SCTR's PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43

An Autonomous Institute affiliated to the
Savitribai Phule Pune University
Approved by AICTE & Government of Maharashtra,
Accredited by NAAC (A+) & NBA [All eligible UG Programs]

Curriculum for

Second Year B. Tech. Computer Engineering

(2025-26 Course)*

With effect from (June 25)
National Education Policy (NEP) 2020 Compliant
*Approved by the Board of Studies (BoS) and Academic Council

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
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Abbreviations used (Refer [1-3] for more details)

Sr. No.	Broad Category	Sub- Category of course	Category Code
I.	BSC/ESC	Basic Science Course (BSC)	01
		Engineering Science Course (ESC)	02
II.	Program Courses (PC)	Program Core Course (PCC)	03
		Program Elective Course (PEC)	04
III.	Multidisciplinary courses (MC)	Multidisciplinary Minor (MDM)	05
		Open Elective (OE) Other than particular program	06
IV.	Skill Courses (SC)	Vocational and Skill Enhancement Course (VSEC)	07
V.	Humanities Social Science and Management (HSSM)	Ability Enhancement Course (AEC-01, AEC-02)	08
		Entrepreneurship/Economics/ Management Courses (EEM)	09
		Indian Knowledge System (IKS)	10
		Value Education Course (VEC)	11
VI.	Experiential Learning Courses (ELC)	Research Methodology (RM)	12
		Community engagement Project (CEP) / Field Project (FP)/Co-curricular Activities (CCA)	13
		Project (PRJ)	14
		Internship/ On Job Training (IP/OJT)	15

Detailed guidelines for General Instructions:

Link: General Instructions

Detailed guidelines for Evaluation and Assessment:

Link: Guidelines for Evaluation and Assessment

Detailed guidelines for examination:

Link: Guidelines for examination

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Semester - III

Semester III			Teaching Scheme (Hours/Week)				Credits/ Grades				Examination Scheme and Marks						
											Theory			Practical			
Broad Category of Course	Subject code	Name of subjects	L	P	T	Total	L	P	T	Total	CIE [20]	ISE [20]	ESE [60]	CIE TW	ESE (PR)	ESE (OR)	Total
PCC	1303101	Data Structures (DS)	3	-	-	3	3	-	-	3	20	20	60	-	-	-	100
PCC	1303102	Computer Organisation and Architecture (COA)	3	-	-	3	3	-	-	3	20	20	60	-	-	-	100
PCC	1303103	Discrete Mathematics (DM)	3	-	-	3	3	-	-	3	20	20	60	-	-	-	100
PCC	1303204	Data Structures Lab (DSL)	-	4	-	4	–	2	-	2	-	-	-	50	50	-	100
PCC	1303205	Computer Organization and Architecture Lab (COAL)	-	2	-	2	-	1	-	1	-	-	-	25	-	50	75
MDM	03051X1	MDM -1	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
MDM	03051X1	MDM -1 #	-	-	1	1	-	-	1	1	-	-	-	25	-	-	25
EEM	1309101	Engineering Economics and Financial Management (EEFM)	1	-	-	1	1	-	-	1	-	-	-	25	-	-	25
AEC	0308202	Professional Development and Career Readiness (PDCR)	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
OE	0306301	Foreign Language Studies (FLS)	-	-	2*	2	-	-	2	2	-	-	-	50	-	-	50
VEC	0311101	Universal Human Values (UHV)	1	-	1	2	1	-	1	2	-	-	-	25	-	-	25
CEP	03132XX	Community Engagement Project (CEP) /Field Project (FP) / Co-Curricular Activity (CCA) $	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
Total			13	10	4	27	13	5	4	22	80	80	240	250	50	50	750

L: Lecture, **P:** Practical, **T:** Tutorial, **ISE**: In-Semester Examination, **CIE:** Continuous Internal Evaluation, **ESE**: End-Semester Examination, **TW**:Term work, **PR:** Practical Examination, **OR**: Oral Examination . **#:** Tutorial or laboratory as applicable.
Choose one course from MDM Baskets. MDM:X is basket number;. **Refer Annexure-1** for MDM details.
***:** Open Elective offered by online platforms such as SWAYAM/ NPTEL, **Refer Annexure-II** for details.
$: Students should choose any one course from Community Engagement project (CEP) /Field project (FP) /CCA prescribed in the syllabus at the start of semester.
X: Serial number of the courses under that particular category.

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Semester- IV

Semester IV			Teaching Scheme (Hours/Week)				Credits/ Grades				Examination Scheme and Marks						
											Theory			Practical			
Broad Category of Course	Subject code	Name of subjects	L	P	T	Total	L	P	T	Total	CIE [20]	ISE [20]	ESE [60]	CIE TW	ESE (PR)	ESE (OR)	Total
PCC	1403106	Software Engineering (SE)	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
PCC	1403107	Database Management Systems (DMS)	3	-	-	3	3	-	-	3	20	20	60	-	-	-	100
PCC	1403108	Operating Systems (OS)	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
PCC	1403209	Operating Systems Lab (OSL)	-	2	-	2	-	1	-	1	-	-	-	25	-	25	50
PCC	1403210	Database Management Systems Lab (DMSL)	-	4	-	4	-	2	-	2	-	-	-	25	25	-	50
MDM	04051X2	MDM - 2	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
MDM	04052X2	MDM - 2 #	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
OE	04063XX	Open Elective - II *	-	-	2	2*	-	-	2	2	-	-	50	-	-	-	50
VSEC	1407201	Project Based Learning (PBL)	-	4	-	4	-	2	-	2	-	-	-	-	-	50	50
EEM	1409102	Entrepreneurship (EP)	1	-	-	1	1	-	-	1	-	-	-	25	-	-	25
EEM	1409202	Entrepreneurship Lab (EPL)	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
AEC	0408203	Collaborative Skills, Digital Ethics, and Cyber Security (CDC)	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
VEC	0411102	Indian Constitution and Social Responsibility (ISCR)	1	-	-	1	1	-	-	1	-	-	-	25	-	-	25
CEP	04132XX	Community Engagement Project (CEP) /Field Project (FP) / Co-Curricular Activity (CCA) $	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
Total			11	18	2	31	11	9	2	22	80	80	290	200	25	75	750

Semester III

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1303101: Data Structures		
Teaching Scheme: L: 03 Hrs./week	**Credits**: 03	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks
Prerequisite: 1. C Programming for Problem Solving (CPPS) 2. Object Oriented Programming Using C++/Java (OOPC)		

Course Objectives:
Course intends to prepare the students

1. To understand the basic techniques of algorithm performance analysis.
2. To understand various data searching and sorting methods with pros and cons.
3. To acquaint with the structural constraints and advantages in usage of the data using Hashing.
4. To learn data manipulation using various data structures like Link List, Stack, Queues.
5. To understand the concept of tree data Structures and manipulate data using its variants.

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

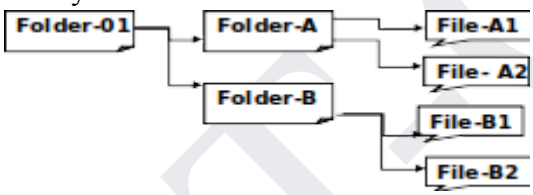
1. **Analyze** the performance of searching and sorting techniques based on the Time and Space complexities of Algorithms.
2. **Demonstrate** the use of linear data structures - Array and Linked lists to store and process structured data.
3. **Apply** principles and primitive operations of Stack and Queue Data Structures to **solve** Expression Conversion, Evaluation, and Job scheduling problems.
4. **Compare** static and dynamic data structure implementations to **select** the suitable method for solving programming problems.
5. **Demonstrate** basic operations of binary trees and all its variants along with their applications.

Course Contents

Module I	**Introduction to Analysis of Algorithm** Introduction of Algorithms, Analysis of Algorithms, Complexity of algorithms- Space complexity, Time complexity. Data Structures: Abstract Data Types (ADT), Concept of linear and Non-linear data structures. Use of Array and Associative/Jagged Arrays. Searching: Search Techniques, Sequential search, Sentinel search, Binary search, Fibonacci search. Sorting- Types of Sorting- Internal and External Sorting, Stable Sorting, Sorting methods- Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Comparison of All Sorting Methods.	**10 Hrs.**

	Hashing: Types of Hashing, Hash table, Hash functions, Collision resolution strategies. **Suggested List of Lab Assignments:** 1. A customer purchased groceries from a store and wants to verify the prices of specific items in the bill where the items are not in sorted order. Write a C++/Java program to apply any 02 appropriate Searching Algorithms to check the cost of a particular item in the bill. Mention the Time and Space Complexities of Algorithms. 2. An E-commerce website has a range of products having Product id, name, manufacturer, price and quality rating out of 5. Write a C++/Java Program to display products as… a. In Increasing order of Product id (Use Bubble Sort) b. In Increasing order of Product price (Use Selection Sort) c. In Decreasing order of Product Quality Rating (Use Insertion Sort) 3. Write a C++/Java program to display the employee names in the order of their joining year. Analyze and compare the efficiency and suitability of different algorithms in solving the problem. Justify the choice of algorithms. 4. Consider a telephone book database where the information is stored as Client's name and telephone number. Write a C++/Java program to quickly search the client's telephone number from the database with O(1) complexity. (Hint: Make use of a Hash table and hash function).	
Module II	**Linked Lists** Static memory allocation vs Dynamic Memory Management, linked list using dynamic memory management, Linked List- Abstract Data Type, linked list operations, Types of linked list- Linear, Circular linked lists and Doubly Linked List and operations, doubly circular linked list, Polynomial representation using Linked List, Generalized Linked List (GLL) concept and use of GLL for multi-variable polynomial. **Suggested List of Lab Assignments:** 1. Consider a person creating a playlist of media/music files. The person wants to store music_id, title, time_duration for every entry and wants the following functionalities: a. Able to insert a media file at any position dynamically. b. Able to delete any entry from the list dynamically. c. Able to sort on any field (music_id, title,time_duration) d. Able to play continuous looping fashion. 2. There is a student's club named 'Techno-Fun' club where Students can get membership on request. Similarly one may cancel the membership of a club. First node is reserved for the president of the club and the last node is reserved for the secretary of the club. Choose a type of linked list to store student PRN and Name. Write functions to: a) Add members b) show members c) delete members, d) Compute total number of members e) Two linked lists exist for two divisions. Concatenate two lists. 3. Browser maintains the history which refers to a list of recently visited websites	**8 Hrs.**

