Dr. D. Y. Patil Educational Federation's
Dr. D. Y. Patil College of Engineering and Innovation
APPROVED BY AICTE, RECOGANIZED BY GOVT. OF MAHARASHTRA,
AUTONOMOUS INSTITUTE AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSITY
Accredited by NAAC with "A" Grade

ACADEMIC COURSE STRUCTURED

AND

DETAILED SYLLABUS

S. Y. BTech

Computer Engineering (CE)

BTech 4 YEAR UG COURSE

(Applicable for the batches admitted from AY 2025-2026 at FY)

Dr. D. Y. Patil College of Engineering & Innovation

Survey No. 27/A/1/2C, Varale Campus,
Near Talegaon Railway Station,
Tal. Maval, Dist. Pune 410 507,
Ph: 020 48522561, 565,566
Web Site: https://www.dypcoei.edu.in,
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Vision and Mission of the Institute

Vision of DYPCOEI

To achieve excellence in quality education through value based rapidly changing technologies and create technical Human-Resource with proficiencies of accepting new challenges.

Mission of DYPCOEI

M1: Continuously strive to impart value-based education to elevate the satisfaction level of all stakeholders.

M2: Take dedicated efforts to create competent professionals by effective teaching learning process with passion of lifelong learning attitude.

M3: Our endeavour is to promote and support innovative research, entrepreneurship and development activities through Industry Interaction.

Vision and Mission of the Department

Vision of Department:

To produce global standard professionals, innovators and entrepreneurs with strong fundamental concepts and desire to learn latest trends and technologies in the field of Computer Engineering.

Mission of Department:

M1: Adapt changes in recent trends and technologies by effective Teaching-Learning process to train the students.

M2: Prepare competent Computer Engineers to sustain in the competitive global corporate world with a spirit of good work ethics.

M3: Inculcate self and continuous learning and the ability to work in a team to share innovation and research.

Program Educational Objectives (PEOs)

PEO1: Prepare graduates to apply their Computer Engineering knowledge while framing the solutions to the real-life problems

PEO2: Inculcate ability of communication, soft skills, ethics and work in a team while demonstrating the professionalism.

PEO3: Impart life-long learning among students to adapt new trends and technologies in the field of Computer Engineering.

Knowledge and Attitude Profile (WK)

A Knowledge and Attitude Profile (KAP), often represented as WK (Knowledge and Attitude Profile) in some contexts, is a framework or assessment tool used to evaluate an individual's knowledge and attitudes related to a specific area, topic, or domain

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make

effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

PSO1: Enhance the ability of design and develop algorithms while studying core courses consisting of concepts of Computer Network, Databases, System Programs, Software Testing and quality assurance.

PSO2: Rigorous hands-on training to enhance the skills in emerging trends and technologies such as WT, IoT, Machine Learning and Information Security.

PSO3: Inculcate professionalism with ethics and compassion towards humanity while working in a team.

Program Outcomes (PO) Mapping with WA & WK (As per National Board of Accreditation (NBA))											
			Knowledge and Attitude Profile (WK)								
PO	**Domain**	**WA**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
PO1	Engineering Knowledge	**WA1**	X	X	X	X						**Analysis of problems & synthesis of solutions**
PO2	Problem Analysis	**WA2**	X	X	X							
PO3	Design/development of solutions	**WA3**					X					
PO4	Investigation	**WA4**								X		
PO5	Tool Usage	**WA5**		X				X				
PO6	The Engineer and the World	**WA6**	X				X		X			**Responsibilities**
PO7	Ethics	**WA7**									X	
PO8	Individual and Collaborative Team work	**WA8**									X	**Required In work place**
PO9	Communication	**WA9**										
PO10	Project Management and Finance	**WA10**										
PO11	Lifelong learning	**WA11**								X		

Program – B. Tech. (Computer Engineering)

(Autonomous Curriculum Structure for students admitted from AY 2025-26 at FY)

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

B. Range of Credits:

Student will become eligible to get Under Graduate (UG) BTech degree in Computer Engineering after earning **160 credits.** A student will be eligible to get Under **Graduate degree with Honors** or additional **Minor Engineering**, if he/she completes an additional **20 credits from SEM-V to SEM-VIII.**

C. Credit for BTech Degree in Computer Engineering

Sr. No.	Year	Semester	Credits
1	First Year	I	**22**
2		II	**22**
3	Second Year	III	**21**
4		IV	**23**
5	Third Year	V	**19**
6		VI	**17**
7	Final Year	VII	**18**
8		VIII	**18**
Total Credits			**160**

D. Structure of BTech program

Abbreviation	Course Type	Credit
BSC	Basic Science Courses	18
ESC	Engineering Science Courses	12
PCC	Program Core Courses	44
PEC	Program Elective Courses	20
MDM	Multidisciplinary Minor	14
OEC	Open Elective Courses	08
VSE	Vocational and Skill Enhancement Course	06
AEC	Ability Enhancement Course	04
EMC	Entrepreneurship and Management Courses	04
IKS	Indian Knowledge System	02
VEC	Value Education Courses	04
REM	Research Methodology	04
CEP	Community Engagement Project	02
IAP	Internship and Project	14
CCC	Co-curricular Courses	04
	Total	**160**

Credit Distribution Structure:

SEM	Total Marks	BSC	ESC	PCC	PEC	MDM	OEC	VSE	AEC	EMC	IKS	VEC	REM	CEP	IAP	CCC	Total Credit
I	700	9	6	4				1	2								**22**
II	700	9	6	3				1			2					1	**22**
III	700			9		2	4			2		2		2			**21**
IV	700			8		2	2	2	2	2		2			2	1	**23**
V	700			5	8	4	2										**19**
VI	700			3	4	2		2							4	2	**17**
VII	700			6	2	2							4		4		**18**
VIII	700			6	6	2									4		**18**
	5600	**18**	**12**	**44**	**20**	**14**	**8**	**6**	**4**	**4**	**2**	**4**	**4**	**2**	**14**	**4**	**160**

L	Lecturer	**T**	Tutorial	**P**	Practical
#	**Semester End Examination (SEE)** based on subjective questions.				
$	**LAB /Practical or Handson/ Activity based Evaluation.**				
*	**Comprehensive Continuous Evaluation (CCE)** based on Unit Tests, Home Assignment/Comprehensive, Presentation/Group Discussion/Laboratory Work/Course Project/Viva Voce/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.				
@	**For MOOCs:** Assignments marks will be converted on the scale of 60 marks.				
%	**For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of SEE Conducted by Institute will be converted on the scale of 60 marks.				

Department Autonomous Coordinator DYPCOEI

Head of Department Computer Engineering, DYPCOEI

Dean Academics DYPCOEI

Director Dr. D. Y. Patil College of Engineering, Talegaon, Pune

Computer Engineering - Second Year (Semester –III)												
Level - 5												
Sr. No.	Code	Course Title	Teaching Scheme (Hours/week)			Credits	Examination scheme					
			L	T	P		CCE	SEE	TW	PR	OR	Total
1	CEPCC201T	Discrete Structures and Graph Theory	3	0	0	3	50	50	0	0	0	100
2	CEPCC202T	Computer Architecture and Organization	2	0	0	2	50	50	0	0	0	100
3	CEPCC203T	Data Structures and Algorithms	2	0	0	2	50	50	0	0	0	100
4	ILMDM201T	Multidisciplinary Minor-I	2	0	0	2	50	50	0	0	0	100
5	CEPCC204P	Data Structures and Algorithms - Lab	0	0	4	2	0	0	25	50	25	100
6	CEVEC205W	Social Well-being	1	1	0	2	0	0	25	0	0	25
7	CECEP206O	Community Engagement – Field Project	0	0	4	2	0	0	25	0	50	75
8	ILOEC201O	Open Elective I	2	0	0	2	0	0	25	0	25	50
9	ILOEC202W	Open Elective II	2	0	0	2	0	0	25	0	0	25
10	CEEMC207W	Entrepreneurship and Startup Ecosystem	1	1	0	2	0	0	25	0	0	25
Total			**15**	**2**	**8**	**21**	**200***	**200#**	**150$**	**50$**	**100$**	**700**

MDM-I (ILMDM201T)	
ILMDM201T-1	Smart cities and intelligent infrastructure
ILMDM201T-2	Fundamentals of autonomy and intelligent behaviour
ILMDM201T-3	Introduction to smart and precision agriculture
ILMDM201T-4	Fundamentals of electric vehicles and comparison with ICE vehicles
ILMDM201T-5	Fundamentals of additive manufacturing
ILMDM201T-6	Fundamentals of healthcare systems and digital health
ILMDM201T-7	Microcontrollers and Industrial Applications

Open Elective -I (ILOEC201W&O)		Open Elective -II (ILOEC202W)	
ILOEC201O-1	Engineering Economics	ILOEC202W-1	MOOC – I
ILOEC201O-2	AI in Finance Management	ILOEC202W-2	Foreign Language - I
ILOEC201O-3	Digital Finance	ILOEC202W-3	Universal Human Values

Computer Engineering - Second Year (Semester –IV)												
Level – 5												
Sr. No.	Code	Course Title	Teaching Scheme (Hours/week)			Credits	Examination scheme					
			L	T	P		CCE	SEE	TW	PR	OR	Total
1	CEPCC208T	Operating Systems	2	0	0	2	50	50	0	0	0	**100**
2	CEPCC209T	Fundamentals of Computer Network	2	0	0	2	50	50	0	0	0	**100**
3	CEPCC210T	Computer Graphics Design	2	0	0	2	50	50	0	0	0	**100**
4	ILMDM202T	Multidisciplinary Minor-II	2	0	0	2	50	50	0	0	0	**100**
5	CEPCC211P	Operating Systems and Computer Graphics Design - Lab	0	0	4	2	0	0	25	50	0	**75**
6	CEVSE212P	Basic Web Application Development	0	0	4	2	0	0	0	50	0	**50**
7	CEIAP213W	Internship	0	0	4	2	0	0	25	0	0	**25**
8	CEVEC214W	Software Engineering & Project Management	2	0	0	2	0	0	25	0	0	**25**
9	ILOEC203O	Open Elective III	2	0	0	2	0	0	25	0	25	**50**
10	CEAEC215W	Employability Skill Development	1	1	0	2	0	0	25	0	0	**25**
11	CEEMC216O	Entrepreneurship and Management Studies	1	1	0	2	0	0	0	0	25	**25**
12	CECCC217W	Co-Curricular Course II	0	0	2	1	0	0	25	0	0	**25**
Total			**14**	**2**	**14**	**23**	**200***	**200#**	**150$**	**50$**	**100$**	**700**

