-	-	-	-	-	-	3	2
22CEE645.5	2	3	-	-	-	-	-	-	-	-	-	-	3	2
22CEE645.6	2	3	-	-	-	-	-	-	-	-	-	-	3	2

MODULE-1	**INTRODUCTION**	**22CEE645.1**	**8 Hours**

Simulation, Advantages and disadvantages, Areas of Application, System environment, components of a system, Model of a system, types of models, steps in a simulation study, Simulation of Queuing systems and Simulation of Inventory System.

Text Book	Text Book 1: Chapter 1.1-1.11, 2.1,2.2

MODULE-2	**PRINCIPLES & STATISTICAL MODELS**	**22CEE645.2 22CEE645.3**	**8 Hours**

Concepts in discrete - event simulation: event scheduling/ Time advance algorithm, simulation using event scheduling. Review of terminology and concepts, Statistical models, Discrete distributions, Continuous distributions, Poisson process, Empirical Distribution.

Self-study	Survey about the simulation software
Text Book	Text Book 1: Chapter 3.1,5.1-5.4

MODULE-3	**QUEUING MODELS & RANDOM NUMBERS**	**22CEE645.4**	**8 Hours**

Characteristics of queuing models, Performance, Steady-state behavior of M/G/1 queue, Networks of Queues, Properties of random numbers, Random numbers Generations methods, Tests for Random number

Applications	**Simulate a queuing system in a bank using MATLAB:** Model customer arrivals, service times, and waiting times to optimize staffing levels and reduce wait times.
Text Book	Text Book 1: Chapter 6.1,6.2,7.1-7.4

MODULE-4	**INPUT MODELING**	**22CEE645.4 22CEE645.5**	**8 Hours**

Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models.

Text Book	Text Book 1: Chapter 9.1-9.7

MODULE-5	**OUTPUT ANALYSIS & COMPARISON**	**22CEE645.5 22CEE645.6**	**8 Hours**

Types of Simulations with Respect to Output Analysis, Output analysis of terminating simulation, Output analysis of steady state simulations. Comparison of two system designs, Meta modelling, Optimization via simulation

Text Book	Text Book 1: Chapter 11.1-11.5, 12.1, 12.3, 12.4.

CIE Assessment Pattern (50 Marks – Theory)

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

SEE Assessment Pattern (50 Marks – Theory)

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

Suggested Learning Resources:

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: "Discrete-Event System Simulation ", 5th Editio Pearson Education, 2010. ISBN-13: 9780136062127.
2. Jeofrey Gordon "System Simulation", Prentice Hall of India, 2009, ISBN-13: 978-0136062127
3. Averill M. Law: "Simulation Modeling and Analysis ", 4th Edition, Tata McGraw- Hill, 2007, ISBN-13: 97 0073401324

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: "Discrete – Event Simulation: A First Course ", Pearson Education, 2006, ISBN-13: 978-0131429178
2. Fitzgerald, Jhon, Larsen,Peter Gorm , "Modelling Systems; Practical Tools and Techniques in software development", Cambridge University Press, 2009,ISBN- 10:0521899117
3. Hopcroft, John E, Motwani, Rajeev, Ullman, Seffrey D, "Introduction to automata theory, languages and computation", pearson/Addison Wesley, 3rd Edition,2007, ISBN-13: 978-8131720479.

Web links and Video Lectures (e-Resources):

- **https://www.youtube.com/watch?v=-gYcZt5iKPA**
- **https://www.youtube.com/watch?v=yLae4Xz2W1Q**
- **https://www.youtube.com/watch?v=hye3ZBFe45E**
- **https://www.youtube.com/watch?v=OsuBhg6TCzI**

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

- Contents related activities (Activity-based discussions)
- Problem Solving
- Case study

PROJECT PHASE-I

Course Code	**22CEE65**	**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:

22CEE65.1	Analyze the real-world problem through survey of existing problems
22CEE65.2	Design the modules for solving the problems identified
22CEE65.3	Implement the design modules with suitable programming language
22CEE65.4	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
22CEE65.1	3	2	3	2	3	-	1	1	3	-	-	2	3	2
22CEE65.2	3	2	3	2	1	-	1	1	3	-	-	3	3	2
22CEE65.3	3	2	3	2	2	-	1	1	3	-	-	3	3	2
22CEE65.4	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. Thecode developed towards the project will be reviewed by a panel of experts during 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