	or web pages in a data structure. Write a C++/Java program to store the browser history or navigation information dynamically as page_id and recent time-stamp. Write functions to a. Visit a specific web page. b. Navigate forward and backward. c. Add new web pages. d. Deleting web pages from existing lists. 4. The ticket booking system of Inox theater has to be implemented using C++/Java program. There are M rows and N seats in each row. Doubly circular linked list has to be maintained to keep track of free seats at rows. Assume some random booking to start with. Use an array to store pointers (Head pointer) to each row. On demand a. The list of available seats is to be displayed, b. The seats are to be booked, c. The booking can be cancelled. 5. In an application maintaining legal documents which are structured hierarchically with sections, subsections, paragraphs, and sub-paragraphs. Design a program to represent and manage such a document structure. Each node will store either textual data element **(**title of section, subsection, paragraph, subparagraph**)**, or A pointer to another linked list (subsections, paragraph, subparagraph) Hint: Use Generalized Linked Lists A = { S1, S2 {P1, P2, P3 {SP1, SP2}}, S3 {P1.P2}, S4, S5}.	
Module III	**Stacks & Queues** Stacks Abstract Data Type, Representation of Stacks Using Sequential Organization, stack operations, Multiple Stacks, Applications of Stack-Polish notation, need for prefix and Postfix expressions, Expression Evaluation and Conversion, Postfix expression evaluation, Linked Stack and Operations. Recursion- concept, variants of recursion- direct, indirect, head, tail. Queue as Abstract Data Type, Realization of Queues Using Arrays, Circular Queue, Advantages of circular queues. Multi-queues, Deque, Priority Queue, Linked Queue and operations. Applications of Queue- Job Scheduling. **Suggested List of Lab Assignments:** 1. In an expression each opening symbol has a corresponding closing symbol and the pairs of parentheses are properly nested. Write a C++/Java program using Stack to check whether a given expression is well parenthesized or not. 2. The expressions can be represented in infix, prefix and postfix form but the system can evaluate postfix expressions easily. Write C++/Java program for expression conversion as infix to postfix and its evaluation using Stack based on given conditions. 3. Consider a Pizza parlour where the orders are received and processed from	**10 Hrs.**

	either ends of the queue. Choose an appropriate data structure to implement a linear list of elements in which additions and deletions of items may be made at either ends of the list.	
Module IV	**Trees** Definition & Basic Terminology of Tree, Binary Tree, Full Binary Tree, Complete Binary Tree, Binary Search Tree and primitive operations, Threaded Binary Tree, Heap Tree, AVL tree and its operations. Introduction to B Tree & B+ Tree. **Suggested List of Lab Assignments:** 1. Write a C++/Java program to construct a binary search tree by inserting the values in the order given. Perform following operations - i. Insert nodes, ii. Display nodes by Preorder, In-order, Post-order, BFS and DFS. iii. Find number of nodes in longest path from root, iv. Minimum data value found in the tree, v. Change a tree so that the roles of the left and right pointers are swapped at every node, vi. Search for a value. 2. In the memory the files and folders are stored in Hierarchical Manner. Write a C++/Java program to create the following structure of files and folders using Binary Tree.  	**10 Hrs.**

Text Books

1. Horowitz and Sahani, "Fundamentals of Data Structures in C++", University Press 2007, 2nd Edition, ISBN: 978-07-1678-292-6.
2. Goodrich, Tamassia, Goldwasser, "Data Structures and Algorithms in Python", Wiley Publication 2021, ISBN- 978-93-5424-786-6.
3. "Java: The Complete Reference",
4. McGraw Hill Education, 9th Edition, ISBN:978-0749467241

Reference Books

1. Brassard & Bratley, "Fundamentals of Algorithmics", Prentice Hall India/Pearson Education 1996, ISBN: 978-8120311312.
2. R. Gilberg, B. Forouzan, "Data Structures: A Pseudocode approach with C++", Cengage Learn 2005, 2nd Edition, ISBN 978-8131503140.
3. M. Weiss, "Data Structures and Algorithm Analysis in C++", 2nd edition, Pearson Education, 2002, ISBN: 978-0201498400.

CIE Activities

1. Problem Solving (05 Marks)

2. Mini Project (10 Marks)
Relevant MOOCs
1. NPTEL course on, "Programming, Data Structures And Algorithms Using Python", By Prof. Madhavan Mukund **:** **https://onlinecourses.nptel.ac.in/noc22_cs26/preview** 2. NPTEL course on, "Design and analysis of algorithms", By Prof. Madhavan Mukund**:** **https://onlinecourses.nptel.ac.in/noc25_cs23/preview** 3. IITBombayX: Foundations of Data Structures: **https://www.edx.org/learn/data-structures/iitbombay-foundations-of-data-structures**
Other Resources/Links
1. NPTEL archived course on "**Programming, Data Structures and Algorithms**" by IIT Madras: **https://archive.nptel.ac.in/courses/106/106/106106127/** 2. NPTEL archived course on "**Programming in C++**" by IIT Kharagpur : **https://archive.nptel.ac.in/courses/106/105/106105151/**

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1303102: Computer Organization and Architecture		
Teaching Scheme: L: 03 Hrs./week	**Credits**: 03	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks
Prerequisite: Digital Electronics and Logic Design		

Course Objectives:
Course intends to prepare the students

1. To understand the structure, function , characteristics of computer Organization.
2. To acquaint the learner with instruction set and logic to build Assembly Language Programs (ALP).
3. To understand instruction level parallelism, parallel organization of multiprocessor,multithreading .
4. To Explore multiple processor organizations , memory architectures (UMA, NUMA, CC-NUMA), and multicore systems.

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

1. **Describe** the basic components of computer architecture
2. **Analyze** various addressing modes to perform arithmetic and logical operations using different data types .
3. **Illustrate** concept and design principles of memory systems- cache, virtual and main memory.
4. **Explore** multiple processor organizations (SSID, SIMD, MISD, MIMD) and memory architectures
5. **Analyze** different approaches to multithreading and explore multicore systems.

Course Contents

Module I	**Introduction to Processor Architecture** **Basic structures of computers**-Functional units, performance Measurement. Evolution of computer architecture. Processor Structure and Function - Processor Organization, Register Organization, The Instruction cycle, instruction pipeline. **Computer Arithmetic:** Integer and Floating-point representation and arithmetic. **Instruction sets**: Characteristics and function, Data types, addressing modes and formats, assembler directives, execution of program. Instruction types-data transfer, arithmetic, logical, branch, call, ret. **Reduced instruction set computer**: Instruction execution characteristics, RISC architecture, RISC pipeline, RISC Vs CISC. **Suggested List of Lab Assignments:** 1. Write a program using inline assembly code for adding two short/long int numbers. 2. Write a program using inline assembly code to find signed multiplication and division. 3. Write a program using inline assembly code to accept the string and to display its length.	**10 Hrs.**

Module II	**Memory organization and management**	**10 Hrs**
	Memory system overview: characteristics of memory system, memory hierarchy. Cache Memory – Basics, cache memory principles, elements of cache design, cache coherence and MESI protocol. **Internal Memory Technology**: DRAM operation, row decoder column decoder chip organization, error correction code (single and double). **Virtual Memory**: main memory allocation, Virtual to Physical Address Translation, Paging, Page Faults, TLB. **Case study**: Memory management in advanced processors. **Suggested List of Lab Assignments:** 1. Write a program using inline assembly code to count the number of positive and negative numbers from the array. 2. Stack simulation in function call-with parameter using compiler explorer tool. 3. Write a program using inline assembly code to find the factorial of a given integer number on a command line .	
Module III	**Parallel processing and Multicore architecture**	**8 Hrs**
	Multiple Processor Organization: SISD, SIMD, MISD, MIMD. Uniform memory access (UMA), Non uniform memory access (NUMA), CC-NUMA. Multicore: Hardware and software performance issues, need of multicore. Multicore organization, heterogeneous multicore organization: CPU and GPU. **Case study**: Intel Core i7 5960X	
Module IV	**Multicore programming**	**8 Hrs.**
	Software developer viewpoint for multicore programming. Challenges of multicore programming. **Multithreading**: Thread, comparing thread to processes, Approaches of Multithreading. **Communication and synchronization of concurrent tasks**: Communication and synchronization, synchronizing concurrency, thread Strategy Approaches **Case study**: POSIX 1. Write an application to demonstrate inter process communication. 2. Write a multithreading application for calculators.	

Text Books

1. W. Stallings, "Computer Organization and Architecture: Designing for Performance", 11th Edition, Pearson, 2019, ISBN-10:0-13-499719-0
2. A. Ray, K. Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming, Interfacing", Tata McGraw Hill, 2016, ISBN: 978-1259006135.

3. James Turley, "Advanced 80386 Programming Techniques", McGraw-Hill, 3rd edition, 2015 ISBN: 978-0078813429.
4. Intel® 64 and IA-32 Architectures Software Developer's Manual (Vol. 1-3) - Intel SDM, Intel VT-x & SGX Whitepapers - Virtualization & security documentation.

Reference Books

1. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", 5th edition, McGraw Hill, 2002,ISBN: 978-1259005275.
2. Cameron Hughes Tracey Hughes "Multicore Programming Design and Implementation for C++ Developers" Wiley,2008, ISBN: 978-0-470-28962-4.
3. Ray Seyfarth, "Introduction to 64-bit Intel Assembly Language Programming for Linux", 2nd Edition, 2014, ISBN 10: 1478119209, ISBN: 9781478119203.
4. Intel, https://www.intel.com/content/dam/www/public/us/en/documents/datasheets/core-i7-900-ee-and-desktop-processor-series-datasheet-vol-1.pdf,

CIE Activities

1. Poster Presentation / Quiz (10 Marks)
2. Problem solving (5 Marks)

Relevant MOOCs Course

1. NPTEL course on, "Microprocessor", Dr. Pramod Agarwal, IIT Roorkee, https://nptel.ac.in/courses/108107029/
2. NPTEL course on "c programing and assembly language", Prof. Janakiraman, IIT Madras. https://onlinecourses.nptel.ac.in/noc23_cs93/preview.
3. NPTEL course on, "Computer Architecture", Dr. Indranil Sengupt, Prof. Kamalika Datta, By IIT Kharagpur, https://archive.nptel.ac.in/courses/106/105/106105163/
4. https://archive.nptel.ac.in/courses/106/106/10...

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1303103: Discrete Mathematics

Teaching Scheme: L: 03 Hrs./Week	**Credits:** 03	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks

Prerequisite: Linear Algebra, Basic Mathematics.

Course Objectives:
Course intends to prepare the students

1. To understand the use of set theory and fundamentals of counting principle.
2. To understand concepts of relation and functions.
3. To solve problems like Traveling Salesperson, Shortest Path and Minimum Spanning Tree.
4. To understand and apply algebraic systems.