MDM-II (ILMDM202T)	
ILMDM202T-1	Sustainable energy and environment
ILMDM202T-2	Perception, sensing, and sensor fusion
ILMDM202T-3	Robotics and automation in farming operations
ILMDM202T-4	Electric powertrain architecture and motor technologies
ILMDM202T-5	3D printing processes: FDM, SLA, SLS, DMLS, Binder Jetting, etc.
ILMDM202T-6	AI techniques (ML, DL, NLP, CV) in diagnostics and prognosis
ILMDM202T-7	Introduction to Embedded Processors

Open Elective -III (ILOEC203W&O)	
ILOEC203O-1	Digital Marketing
ILOEC203O-2	Critical Thinking and Problem Solving
ILOEC203O-3	Ethics in Artificial Intelligence

Co-Curriculum Course II (CECCC217W) Professional Self Initiatives and Social Activity
• Technical Events/Quiz/Paper Contest/Project Contest / Model Making etc.
• MOOC/ NPTEL/ SWAYAM/ Coursera etc. related to Professional Development and Social Activity
• Competitions/ Events Conducted by Professional Societies (ISTE, IEI, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.)
• Attending Full time Conference/ Seminars/ Exhibitions/ Workshop/ STTP Conducted at IITs/ NITs/ Reputed Institutes/ Universities
• Attending Full time Conference/ Seminars/ Exhibitions/ Workshop/ STTP Conducted at DYPCOEI
• Paper Presentation in National/ International Conference of High Repute
• Poster Presentation in National/ International Conference of High Repute
• Paper Publication in National/ International Journal of High Repute
• Industrial Training/ Internship (at least for 04 Weeks)
• Participation in Institute Level Student Clubs
• Elected Student Representative of Student Council (University Representative, General Secretary, Cultural, Sports, NSS Secretary, Ladies Representative, Academic Toppers, Invitee Members)
• Office Bearer of Professional Society Chapter (ISTE, IEI, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.)
• Office Bearer of Institute Level Student Club
• Office Bearer of Departmental Student Association
• Office Bearer of ECell, Digital Content Lab etc.
• Student Ambassador for Mayura AICTE IDEA Lab/ NIDHI iTBI etc.
• Editorial Board Member of Annual Magazine
• Editorial Board Member of E-Newsletter
• Member of Governance Committee/ Statutory Committee

Computer Engineering - Second Year (Semester –III)

Syllabus

Second Year Computer Engineering (2022 Course) Discrete Structures and Graph Theory			
Course Code	CEPCC201T	**Credit**	03
Contact Hours	03 Hrs/weeks (L)	**Type of Course**	Lecture
Examination Scheme	CCE: 50 Marks SEE: 50 Marks	**Total Marks**	100

Pre-requisites: Basic Knowledge of Mathematics.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Comprehensive Continuous Evaluation	Internal	50*
2.	Semester End Examination	External	50#

Course Objectives	
1	Apply mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving
2	Demonstrate the fundamental concepts related to set theory, relations and functions which are frequently required in advanced courses such as analysis of algorithms.
3	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics
4	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
5	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.

Course Outcomes	
1	To introduce students to understand, explain, and apply the foundational mathematical concepts at the core of computer science.

2	To understand use of set, function and relation models to understand practical examples, and interpret the associated operations and terminologies in context.
3	To analyse and learn the fundamental counting principle, permutations, and combinations.
4	To study how to model problem using graph and tree.
5	To learn how abstract algebra is used in coding theory.

Topics covered:
UNIT-I: Set Theory and Logic (6 Hrs)
Sets– Types of Sets, Set Operations, Cardinality of set, Principle of inclusion and exclusion. Proof by Mathematical Induction and Strong Mathematical Induction. Propositional Logic- logic, Propositional Equivalences, Application of Propositional Logic- Translating English Sentences.
UNIT-II: Relations and Functions (7 Hrs)
Relations- Types of Relations, Partial orderings, Partitions, Hasse diagram, Lattices, Chains and Anti-Chains, Transitive closure and Warshall's algorithm. Functions- Surjective, Injective and Bijective functions, Identity function, Partial function, Invertible function, Constant function, Inverse functions and Compositions of functions, The Pigeonhole Principle.
UNIT-III: Counting Principles (6 Hrs)
The Basics of Counting, rule of Sum and Product, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Algorithms for generating Permutations and Combinations.
UNIT-IV: Trees and Graph Theory (7 Hrs)

Introduction, properties of trees, Binary search tree, tree traversal, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal's and Prim's algorithms, The Max flow- Min Cut Theorem (Transport network). Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, the handshaking lemma, Single source shortest path- Dijkstra's Algorithm, Planar Graphs, Graph Coloring.
UNIT-V: Algebraic Structures and Coding Theory (6 Hrs)
The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and Congruence relations, Rings, Integral Domains and Fields, Coding theory, Polynomial Rings and polynomial Codes, Galois Theory –Field Theory and Group Theory.

Text Books:

1. "Discrete mathematical structures", B Kolman RC Busby, S Ross PHI Pvt. Ltd
2. "Probability and Statistics", Murray R. Spiegel, John Schiller and R. Alu Srinivasan, Tata McGraw- Hill Edition.
3. "Probability and Statistics for Engineering and the Sciences", Jay Devore, Eighth Edition

Reference Books:

1. "Discrete structures", Liu, Tata McGraw -Hill.
2. "Discrete Mathematical structures", Y N Singh, Wiley- India
3. "Introduction to Probability and Statistics for Engineers and Scientists", Sheldon M. Ross, Academic Press.
4. "Probability and Statistics for Engineers and Scientists", Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Ninth Edition
5. "Applied Statistics and Probability for Engineers", D. C. Montgomery and G.C. Runger, 5th edition, John Wiley & Sons

EBooks:

1. Discrete Mathematics (openmathbooks.org)
2. mth202.pdf (iitk.ac.in)
3. cs103x-notes.pdf (stanford.edu)

MOOC Course:

1. Introduction to Probability and Statistics

Introduction to Probability and Statistics - Course (nptel.ac.in)

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Computer Architecture and Organization			
Course Code	CEPCC202T	**Credit**	02
Contact Hours	02 Hrs/weeks (L)	**Type of Course**	Lecture
Examination Scheme	CCE: 50 Marks SEE: 50 Marks	**Total Marks**	100

TOP

Pre-requisites:

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Comprehensive Continuous Evaluation	Internal	50*
2.	Semester End Examination	External	50#

Course Objectives	
1	To understand the structure, function & characteristics of computer systems
2	To understand the design and operation of micro-programmed control units and explore hardware algorithms for performing basic arithmetic operations.
3	To develop an understanding of algorithms used for arithmetic computations and their hardware realization.
4	To provide an understanding of memory hierarchy and I/O organization, focusing on memory technologies, performance, and data transfer mechanisms.
5	To understand instruction level parallelism & parallel organization of multi-processor & multi core systems

Course Outcomes	
1	Explain processor structure & its functions.
2	Understand and analyze the basic structure and functioning of a computer system, and the fundamentals of RISC architecture.
3	Design a basic control unit using micro-programming techniques and apply various algorithms at the hardware level.

4	Explain the organization and functioning of memory systems and I/O architectures.
5	Explain the basics of multiprocessors, multicores, and parallel computing systems.

Topics covered:		
UNIT-I:	**UNIT-I: Basic Structure of Computers**	**(5 Hrs)**
Functional Units: Input unit, Output unit, Memory unit, Arithmetic logic unit, Control unit, Registers and their types, Interconnection of functional units, Basic Structures: Data bus, Address bus, Control bus, Bus arbitration techniques, Synchronous and asynchronous bus systems, Architecture: Von-Neumann Architecture, Harvard Architecture.		
UNIT-II:	**UNIT-II: Data Representation**	**(5 Hrs)**
Number Systems: Binary, Octal, Decimal, Hexadecimal, Conversion between number systems, Signed and unsigned number representation, Binary Arithmetic: Addition, Subtraction, Multiplication, Division, 1s complement and 2s complement arithmetic, Overflow and underflow conditions, Representation: Fixed point representation, Floating point representation, Floating point arithmetic operations.		
UNIT-III:	**UNIT-III: CPU Organization**	**(5 Hrs)**
Introduction to x86 Architecture, Instruction set Architecture of a CPU: Register Transfer Language, Register Transfer, Memory Transfer, Instruction Cycle, Addressing modes, Instruction set, CISC vs RISC Architecture. CPU Control unit design: Hardwired and Micro-programmed design approaches.		
UNIT-IV:	**UNIT-IV: Memory Organization**	**(5 Hrs)**
Memory Hierarchy Levels: Registers, Cache memory, Main memory, Secondary memory, Access time, Cost and capacity trade-offs, Locality of reference including temporal and spatial locality, Cache Memory: Cache organization, Mapping techniques such as direct mapping, Associative mapping, Set associative mapping.		
UNIT-V:	**I/O Organization**	**(5 Hrs)**
I O Interface: Peripheral devices and their characteristics, I O interface modules, Memory mapped I O, Isolated I O, Handshaking, Synchronization, Interrupts: Concept and need of interrupts, Hardware interrupts, Software interrupts, Interrupt handling		

mechanism, Priority interrupts, Vectored interrupts. CPI calculations and case studies in modern computer systems.

Text Books:

1. David A. Paterson and John L. Hennessey, Computer 0 i ganization and Design, Fifth edition, Morgan Kauffman / Elsevier, 2014.
2. Miles. Murdocca and Vincent P. Heuring, Computer Architecture and Organization: An Integrated approach, Secon‹t editio n, Wiley lndia Pvt Ltd, 2015.