PROBLEM SOLVING SKILLS			
Course Code	**22SDK66**	**CIE Marks**	**50**
L:T:P:S	**0:0:1:0**	**SEE Marks**	**-**
Hrs / Week	**3**	**Total Marks**	**50**
Credits	**1**	**Exam Hours**	**1**

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

22SDK66.1	Infer the complex problems using the concepts of data structures and C programming
22SDK66.2	Apply object-oriented programming concepts in C++and Java to solve real time problem statements.
22SDK66.3	Solve real-world problem using python and C#
22SDK66.4	Develop the skills of handling data base queries and procedures

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
22SDK66.1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
22SDK66.2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
22SDK66.3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
22SDK66.4	3	3	3	2	2	-	-	-	-	-	-	2	2	2

MODULE-1	PROBLEM SOLVING ON DATA STRUCTURES AND C	22SDK66.1	6 Hours

Data Structures using C: Stack and queues, list, graph, tree, sorting and searching, Hash functions

Advanced C programming: Pointers, Recursion, Functions, Structure, Union, C Preprocessor

MODULE-2	PROBLEM SOLVING ON OBJECT ORIENTED PROGRAMMING USING CPP	22SDK66.2	6 Hours

Object Oriented Programming: Inheritance, Polymorphism, Exception handling, File Handling, Predefined function, Void function, Name spaces, Input and output streams.

MODULE-3	PROBLEM SOLVING ON JAVA AND XML	22SDK66.2	6 Hours

Object oriented programming using Java: Inheritance, Polymorphism, Abstract class and Interface, Collections, Exception handling, Streams, Functional Interface.

XML: DTD, Schema, Server Path, DOM, XSLT, Name Space, AJAX.

MODULE-4	PROBLEM SOLVING USING C # AND PYTHON	22SDK66.3	6 Hours

Python: Functions, iterators, Object oriented Programming, Exception Handling, Packages, Frame works- Django, Collections.

C#: Object oriented Programming, Delegate, Collections and generic, Name space.

MODULE-5	SCENARIO BASED PROBLEMS ON DBMS	22SDK66.4	6 Hours

ER Model, SQL- DDL, DML, TCL, DCL, Joins, subquery, PL/SQL-Index, Sequence, procedures and functions, normalization, B tree, B+ tree, Forms.

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Test (s)
		50
L1	Remember	5
L2	Understand	10
L3	Apply	20
L4	Analyze	15
L5	Evaluate	
L6	Create	-

Suggested Learning Resources:

Reference Books:

1. Martin C Brown, "Python-The Complete Reference", Mc Graw Hill, 4th edition, 2020
2. Reema Tharega, "Data Structures using C", Oxford University Press, 2020
3. Ullakirch-Prinz, "A complete guide to program in C++", Jonas and Bartlett Learning, 2022
4. Kathy Sierra, "Headfirst Java", O'reilly Media, 2021
5. Andrew Stellman, "Headfirst C#", O'reilly Media, 2021

Web links and Video Lectures (e-Resources):

- **https://www.learncpp.com/**
- **https://www.programiz.com/dsa**
- **https://code.visualstudio.com/Docs/languages/csharp**
- **https://www.udemy.com/course/the-complete-java-course-from-basics-toadvanced/**
- **https://www.codecademy.com/learn/paths/c**

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

- Analysis of industry relevant use cases
- Problem solving on scenario-based questions
- Placement portal practice sessions

SWIFT PROGRAMMING

Course Code	**22CEE671**	**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:

22CEE671.1	Understand the basics of Swift syntax and structure.
22CEE671.2	Analyze the Swift programming environment and tools (Xcode).
22CEE671.3	Conduct experiments as individuals by using swift programming tools.
22CEE671.4	Examine the design patterns in Swift development. to solve Swift UI for building user interfaces.