Course Outcomes:
At the end of the Course Students will be able to

1. **Formulate** problems precisely using set theory, logic and counting.
2. **Apply** formal proof techniques to explain the reasoning clearly.
3. **Apply** the concept of relations and functions to solve computing problems.
4. **Solve** Traveling Salesperson, Minimum Spanning Tree, Shortest Path and Huffman Coding using graph theory.
5. **Evaluate** the algebraic structures using properties of binary operations.

Course Contents

Module I	**Set Theory and Counting** **Set Theory:** Introduction to Sets– Set Operations, Cardinality of set, Principle of inclusion and exclusion, Types of Sets, Power set, Methods of Proof-Proof by Contradiction, Proof by Mathematical Induction. **Propositional Logic-** logic, Propositional Equivalences, Application of Propositional Logic- Translating English Sentences. **Counting:** The Basics of Counting, rule of Sum and Product, Permutations and Combinations.	**8 Hrs.**
Module II	**Relations and Functions** **Relations:** Relations and their Properties, n-ary relations, Representing relations, Equivalence relations, Partial orderings, Hasse diagram, Chains and Anti-Chains, Transitive closure and Warshall's algorithm. **Functions:** Surjective, Injective and Bijective functions, Identity function, Inverse functions and Compositions of functions.	**8 Hrs.**

Module III	**Graph Theory and Applications**	**10 Hrs.**
	Graph: Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Euler and Hamilton Paths, the handshaking lemma, Single source shortest path-Dijkstra's Algorithm, Planar Graphs. **Trees:** Trees Introduction, properties of trees, Binary tree, Binary search tree, tree traversal, Expression tree, Huffman coding, Minimum Spanning Tree, Kruskal's and Prim's algorithms	
Module IV	**Algebraic Structures**	**6 Hrs.**
	Groups: Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups. Rings: Integral Domains and Fields, Coding Theory.	

Text Books

1. "Elements of Discrete Mathematics", 4th Edition, Author- C L Liu, D P Mohapatra, Publisher- McGraw Hills, ISBN-1259006395.
2. "Discrete Mathematics", 2nd Edition, Author- Norman L. Biggs, Publisher- Oxford University Press, ISBN- 0 –19-850718–6.

Reference Books

1. "Discrete Mathematics and its Applications", 7th Edition, Author- Kenneth H. Rosen, Publisher- Tata McGraw-Hill, ISBN-9780070681880.
2. "Discrete Mathematical Structures", 6th Edition, Author- Bernard Kolman, Robert C. Busby and Sharon Ross, Publisher- Pearson, ISBN- 9332549591.
3. "Computational Discrete Mathematics", 4th Edition, Author-Sriram P, Steven S, Publisher Cambridge University Press, ISBN- 978-0521121460.

CIE ACTIVITIES

1. Problems Solving (5 Marks).
2. Poster Presentation (10 Marks).

Relevant MOOCs

1. https://onlinecourses.nptel.ac.in/noc24_cs92/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma18/preview

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1303204 Data Structures Lab

Teaching Scheme: P: 04 Hrs./week	**Credits:** 02	**Examination Scheme:** CIE(TW): 50 Marks ESE(PR): 50 Marks

Prerequisite: 1. C Programming for Problem Solving (CPPS)
2. Object Oriented Programming Using C++ (OOPC)

Course Objectives:
Course intends to prepare the students

1. To understand the working of Searching & Sorting Algorithms.
2. To learn linked list and types of linked list implementations.
3. To acquaint with the use of Hash Table using Hash Functions.
4. To learn applicability of Stack and Queue data structures.
5. To understand the working of Binary Tree operations.

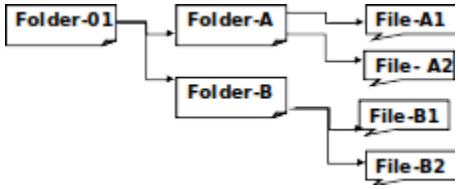
Course Outcomes:
At the end of the Course Students will be able to

1. **Implement** various Searching & Sorting Algorithms.
2. **Select** appropriate types of linked lists implementations for solving problems.
3. **Apply** suitable Hash Functions for data manipulation in Hash Table.
4. **Apply** Stack and Queue data structures for expression conversion & recursion.
5. **Implement** primitive operations of various types of Binary Trees.

List of Assignments

01	A customer purchased groceries from a store and wants to verify the prices of specific items in the bill where the items are not in sorted order. Write a C++/Java program to apply any 02 appropriate Searching Algorithms to check the cost of a particular item in the bill. Mention the Time and Space Complexities of Algorithms.
02	An E-commerce website has a range of products having Product id, name, manufacturer, price and quality rating out of 5. Write a C++/Java Program to display products as… 1. In Increasing order of Product id (Use Bubble Sort) 2. In Increasing order of Product price (Use Selection Sort) 3. In Decreasing order of Product Quality Rating (Use Insertion Sort)
03	Write a C++/Java program to display the employee names in the order of their joining year. Analyze and compare the efficiency and suitability of different algorithms in solving the problem. Justify the choice of algorithms.

04	Consider a telephone book database where the information is stored as Client's name and telephone number. Write a C++/Java program to quickly search the client's telephone number from the database with O(1) complexity. (Hint: Make use of a Hash table and hash function).
05	Consider a person creating a playlist of media/music files. The person wants to store music_id, title, time_duration for every entry and wants the following functionalities: 1. Able to insert a media file at any position dynamically. 2. Able to delete any entry from the list dynamically. 3. Able to sort on any field (music_id, title,time_duration) 4. Able to play continuous looping fashion.
06	There is a student's club named 'Techno-Fun' club where Students can get membership on request. Similarly one may cancel the membership of a club. First node is reserved for the president of the club and the last node is reserved for the secretary of the club. Choose a type of linked list to store student PRN and Name. Write functions to: a) Add members b) show members c) delete members, d) Compute total number of members e) Two linked lists exist for two divisions. Concatenate two lists.
07	Browser maintains the history which refers to a list of recently visited websites or web pages in a data structure. Write a C++/Java program to store the browser history or navigation information dynamically as page_id and recent time-stamp. Write functions to… 1. Visit a specific web page. 2. Navigate forward and backward. 3. Add new web pages. 4. Deleting web pages from existing lists.
08	The ticket booking system of Inox theater has to be implemented using C++/Java program. There are M rows and N seats in each row. Doubly circular linked list has to be maintained to keep track of free seats at rows. Assume some random booking to start with. Use an array to store pointers (Head pointer) to each row. On demand 1. The list of available seats is to be displayed, 2. The seats are to be booked, 3. The booking can be cancelled.
09	In an application maintaining legal documents which are structured hierarchically with sections, subsections, paragraphs, and sub-paragraphs. Design a program to represent and manage such a document structure. Each node will store either textual data element (title of section, subsection, paragraph, subparagraph), or A pointer to another linked list (subsections, paragraph, subparagraph) Hint: Use Generalized Linked Lists A = { S1, S2 {P1, P2, P3 {SP1, SP2}}, S3 {P1.P2}, S4, S5}.
10	In an expression each opening symbol has a corresponding closing symbol and the pairs of parentheses are properly nested. Write a C++/Java program using Stack to check whether a given expression is well parenthesized or not.

11	The expressions can be represented in infix, prefix and postfix form but the system can evaluate postfix expressions easily. Write C++/Java program for expression conversion as infix to postfix and its evaluation using Stack based on given conditions.
12	Consider a Pizza parlour where the orders are received and processed from either ends of the queue. Choose an appropriate data structure to implement a linear list of elements in which additions and deletions of items may be made at either ends of the list.
13	Write a C++/Java program to construct a binary search tree by inserting the values in the order given. Perform following operations - i. Insert nodes, ii. Display nodes by Preorder, In-order, Post-order, BFS and DFS. iii. Find number of nodes in longest path from root, iv. Minimum data value found in the tree, v. Change a tree so that the roles of the left and right pointers are swapped at every node, vi. Search for a value.
14	In the memory the files and folders are stored in Hierarchical Manner. Write a C++/Java program to create the following structure of files and folders using Binary Tree. 

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1303205 Computer Organization and Architecture Lab

Teaching Scheme: P: 02 Hrs. / Week	**Credits**: 01	**Examination Scheme:** CIE (TW): 25 Marks ESE(OR): 50 Marks

Prerequisite: Digital Electronics and Logic Design Laboratory

Course Objectives:
Course intends to prepare the students

1. To understand basic architectural features of processors.
2. To acquaint the learner with application instruction set and logic to build assembly language programs.
3. To learn command line argument and stack simulation using tools
4. To explore multithreading concepts using POSIX

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

1. **Use** Assembler tool for 64-bit assembly programming.
2. **Exhibit** skill of assembly language programming using instruction set.
3. **Demonstrate** stack simulation using function call
4. **Explore** multithreading concept using Arithmetic calculator

List of Assignments

1.	Write inline assembly code for adding two short/long int numbers.
2.	Write inline assembly code to find signed multiplication and division.
3.	Write inline assembly code to accept the string and to display its length.
4.	Write inline assembly code to count the number of positive and negative numbers from the array.
5.	Stack simulation in function call-with parameter using compiler explorer tool.
6.	Write inline assembly code to find the factorial of a given integer number on a command line.
7.	Write an application to demonstrate inter process communication.
8.	Write a multithreading application for Arithmetic calculators.

Text Books

1. W. Stallings, "Computer Organization and Architecture: Designing for Performance", 11th Edition, Pearson, 2019, ISBN-10:0-13-499719-0.
2. Ray, K. Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming, Interfacing", Tata McGraw Hill, 2016, ISBN: 978-1259006135.
3. James Turley, "Advanced 80386 Programming Techniques", McGraw-Hill, 3rd edition, 2015 ISBN:

978-0078813429.
4. Intel® 64 and IA-32 Architectures Software Developer's Manual (Vol. 1-3) - Intel SDM, Intel VT-x & SGX Whitepapers - Virtualization & security documentation.

Reference Books

1. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", 5th edition, McGraw Hill, 2002, ISBN:978-1259005275.
2. Cameron Hughes Tracey Hughes "Multicore Programming Design and Implementation for C++ Developers" Wiley,2008, ISBN: 978-0-470-28962-4.
3. Ray Seyfarth, "Introduction to 64-bit Intel Assembly Language Programming for Linux", 2nd Edition,2014, ISBN 10: 1478119209, ISBN: 9781478119203.
4. Intel, https://www.intel.com/content/dam/www/public/us/en/documents/datasheets/core-i7-900-ee-and-desktop-processor-series-datasheet-vol-1.pdf.