Reference Books:

1. "Computer Organization, 5th edition", Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002) Tata McGraw -Hill.
2. "Computer System Architecture", 3rd edition M. Moris Mano(2006) Pearson/ PHI, India.
3. Govindarajalu, -Comp uter Architecture and Organization, Design Principles and Applications", Second edition, McGraw- Hill Ed ucation India Pvt Ltd, 2014.

EBooks:

1. https://msajce-edu.in/academics/ece/LectureNote/EC8552-LN.pdf
2. https://vardhaman.org/wp-content/uploads/2021/03/CO.pdf

MOOC Course:

1. NPTEL Course: Computer Architecture(Detailed course covering all the units you mentioned including microprogrammed control and parallel architectures.)
2. Udemy Course: Computer Organization and Architecture Fundamentals (Beginner to intermediate level, covering instruction sets, CPU, memory, and IO.)

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Data Structures and Algorithms			
Course Code	CEPCC203T	**Credit**	02
Contact Hours	02 Hrs/weeks(L)	**Type of Course**	Theory
Examination Scheme	CCE: 50 marks SEE: 50 marks	**Total Marks**	100

TOP

Pre-requisites: Advanced Knowledge of Data Structures.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Comprehensive Continuous Evaluation	Internal	50*
2.	Semester End Examination	External	50#

Course Objectives	
1	Understand the Fundamentals and importance of data structures in algorithm and software development.
2	To study concept of ADT (abstract data type) for linear data structure
3	To study various linear data structure and its uses in software development.
4	To study and understand various applications of stack n queue.
5	To understand various algorithmic strategies using data structure in problem solving.

Course Outcomes	
1	Describe the basic concepts and classifications of data structures, particularly linear data structures such as arrays, stacks, queues, and linked lists.
2	Implement arrays and perform operations such as insertion, deletion, and traversal in various programming environments.

3	Construct and manipulate singly, doubly, and circular linked lists for efficient dynamic memory usage.
4	Develop and manipulate stack and queue data structures for applications like expression evaluation, balancing symbols, and task scheduling.
5	Design and implement solutions to real-world problems using appropriate linear data structures.

Topics covered:
UNIT-I: Introduction to fundamentals of data structure. (5 Hrs)
Introduction to Data Structures and Algorithms. Definition and classification of data structures, Abstract Data Types (ADT). Introduction to Algorithm, its classification and algorithm analysis: Time and Space complexity, Big-O notation. Branch and Bound design strategies. Heuristic and Meta Heuristic approaches.
UNIT-II: Linear data structure Array (5 Hrs)
One-dimensional and multidimensional arrays. Operations: insertion, deletion, traversal, searching, sorting. Dynamic arrays and memory management. String representation and manipulation. Sparse matrix introduction, its transpose, addition, Compressed Sparse Row (CSR)and compressed sparse Column (CSC) formats.
UNIT-III: Linear data structure Linked List (5 Hrs)
Introduction to linked list, linked list as ADT. Types of linked list. Singly linked list: operations and applications. Doubly linked list: insertion and deletion. Circular linked lists: insertion and deletion Skip list, XOR linked list introduction. Its realworld application like memory management and file system.
UNIT-IV: Linear data structure Stack (5 Hrs)
Introduction to stack. Stack ADT and its applications. Operations: push, pop, peek. Implementation using arrays and linked lists. Advanced stack operations like segmented stack and lock free stacks. Applications: Expression conversion (infix to postfix), postfix evaluation, recursion simulation.
UNIT-V: Linear data structure Queue (5 Hrs)

Introduction to queue, Queue ADT: basic operations. Types of queues: linear, circular, dequeue (double-ended queue), and priority queue. Multilevel feedback queue, circular deque n dynamic circular queue. Implementation using arrays and linked lists

Applications: task scheduling, CPU scheduling, buffering, networking.

Text Books:

1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
2. "Algorithms", Robert Sedgewick, Kevin Wayne
3. "Data Structures and Algorithms Made Easy", "Data Structures and Algorithms Made Easy"

Reference Books:

1. "Algorithmics: The Spirit of Computing", David Harel and Yishai Feldman
2. "The Algorithm Design Manual", Steven S. Skiena
3. "Data Structures Using C", Reema Thareja

EBooks:

1. Data Structures and Algorithms by Catherine Leung (e-booksdirectory.com)
2. Notes on Data Structures and Programming Techniques by James Aspnes (e-booksdirectory.com)

MOOC Course:

Introduction to Data Structures and Algorithms- Course (nptel.ac.2in)

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Data Structures and Algorithms – Lab			
Course Code	CEPCC204P	**Credit**	02
Contact Hours	04 Hrs/weeks(P)	**Type of Course**	Practical
Examination Scheme	TW: 25 Marks PR: 75 Marks OR: 25 Marks	**Total Marks**	100

TOP

Pre-requisites: Data Structures and Algorithms

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25$
2.	Practical	External	50$
3.	Oral	External	25$

Course Objectives	
1	To understand the basic concepts of data structures and their applications.
2	To learn different linear data structures such as arrays, linked lists, stacks, and queues.
3	To develop programming skills for implementing various data structures.
4	To perform operations on arrays, linked lists, stacks, and queues.
5	To apply data structures in solving real-world problems efficiently.

Course Outcomes	
1	Implement one-dimensional and two-dimensional arrays and perform various operations on them.
2	Develop singly linked lists, doubly linked lists, and circular linked lists using different insertion, deletion, and traversal operations.
3	Implement stack data structure and solve applications such as expression conversion, expression evaluation, string reversal, and stack sorting.
4	Implement queue and circular queue data structures and apply them to real-life applications such as order management systems.
5	Analyze and select appropriate data structures for solving different computational problems efficiently.

Suggested List of Laboratory Experiments/Assignments
1. Write a program to implement 1D array and find following values Maximum, Minimum, Average and display highest value with maximum frequency
2. Write a program to implement 2D matrix and its operation a) Addition b) Subtraction c) Multiplication d) Transpose
3. Write a program to implement a singly linked list with its primary operations create a list, insert at beginning, insert at end, insert at given position, delete from beginning, delete from end, delete from given position, display and count number of nodes.
4. Write a program to implement doubly linked list with following operations: a) Create b) Insert at beginning c) Delete from end d) Traverse forward n backward e) Reverse the list
5. Write a program to implement a record of book library using circular linked list along with maintaining latest record in descending order, avoiding duplicate records.
6. Write a program to implement a conversion of infix expression to postfix expression using stack and also evaluate it.
7. Write a program to reverse a string using stack.
8. Write a program to sort a stack using another stack.
9. Write a program to implement a ice cream shop app with menu of ice cream types, taking order in bulk, no order cancelling once placed. Write a program using queue.
10. Write a program to implement circular queue.

Mini projects:
1. "Student Record Management System using linked list" Project feature: a. Add record at end and beginning of the list b. Display all student records c. Delete a record using roll number d. Search the record using roll number, name etc. d. Sort a record using any one of the sorting algorithms. Use doubly or circular linked list
2. Tower of Hanoi using Stack.

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Social Well-being			
Course Code	CEVEC205W	**Credit**	02
Contact Hours	01 Hrs/weeks(L) 01 Hrs/weeks(T)	**Type of Course**	Theory
Examination Scheme	TW: 25 marks	**Total Marks**	25

Pre-requisites: communication skills, General awareness of societal issues and community life, Basic Digital Literacy

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25$

Course Objectives	
1	To develop awareness of social values, ethics, and responsible citizenship that directs towards social well being
2	To enhance communication, empathy, and interpersonal skills for better social interaction
3	To understand social issues and challenges in society and their impact
4	To promote teamwork, collaboration, and community engagement
5	To foster a sense of social responsibility and sustainable development

Course Outcomes	
1	Demonstrate understanding of social values, ethics, and responsible citizenship
2	Apply effective communication and interpersonal skills in social interactions
3	Identify and analyze key social issues and their impact on society
4	Work collaboratively in teams and participate in community-based activities
5	Exhibit a sense of social responsibility towards sustainable development

Topics to be covered (Need to cover in Lecture)

1.	**Introduction to Social Well-Being** Concept of social wellbeing, importance of social wellbeing, human values related to social wellbeing, ethics, and responsible citizenship, Indicators of Social Wellbeing
2.	**Communication and Interpersonal Skills** Effective communication, empathy, active listening, relationship building
3.	**Understanding Society and Social Issues** Social structure, diversity, inclusion, key social challenges (poverty, education, environment)
4.	**Teamwork and Community Engagement** Team dynamics, collaboration, role of individuals in society, community participation
5.	**Ways of improving Social Wellbeing:** Approaching friends and family for support, Treating others with respect, Balancing own social and personal time, Engaging in conflict resolution and softening barriers Social Responsibility and Sustainability related to social well being Sustainable development goals for social well being, environmental awareness, social responsibility practices

List of Assignments

1.	**Write a short reflection**: "Role of Engineers in Society for maintaining social well being" (300–400 words) **Case study discussion**: Analyze a real-life example of ethical/unethical engineering practice **Activity**: Identify 5 social responsibilities of an engineer
2.	**Communication and Interpersonal Skills** **Role play**: Effective vs ineffective communication in a team project **Activity**: Practice active listening and summarize partner's views Assignment: Write a professional email/report on a social issue
3.	**Understanding Society and Social Issues** **Mini-survey**: Collect data on a local social issue (e.g., waste management, traffic, water usage) **Data analysis**: Present findings using charts/graphs Discussion: Impact of technology on society (positive & negative)
4.	**Teamwork and Community Engagement** **Group activity**: Solve a community problem using engineering thinking **Task:** Plan a small social initiative (cleanliness drive, awareness

	campaign, etc.)
5.	**Social Responsibility and Sustainability** **Activity:** Conduct a simple sustainability audit (energy/water usage at home/college) **Task:** Propose an eco-friendly engineering solution Poster/Presentation: Sustainable development goals (SDGs)
6	**Ethics and Decision-Making** **Case study:** Analyze ethical dilemmas in engineering (e.g., safety vs cost) **Debate:** "Technology always improves quality of life – Agree/Disagree" Assignment: Suggest ethical solutions for a given scenario