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
22CEE671.1	3	3	3	3	2	-	-	-	1	1	-	2	3	3
22CEE671.2	3	3	3	3	2	-	-	-	1	1	-	2	3	3
22CEE671.3	3	3	3	3	2	-	-	-	1	1	-	2	3	3
22CEE671.4	3	3	3	3	2	-	-	-	1	1	-	2	3	3

Exp. No. / Pgm. No.	List of Programs	Hours	COs
	Prerequisite Experiments / Programs / Demo		
NA	❖ Basic Knowledge about Excel. ❖ Basic knowledge in datasets.	-	NA
	PART-A		
1	Getting started with swift programming basics	2	22CEE671.1
2	Create and use classes and structures.	2	22CEE671.1
3	Hands on arrays, dictionaries, and sets.	2	22CEE671.2
4	Understand collection types and their methods.	2	22CEE671.2
5	Parse JSON data and work with APIs.	2	22CEE671.3
6	Explore advanced topics such as generics, functional programming, and Swift Package Manager.	2	22CEE671.3
	PART-B		
7	Getting started with use of modules and libraries.	2	22CEE671.4
8	Getting started with parameters, return types, and function overloading.	2	22CEE671.4
9	Creating dashboards with handle errors and exceptions	2	22CEE671.3
10	Creating dashboards with views, modifiers, and layout.	2	22CEE671.3
11	Creating dashboards for best practices and design patterns in Swift development.	2	22CEE671.4
12	Getting started to Learn debugging techniques and tools.	2	22CEE671.4

PART-C

Beyond Syllabus Virtual Lab Content

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

- **Online compiler: https://www.jdoodle.com/execute-swift-online-ide**

CIE Assessment Pattern (50 Marks – Lab)

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

SEE Assessment Pattern (50 Marks – Lab)

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:

https://developer.apple.com/swift/resources/

Reference Books:

1. Swift: A Programming Guide to Create a Fully Functioning App:", Kindle Edition, Cole Nussbaumer, Wiley publication, 1st Edition 2016.

DATA VISUALIZATION AND ITS APPLICATIONS

Course Code	**22CEE672**	**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:

22CEE672.1	Understand the importance of data visualization for business intelligence and decision making.
22CEE672.2	Analyze different approaches to understand visual perception.
22CEE672.3	Conduct experiments as individuals by using data visualization tools.
22CEE672.4	Examine the effective data visuals to solve workplace 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
22CEE672.1	3	3	3	3	2	-	-	-	1	1	-	2	3	3
22CEE672.2	3	3	3	3	2	-	-	-	1	1	-	2	3	3
22CEE672.3	3	3	3	3	2	-	-	-	1	1	-	2	3	3
22CEE672.4	3	3	3	3	2	-	-	-	1	1	-	2	3	3

Exp. No. / Pgm. No.	List of Programs	Hours	COs
	Prerequisite Experiments / Programs / Demo		
	❖ Basic Knowledge about Excel. ❖ Basic knowledge in datasets.	-	NA
	PART-A		
1	Getting started with Tableau basics	2	22CEE672.1
2	Connecting with Different Database.	2	22CEE672.1
3	Hands on Practice on Live Vs Extract Data.	2	22CEE672.2
4	Data Type & Column Formatting.	2	22CEE672.2
5	Creating a plot, Histograms, Line charts.	2	22CEE672.3
6	Bar charts, Pie charts, Box plots, Scatter plots.	2	22CEE672.3
	PART-B		
7	Getting started with Tableau – Tableau Public	2	22CEE672.4
8	Getting started with Tableau- Tableau Desktop.	2	22CEE672.4
9	Creating dashboards with effects of colors.	2	22CEE672.3
10	Creating dashboards with different formats.	2	22CEE672.3
11	Creating dashboards and digital presentations with story.	2	22CEE672.4
12	Getting started with Tableau – Tableau Server.	2	22CEE672.4

PART-C

Beyond Syllabus Virtual Lab Content

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

- **E-learning : https://www.tableau.com/learn/training/elearning**

CIE Assessment Pattern (50 Marks – Lab)

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

SEE Assessment Pattern (50 Marks – Lab)

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:

1. **https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/data-to-dashboard-mastering-visual-storytelling-with-tableau/?v=c86ee0d9d7ed**

Reference Books:

1. Storytelling with Data: A data visualization guide for business professions", Knaflic, Cole Nussbaumer, Wiley publication, 1st Edition 2015

CASANDRA/NOSQL

Course Code	**22CEE673**	**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:

22CEE673.1	Understand, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph). Apply Document-oriented databases.
22CEE673.2	Apply the detailed architecture; define objects, load data, query data and performance tune Columnar databases.
22CEE673.3	Analyze the detailed architecture, define objects, load data, query data and performance tune Key- Value NoSQL databases.
22CEE673.4	Analyze the detailed architecture, define objects, load data, query data and performance graph- based Databases.