03051X1: Multidisciplinary Minor (MDM-1)		
Teaching Scheme: L: 02 Hr./week	**Credits**: 02	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks
Refer Annexure-I		

03051X1: Multidisciplinary Minor Lab (MDM-1)		
Teaching Scheme: T : 01 Hr./week	**Credits:** 01	**Examination Scheme:** **CIE(TW):** 25 Marks
Refer Annexure-I		

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1309101: Engineering Economics and Financial Management

Teaching Scheme: L: 01 Hr./week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic Mathematics, Introductory Engineering Concepts.

Course Objectives:
Course intends to prepare the students

1. Understand and apply the concept of Time Value of Money.
2. To equip students with the skills to apply financial evaluation techniques.

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

1. **Compute** the worth of money at various points of time.
2. **Apply** various depreciation methods in determining the value of an asset
3. **Describe** and apply the basic techniques of financial statement analysis.
4. **Evaluate** the replacement of an existing asset based on standard replacement analysis techniques.
5. **Evaluate** the best alternative in Engineering Economics problems considering risk and safety.

Course Contents

Module I	**Financial Decision Making: Time Value and Cash Flow Analysis** Time value of money, Interest factors for discrete compounding, Nominal & effective interest rates, Present and future worth of Single, Uniform, and Gradient cash flow. Related problems and case studies.	**4 Hrs.**
Module II	**Economic Analysis and Decision-Making Techniques** Bases for comparison of alternatives, Present worth amount, Capitalized equivalent amount, Annual equivalent amount, Future worth amount, Capital recovery with return, Rate of return method, Incremental approach for economic analysis of alternatives, Replacement analysis.	**4 Hrs.**
Module III	**Rate-of-Return Analysis and Depreciation** Break even analysis for single product and multi product firms, Break even analysis for evaluation of investment alternatives. Physical & functional depreciation, Straight line depreciation, declining and double declining balance method of depreciation, Sum-of-the-Years Digits, Sinking Fund and Service Output Methods, Case Study.	**4 Hrs.**
Module IV	**Project Risk and Uncertainty** Balance sheet and profit & loss statement. Meaning & Contents. Ratio analysis, financial ratios such as liquidity ratios, Leverage ratios, Turnover ratios, and profitability ratios, Drawbacks. Safety and Risk, Assessment of Risk and safety, Case study, Risk Benefit Analysis and Reducing Risk.	**3 Hrs.**

Textbooks

1. Chan S. Park, "Contemporary Engineering Economics", 4th Edition, Pearson Prentice Hall 2007, ISBN: 978-0131492480.
2. Thuesen G. J, "Engineering Economics", Prentice Hall of India, New Delhi, 2005, ISBN: 978-0131233232.
3. Blank Leland T. and Tarquin Anthony J., "Engineering Economy", McGraw Hill, Delhi, 2002 ISBN: 978-0074620427.

Reference Books

1. Prasanna Chandra, "Fundamentals of Financial Management", Tata McGraw Hill, Delhi-2006, ISBN: 978-0070609137.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi-2003, ISBN: 978-0074602751.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi- 2004,ISBN: 978-0131452412.

CIE Activities

1. Idea Documentation (10 Marks)
2. Presentation (5 Marks)

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0308202: Professional Development and Career Readiness		
Teaching Scheme: P: 02 Hrs./week	**Credits**: 01	**Examination Scheme:** CIE(TW) : 25 Marks
Prerequisite: Course on Soft Skills (SS)		

Course Objectives:
Course intends to prepare the students

1. Prepare a good resume, prepare for interviews and group discussions.
2. Explore the desired career opportunities in the employment market in consideration. of personal strengths, weakness, opportunities, and threats (SWOT).
3. Acquire career skills and to partake in and fully pursue a successful career path.

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

1. Prepare the resume on an appropriate template without any grammatical and syntax errors, and Present and Discuss with students.
2. Participate in a simulated interview and Evaluate your own performance for betterment.
3. Demonstrate effective communication skills through Group Discussion, self-management attributes.
4. Define personal and career goals (short-term and long-term) using introspective skills and Perform SWOT assessment.
5. Identify career opportunities in consideration of potential and aspirations.

Course Contents

Expt. No	Title/Problem Statement	Hrs.
1.	Trust and Collaboration Explain the Importance of Trust in Creating a Collaborative Team Agree to Disagree and Disagree to Agree – Spirit of Teamwork • Understanding Fear of Being Judged and Strategies to Overcome Fear	4 Hrs.
2.	Listening as a Team Skill Advantages of Effective Listening Listening as a Team Member and Team Leader. Use of active listening strategies to encourage sharing of ideas (full and undivided attention, no interruptions, no pre-think, use empathy, listen to tone and voice modulation, recapitulate points).	2 Hrs.
3.	Brainstorming Brainstorming as a Technique to Promote Idea Generation a. Brainstorming: Meaning and the Process b. Procedure for Conducting Brainstorming c. Importance of Using Brainstorming Technique	2 Hrs.

	d. Types of Brainstorming	
4.	Learning and Showcasing the Principles of Documentation of Team Session Outcomes.	2 Hrs.
5.	Social and Cultural Etiquette Need for Etiquette (impression, image, earn respect, appreciation) • Aspects of Social and Cultural/Corporate Etiquette in Promoting Teamwork • Importance of Time, Place, Propriety and Adaptability to Diverse Cultures	2 Hrs.
6.	Digital Ethics Digital Ethics i. Digital Literacy Skills, ii. Digital Etiquette, iii. Digital Life Skills	2 Hrs.
7.	Cyber Security The Art of Protecting Secrets a. Understanding Encryption and Decryption and Its Different Types b. Art of Data Masking c. Firewall and Its Proper Use in Cyber Protection	2 Hrs.

Text Books:

1. Jill Ratliff, "Leadership Through Trust & Collaboration: Practical Tools for Today's Results-Driven Leader", Morgan James Publishing, 2020, ISBN: 978-1642798593
2. Joseph Dauda, "Cybersecurity and Digital Ethics: Principles of Cybersecurity", (Cybersecurity practices, technologies, and processes, e-book.

Reference Books :

1. Kelly, T., and Kelly, D., "Creative Confidence: Unleashing the Creative Potential Within Us All", Harper Collins Publishers India, 2013, ISBN: 978-0385349369.
2. Simon Sweeney, "English for Business Communication", 2nd Edition, Cambridge University Press, 2003, ISBN: 978-0521754491.
3. Sanjay Kumar and Pushpa Lata, "Communication Skills", Oxford University Press, 2011, ISBN: 978-0198069324.

Relevant MOOCs Course :

1. NPTEL Course on Leadership. https://nptel.ac.in/courses/122105021/9
2. Global Business Foundation Skills (GBFS) – Refer websites like https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

0306301 Foreign Language Studies - German (FLSG)		
Teaching Scheme: T: 02 Hrs./Week	**Credits:** 02	**Examination Scheme:** CIE(TW): 50 Marks
Prerequisite: NA		

Course Objectives:
Course intends to prepare the students

1. Communicate about everyday topics in German.
2. Learn basic German grammar rules.
3. Build a practical German vocabulary.
4. Gain awareness of German culture.

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

1. Introduce themselves and others in German.
2. Describe daily life and their surroundings
3. Discuss time, jobs, and health in German.
4. Plan leisure activities and travel in German

Course Contents

Module I	**Introduction, Personal Information, and Basic Grammar** **Themes:** ● Introducing oneself and others ● Hobbies ● Days of the week, months, seasons **Grammar:** ● W questions ● Personal pronouns ● Simple sentences ● Verb conjugation ● Articles (definite and indefinite) ● Plurals ● Verbs "to have" and "to be" **Module Content:** ● Introduction to German greetings and how to introduce oneself. ● Practicing conjugation of common verbs. ● Learning W-questions and using personal pronouns in conversation. ● Discussing hobbies and daily routines. ● Days of the week, months, and seasons in German.	**6 Hrs.**

	● Building simple sentences using the conjugated verb forms and personal pronouns. ● Grammar practice: Definite and indefinite articles, plural forms. ● Introducing the verbs "haben" (to have) and "sein" (to be) with conjugation practice. **Activities:** ● **Role-play:** Students practice introducing themselves, asking and answering W-questions. ● **Group discussion:** Students talk about their hobbies, days of the week, and favorite months/seasons using the vocabulary they learned. ● **Grammar Quiz:** Personal pronouns, articles, and verb conjugations.	
Module II	**City Life, Directions, and Food** **Themes:** ● In the city (naming places, buildings, means of transport, basic directions) ● Food, drink, family, groceries, meals **Grammar:** ● Articles and plural forms ● Negation (kein, nicht) ● Imperative forms **Module Content:** ● Vocabulary related to city life: buildings, streets, means of transport. ● Giving and asking for directions. ● Learning the imperative mood for giving directions and requests. ● Vocabulary related to food, meals, and drinks. ● Talking about family and daily meal routines. ● Grammar: Using "kein" and "nicht" to form negations. ● Practice with the accusative case. **Activities:** ● **City tour role-play:** Students practice asking for and giving directions. ● **Group activity:** Create a menu with German food items, then role-play ordering food. **Grammar exercise:** Negation using "kein" and "nicht."	**6 Hrs.**
	Everyday Life, Time, Professions, and Health **Themes:** ● Everyday life, telling time, making appointments ● Professions ● Health and the body	

Module-III	**Grammar:** ● Prepositions: "am," "um," "von…bis" ● Modal verbs ● Possessive articles ● Perfect tense **Module Content:** ● Telling time and scheduling appointments. ● Using prepositions (am, um, von…bis) in sentences. ● Practice with modal verbs for expressing necessity or ability. ● Talking about professions and workplace vocabulary. ● Discussing health, body parts, and feelings. ● Practice using the perfect tense for past actions. **Activities:** ● Time-based role-play: Scheduling appointments and practicing telling time. ● Profession Bingo: Students match professions with corresponding vocabulary. ● Health questionnaire: Ask classmates about their health using body-related vocabulary and modal verbs.	6 Hrs.
Module-IV	**Leisure, Travel** **Themes:** ● Leisure activities and celebrations ● Travel, holiday plans, weather **Grammar:** ● Separable verbs ● Accusative case (continued) ● Imperative and modal verbs (review) **Module Content:** ● Discussing hobbies, leisure activities, and holiday celebrations. ● Using separable verbs in the context of free time. ● Grammar review: Imperative mood, modal verbs. ● Talking about holiday plans, travel vocabulary, and discussing weather. ● Review of key grammar concepts throughout the course. **Activities:** ● Group activity: Plan a holiday trip in German, using travel-related vocabulary and separable verbs. ● Weather forecast role-play: Students practice talking about the weather and making holiday plans. Final review quiz: Comprehensive review of grammar topics such as accusative, modal verbs, perfect tense, and imperative.	6 Hrs.