Text Books:

1. Human Values and Professional Ethics – Suresh Jayshree
2. Textbook on Professional Ethics and Human Values – R. S. Naagarazan
3. Universal Human Values and Professional Ethics – Dr. Ritu Soryan

Reference Books:

1. Human Values and Professional Ethics – Subhash B. Gogate Vikas Publishing House Pvt. Ltd.
2. Ethics and Human Values in Engineering Practices – Dr. Subrata Das
3. Ethics in Engineering – Mike W. Martin & Roland Schinzinger Publisher: Tata McGraw-Hill

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Community Engagement – Field Project			
Course Code	CECEP206O	**Credit**	02
Contact Hours	04 Hrs/weeks(P)	**Type of Course**	Practical
Examination Scheme	TW: 25 marks Oral: 50 marks	**Total Marks**	75

Pre-requisites

- Basic knowledge of data collection and analysis
- Communication and teamwork skills
- Basic computer literacy
- Willingness for fieldwork and community interaction

Course assessment methods/tools:

Sr. No.	Course assessment methods/ tools	External/ Internal	Marks
1.	Term Work	Internal	25$
2.	Oral	External	50$

Course Objectives	
1	To provide experiential learning through direct community interaction
2	To identify and address real-world socio-technical issues
3	To develop sustainable and inclusive solutions
4	To enhance teamwork, communication, and leadership skills
5	To inculcate ethical values and social responsibility

Course Outcomes	
1	**Identify** appropriate tools and techniques
2	**Select** community problems using interdisciplinary approaches
3	**Apply** feasible solutions for community problem
4	**Organize** social, environmental, and economic impact
5	**Design** professional reports and present findings effectively

Implementation Guidelines

1. Group Formation

Students shall work in **groups of 3–4 members**

Each group shall be assigned a **village/habitation/municipal ward**, preferably near the institution

2. Mentorship

Each group/batch shall be assigned a **faculty mentor**

The mentor will guide, supervise, and evaluate the project

3. Batch Structure

A class of **60 students** may be divided into **3 batches (20 students each)**

Each batch shall have a **4-hour weekly practical session**

4. External Association

Students shall collaborate with:

Government officials

Village authorities

NGOs / local bodies

Allocation may be facilitated by district/local administration

5. Nature of the Project

The project must be **independent of NSS/NCC/Clubs activities**

It should focus on **real, localized community issues**

6. Documentation

Each student shall maintain an **Activity Log Book**

It must include:

Daily/weekly activities

Observations

Learning outcomes

Logbook must be **signed by Mentor/HoD**

7. Project Report

Each group shall submit a **detailed project report** including:

Community profile

Problem statement

Methodology

Implementation details

Results and impact

8. Internal Evaluation

Conducted by a **committee constituted by HoD**

Based on:

Participation

Field work

Innovation

Documentation quality

Marks awarded by **mentor/HoD**

9. Awareness Activities

Students may conduct awareness programs in:

Health and hygiene

Organic farming

Renewable energy

E-waste management

De-addiction awareness

Any relevant domain based on student expertise

10. Final Evaluation

Oral Examination (Viva Voce) consisting of:

Project presentation

Demonstration of outcomes

Assessment Scheme

Component	Weightage
Survey & Activity Log Book	15%
Problem Identification & Proposal	15%
Field Implementation	30%
Final Report	20%
Presentation & Viva Voce	20%

Suggestive Project Topics

A. Social and Behavioural Studies

Use/misuse of mobile phones, Career guidance for youth, Women education and empowerment, Cultural engagement (music, arts)

B. Health and Hygiene

Community health awareness, Hygiene practices (students, homemakers, elderly), Diabetes and chronic disease awareness, Nutrition and food habits, Yoga and wellness practices

C. Environment and Sustainability

Air, water, and noise pollution, Plantation and soil conservation, Renewable energy (solar systems), E-waste management, Chemicals in daily life

D. Agriculture and Rural Development

Organic farming, Horticulture, Herbal and nutritional plants, Fisheries and rural livelihood

E. Water and Sanitation

Drinking water availability, Water conservation, Sanitation systems

F. Food and Public Health

Food adulteration, Nutritional awareness, Safe food practices

G. Traditional and Modern Practices

Traditional vs modern healthcare methods, Indigenous knowledge systems

Learning Resources

Textbooks

1. "Participatory Rural Appraisal: Principles, Methods and Applications ", N. Narayanasamy, SAGE Publications, ISBN: 9788178298856
2. "Rural Development in India: Past, Present and Future – A Challenge in the Crisis", Vasant Desai, Himalaya Publishing House, ISBN: 978818488

Reference Books

1. "Rural Development: Principles, Policies and Management " , Katar Singh, SAGE Publications India Pvt. Ltd., ISBN (3rd Edition): 9788178299266
2. United Nations – *Sustainable Development Goals Reports*

Online Resources

1. SWAYAM / NPTEL courses
2. Government initiatives (Swachh Bharat, Digital India, Jal Jeevan Mission)
3. NGO case studies

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Entrepreneurship and Startup Ecosystem			
Course Code	CEPCC207W	**Credit**	02
Contact Hours	01 Hrs/weeks (L) 01 Hrs/week (T)	**Type of Course**	Lecture
Examination Scheme	TW: 25 marks	**Total Marks**	25

Pre-requisites: Completion of foundational engineering courses like Engineering Mathematics or Introduction to Computers for better context in tech startups.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25$

Course Objectives	
1	To understand the basic concepts, characteristics, and importance of entrepreneurship.
2	To study the startup ecosystem and its support and incubation mechanisms.
3	To identify business opportunities through market analysis and demand-supply gap assessment.
4	To develop preliminary startup ideas and feasibility-based concept notes.
5	To evaluate startup ideas based on innovation, viability, and ecosystem support.

Course Outcomes	
1	Ability to Explain entrepreneurship concepts, traits, and business ownership forms.
2	Ability to Describe the startup ecosystem and institutional support available to entrepreneurs.
3	Ability to Analyze market problems and identify viable business opportunities.
4	Ability to Prepare a preliminary startup concept note with basic feasibility inputs.
5	Ability to Evaluate a startup idea for innovation, scalability, risk, and incubation readiness.

Topics covered:	
UNIT-I: Entrepreneurship Basics	**(2 hours)**
Concept, need, characteristics, qualities, functions, types of entrepreneurs; barriers.	
UNIT-II: Ownership and Roles	**(2 hours)**
Entrepreneur vs. manager; forms of business ownership (sole proprietorship, partnership); types of industries.	
UNIT-III: Startup Ecosystem	**(2 hours)**
Concept of startups; support agencies (DIC, NSIC, SIDBI, NABARD, KVIC, banks).	
UNIT-IV: Incubation Support	**(3 hours)**
Role of Technology Business Incubators (TBI) and Science & Technology Entrepreneur Parks (STEP).	
UNIT-V: Opportunity Identification	**(3 hours)**
Business opportunity spotting; SSI, ancillary, tiny units; demand-supply assessment.	

Assignments:

1. Prepare a profile of an entrepreneur and compare the role of an entrepreneur with that of a manager.
2. Map the startup ecosystem for a chosen sector and identify the key support agencies, incubators, and funding sources available in India.
3. Identify a real local market problem and analyze whether it can become a viable startup opportunity based on demand-supply gaps.
4. Develop a preliminary startup concept note for an identified idea, including the problem, solution, target customer, and basic feasibility.
5. Evaluate a startup idea for innovation, scalability, risks, and incubation readiness using ecosystem support parameters.

Textbooks:

1. Entrepreneurship Development and Management by R. K. Singhal, Katson Books.
2. Entrepreneurship Development and Management by Vasant Desai, Himalaya Publishing House.

Reference Books:

1. The Lean Startup, Author name: Eric Ries, ISBN: 978-0307887894
2. Publisher: Crown Business

3. Zero to One, Author name: Peter Thiel with Blake Masters, ISBN: 978-0753555194, Publisher: Virgin Books
4. The Startup Owner's Manual, Author name: Steve Blank and Bob Dorf, ISBN: 978-0984999309, Publisher: K&S Ranch
5. Startup Ecosystem in India: Text & Cases, Author name: Rajeeb Mishra, ISBN: 978-9356737153, Publisher: Himalaya Publishing House
6. The $100 Startup, Author name: Chris Guillebeau, ISBN: 978-0307951526, Publisher: Crown Business

eBooks:

1. Entrepreneurship, Michael Laverty and Chris Littel, Colorado State University Global / Pressbooks, Free PDF from freebookcentre.net
2. Introduction to Entrepreneurship, Sathyabama Institute of Science and Technology, Sathyabama Institute, Free PDF from freebookcentre.net
3. The Entrepreneur's Guide to Building a Successful Business, Jonathan T. Scott, Free PDF from efmdglobal.org
4. Entrepreneurship and Small Business Management, Hitesh Jhanji (Editor), Lovely Professional University / Excel Books, Free PDF from ebooks.lpude.in

MOOC Course:

1. "Entrepreneurship 101: Who is your customer?" by MIT on edX.
2. "How to Build a Startup" by Steve Blank on Coursera.
3. "Startup Ecosystem" by Startup School on Udacity.

CO-PO Mapping:

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

Computer Engineering - Second Year (Semester –IV)

Syllabus

Second Year Computer Engineering (2025 Course) Operating System			
Course Code	CEPCC208T	**Credit**	02
Contact Hours	02 Hrs/weeks (L)	**Type of Course**	Theory
Examination Scheme	CCE: 50 Marks SSE: 50 Marks	**Total Marks**	100

Pre-requisites: Computer Organization, Data Structures and Algorithms

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Comprehensive Continuous Evaluation	Internal	50*
2.	Semester End Examination	External	50#

Course Objectives	
1	**Fundamental Knowledge (L1/L2):** To introduce students to the evolution, types, and architectural components of modern operating systems.
2	**Algorithm Application (L3):** To train students in applying mathematical models for CPU scheduling, memory allocation, and disk head movement.
3	**Critical Problem Solving (L3/L4):** To enable students to identify and resolve concurrency issues, race conditions, and deadlock scenarios in a multi-processing environment.
4	**System Abstraction (L2/L4):** To explain the logic behind virtual memory, paging, and file system hierarchies as abstractions of physical hardware.
5	**Comparative Analysis (L4/L5):** To facilitate the evaluation of different OS designs (Linux, Windows, Android) based on performance, reliability, and use-case requirements.