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
22CEE673.1	3	3	3	2	-	-	-	-	-	-	-	2	3	3
22CEE673.2	3	3	3	2	-	-	-	-	-	-	-	2	3	3
22CEE673.3	3	3	3	2	-	-	-	-	-	-	-	2	3	3
22CEE673.4	3	3	3	2	-	-	-	-	-	-	-	2	3	3

Pgm. No.	List of Programs	Hours	COs
	Prerequisite Experiments / Programs / Demo		
	❖ Database Management System.	**2**	**NA**
	PART-A		
1	Create a database and collection using MongoDB.	**2**	22CEE673.1
2	Apply the respective functions to create one document and many documents at a time.	**2**	22CEE673.1
3	Apply the respective functions to access one and many documents.	**2**	22CEE673.1
4	Apply the respective functions to update one and many documents.	**2**	22CEE673.1
5	Apply the respective functions to delete one and many documents.	**2**	22CEE673.1
6	Create the key space and column family (table) in Cassandra using CQL.	**2**	22CEE673.2
	PART-B		
7	Apply the respective functions to insert one and many rows in Cassandra.	**2**	22CEE673.2
8	Apply the respective functions to update one and many rows in Cassandra.	**2**	22CEE673.2
9	Apply the respective functions to delete one and many rows	**2**	22CEE673.2
10	Create a key-value pair using redis database and apply the following commands:	**2**	22CEE673.3
11	Create a key-value pair using redis database and apply the following commands;	**2**	22CEE673.3
12	Draw the graph database for college database using 5 nodes with their associated relationships also write the query for all 5 nodes creation along with its properties and relationship creation.	**2**	22CEE673.4

PART-C

Beyond Syllabus Virtual Lab Content

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

1. Create replica sets on windows Operating System
   https://www.youtube.com/watch?v=t_9QJTBbo30&t=546s

CIE Assessment Pattern (50 Marks – Lab)

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

SEE Assessment Pattern (50 Marks – Lab)

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:

Reference Books:

1. Amit Phaltankar, Juned Ahsan, Michael Harrison, LiviuNedov "MongoDB Fundamentals: A hands-on guide to using MongoDB and Atlas in the real world", Packt Publishing Ltd, Dec 22, 2020.
2. Andreas Meier, Michael Kaufmann, "SQL &NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management",Springer Vieweg, Aug 29, 2019.
3. R. Elmasri S. B. Navathe,"Fundamentals of Database Systems", Addison Wesley, 2018.
4. Raghu Ramakrishnan, "Database Management Systems", Mcgraw-Hill, 4th edition,2018.
5. Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide tomerging world of Polyglot persistence, Addison Wesley, 2018.
6. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6th Edition,2018

Web links and Video Lectures (e-Resources):

1. "Introduction to NOSQL", https://www.simplilearn.com/introduction-to-nosql-databases-tutorial-video.
2. MongoDB For Beginners, https://www.youtube.com/watch?v=8eJJe4Slnik
3. Introduction to MongoDB, https://www.youtube.com/watch?v=XeDM28c5kO4&list=PLwGdqUZWnOp1P9xSsJg7g3AY0CUjs-WOa
4. Getting Started with NoSQL, https://www.youtube.com/watch?v=F1TklaUfKcM&list=PLsyeobzWxl7r0bn6dzVA8bQNxcx7DRl5F&index=2
5. Cassandra Query Language, https://www.youtube.com/watch?v=HTuSgkDlbSA
6. Cassandra Query Language, UPSERT, https://www.youtube.com/watch?v=Y-vY49lDeKY

INTRODUCTION TO FULL STACK DEVELOPMENT TOOLKIT			
Course Code	**22CEE674**	**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:

22CEE671.1	Illustrate mark-up tags with styles to design aesthetic web pages.
22CEE671.2	Illustrate client-side scripting to validate the web pages.
22CEE671.3	Analyze the development of Web Application with database support.
22CEE671.4	Illustrate the databases using MySQL databases.