Textbooks/ Reference Books:

1. Helen Schmitz, Stefanie Dengler,Paul Rusch, "NETZWERK Deutsch als Fremdsprache A1", BlueNBells, 2012, ISBN: 978-8183077033.
2. Dora Schulz; Heinz Griesbach, "Schulz-Griesbach: Deutsch als Fremdsprache. Grundstufe in einem Band", Max Hueber Verlag, 1976, ISBN: 978-3190010066.

Relevant MOOCs Course

1. **German - I By Prof. Milind Brahme | IIT Madras – NPTEL**
   https://onlinecourses.nptel.ac.in/noc21_hs30/preview
2. **PICT - Powerlingo Foreign Languages Institute**
   https://pict.edu/pict/
3. **FACTS ABOUT GERMANY**
   https://www.tatsachen-ueber-deutschland.de/en
4. **ONLINE GERMAN-ENGLISH DICTIONARY**
   http://www.leo.org/

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0306301 Foreign Language Studies - Japanese (FLSJ)		
Teaching Scheme: T: 02 Hrs./Week	**Credits:** 02	**Examination Scheme:** CIE(TW): 50 Marks
Prerequisite: NA		

Course Objectives:
Course intends to prepare the students

1. Enable students to communicate in basic Japanese about themselves and everyday topics.
2. Develop an understanding of fundamental Japanese grammar, including particles and basic verb forms.
3. Build a vocabulary related to daily life, city environments, food, leisure, and travel.
4. Introduce students to aspects of Japanese culture and customs.

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

1. Introduce themselves and others, and talk about their hobbies in Japanese.
2. Describe places in the city, give directions, and order food in Japanese.
3. Discuss daily routines, professions, and basic health in Japanese.
4. Talk about their leisure activities and travel plans in Japanese.

Course Contents

Module I	**Introduction, Personal Information, and Basic Grammar** **Themes:** ● Introduction to Japanese scripts (Hiragana, Katakana) ● Introducing oneself and others (name, nationality, etc.) ● Hobbies **Grammar:** ● Basic sentence structure (Subject-Object-Verb) ● Particles: wa (は), ga (が), mo (も) ● Pronouns: watashi (私), anata (あなた) ● Counters (basic introduction) **Module Content:** ● Introduction to Hiragana and Katakana, basic stroke order and pronunciation. ● Greetings and introductions: Hajimemashite, Yoroshiku onegaishimasu. ● Using particles to indicate the topic and subject of a sentence. ● Talking about hobbies using simple sentence structures. ● Counting simple objects (using basic counters). **Activities:** ● **Writing practice:** Hiragana and Katakana characters. ● **Role-play:** Introducing oneself to a classmate and asking about hobbies. ● Counting objects in the classroom (e.g., pencils, books).	**6 Hrs.**

Module II	**City Life, Directions, and Food** **Themes:** ● Places in the city (train station, school, supermarket, etc.) ● Asking for and giving directions ● Food and drinks **Grammar:** ● Locational particles: ni (に), e (へ) ● Directional words: migi (右), hidari (左), mae (前), ushiro (後ろ) ● Verb arimasu/imasu (あります/います) **Module Content:** ● Vocabulary for common places in a city. ● Giving and understanding basic directions using landmarks. ● Talking about food and drinks, ordering in a restaurant. ● Using arimasu/imasu to indicate the existence of things/people. **Activities:** ● **City map activity:** Pointing out places and giving directions. ● **Restaurant role-play:** Ordering food and drinks. ● Describing the contents of a room using arimasu/imasu.	**6 Hrs.**
Module-III	**Everyday Life, Time, Professions, and Health** **Themes:** ● Daily routines ● Telling time and making appointments ● Professions ● Basic health vocabulary **Grammar:** ● Time expressions: ji (時), fun (分), gozen (午前), gogo (午後) ● Verb conjugation (present and past tense) ● Particles kara (から) and made (まで) to indicate time duration **Module Content:** ● Describing daily routines using time expressions and verbs. ● Asking about and stating professions. ● Basic vocabulary related to health and common ailments. ● Making simple appointments. **Activities:** ● **Daily routine presentation:** Describing one's daily schedule. ● **Role-play:** Making an appointment with a doctor. ● **Profession guessing game.**	**6 Hrs.**

Module-IV	**Leisure, Travel** **Themes:** ● Hobbies and leisure activities ● Travel and holiday plans ● Weather **Grammar:** ● ~tai desu (〜たいです) to express desires ● Adjectives (review and expansion) ● Conditional form ~tara (〜たら) for hypothetical situations **Module Content:** ● Talking about hobbies and things you want to do. ● Describing travel plans and destinations. ● Talking about the weather. ● Using conditional sentences to express hypothetical travel scenarios. **Activities:** ● **Holiday plan presentation:** Describing a dream vacation. ● **Role Play:** Weather forecast. ● **Sentence construction:** Expressing desires and hypothetical situations using ~tai desu and ~tara.	**6 Hrs.**

Textbooks

1. Yamamoto, N. , "Shin Nihongo no kiso I (Romanized edition)", Association for Overseas Technical Scholars(AOTS),3A Corp ,June 1990.
2. "Minna no Nihongo", 3 A Network, 2nd Publication, Goyal Publishers, ISBN: 978-9388141161.

Reference Books

1. Osamu Mizutani, Nobuko Mizutani, "Introduction to Modern Japanese", Japan Times, 1992, ISBN: 978-4789000581.
2. Nishimo A., "250 Essential Kanji for Everyday Use", 2nd Edition,Tuttle Publishing, 2004, ISBN: 978-0804836388 .
3. "Japanese for Busy People,3rd edition",Association for Japanese Language Teaching, Kodansha Tokyo Japan Kodansha International,November, 2011.

Relevant MOOCs Course

1. Introduction to Japanese Language and Culture by Prof. Vatsala Misra | IIT Kanpur NPTEL
https://onlinecourses.nptel.ac.in/noc19_hs52/preview

2. PICT - Powerlingo Foreign Languages Institute
https://pict.edu/pict/

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0311101 Universal Human Values		
Teaching Scheme: L: 01 Hr./Week T: 01 Hr./Week	**Credits:** 02	**Examination Scheme:** CIE(TW): 25 Marks
Prerequisite: UHV-I: Universal Human Values-Introduction (SIP)		

Course Objectives:
Course intends to prepare the students

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature. Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

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

1. **Distinguish** between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
2. **Analyze** the value of harmonious relationships based on trust and respect in their life and profession.
3. **Examine** the role of a human being in ensuring harmony in society and nature and Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

Course Contents

Module I	**Basic aspiration of Human being & Harmony in Human being**	**6 Hrs.**
	Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations. Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Program to ensure self-regulation and Health.	

List of Tutorial Assignments:

1. Self–exploration– Results in the discovery of the inherent relationship, harmony and co–existence facilitating transformation towards a holistic world vision and 'Human Consciousness'.

What does a fulfilling life mean for you ? List out the top five points that occur to you when you think of a fulfilling life. While making the list, please consider your entire life, not just the present stage of your life (childhood, youth, middle age, old age, etc).

2. Sharing about Oneself, Exploring Human Consciousness, Exploring Natural Acceptance.

Look into yourself, into 'what I am' and into 'what is naturally acceptable to me'. Make a list of at least ten things you can observe in your thought, behaviour or work. Now note these down in a tabular format.

Can you see that 'what I am' and 'what is naturally acceptable to me' are two realities within you? Who else can see these two realities, other than you ? Are you able to see that all those things that are naturally acceptable to you are really valuable for you ? Write down the conclusions you have arrived at from seeing these two realities.

3. Look into what you really want to be and prepare a document (like a resume) as you see yourself three years from now. We can call it 'future resume'. Please include following five sub-sections:

a) About you
b) About your role in your family
c) About your participation in the workplace
d) About your participation in the neighbourhood / institution / larger society
e) About your interaction with the rest of nature

Can you see that you already have commitment and potential for it ? And you can make a program to use your next three years productively.

4. Make a list of your desires. Now for each item on the list, find out what would be necessary to fulfil it, i.e. will it require:

a) right understanding ?
b) relationship (right feeling)
c) physical facility ?

5. List your activities throughout a typical day in your life. Categories these activities as activity for developing right understanding, activity of fulfilment in relationship and activity for physical facility. Find out what percentage of your time and efforts is being spent for each of these three. What do you conclude from this exercise ?

6. Make your list of desires. For each desire, identify the primary source of motivation (sensation, preconditioning or natural acceptance). If there is any desire which has more than one source of motivation, split it into two or more desires. Now write down your observations:

a) What percentage (approximately) of your desires are motivated by your natural acceptance?
b) What percentage (approximately) of your desires are motivated by sensation or preconditioning?
c) What effort is necessary to be completely self-organised or autonomous (if that is your goal)?

	7. Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self,Exploring Harmony of Self with the Body. 8. Exploring the Feeling of Trust, Exploring the Feeling of Respect.	
Module II	**Harmony in the Family, society & Nature / Existence** Harmony in the Family – the Basic Unit of Human Interaction, Values in Human–to–Human Relationship,Nine universal values in relationships viz. Trust, Respect, Affection, Care, Guidance, Reverence, Glory,Gratitude, Love. Understanding Harmony in Society, Vision for the Universal Human Order, Human Order Five Dimension.. Understanding Harmony in Nature, self–regulation & mutual fulfillment among the Four orders of Nature, Realizing Existence as coexistence at all levels holistic perception of harmony in existence. **List of Tutorial Assignments:** Take any one environmental issue in your neighbourhood and try to find out the root cause of it. What exactly can you contribute as an individual to the solution ? In your opinion, is any sustainable environmental recovery possible without sustainable effort for right understanding and right feeling in every human being ? Update your future resume to address the section on the environment with your commitment and ideas for it.	**8 Hrs.**

Textbooks :

1. R R Gaur, R Sangal, G P Bagaria, "Human Values and Professional Ethics", Excel Books Pvt. Ltd., New Delhi, 2010, 3rd revised edition, printed by PHI. ISBN: 978-81-957703-7-3 (Printed Copy) ISBN: 978-81-957703-6-6 (e–book).