Course Outcomes By the end of the course, students will be able to:	
1	**L2: Understand** **CO1:** Describe the core functions of an OS and explain how system calls provide an interface between user programs and hardware.
2	**L3 Apply**

	CO2: Apply various CPU scheduling algorithms (FCFS, SJF, RR) to determine system performance metrics like turn-around and waiting time.
3	**L4 Analyze** **CO3:** Analyze the causes of deadlocks and race conditions in concurrent systems and implement synchronization solutions using Semaphores and Mutexes.
4	**L3 Apply** **CO4:** Demonstrate memory management techniques, including address translation in paging and the application of page replacement algorithms (LRU, FIFO).
5	**L5 Evaluate** **CO5:** Evaluate the efficiency of different disk scheduling algorithms and compare the structures of NTFS, EXT4, and Android file systems.

Topics to be covered:
UNIT-I OPERATING SYSTEMS ARCHITECTURE AND INTERFACES (5 Hrs) Concepts: Evolution of OS, Types (Batch, Time-sharing, Real-time). Structure: Monolithic vs. Microkernel, Layered approach. Interface: Introduction to System Calls (Process, File, Device). Linux Intro: Kernel vs. Shell, basic CLI (ls, cd, chmod). **Case Study:** Comparing Windows (Monolithic/Hybrid) vs. QNX (Microkernel).
UNIT-II PROCESS MANAGEMENT AND THREADS (5 Hrs) The Process: Process Control Block (PCB), State Transition Diagram. Multithreading: User-level vs. Kernel-level threads, Benefits of Multithreading. Scheduling: Context Switching, Schedulers (Long, Short, Medium term). Algorithms: FCFS, SJF and Priority (Preemptive/Non-preemptive), and Round Robin (RR). **Case Study:** Process management in Android
UNIT III CONCURRENCY AND DEADLOCKS (5 HRS) Synchronization: Critical Section Problem, Race Conditions. Primitives: Mutex vs. Semaphores (Binary & Counting). Classic Problems: Producer-Consumer and Dining Philosophers. Deadlocks: Necessary conditions (Mutual Exclusion, Circular Wait), Banker's Algorithm for Avoidance. **Case Study:** Deadlock scenarios in automated Railway Signalling.

UNIT IV MEMORY MANAGEMENT (5 Hrs)

Basic Logic: Contiguous vs. Non-contiguous allocation, Fragmentation (Internal/External). Paging: Page tables and Hardware support. Virtual Memory: Demand Paging, Thrashing. Page Replacement: FIFO, LRU, and Optimal algorithms.

Case Study: How the Intel Pentium handles memory addresses?

UNIT V STORAGE AND FILE SYSTEMS (5 Hrs)

File Management: Concept of Files and Directories, File-System Structure, File-System Implementation, Directory Implementation, File Allocation Methods, Free-Space Management. Disk Scheduling-Disk Scheduling policies like FIFO, SSTF, SCAN, C-SCAN.

Case study: xv6 Operating System

Text Books:

1. Silberschatz, Galvin, Gagne, "Operating System Principles", 10th Edition - 2018, Wiley, ISBN 978-1-118- 063330

2. Stallings W., "Operating Systems- internals and design principles", 9th Edition-2018, pearson, ISBN-13: 978- 013-467-0959.

3. The Design of Unix Operating System by Maurice Bach

4. The Linux Programming Interface.. Linux and UNIX System Programming Handbook by Michael Kerrisk

Reference Books:

1. Andrew S. Tanenbaum; Modern Operating Systems; Prentice Hall of India Publication; 4th Edition-2015. ISBN-13: 978-0133-591620

2. H.M. Deitel, P. J. Deitel, D. R. Choffnes, "Operating Systems ", Pearson, 3rd Edition, ISBN 0131828274, 97801318282.

EBooks:

1. https://os.ecci.ucr.ac.cr/slides/Abraham-Silberschatz-Operating-System-Concepts-10th-2018.pdf
2. https://os.ecci.ucr.ac.cr/slides/Andrew-S.-Tanenbaum-Modern-Operating-Systems.pdf

3. https://www.greenteapress.com/thinkos/thinkos.pdf
4. https://pdos.csail.mit.edu/6.828/2018/xv6/book-rev11.pdf

MOOC Course:

1. https://onlinecourses.nptel.ac.in/noc19_cs50/preview
2. Introduction to Operating Systems | Coursera
3. Best Online Operating Systems Courses and Programs | edX

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Fundamentals of Computer Network			
Course Code	CEPCC209T	**Credit**	02
Contact Hours	02 Hrs/weeks (L)	**Type of Course**	Lecture
Examination Scheme	CCE-50 Marks SEE-50 Marks	**Total Marks**	100

Pre-requisites: Basics of Communication

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Comprehensive Continuous Evaluation	Internal	50*
2.	Semester End Examination	External	50#

Course Objectives	
1	To **introduce and describe** the fundamental concepts of computer networks, network models, architectures, and devices.
2	To **familiarize students with and illustrate** data link layer techniques such as framing, error detection & correction, and flow control.
3	To **develop understanding of** multiple access protocols and Ethernet standards (IEEE 802.x).
4	To **build analytical understanding of** network layer concepts including IPv4/IPv6 addressing, NAT, subnetting, and packet forwarding.
5	**To provide insight into and compare** routing algorithms and protocols used in modern networks.

Course Outcomes	
1	**Define and describe** fundamental concepts of computer networks including types, models, architectures, and networking devices.
2	**Illustrate** the working and functions of the Data Link Layer.
3	**Interpret and apply** multiple access techniques and Ethernet standards (IEEE 802.x) for network communication.
4	**Analyze and examine** network layer concepts including IPv4/IPv6 addressing, NAT, subnetting, and packet forwarding.

5	**Analyze and compare** routing algorithms and protocols (RIP, OSPF, EIGRP, BGP) for efficient data communication.

Topics covered:
UNIT-I: Introduction to Computer Network (5Hrs) Definition, Types of Networks: Local area networks (LAN), Metropolitan area networks (MAN), Wide area networks (WAN), Wireless networks, Networks Software, Protocol, Design issues for the Network layers. Network Models: The OSI Reference Model, TCP/IP Model, Network Topologies, Types of Transmission Medium. Network Architectures: Client-Server, Peer To Peer, Hybrid. Network Devices: Bridge, Switch, Router, Gateway, Access Point.
UNIT-II: Error Detection, Correction and Data Link Control (5 Hrs) DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction(Hamming Code, CRC, Checksum) , Elementary Data Link protocols , Stop and Wait, Sliding Window(Go Back N, Selective Repeat) DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction(Hamming Code, CRC, Checksum) , Elementary Data Link protocols , Stop and Wait, Sliding Window(Go Back N, Selective Repeat)
UNIT-III: Multi-Access Mechanism and Ethernet Standards (5 Hrs) Random Access Techniques: CSMA, CSMA/CD, CSMA/CA, Controlled Access Techniques: Reservation, Polling, Token Passing, Channelization: FDMA, TDMA, CDMA, Ethernet: IEEE Standards- 802.3, 802.4, 802.5, 802.6 Comparison of Ethernet Standards: Standard Ethernet, Fast Ethernet, Gigabit Ethernet with reference to MAC layer and Physical Layer (Wired Network Only)
UNIT-IV: Network Layer: Services and Addressing (5 Hrs) Network Layer: Network Layer Services, IPv4 Addresses: Static and Dynamic Configuration Classful and Classless Addressing, Special Addresses, NAT, Subnetting, Supernetting, Delivery and Forwarding of IP Packet, Structure of Router, IPv4: Datagrams, Fragmentation, Options, Checksum, IPv6Addressing: Notations, Address Space, Packet Format, Transition from Ipv4 to IPv6
UNIT-V: Network Layer: Routing Protocols (5 Hrs) Routing: Metric, Static vs Dynamic Routing Tables, Routing Protocol, Unicast Routing Protocols - Optimality Principle, Intra and Inter Domain Routing, Shortest

Path Routing, Flooding, Distant Vector Routing, Link State Routing, Path Vector Routing Interior Gateway Routing Protocol- OSPF, EIGRP, RIP, Exterior Gateway Routing Protocol– BGP

Textbooks:

1. "Computer Networks ", A.S. Tanenbaum, 4th edition, Pearson Education
2. "Data Communications and Networking", B.A. Forouzan, 5th edition, TMH
3. "Computer Networking a Top-Down Approach Featuring the Internet", James F. Kurose, Keith W. Ross, Addison Wesley

Reference Books:

1. "Computer Networks: A Systems Approach", L. Peterson and B. Davie, 5th Edition, Morgan-Kaufmann, 2012.
2. " Computer Network & Internet", Douglas E. Comer & M.S Narayanan, Pearson Education

eBooks:

1. https://people.cs.clemson.edu/~jmarty/courses/kurose/KuroseCh1-2.pdf
2. http://eti2506.elimu.net/Introduction/Books/Data Communications and Networking By Behrouz A.Forouzan.pdf
3. http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf

MOOC Course:

- nptel.ac.in/courses/106/105/106105183
- nptel.ac.in/courses/106/105/106105080
- https://www.coursera.org/courses?query=computer%20network

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Computer Graphics Design			
Course Code	CEPCC210T	**Credit**	02
Contact Hours	02 Hrs/weeks (L)	**Type of Course**	Theory
Examination Scheme	CCE: 50 marks SSE: 50 marks	**Total Marks**	100

Pre-requisites: C/C++

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Comprehensive Continuous Evaluation	Internal	50*
2.	Semester End Examination	External	50#

Course Objectives	
1	To introduce the core concepts of computer graphics, including hardware systems, raster scan systems, and display technologies.
2	To teach fundamental algorithms for producing output primitives, including points, lines, circles, and polygons.
3	To understand the mathematics behind 2D and 3D transformations (translation, rotation, scaling) and composite transformations.
4	To understand the viewing pipeline, window-to-viewport mapping, and clipping algorithms (e.g., Cohen-Sutherland).
5	To introduce 3D object modeling (surfaces, splines) and techniques for rendering, such as lighting, shading, and hidden surface removal.