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
22CEE671.1	**1**	**-**	**2**	**1**	-	-	-	-	-	-	-	**-**	**2**	**-**
22CEE671.2	**-**	**1**	**1**	**1**	-	-	-	-	-	-	-	**-**	**2**	**-**
22CEE671.3	**-**	**-**	**1**	**1**	-	-	-	-	-	-	-	**-**	**2**	**-**
22CEE671.4	**-**	**-**	**2**	**1**	-	-	-	-	-	-	-	**-**	**2**	**-**

Pgm. No.	List of Programs	Hours	COs
	Prerequisite Programs / Demo		
	❖ Basic concept of HTML, CSS, JAVA Script, MongoDB, Node.js.	2	NA
	PART-A		
1	Design a user interface for a given scenario using basic tags, lists, hyperlinks and tables using HTML.	2	22CEE671.1
2	Design responsive web pages for user registration using HTML forms.	2	22CEE671.1
3	Implement the concepts of CSS flex.	2	22CEE671.2
4	Implement the concept of array manipulation methods in JavaScript.	2	22CEE671.4
5	Create a table at least with 5 rows and 5 columns without using tags (create the element by DOM)	2	22CEE671.4
6	Using the JavaScript event(onclick) change the background color of a page.	2	22CEE671.4
	PART-B		
7	Design a registration form using Bootstrap form classes. Include fields for name, email, and password.	2	22CEE671.3
8	Use a Bootstrap to create 3 rows and 3 columns cards with a button that navigates to another page.	2	22CEE671.3
9	Use UseState( ) hook to increment and decrement the value when we click the respective buttons respectively.	2	22CEE671.3
10	Create a simple HTTP server in Node.js using Express's	2	22CEE671.3
11	Create and Connect a Node.js application to a MongoDB database.	2	22CEE671.3
12	Implement and manage root in a Node.js application.	2	22CEE671.3

PART-C

Beyond Syllabus Virtual Lab Content

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

1. Demonstrate how to pass the props from one component to another.
2. Demonstrate the concepts of various UI components of Bootstrap**.**

CIE Assessment Pattern (50 Marks – Lab)

RBT Levels		Test (s)	Project / Demo	Weekly Assessment
		20	**20**	**10**
L1	**Remember**	**-**	**-**	**-**
L2	**Understand**	5	-	5
L3	**Apply**	5	10	5
L4	**Analyze**	5	5	-
L5	**Evaluate**	5	5	-

L6	**Create**	-	-	-

SEE Assessment Pattern (50 Marks – Lab)

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:

Reference Books:

1. Mark Meyers, "A Smart way to Learn JavaScript", 2013-14, ISBN-13-978-1497408180 (e-book and Kindle version only).
2. Benjamin la kobus, Jason Mara h, "Mastering Bootstrap4", Edition 2016, Packet Publishing, ISBN-10-1783981121.
3. Chris Bates, "Web Programming", Wiley Publications HTML5 Black Book by Dreamtech, Edition 2007, ISBN-10-9788126512904.

NATIONAL SERVICE SCHEME (NSS)			
Course Code	**22NSS60**	**CIE Marks**	**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:

22NSS60.1	Understand the importance of his / her responsibilities towards society.
22NSS60.2	Analyse the environmental and societal problems/issues and will be able to design solutions for the same.
22NSS60.3	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.
22NSS60.4	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
22NSS60.1	-	-	-	-	-	3	-	-	2	-	-	1
22NSS60.2	-	-	-	-	-	3	3	-	2	-	-	1
22NSS60.3	-	-	-	-	-	3	3	-	2	-	-	1
22NSS60.4	-	-	-	-	-	3	3	-	2	-	-	1