Reference Books :

1. A Nagaraj, "Jeevan Vidya, Ek Parichaya", Jeevan Vidya Prakashan, Amarkantak, 1999.
2. A. N. Tripathi, "Human Values",3rd Edition, New Age Intl. Publishers, New Delhi 2004, ISBN: 978-8122425895.
3. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", Fingerprint Publishing, ISBN: 978-8172343118.
4. Dharampal "Education Rediscovering India", Stosius Inc/Advent Books Division Publishing, ISBN: 978-0706922776.
5. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule", ISBN :978-1449922214
6. IKS: https://www.amazon.in/dp/819731733X?ref=cm_sw_r_apan_dp_4TA0A9TXSRY81KWDG861&ref_=cm_sw_r_apan_dp_4TA0A9TXSRY81KWDG861&social_share=cm_sw_r_apan_dp_4TA0A9TXSRY81KWDG861&language=en-IN Author: Acharya Shreyas C Kurhekar 9767389646
7. https://amzn.in/d/06Owa6VX Author:Anurag A. Deshpande: 7387519003

CIE Activities
1. Self–exploration– Results in the discovery of the inherent relationship, harmony and co–existence facilitating transformation towards a holistic world vision and 'Human Consciousness'. 2. Sharing about Oneself, Exploring Human Consciousness, Exploring Natural Acceptance. 3. Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body. 4. Exploring the Feeling of Trust, Exploring the Feeling of Respect. 5. Role play based on outer triggers for self–decisions. 6. Group Discussion: Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Exploring the Feelings.

Other Resources
1. http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/ 2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw 3. https://youtu.be/OgdNx0X923I 4. https://uhvpublications.in/products/a-foundation-course-in-human-values-and-professional-ethics 5. www.coexistence.info
MOOC Courses:
1. NPTEL course on, " Exploring Human Values: Visions of Happiness and Perfect Society - Web course", By Prof. A.K. Sharma Department of Humanities and Social SciencesIIT, Kanpur https://archive.nptel.ac.in/courses/109/104/109104068/

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
Second Year B. Tech. Curriculum
With effect from the A.Y. 2025-26

03132XX: Community Engagement project		
Teaching Scheme: P: 2 Hrs./ Week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic understanding of social and ethical responsibilities. Teamwork and communication skills acquired in prior coursework or group activities. Familiarity with problem-solving methodologies and project planning.

Course Objectives:
Course intends to prepare the students

1. Opportunities to engage with their local community, fostering empathy, teamwork, and problem-solving skills while contributing positively to their surroundings.
2. An understanding of the challenges faced by the local community and the role of engineering in addressing those challenges.
3. The ability to apply technical knowledge and skills to design solutions or interventions that create a positive impact on the community.
4. The skills to evaluate and critically analyze the outcomes of their engagement activities, deriving actionable insights for sustainable impact.

Course Outcomes:
At the end of the Course Students will be able to

1. **Identify and Analyze** community needs and challenges by engaging with stakeholders and evaluating real-world problems. (Remembering & analyzing)
2. **Design and Implement** practical, creative, and context-specific solutions using engineering principles to address community issues. (Creating & applying)
3. **Reflect and Evaluate** the effectiveness of their interventions and articulate lessons learned through reports and presentations. (Evaluating & Understanding)

Guidelines

A. Group Formation:

- Form a group of 3-4 students that share a similar interest in each batch, Duration: 24 hours (divided into manageable sessions or shifts).
- The group should be cohesive, sharing , caring, and contribute to the task assigned.
- The tasks carried out need to be maintained in the LOG book by each group.

B. Project Scope:

The CEP should focus on addressing a specific community or societal issue. Projects may fall under the following themes:

1. Education and Awareness:
   Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability,

mental health, or career planning for local stakeholders.

2. Technology for Social Good:
   Develop a simple prototype or solution that addresses a real-world problem (e.g., a water-saving device, simple mobile apps, or tools for community use).
3. Environmental Sustainability:
   Organize clean-up drives, tree plantations, recycling campaigns, or energy conservation initiatives.
4. Health and Wellness:
   Promote health through awareness programs on hygiene, nutrition, and exercise.
5. Skill Development:
   Teach basic computer or technical skills to students, staff, or the community.

C. Step-by-Step Execution Plan:

1. Planning Phase:

- Team Formation:
  Form teams of 3-4 students with a balance of skills and interests.
- Project Selection:
  Choose a project theme and define a clear objective that aligns with community needs.
- Proposal Submission:
  Submit a one-page project proposal outlining:
  Title of the project.
  Objective and expected outcome.
  Plan of execution (timeline and activities).
  Required resources (if any).
  Get approval from the designated faculty mentor.

2. Execution Phase (24 Hours):

- Day 1 Activities (First 12 Hours):
  Conduct initial outreach and engage with the community or target participants.
  Implement planned activities with close teamwork and documentation.
- Day 2 Activities (Second 12 Hours):
  Continue engagement and collect feedback from the participants.
  Begin summarizing the outcomes of the project.
  Best Practices:
  Maintain a positive attitude and open communication with the community.
  Respect cultural norms and values of the participants.
  Adapt your plan based on real-time needs or challenges.

3. Reporting Phase:

- Documentation:
  Create a detailed report containing:
  Title, objective, and scope of the project.
  Activities conducted and timeline.
  Outcomes and community feedback.
  Photos/videos of the activities (if permitted).
  Challenges faced and how they were addressed.
- Presentation:
  Each team will present their project to a panel of faculty members or peers, showcasing their efforts and outcomes.

Duration of presentation: 5-7 minutes per team.

D. Evaluation Criteria:

Projects will be evaluated based on:

- Relevance: How well the project aligns with community needs.
- Impact: The tangible and intangible benefits delivered to the community.
- Innovation: Creativity in the approach or solution provided.
- Teamwork: Collaboration and effective delegation within the group.
- Documentation & Presentation: Clarity, depth, and overall delivery of the report and presentation.

E. Guidelines for Conduct:

- Behavior: Students should display professionalism, punctuality, and respect.
- Safety: Follow all safety protocols during on-campus or fieldwork activities.
- Feedback: Collect feedback from participants to measure the success and identify areas for improvement.

F. Support and Supervision:

- Faculty mentors will be assigned to each group to guide them throughout the project.
- A resource or helpdesk will be available for logistical or technical support.

Reference Books:

1. Lina D. Dostilio "The Community Engagement Professional's Guidebook: A Companion to The Community Engagement Professional in Higher Education", 2019, Campus Compact, ISBN: 978-1945459184.
2. Alan Waterman, "Service-Learning: A Guide to Planning, Implementing, and Assessing Student Projects", 2015, Skyhorse, ISBN: 978-1632205704.
3. Mary Beckman, Joyce F. Long, "Community-Based Research: Teaching for Community Impact", 2016, Stylus Publishing, 1st Edition, ISBN: 978-1620363560.
4. Authors: IDEO.org., "Design Thinking for Social Innovation".
5. Lonnie R. Sherrod, Judith Torney-Purta, Constance A. Flanagan., "Handbook of Research on Civic Engagement in Youth", 2010, John Wiley & Sons, ISBN: 978-0470522745.

Websites and Online Resources:

1. UNESCO: Education for Sustainable Development
- Website: https://www.unesco.org
- Focus: Resources and case studies related to sustainability and community engagement.
2. EPICS (Engineering Projects in Community Service)
- Website: https://engineering.purdue.edu/EPICS
- Focus: Offers methodologies and tools for engineering students to work on real-world projects benefiting communities.
3. Ashoka: Innovators for the Public
- Website: https://www.ashoka.org
- Focus: Information on social entrepreneurship and community innovation projects.
4. Design for Change
- Website: https://www.dfcworld.com

- Focus: Templates, toolkits, and project ideas for implementing impactful community-based projects.

For Evaluation and Impact Assessment:

1. Community Tool Box (University of Kansas)
- Website: https://ctb.ku.edu
- Focus: Comprehensive resources for community engagement, project evaluation, and measuring outcomes.

2. UN SDG (Sustainable Development Goals) Knowledge Platform
- Website: https://sdgs.un.org/
- Focus: Guidance on aligning community engagement projects with UN Sustainable Development Goals (SDGs).

3. Campus Compact
- Website: https://www.compact.org/
- Focus: Resources on civic and community engagement for students and educators, with a focus on project assessment.

4. BetterEvaluation
- Website: https://www.betterevaluation.org
- Focus: Tools and frameworks to evaluate the impact of community projects effectively.

5. lan-Do-Check-Act Cycle (PDCA) – Deming Institute
- Website: https://deming.org/explore/pdsa
- Focus: Step-by-step guides for planning, implementing, and refining community projects.

Relevant MOOCs Course (Course name and Weblink)

1. Ecology and Society
- Instructor: Prof. Ngamjahao Kipgen, IIT Guwahati
- Description: This course delves into the dynamic relationships between human cultures and their ecological environments, focusing on human-environment interactions and sustainable development.
- Link: https://onlinecourses.nptel.ac.in/noc20_hs77/preview.

2. Basics of Health Promotion and Education Intervention
- Instructors: Dr. Arista Lahiri, Dr. Sweety Suman Jha (IIT Kharagpur), Dr. Madhumita Dobe, Dr. Chandrashekhar Taklikar (AIIH&PH, Kolkata)
- Description: This course provides a comprehensive understanding of health promotion and education interventions, covering planning, implementation, and evaluation strategies.
- Link: https://onlinecourses.nptel.ac.in/noc22_ge18/preview

3. A Hybrid Course on Water Quality – An Approach to People's Water Data
- Instructor: IIT Madras
- Description: This hybrid course emphasizes practical fieldwork, including water sample collection and analysis, engaging with communities to assess water quality.
- Link: https://elearn.nptel.ac.in/shop/iit-workshops/completed/a-hybrid-course-on-water-quality-an-approach-to-peoples-water-data/?v=c86ee0d9d7ed

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
Second Year B. Tech. Curriculum
With effect from the A.Y. 2025-26

03132XX: Field Project (FP)		
Teaching Scheme: P: 2 Hrs./ Week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic understanding of core engineering concepts relevant to the chosen field of work.
Knowledge of teamwork, communication, and project planning.
Awareness of safety protocols and ethical considerations for fieldwork.

Course Objectives:
Course intends to prepare the students

1. Hands-on, real-world experience in applying engineering concepts through practical problem-solving and teamwork.
2. The ability to analyze real-world field situations by identifying key challenges and requirements.
3. The skills to apply engineering knowledge, tools, and techniques to develop effective solutions.
4. The capability to critically evaluate their fieldwork outcomes in terms of impact, feasibility, and sustainability.