Course Outcomes	
1	Explain the applications, display technologies, and graphic pipelines of computer graphics systems.
2	Implement and analyze 2D/3D drawing, scan conversion, and polygon

	filling algorithms.
3	Apply 2D and 3D geometric transformations and viewing transformations on objects.
4	Implement clipping algorithms and techniques for hidden surface removal.
5	Create 3D graphics scenes using open-source tools (e.g., Blender) or OpenGL to perform lighting, rendering, and animation.

Topics covered:
UNIT-I: Introduction & Output Primitives (6 Hrs) Overview of graphics systems, display devices (CRT, LCD), raster vs. vector graphics, and graphics pipelines. Line drawing algorithms (DDA, Bresenham's), circle drawing algorithms (Mid-point), ellipse drawing, and polygon filling algorithms. Line attributes, color/grayscale models, and area-fill attributes.
UNIT-II: 2D Geometric Transformations & Viewing (5 Hrs) Transformations: Translation, rotation, scaling, reflection, and shear, homogeneous coordinates. Viewing Pipeline: Window-to-viewpoint coordinate transformation, viewing functions. Clipping: Point clipping, Cohen-Sutherland line clipping, Sutherland-Hodgeman polygon clipping.
UNIT-III: 3D Concepts & Object Representation (5 Hrs) 3D Transformations: Translation, rotation, scaling, and reflection in 3D. Representation: Polygon surfaces, curved surfaces, spline representations, and Bezier curves/surfaces.Visible Surface Detection: Back-face detection, Depth-Buffer (Z-buffer) method, scan-line method.
UNIT-IV: Illumination, Shading & Color Models (5 Hrs) Light Models: Basic illumination models, ambient light, diffuse reflection, and specular reflection. Shading: Constant shading, Gouraud shading, and Phong shading algorithms. Color Models: Properties of light, XYZ, RGB, YIQ, CMY, and HSV color models.
UNIT-V: Computer Animation & Multimedia (4 Hrs)

Animation: Principles of animation, key-framing, morphing, and motion specification. Design & Composition: Character design, screen layout, and storyboarding. Multimedia: Introduction to digital audio/video formats, compression techniques (MPEG), and hardware.

Text Books:

1. "Introduction of Computer Graphics" David J. Eck.
2. "Computer Graphics And Design" P Radhakrishnan , C. P Kothandaraman

Reference Books:

3. "Fundamentals of Computer Graphics" Shirley & Marschner
4. "Computer Graphics: Principles and Practice" Andries van Dam

EBooks:

https://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf

MOOC Course:

Computer Graphics - Course (nptel.ac.2in)

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Operating System and Computer Graphics design Lab			
Course Code	CEPCC211P	**Credit**	2
Practical	04 Hrs/weeks (PR)	**Type of Course**	Practical
Examination Scheme	TW: 25 Marks PR: 50 Marks	**Total Marks**	75

TOP

Pre-requisites: C/C++, Operating System (CEPCC401T) and Computer Graphics Design (CEPCC403T)

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25$
2.	Practical	External	50$

Course Objectives	
1	Understand the fundamentals of UNIX commands and shell scripting for basic process and file management.
2	Demonstrate process and thread management techniques including creation, synchronization, and termination.
3	Implement classic inter-process communication (IPC) problems such as producer-consumer and reader-writer using semaphores.
4	Analyze and simulate deadlock prevention, detection, avoidance, and recovery techniques.
5	Develop simulations for memory management and page replacement algorithms.
6	Evaluate and compare various disk scheduling algorithms through practical implementation.

Course Outcomes By the end of the course, students will be able to:	
1	Apply basic UNIX commands and develop shell scripts for process and file management.
2	Implement process and thread creation, execution, and termination using system-level programming.

3	Design synchronization solutions for producer-consumer and reader-writer problems using semaphores.
4	Simulate deadlock handling algorithms including prevention, detection, avoidance, and recovery.
5	Implement and evaluate memory allocation and page replacement algorithms.
6	Compare and implement different disk scheduling algorithms to analyze their efficiency.

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a reference and hands-on resource. It should include prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, Test Data Set (if applicable), mathematical model (if applicable), conclusion/analysis. Program codes with sample output of all performed assignments are to be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal must be avoided. Use of DVD containing students programs maintained by Laboratory In-charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, innovation, efficient codes, and punctuality.

Guidelines for Practical Examination

Problem statements must be decided jointly by the internal examiner and external examiner. During practical assessment, maximum weightage should be given to satisfactory implementation of the problem statement. Relevant questions may be asked at the time of evaluation to test the student's understanding of the fundamentals, effective and efficient implementation. This will encourage, transparent evaluation and fair approach, and hence will not create any uncertainty or doubt in the minds of the students. So, adhering to these principles will consummate our team efforts to the promising start of student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. Use of open source software is encouraged. Based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus. Operating System recommended :- 64-bit Open source Linux or its derivative Programming tools recommended: - C/C++/Java/Python

SR NO	Group A
1	Basics of UNIX commands and Implementation of Shell Programming
2	Implementation of Process and thread (Life cycle of process): (i) Process creation and Termination; (ii) Thread creation and Termination
3	Producer-Consumer Problem using Semaphores and Reader Writer Problem
4	Simulate algorithm for deadlock prevention and detection
5	Simulate the algorithm for deadlock avoidance and study about deadlock Recovery
6	Simulate memory allocation methods: (i) Best Fit, (ii) First Fit (iii) Next Fit and iv) Worst Fit
7	Simulate page replacement algorithms: FIFO, LRU and Optimal
8	Implementation of Disk Scheduling using FCFS, SCAN and C-SCAN Algorithm
9	Implementation of Disk Scheduling using LOOK, C-LOOK and SSTF

	Algorithm
10	Mini Project
	Group B
1	Write a C/C++ program to draw the following pattern using (a) the DDA line drawing algorithm for both rectangles with Dotted, Thick line style and (b) Bresenham's line drawing algorithm for a diamond shape with Dashed, Solid line style.
2	Write a menu driven program in C/C++ to draw circle using DDA, Bresenham's, Midpoint circle drawing algorithm with different styles as solid, dotted and dashed circles.
3	Write a program to implement the Sutherland-Hodgeman algorithm for clipping any polygon. Provide the vertices of the polygon to be clipped and the pattern of clipping interactively.
4	Write a C/C++ program to implement the Cohen-Sutherland line clipping algorithm.
5	Write a C/C++ program to implement translation, rotation, shear and scaling transformations on a 2D object about X axis, Y axis.
6	Write C/C++ program to implement translation, sheer, rotation and scaling transformations on equilateral triangle and rhombus.
7	Write a C/C++ program to implement rotation of a 2D object about X axis and an arbitrary point.
8	Mini Project

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Basic Web Application Development			
Course Code	CEVSE212P	**Credit**	02
Contact Hours	04 Hrs/weeks(P)	**Type of Course**	Practical
Examination Scheme	PR: 50 marks	**Total Marks**	50

TOP

Pre-requisites: Basic of HTML, Notepad, Web Browser

Course assessment methods/tools: VS code/Notepad

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Practical	External	50$

Suggested List of Laboratory Experiments/Assignments
1. Design a class timetable using an HTML table with:, Days of the week , Subjects, Proper use of rowspan and colspan
2. Design a homepage for a college including: Header (college name/logo) ,Navigation bar (Home, About, Courses, Contact), Image banner, Footer.
3. Create a restaurant menu page that shows: Categories (Starters, Main Course, Desserts) Images and prices Use lists and tables
4. Design a feedback form with: Name, Email Rating (dropdown) Comments (textarea) Required field validation
5. Create a resume webpage using HTML that includes sections for Education, Skills, Projects, and Experience.

6. Design and develop an image gallery webpage using HTML, where images are arranged in a grid layout, each image has a caption, and clicking on an image opens a larger view.
7. Build a well-organized blog page using HTML that includes a heading, article content, a sidebar for recent posts, and a footer section.
8. Create a webpage layout using CSS Grid that includes a header, sidebar, main content area, and footer.
9. Design and develop a login form using HTML and CSS, applying modern styling techniques such as box shadows and rounded corners.
10. Create an animated landing page using HTML and CSS that includes a hero section with a background image, smooth animations, and a call-to-action button with hover and keyframe effects.
11. Create a Netflix/Amazon-style homepage using HTML and CSS that includes a banner, movie/product cards, and focuses on layout and styling.
12. Design and develop a personal portfolio website using HTML and CSS. The site should feature an About Me section, a Projects section, and a Contact form, with complete styling and responsive design for various devices.

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Internship			
Course Code	CEIAP213W	**Credit**	02
Contact Hours	4 Hrs/weeks (P)	**Type of Course**	Practical
Examination Scheme	TW: 25 marks	**Total Marks**	25

TOP

Pre-requisites: --

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25$

Course Objectives	
1	To encourage and provide opportunities for students to get professional/personal experience through internships.
2	To learn and understand real life/industrial situations.
3	To get familiar with various tools and technologies used in industries and their applications.
4	To nurture professional and societal ethics.
5	To create awareness of social, economic and administrative considerations in the working environment of industry organizations.

Course Outcomes By the end of the course, students will be able to:	
1	To demonstrate professional competence through industry internship.
2	To apply knowledge gained through internships to complete academic activities in a professional manner.
3	To choose appropriate technology and tools to solve given problem.
4	To demonstrate abilities of a responsible professional and use ethical practices in day to day life.
5	Creating network and social circle, and developing relationships with industry people. To analyze various career opportunities and decide carrier goals.