Semester/ Course Code	CONTENT	COs	HOURS
6TH 22NSS60	1. Organize National integration and social harmony events / workshops / seminars. (Minimum TWO programs). 2. 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 Selection of topic, PHASE - 1	10
Commencement of activity and its progress - PHASE – 2	10
Case study-based Assessment Individual performance	10
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 NSSofficer 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:

- Students should have a service-oriented mindset and social concern.
- Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.
- 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 contributionin 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. (minimum5 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	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

	programs).					
11.	Govt. school Rejuvenation andhelping 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	**22PED60**	**CIE Marks**	**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:

22PED60.1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
22PED60.2	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle
22PED60.3	Perform in the selected sports or athletics of student's choice and participate in the competition at regional/state / national / international levels.
22PED60.4	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
22PED60.1	-	-	-	-	-	2	-	3	3	-	-	2
22PED60.2	-	-	-	-	-	2	-	3	3	-	-	2
22PED60.3	-	-	-	-	-	2	-	3	3	-	-	2
22PED60.4	-	-	-	-	-	2	-	3	3	-	-	2

Semester	CONTENT	COs	HOURS
6TH 22PED60	**Athletics**: 1. Track -110 Mtrs and 400Mtrs: • Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles • Crouch start (its variations)use of Starting Block. • Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing. 2. Jumps- High jump: Approach Run, Take-off, Bar Clearance (Straddle) and Landing. 3. Throws- Discus Throw: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle). **Football OR Hockey** **Football:** A. Fundamental Skills 1. Kicking: Kicking the ball with inside of the foot, Kicking the ball with Full Instep of the foot, Kicking the ball with Inner Instep of the foot, Kicking the ball with Outer Instep of the foot and Lofted Kick. 2. Trapping: Trapping- the Rolling ball, and the Bouncing ball with sole of the foot. 3. Dribbling: Dribbling the ball with Instep of the foot, Dribbling the ball with Inner and Outer Instep of the foot. 4. Heading: In standing, running and jumping condition. 5. Throw-in: Standing throw-in and Running throw-in. 6. Feinting: With the lower limb and upper part of the body. 7. Tackling: Simple Tackling, Slide Tackling. 8. Goal Keeping: Collection of Ball, Ball clearance-kicking, throwing and deflecting. 9. Game practice with application of Rules and Regulations. A. Rules and their interpretation and duties of officials. **Hockey:** A. Fundamental Skills 1. Passing: Short pass, Longpass, pushpass, hit 2. Trapping.	22PED60.1, 22PED60.2, 22PED60.3, 22PED60.4	Total 30 Hrs/ Semester 2 Hrs/week

	3. Dribbling and Dozing 4. Penalty stroke practice. 5. Penalty corner practice. 6. Tackling: Simple Tackling, Slide Tackling. 7. Goal Keeping, Ball clearance- kicking, and deflecting. 8. Game practice with application of Rules and Regulations. B. Rules and their interpretation and duties of officials		

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	**22YOG60**	**CIE Marks**	**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:

22YOG60.1	Use Yogasana practices in an effective manner
22YOG60.2	Become familiar with an authentic foundation of Yogic practices
22YOG60.3	Practice different Yogic methods such as Suryanamaskara, Pranayama and some of the Shat Kriyas
22YOG60.4	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
22YOG60.1	-	-	-	-	-	3	-	-	-	-	-	1
22YOG60.2	-	-	-	-	-	3	-	-	-	-	-	1
22YOG60.3	-	-	-	-	-	3	-	-	-	-	-	1
22YOG60.4	-	-	-	-	-	3	-	-	-	-	-	1

Semester / Course Code	CONTENT	COs	HOURS
6TH 22YOG60	**Kapalabhati:** Revision of Kapalabhati – 80 strokes/min3rounds **Brief introduction and importance of:** **Different types of Asanas**: 1. Sitting: Bakasana, Hanumanasana, Ekapada Rajakapotasana 2. Standing: Parivritta Trikonasana, Utkatasana, Parshvakonasana 3. Supine line: Setubandhasana, Shavasanaa (Relaxation posture) 4. Balancing: Sheershasana **Patanjali's AshtangaYoga**: Dhyana (Meditation), Samadhi **Pranayama:** Bhastrika, Bhramari, Ujjai **Shat Kriyas:** Jalaneti and sutraneti, Sheetkarma Kapalabhati	22YOG60.1, 22YOG60.2, 22YOG60.3, 22YOG60.4	Total 32 Hrs/ Semester 2 Hrs/week