Course Outcomes:
At the end of the Course Students will be able to

1. Assess field conditions and identify problems through observation and interaction with stakeholders. (Analyzing & remembering).
2. Develop and execute a practical, field-based solution or prototype aligned with the identified needs. (Creating & applying).
3. Reflect on and evaluate the project outcomes in terms of their technical, social, and ethical impact. (Evaluating & Understanding).

Guidelines

A. Group Formation:
- Form a group of 3-4 students that share a similar interest in each batch, Duration: 24 hours (divided into manageable sessions or shifts).
- The group should be cohesive, sharing and caring, contribute to the task assigned.
The task carried out need to be maintained in the LOG book by each group.

B. Field Project Execution Guidelines

1. Team Formation and Topic Selection:
Students form groups of 3-4.
Select a project aligned with an engineering problem or theme, such as:
    - Environmental monitoring and solutions.
    - Designing small-scale engineering systems.
    - Infrastructure or community development.
    - Renewable energy solutions.

2. Proposal Submission:
   Prepare a proposal that includes:
   - Project title and objectives.
   - Problem statement and proposed solution.
   - Field location and timeline.
   - Required resources.

   Obtain faculty mentor approval.
3. Fieldwork (24 Hours):

- Conduct site visits, data collection, and stakeholder interactions.
- Design or develop the solution based on field observations.
- Ensure proper documentation of all activities.

4. Reporting and Presentation:
   Prepare a detailed report with:
   - Objectives, methodology, and field observations.
   - Design, implementation, and results.
   - Challenges faced and lessons learned.
   - Present the report and findings to faculty and peers.

Reference Books:

1. Stuart G. Walesh, "Engineering Your Future: The Professional Practice of Engineering", 2012, 4th Edition, John Wiley & Sons Inc, ISBN: 978-0470900444.
2. Richard Phillips, Jennifer Johns,"Fieldwork for Human Geography", 2012, 1st Edition, SAGE Publications Ltd, ISBN: 978-0857025876.
3. Garold D. Oberlender, "Project Management for Engineering and Construction", 2004, 3rd Edition, McGraw Hill, ISBN: 978-0071822312.
4. Daniel E. Williams, "Sustainable Design: Ecology, Architecture, and Planning", 2007, 1st Edition, John Wiley & Sons Inc., ISBN: 978-0471709534.
5. Mike W. Martin, Roland Schinzinger.,"Introduction to Engineering Ethics", 2019, McGraw-Hill Education, ISBN: 978-0072483116.

Websites and Online Resources:

W1. Engineering Projects in Community Service (EPICS)
- Website: https://engineering.purdue.edu/EPICS
- Focus: Resources for field-based projects benefiting communities.

W2. Community Tool Box
- Website: https://ctb.ku.edu
- Focus: Guidelines for project planning, stakeholder engagement, and evaluation.

W3. National Geographic Education – Fieldwork Resources
- Website: https://education.nationalgeographic.org/
- Focus: Tips for conducting fieldwork, documenting findings, and analyzing data.

W4. BetterEvaluation

- Website: https://www.betterevaluation.org
- Focus: Frameworks and tools for project evaluation and impact assessment.

W5. Design for Change (DFC)
- Website: https://www.dfcworld.com
- Focus: Step-by-step guidance for impactful, design-based field projects.

W6. PDCA (Plan-Do-Check-Act) Methodology
- Website: https://deming.org/explore/pdsa
- Focus: Tools for iterative project planning and improvement during field execution.

Relevant MOOCs Course (Course name and Weblink)

1. Project Management, By Prof. Ramesh Anbanandam , IIT Roorkee, https://onlinecourses.nptel.ac.in/noc24_mg01/preview.
2. Project Planning & Control, By Prof. Koshy Varghese, IIT Madras, https://onlinecourses.nptel.ac.in/noc19_ce30/preview.
3. Project Management: Planning, Execution, Evaluation and Control, By Prof. Sanjib Chowdhury, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc24_mg78/preview.

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
Second Year B. Tech. Curriculum
With effect from the A.Y. 2025-26

03132XX: Co-curricular Activity (CCA)		
Teaching Scheme: P: 2 Hrs./ Week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic understanding of core engineering concepts relevant to the chosen field of work.
Knowledge of teamwork, communication, and project planning.
Awareness of safety protocols and ethical considerations for fieldwork.

Course Objectives:
Course intends to prepare the students

1. An opportunity to acquire skills and competencies beyond the core curriculum.
2. A foundation for holistic personality development.
3. Preparation for future academic, professional, and personal growth.

Course Outcomes:
At the end of the Course Students will be able to

1. Demonstrate the ability to lead and participate in teams.
2. Develop several important life skills such as leadership, organization, confidence, time management, and socialization.
3. Improve self-confidence and decision-making abilities.
4. Experience the importance of community involvement.

Guidelines for Co-curricular Activities

As part of the implementation of autonomy effective from Academic Year 2025-26 for the UG Co-curricular activities are included as credit courses in the curriculum. Accordingly, the number of credits is incorporated in the curriculum structure.

BACKGROUND

SCTR's Pune Institute of Computer Technology believes in holistic development of students catering to the requirements of engineering attributes (program outcomes) prescribed by Washington Accord and NBA through the implementation of Outcome Based Education. There is a limited scope of attaining all the program outcomes through classroom and laboratory teaching learning process. To expand the scope of learning to acquire all the attributes, PICT proposes to institutionalize and formalize the ongoing extra and co-curricular activities which are being carried out by students by awarding due credits and a certificate at the time of their graduation in addition to the University degree certificate. The purpose of extracurricular activities is primarily the acquisition of skills and competencies in areas that are not directly part of the curriculum.

SCOPE

Co-curricular activity (CCA) is an activity, performed by students, that falls outside the realm of the normal academics of college or university education. Such activities are generally social, philanthropic, and often involve others of the same age. However, as part of autonomy and NEP 2020 guidelines some Co-curricular activity (CCA) is an activity, performed by students, that falls outside the realm of the normal academics of

college or university education. Such activities are generally social, philanthropic, and often involve others of the same age. However, as part of autonomy and NEP 2020 guidelines some of the credits are included in the curriculum as mandatory for CCA. CC Activities Include but not limited to Community Service Organizations (NCC,NSS), Cultural / Ethnic Organizations, Engineering Academic Honor Societies, Engineering Clubs/ Organizations, Orientation Programs, Health Related Organizations, Professional Engineering Societies – Student Chapters, Research(Voluntary Basis), Sports, educational activities that include, seminars, workshops, project competitions, hackathons, debate competitions, and mathematics, robotics, and engineering teams and contests.

A student can earn two credits per year and a maximum of 8 credits in 4 years.
The activity hours accumulated throughout the year shall be calculated by the Co-Curricular Activity Committee (CCAC) to fix the number of credits to be granted to students at the end of the year. (Note: 30 hours =1credit)

MODE OF IMPLEMENTATION

1. A committee called Co-Curricular Activity Committee (CCAC) consisting of Dean Student Affairs and all the functional in-charges of various activities shall facilitate the activities.
2. Identification and inclusion of Co-Curricular Activities to be considered for the Credit System.
3. Mapping each activity to the program outcomes, design the assessment methodology.
4. Define the scope, methodology, number of hours required of each activity.
5. Announcement of activity calendar.
6. Registration and enrollment of interested students.
7. Allocation of faculty mentors to interested students based on the activity and expertise/interest.
8. Carry out the activities, submission of weekly reports in the form of a logbook.
9. Submission of detailed report in prescribed format mentioning all the activities carried out along with certificates, mementoes, photographs etc.
10. The Evaluation is continuous with a CIE of total 25 Marks.

LIST OF VARIOUS CO-CURRICULAR ACTIVITIES

1. Art Circle
2. ADDICTION- Annual Social Gathering
3. Sports
4. Student Welfare & Discipline
5. National Service Scheme (NSS)
6. PICTOREAL
7. Debate Society DEBSOC
8. TEDx PICT
9. Model United Nations (MUN)
10. Game Development Club (Game Utopia)
11. PICT Coders League
12. Social media Cell
13. Entrepreneurship Development Cell
14. Smart India Hackathon (SIH)
15. Cyber Security Club
16. Training and Placement Cell
17. Alumni Association
18. Competitive Examination and Guidance Cell
19. Impetus & Concepts (INC)
20. TechFiesta (PICT International Hackathon)
21. ACM (PASC)
22. IEEE (PISB)
23. IEEE APS
24. CSI
25. Robotics
26. Automobile Club
27. Universal Human Values (UHV)
28. PICT Finance Society club (PFISOC)
29. FOSS Club
30. Astro Club
31. Ethicraft Club
32. AWS Cloud Club
33. Defence Aspirant Club
34. Startup and Innovation Cell

Semester IV

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
Second Year B. Tech. Curriculum
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1403106: Software Engineering		
Teaching Scheme: L: 02 Hrs./Week	**Credits**: 02	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks
Prerequisite: Fundamentals of Programming Languages		

Course Objectives:
Course intends to prepare the students

1. To introduce the concepts of Software Engineering and its diagrams.
2. To justify the concept of software planning.
3. To utilize the concept of software modeling.
4. To evaluate the software using risk and various software testing techniques.

Course Outcomes:
At the end of the Course Students will be able to:

1. **Analyze** software requirements for design of a software.
2. **Apply** the concepts of planning and estimate a software.
3. **Create** a model or design of a software.
4. **Identify** the risk and Evaluate the software using software testing.

Course Contents

Module I	**Introduction** Introduction to software engineering, The nature of software, Define software, software engineering practice, Software Process: A generic process model, A framework activity, Requirement Vs Analysis Vs Architecture Vs Design Vs Development 4+1 view Architecture, Introduction to UML -Basic building blocks. Requirement Engineering: Building the requirements model. Agile Model. **Case study:** Write Software Requirements Specification (SRS) in IEEE format for given problem statements. **Suggested List of Lab Assignment**:Idea Inception for a given problem statement.	**7 Hrs.**
Module II	**Planning in software engineering** Estimation: Project planning process, defining scope, checking feasibility, Resource management, Decomposition techniques, software sizing, LOC based & FP based Estimation. The COCOMO-II Model.Project Scheduling: Defining the task for project scheduling. **Case Study:** Preparing requirement traceability matrix. **Suggested List of Lab Assignments:**Estimate outcome for a given problem	**6 Hrs.**

	statement.	
Module III	**Modeling in Software Engineering**	**6 rs.**
	Design: Process, Attributes. Design Patterns: Creational Design Pattern, Structural Design Pattern, Behavioral Design Pattern. Concepts: Abstraction, Architecture, Modularity, information hiding, functional independence, refactoring. **Case study-** Design for a given problem statement. **Suggested List of Lab Assignments:**Create a design document for a given problem statement.	
Module IV	**Risk Management and Deployment**	**7 Hrs.**
	Risk Management: Software risks, risk identification, risk projection, risk refinement, risk mitigation, monitoring and management (The RMMM plan). Software Configuration Management Testing: verification & validation, software testing strategies. **Case Study:** Selenium testing for given web application. **Suggested List of Lab Assignments:**Demonstration & Deployment of a given problem statement.	