Guidelines:
Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internships are far more important as

the employers are looking for employees who are properly skilled and having awareness about industry environment, practices and culture. Internship is structured, short-term, supervised training often focused around particular tasks or projects with defined time scales.

Core objective is to expose technical students to the industrial environment, which cannot be simulated/experienced in the classroom and hence creating competent professionals in the industry and to understand the social, economic and administrative considerations that influence the working environment of industrial organizations.

Engineering internships are intended to provide students with an opportunity to apply conceptual knowledge from academics to the realities of the field work/training. The following guidelines are proposed to give academic credit for the internship undergone as a part of the Third Year Engineering curriculum.

Duration:

Internship is to be completed after semester 5 and before commencement of semester 6 of at least 4 to 6 weeks; and it is to be assessed and evaluated in semester 6.

Internship work Identification:

Student may choose to undergo Internship at Industry/Govt. Organizations/NGO/MSME/Rural Internship/ Innovation/IPR/Entrepreneurship. Student may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/NGO's/Government organizations/Micro/Small/ Medium enterprises to make themselves ready for the industry [1].

Students must register at Internshala [2]. Students must get Internship proposals sanctioned from college authority well in advance. Internship work identification process should be initiated in the Vth semester in coordination with training and placement cell/ industry institute cell/ internship cell. This will help students to start their internship work on time. Also, it will allow students to work in vacation period after their Vth semester examination and before academic schedule of semester VI. Student can take internship work in the form of the following but not limited to:

- Working for consultancy/ research project,
- Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council/ startups cells of institute /
- Learning at Departmental Lab/Tinkering Lab/ Institutional workshop,
- Development of new product/ Business Plan/ registration of start-up,
- Industry / Government Organization Internship,
- Internship through Internshala,

- In-house product development, intercollegiate, inter department research internship under research lab/group, micro/small/medium enterprise/online internship,
- Research internship under professors, IISC, IIT's, Research organizations,
- NGOs or Social Internships, rural internship,
- Participate in open source development.

Internship Diary/ Internship Workbook:

Students must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. The training diary/workbook should be signed every day by the supervisor.

Internship Diary/workbook and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training.

Internship Work Evaluation:

Every student is required to prepare a maintain documentary proofs of the activities done by him as internship diary or as workbook. The evaluation of these activities will be done by Programme Head/Cell In-charge/ Project Head/ faculty mentor or Industry Supervisor based on- Overall compilation of internship activities, sub-activities, the level of achievement expected, evidence needed to assign the points and the duration for certain activities.

Assessment and Evaluation is to be done in consultation with internship supervisor (Internal and External – a supervisor from place of internship.

Recommended evaluation parameters-Post Internship Internal Evaluation

Internship Diary/Workbook and Internship Report - 50 Marks (TW)

Presentation and demonstration of work -50 Marks (OR)

Evaluation through Presentation/Viva-Voce

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

Depth of knowledge and skills

Communication & Presentation Skills

Team Work

Creativity

Planning & Organizational skills
Adaptability
Analytical Skills
Attitude & Behavior at work
Societal Understanding
Ethics
Regularity and punctuality
Attendance record
Diary/Work book
Student's Feedback from External Internship Supervisor

After completion of Internship, the student should prepare a comprehensive report to indicate what he/she has observed and learnt in the training period.
Internship Diary/workbook may be evaluated on the basis of the following criteria:
Proper and timely documented entries
Adequacy & quality of information recorded
Data recorded
Thought process and recording techniques used
Organization of the information

The report shall be presented covering following recommended fields but limited to,
Title/Cover Page
Internship completion certificate
Internship Place Details- Company background-organization and activities/Scope and object of the study / Supervisor details
Index/Table of Contents
Introduction
Title/Problem statement/objectives
Motivation/Scope and rationale of the study
Methodological details
Results / Analysis /inferences and conclusion
Suggestions / Recommendations for improvement to industry, if any
Attendance Record
Acknowledgement
List of reference (Library books, magazines and other sources)

Feedback from internship supervisor (External and Internal)
Post internship, faculty coordinator should collect feedback about student with recommended parameters include as- Technical knowledge, Discipline, Punctuality, Commitment, Willingness to do the work, Communication skill, individual work, Team work, Leadership…..

References:

[1] https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf
[2] https://internship.aicte-india.org/

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Software Engineering & Project Management			
Course Code	CEVAC214W	**Credit**	02
Contact Hours	02 Hrs/weeks (L)	**Type of Course**	Lecture
Examination Scheme	TW – 25	**Total Marks**	25

TOP

Pre-requisites: Programming and Problem Solving

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Teamwork	Internal	25$

Course Objectives	
1	To learn and understand the fundamental principles of Software Engineering.
2	To understand project management through life cycle of the project.
3	To apply software estimation techniques, design and testing principles for large scale software projects.
4	To acquire knowledge of software process/product metrics, risk management and quality management.

Course Outcomes	
Students are competent and able to	
CO1	**Understand and apply** new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
CO2	**Analyze** software requirements and formulate design solution for a software that integrate ethical, social, legal and economic concerns.

CO3	**Design** applicable solutions in one or more application domains using software engineering approach.
CO4	**Identify** and handle risk management and software configuration management.
CO5	**Utilize** modern tools and techniques for software testing and **construct** high quality software.

Topics covered:
UNIT-I: Fundamentals of Software Engineering and Project Management (5 Hrs) Fundamentals of Software Engineering: Introduction to software engineering, The Nature of Software, Generic Process Framework, Layered technology, Process Assessment and Improvement, Process Models: Waterfall model, Incremental Process models, Evolutionary process models, Concurrent Development Model, Unified Process Model, Software Development Life Cycle, Agile Software development, Plan Driven development vs Agile Development, Agile Development Models: Scrum, Kanban, XP. Project Management: Project Life Cycle, Project management need and scope, Principles of project management.
UNIT-II: Requirements Engineering and Project Planning (5 Hrs) Requirements Engineering: Requirements Engineering, Functional and non-functional requirements, Requirement Engineering Process, Feasibility study, Identifying Stakeholders, Eliciting Requirements, Requirements Gathering and analysis techniques, Developing Use Cases, Building the Requirements Model, Elements of the Requirements Model, Negotiating Requirements, Validating Requirements, Software Requirement Specification (SRS). Project Planning: Objectives of project planning, Process of project planning, Work Breakdown Structure, Project selection and formulation, Tools for project planning.
UNIT-III: Software Estimation and Design Engineering (5 Hrs) Software Estimation: Types of Resources, Resource management, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition

Techniques, Software Sizing, Types of Estimation: Problem-Based, LOC-Based, COCOMO, FP-Based, Empirical Estimation Models, COCOMO-II, Requirement Traceability Matrix, Gantt Chart, Critical Path Method, Program Evaluation and Review Technique (PERT) Design Engineering: The Design Process, Design Concepts - Abstraction, Modularity, Information Hiding, Functional Independence, Refinement, Refactoring, Polymorphism, Design Classes, Design Patterns, Software Architecture, Architectural Styles, UML design, User Interface Design, Golden Rules of UI design.
UNIT-IV: Risks and Configuration Management (5 Hrs) Risk Management: Software Risks, Risk management process, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan. Software Configuration Management: Software Configuration Management (SCM), Scope for configuration, The SCM Repository, The SCM Process, Roles in SCM process.
UNIT-V: Software Testing & Quality Management (5 Hrs) Software Testing: A Strategic Approach to Software Testing, Verification and Validation, Software Testing Strategy, V Model, Criteria for Completion of Testing, Strategic Issues, Test Strategies, Unit Testing, Integration Testing, System testing, Acceptance Testing, Functional Testing, Regression Testing, Validation Testing, Validation-Test Criteria, Inspection, Walkthrough, Configuration Review, Test methods- White box, Black Box, Gray Box testing. Software Quality- Definition Quality, Software Quality metrics, Software Quality Control, Software Quality Assurance, ISO Quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

Reference Books:

1. "Fundamentals of Software Engineering", Rajib Mall, PHI, ISBN-13: 978-8120348981

2. "Software Engineering Project Management", Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India.
3. "Fundamentals of Software Engineering", Carlo Ghezzi, PHI, ISBN-10: 0133056996
4. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Harold Kerzner, Wiley, 12th Edition, 978-1119165354

EBooks:

https://ebookpdf.com/roger-s-pressman-software-engineering

MOOC Course:

https://swayam.gov.in/nd1_noc19_cs69/preview

https://swayam.gov.in/nd2_cec20_cs07/preview

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Employability Skill Development			
Course Code	CEAEC215W	**Credit**	02
Contact Hours	01 Hrs/weeks(L) 01 Hrs/weeks(T)	**Type of Course**	Lecture
Examination Scheme	TW: 25 marks	**Total Marks**	25

Pre-requisites:

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25$

Course Objectives	
1	To develop analytical abilities
2	To develop communication skills
3	To introduce the students to skills necessary for getting, keeping and being successful in a profession.
4	To expose the students to leadership and team-building skills

Course Outcomes	
1	To **identify** skills and preparedness for aptitude tests.
2	To **recognize** essential communication skills (writing, verbal and non-verbal)
3	To **demonstrate** the presentation skill and be ready to face interviews.
4	To **examine** team building skill and lead it for problem solving.
5	To **critique** interviews and group discussions by applying communication, listening, and non-verbal skills to improving their performance for professional success. performance for professional success.

Topics covered:

Unit I: Soft Skills & Communication basics (4Hrs)

Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills. Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume – Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation, Technical writing

Assignment:

1. Write up on

a. Blooms taxonomy

b. Multiple intelligence theory

c. Every student should identify his/her strength and weaknesses

d. Action plan to improve the weaknesses

Unit II: Arithmetic and Mathematical Reasoning (4 Hours)

Aspects of intelligence, Bloom taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic (square and square root, LCM and HCF, speed calculation, reminder theorem)

Assignment:

1. Every student should collect five questions of each type

a. Number sequence

b. Mental arithmetic

c. Square, square roots

d. LCM, HCF e. Speed calculations

Unit III: Analytical Reasoning and Quantitative Ability (4 Hours)

Matching, Selection, Arrangement, Verifications (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy)

Assignment:

1. Every student should collect five questions of each type

a. Matching

b. Selection

c. Arrangements

d. Verifications

Note: Teacher should distribute the question set randomly amongst the students.