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)

CIE	Marks
Avg of Test 1 and Test 2	25
Demonstration of Yogasana	25
Total	**50**

Suggested Learning Resources:
Reference Books:

1. Swami Kuvulyananda: Asma (Kavalyadhama, Lonavala)
2. Tiwari, O P: Asana Why and How
3. Ajitkumar: Yoga Pravesha (Kannada)
4. Swami Satyananda Saraswati: Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger)
5. Swami Satyananda Saraswati: Surya Namaskar (Bihar School of yoga, Munger)
6. Nagendra H R: The art and science of Pranayama
7. Tiruka: Shatkriyegalu (Kannada)
8. Iyengar B K S: Yoga Pradipika (Kannada)
9. Iyengar B K S: Light on Yoga (English)

Web links and Video Lectures (e-Resources):

- https://youtu.be/KB-TYlgd1wE
- **https://youtu.be/aa-TG0Wg1Ls**

APPENDIX A

LIST OF ASSESSMENT PATTERNS

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 and 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.

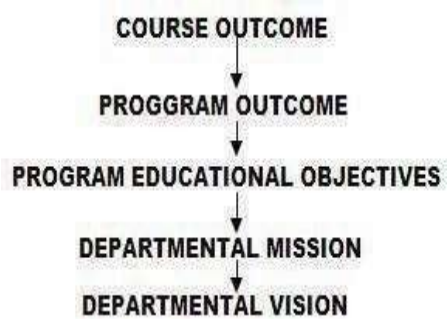
There are three educational Outcomes as defined by the National Board of Accreditation:

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 attributesare 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 straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in manyways 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 withan 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 theprofessional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutionsin 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 ofthe engineering practice.

Individual and teamwork: 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 reportsand design documentation, make effective presentations, and give and receive clear instructions.

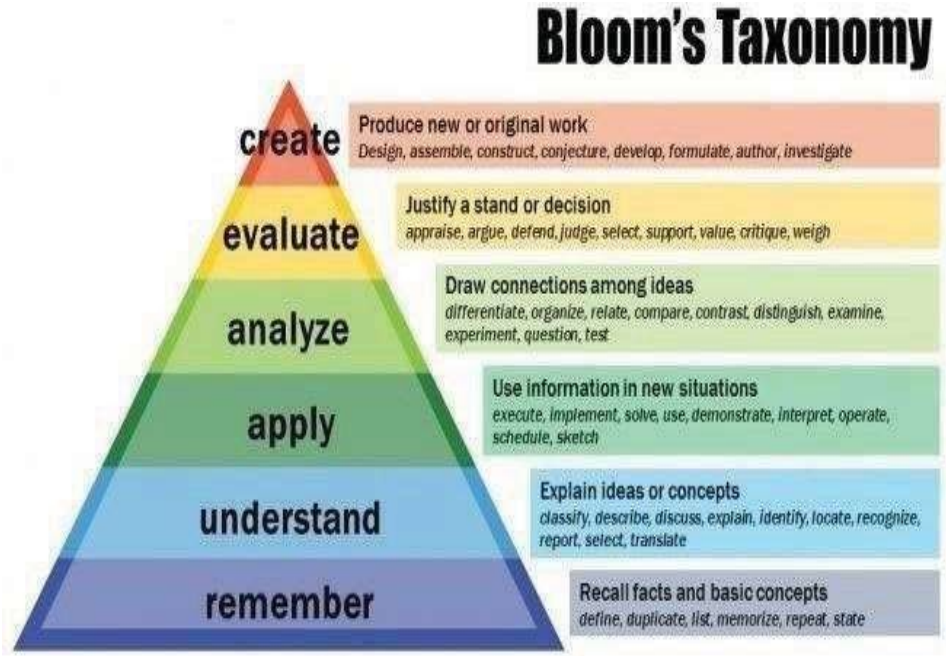
Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi- disciplinary environments.

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 evaluationsof 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, Karnataka 560103, India.

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