Unit IV: Grammar and Comprehension (4 Hours)

English sentences and phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, précis writing, Paraphrasing and e-mail writing.

Assignment:

1. Solve exercises from book (Wren and Martin, "English grammar and Composition") based on

a. English sentences and phrases

b. Paragraph writing

c. Story writing

d. Letter writing

2. Every student should collect five questions of each type

a. Verbal aptitude

b. Synonym

c. Antonym

d. Analogy

Note: Teacher should distribute the question set randomly amongst the students.

Unit V: Skills for interviews (4Hours)

Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, personality traits evaluated in group discussions, tips for successful participation in group discussion, Listening skills- virtues of listening, fundamentals of good listening, Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time.

Assignment:

1. Practice tests (aptitude, analytical abilities, logical reasoning)
2. Extempore, group discussions and debate.
3. Technical report writing and Seminar Presentation.
4. Mock interviews.

Text Books:

1. R. Gajendra Singh Chauhan, Sangeeta Sharma, "Soft Skills- An integrated approach to maximize personality", ISBN: 987-81-265-5639-7, First Edition 2016, Wiley.

2. Wren and Martin, "English grammar and Composition", S. Chand publications.

3. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications

Reference Books:

1. Philip Carter, "The Complete Book Of Intelligence Test", John Willey & Sons Ltd.

2. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page

3. Eugene Ehrlich, Daniel Murphy, "Schaum's Outline of English Grammar", McGraw Hills.

4. David F. Beer, David A. McMurrey, "A Guide to Writing as an Engineer", ISBN : 978-1-118-30027-5 4th Edition, 2014, Wiley

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Entrepreneurship and Management Studies			
Course Code	CEEMC216O	**Credit**	02
Contact Hours	01 Hrs/weeks (L) 01 Hrs/week(T)	**Type of Course**	Lecture
Examination Scheme	Oral: 25 marks	**Total Marks**	25

TOP

Pre-requisites: Basic entrepreneurship knowledge

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Oral	Internal	25$

Course Objectives	
1	To Apply and analyze core management functions
2	To Develop and demonstrate advanced leadership and communication competencies.
3	To Evaluate ethical principles and quality management frameworks
4	To Assess and integrate emerging smart technologies into managerial processes to drive innovation, efficiency, and competitive advantage.

Course Outcomes	
1	Apply core management principles and functional areas.
2	Demonstrate leadership styles, motivation, and communication skills.
3	Analyse quality, safety, and organizational excellence practices
4	Evaluate ethics, legislation, and smart technology in enterprises.

Topics covered:

UNIT-I: Management Fundamentals (2 hours)

Definitions, principles, functions (planning, organizing, staffing, directing, controlling); levels of management.

UNIT-II: Functional Management (2 hours) Production, financial (working capital, break-even), marketing (4Ps), HR basics.
UNIT-III: Leadership and Motivation (2 hours) Leader qualities/styles; manager vs. leader; Maslow's theory; communication types/barriers.
UNIT-IV: Organizational Practices (3 hours) TQM, quality policy; workplace safety; human relations.
UNIT-V: Ethics and Smart Tech (3 hours) IPR, IT Act, Factories Act; ethics; IoT concepts/applications in enterprises.

Textbooks:

1. Industrial Engineering and Management by O. P. Khanna, Dhanpat Rai and Sons.
2. Entrepreneurship Development and Management by U. Saroj and V. Mahendiratta, Abhishek Publications.

Reference Books:

1. Good to Great, Jim Collins, ISBN: 978-0066620991, HarperBusiness
2. The Hard Thing About Hard Things, Ben Horowitz, ISBN: 978-0062273208, HarperBusiness
3. Principles of Life and Work, Ray Dalio, ISBN: 978-1501124020, Simon & Schuster
4. High Output Management, Andrew S. Grove, ISBN: 978-0679762881, Vintage
5. The Making of a Manager, Julie Zhuo, ISBN: 978-0735219562, Portfolio

eBooks:

1. Entrepreneurship and Small Business Management, Institute of Textile Technology, Choudwa, Institute of Textile Technology, Free PDF from freebookcentre.net (103 pages)
2. Innovation, Startups and Entrepreneurship, MRCET Faculty, Malla Reddy College of Engineering & Technology, Free PDF from mrcet.com
3. Basics of Entrepreneurship and Management, SDE UoC, SDE, University of Calicut, Free PDF from sde.uoc.ac.in

4. Entrepreneurship: A World of Opportunity, Small Business Notes, Freebookcentre, Free PDF from freebookcentre.net (228 pages)
5. Psychology and Management, Ashish Bhagoria, Free-ebooks.net, Free from free-ebooks.net

MOOC Course:

1. "Principles of Management" by Saylor Academy on Coursera.
2. "Strategic Management" by Copenhagen Business School on Coursera.
3. "Leadership and Emotional Intelligence" by Indian School of Business on edX.

CO-PO Mapping:

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

Second Year Computer Engineering (2025 Course) Co -Curricular Course - II			
Course Code	CECCC217W	**Credit**	01
Contact Hours	02 Hrs/weeks(P)	**Type of Course**	Practical
Examination Scheme	TW: 25 Marks	**Total Marks**	25

TOP

Pre-requisites: This course is open to all second-year engineering students interested in enhancing their personal and professional development through co-curricular activities.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term work	Internal	25$

Term work: Assessment is based on the student's participation in various Co-Curricular Activities and Guidelines given in "Rules for Assigning Activity Points: Activity – Event Grade Point Scheme" Policy Document.

Course Objectives	
1	To encourage students to showcase their intellectual and independent thinking skills.
2	To imbibe a sense of confidence and managerial capabilities among students.
3	To promote the ability to work in team, organize and analyse available resources.
4	To build responsiveness among students about the social and cultural responsibilities.

Course Outcomes	
Students are competent and able to employ	
CO1	Demonstrate the ability to critically analyse information and apply independent judgment in decision-making within the context of the activity.
CO2	Apply principles of management and organizational skills to plan, coordinate, and execute tasks related to the co-curricular activity.
CO3	Collaborate effectively with peers to achieve common goals and objectives within the cocurricular activity.
CO4	Reflect on their roles and responsibilities as members of a diverse community, fostering empathy and inclusivity.

Course Guidelines:

1. Students are entitled to gain academic knowledge in this fast-paced environment, but it is also necessary for them to develop their personalities in both internal and external situations.
2. Co-curricular activities help students grow and develop their personalities. These activities contribute to a student's total personality development.
3. Not every student is intellectually inclined. Similarly, not all pupils are interested in co-curricular activities. Therefore, there is a need to provide a solid balance of co-curricular and extra-curricular activities in order to achieve the course learning objectives.
4. It primarily refers to intellectual, physical, emotional, and social growth that can be attained by a careful mix of academic, co-curricular, and extra-curricular activities.
5. So, keeping the course learning objectives the "Rules for Assigning Activity Points: Activity – Event Grade Point Scheme" Policy Document is proposed.
6. Student participation is assessed and reflected in the final activity performance report in order to get most students involved in extra-curricular activities (Group A) and co-curricular activities (Group B) as shown in Table 1 in the Policy Document.

7. All undergraduate students must choose at least ONE activity/event from each group i.e. (Group A and B).
8. Students shall choose one activity/ event from Group A and One from Group B that take place on- campus or off-campus.
9. Freedom shall be given to the students to take part in more than one activity under the group.
10. Students are expected to actively participate in activities, participate in contests, and earn grade points.
11. One student in each group must earn up to 50 grades in one semester so that they can achieve up to 100 grades in one year.
12. Grades for each semester are awarded based on the points achieved by the student, as shown in Table 2 in the Policy Document.

Course Structure: ***(Refer Rules for Assigning Activity Points: Activity – Event Grade Point Scheme)***

Co-Curriculum Course II (CECCC417W) **Professional Self Initiatives and Social Activity**
• Technical Events/Quiz/Paper Contest/Project Contest / Model Making etc.
• MOOC/ NPTEL/ SWAYAM/ Coursera etc. related to Professional Development and Social Activity
• Competitions/ Events Conducted by Professional Societies (ISTE, IEI, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.)
• Attending Full time Conference/ Seminars/ Exhibitions/ Workshop/ STTP Conducted at IITs/ NITs/ Reputed Institutes/ Universities
• Attending Full time Conference/ Seminars/ Exhibitions/ Workshop/ STTP Conducted at DYPCOEI
• Paper Presentation in National/ International Conference of High Repute
• Poster Presentation in National/ International Conference of High Repute
• Paper Publication in National/ International Journal of High Repute
• Industrial Training/ Internship (at least for 04 Weeks)
• Participation in Institute Level Student Clubs
• Elected Student Representative of Student Council (University Representative, General Secretary, Cultural, Sports, NSS Secretary, Ladies Representative, Academic Toppers, Invitee Members)
• Office Bearer of Professional Society Chapter (ISTE, IEI, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.)
• Office Bearer of Institute Level Student Club
• Office Bearer of Departmental Student Association
• Office Bearer of ECell, Digital Content Lab etc.
• Student Ambassador for Mayura AICTE IDEA Lab/ NIDHI iTBI etc.

• Editorial Board Member of Annual Magazine
• Editorial Board Member of E-Newsletter
• Member of Governance Committee/ Statutory Committee

Participation Levels:

1. Level: I College Level Events
2. Level: II District/ Central/ Zonal Level Events
3. Level: III State Level Events
4. Level: IV National Level Events
5. Level: V International Level Events

Approval Documents:

1. Certificate
2. Letter from Authorities
3. Appreciation recognition letter
4. Documentary evidence
5. Legal Proof

Grading Scheme:

Grade Range	Grade	Academic Performance
90-100	O	Outstanding
71 to 90	A+	Excellent
68-71	A	Very Good
65-68	B+	Good
60-65	B	Average
55-60	C	Below Average
50-55	D	Marginal
< 50	F1	Fail due to Poor Performance

CO-PO Mapping:

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