Text Books

1. Roger Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill, ISBN: 007–337597–7.
2. Ian Sommerville, "Software Engineering", Addison and Wesley, ISBN: 0-13-703515-2.

Reference Books

1. S K Chang, ―Handbook of Software Engineering and Knowledge Engineering‖, World Scientific, Vol I, II, ISBN: 978-981-02-4973-1.
2. Pankaj Jalote, ―An Integrated Approach to Software Engineering‖, Springer, ISBN: 978-8173192715.
3. Carlo Ghezzi, ―Fundamentals of Software Engineering", Prentice Hall India, ISBN-10: 0133056996
4. Tom Halt, ―Handbook of Software Engineering‖, Clanrye International ISBN- 10: 1632402939

CIE Activities

1. Presentation/Quiz (10 Marks)
2. Assignments(5 Marks)

<table>
<tr><th colspan="4">1403107: Database Management System</th></tr>
<tr><td>Teaching Scheme:
L: 03
Hrs./Week</td><td colspan="2">Credits: 03</td><td>Examination Scheme:
CIE: 20 Marks
ISE: 20 Marks
ESE: 60 Marks</td></tr>
<tr><td colspan="4">Prerequisite: Discrete Mathematics, Data Structures</td></tr>
<tr><td colspan="4">Course Objectives:
Course intends to prepare the students
1. To understand the fundamental concepts of database management like database design and database languages.
2. To learn SQL and NoSQL concepts through database management tools.
3. To get familiar with the basics of transaction management and concurrency control.</td></tr>
<tr><td colspan="4">Course Outcomes:
At the end of the Course Students will be able to
1. Design an E-R Model for the given requirements and convert into normalized database tables.
2. Write SQL queries and PL/SQL code for given requirements.
3. Illustrate NoSQL database concepts and write queries using MongoDB.
4. Describe database transaction management concepts.</td></tr>
<tr><td colspan="4">Course Contents</td></tr>
<tr><td rowspan="2">Module I</td><td colspan="2">Introduction to Databases and Database Design</td><td rowspan="2">10 Hrs.</td></tr>
<tr><td colspan="2">Introduction: Need for Database Management Systems, Evolution, Database System Concepts,and Architecture.
Data Modeling: Entity Relationship (ER) Model,Relational Model, Extended ER Model, converting ER and EER diagram into tables.
Database Design: Codd's Rules, Need of Normalization, Functional Dependencies, Inference Rules, Functional Dependency Closure, Decomposition Properties, Normal Forms: 1NF, 2NF, 3NF, and BCNF.</td></tr>
<tr><td rowspan="2">Module II</td><td colspan="2">SQL and PL/SQL</td><td rowspan="2">7 Hrs.</td></tr>
<tr><td colspan="2">SQL Characteristics and Advantages, Data Types and Literals, DDL, DML, Select Queries and clauses, SQL Operators, Functions, Aggregate Functions, Nested queries, Join Queries, Views: Creating, Dropping, Updating, Index and Sequence in SQL, DCL, TCL, PL/SQL: Procedure, Function, Cursors, Trigger.

Suggested list of Assignments:
1. Use an open source database tool to implement a structured database system for a Retail Store to manage products, customers and orders. Write SQL queries to perform DDL operations for table creation in the Retail Store database with constraints (Not Null, Primary, Foreign etc) and Modification using Alter</td></tr>
</table>

	command variations, and also perform basic DML operations (Insert, Select, Update, Delete), and executing various Select statement queries with different clauses for given schemas of Retail Store database.. 2. An University maintains a structured database to manage student enrollments, courses, instructors and departments. Write SQL queries using various JOIN types (Natural, Inner, Equi, Non-Equi, Outer, Left Outer, Right Outer), as well as Subqueries and Views to extract insights from the university database system. 3. A Bank wants to automate its customer credit scoring system based on their financial standing. Let the credit score be computed on a scale of 0 to 5 by a PLSQL function based on the account balance and loan amount of any customer. (hint: if loan_amount is 50% of account balance then, credit_score: Customer(Cust_name, AccNo, Balance, city) Loan(Loan_no, branch_name, Amount) Borrower(Cust_name, Loan_no, CreditScore). 4. A Company wants to track employee salary changes, maintain company-wide statistics, and log employment history efficiently using row-level triggers. Implement BEFORE and AFTER triggers on EMPLOYEE, COMPANY_INFO, and EMP_LOG tables using INSERT, UPDATE and DELETE operations. EMPLOYEE(Emp_Id, First_Name, Last_Name, Email, Phone_No, Hire_Date, Job_Profile, Salary, HRA) COMPANY_INFO(Emp_Count, Total_Salary_Expenses) EMP_LOG(Emp_Id, Old_Salary, New_Salary, Edit_Time, Job_Status)	
Module III	**NoSQL Databases** Introduction to NoSQL Databases, Types of NoSQL Databases, BASE properties, CAP Theorem, Comparative study of RDBMS and NoSQL, MongoDB (syntax and usage): CRUD Operations, Indexing, Aggregation, MapReduce. **Suggested list of Assignments:** 1. An institute maintains details of all teachers, including name, qualifications, department details, experience, salary structure, date of joining, appointement_nature and area of expertise. Design and implement MongoDB queries to perform CRUD operations on the teachers collection for various administrative tasks. Create the above collection, insert suitable documents and design updation and retrieval queries requiring comparison and logical operators,save() method, etc.	**7 Hrs.**

	2. Customers of an online marketplace frequently search for products and their orders, and the search becomes slow as the products and orders grow. Implement all types of indexes on the products and order MongoDB collections. 3. The University wants to analyze course enrollments, faculty performance and student achievements using MongoDB aggregation pipelines. The university maintains a "courses" collections, which includes: Course details (title, department, credit hours, instructor) Student enrollments (student names, scores, pass/fail status) Faculty details (experience, designation, department) Design and implement aggregation queries to generate various reports using multiple aggregation stages with the given collection in MongoDB. Design and implement aggregation queries requiring various stages with a suitable collection using MongoDB. 4. Implement various database operations through suitable programming language.	
Module IV	**Database Transactions** Introduction to query processing,basic concepts of a Transaction, ACID Properties, State diagram, Concept of Schedule, Serializability – Conflict and View, Concurrency Control Protocols-Lock based and timestamp-based protocols, Recovery techniques.	**7 Hrs**

Text Books
1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 2019, Seventh Edition, McGraw-Hill, ISBN 9780078022159.
Reference Books
1. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide", 2020, O'Reilly Publications, ISBN: 978-1-449-34468-9. 2. S. K. Singh, "Database Systems: Concepts, Design and Application", 2013, Second Edition, Pearson Education, ISBN 978-81-317-6092-5.
CIE Activities
1. Quizzes/Assignment (10 Marks) 2. Crossword (5 Marks)
Relevant MOOCs
1. http://www.nptelvideos.com/lecture.php?id=6518

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
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1403108: Operating Systems

Teaching Scheme: L: 02 Hrs./week	**Credits**: 02	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks

Prerequisite: Computer Fundamentals

Course Objectives:
Course intends to prepare the students

1. To understand internals and functioning of OS.
2. To study organization of data and I/O devices in OS.
3. To understand the mechanism of interacting user space applications with kernel space,Linux system calls.
4. To learn different constructs of shell scripting.

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

1. **Analyse** various strategies of Process and Memory management in OS.
2. **Compare** different file systems and device management methods.
3. **Develop** applications using system calls and containerization.
4. **Write** shell scripts for managing users and resources.

Course Contents

Module I	**Introduction, Process and Memory Management** **Introduction:** Introduction to Operating Systems, definition, functions, and types of operating systems, OS Structure: Monolithic, Microkernels, Layered, Modular, and Hybrid systems, OS Services, and Design, Modern Operating Systems and Concepts like containerization, virtualization and Dockers. **Process Management:** Process Concept: States, Process Control Block (PCB), **Multithreading:** Threads, User vs Kernel Threads, CPU Scheduling: SchedulingCriteria, Types of Schedulers, Scheduling Algorithms: FCFS, SJF, Priority, Round-Robin, Inter-process Communication (IPC): Process Synchronization, Critical Section Problem, Semaphores, and Monitors, Philosophers), Deadlock:Detection, Prevention, and Recovery. Multi threaded echo server. **Memory Management:** Memory Management Requirements, Memory Partitioning, and Virtual memory , Placement Algorithms: First Fit, Best Fit,Worst Fit, Paging, Page replacement algorithms: FIFO, LRU, OPTIMAL,Segmentation. **Assignment 1:** Containerization of a Web Application using Docker	**10 Hrs.**

	Objective: Containerize a simple web application using Docker, understand the container lifecycle, and explore best practices for optimizing containerized deployments. **Problem Statement:** Develop a lightweight and portable web application that needs to run consistently across multiple environments (development, testing, and production). Following are the functionalities you need to perform: 1. Containerize a simple Python Flask web application using Docker. 2. Ensure that the application runs consistently across different environments. 3. Optimize the container by reducing image size and improving performance. 4. Deploy and manage the container using essential Docker commands.	
Module II	**File Systems and Device Management** **File Systems:** Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, File System Security, UNIX File System, Linux Virtual File System, Windows File System, Case studies of advanced file systems (ext4, ZFS, Btrfs). **Device Management:** I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, I/O hub, Disk Scheduling Policies: FIFO, PRIORITY, SSTF, SCAN, C-SCAN, Linux I/O, Windows I/O. **Assignment 2:** Microkernel Simulation **Objective:** Write a simple microkernel simulation using C/Python to: 1. Handle messages passing between system services. 2. Simulate basic IPC (Inter-Process Communication). 3. Run the program and demonstrate IPC functionality.	**8 Hrs.**
Module III	**Systems Calls Design and Implementation** **Introduction to System Calls:** Definition of system calls and their role in the OS, Differences between user mode and kernel mode, Overview of the system call interface Mechanisms of System Calls: Working of a system call (traps, interrupts),Transition from user mode to kernel mode, Context switching and its overhead. **Types of System Calls: Process Control:** Creating and terminating processes (fork, exec, exit), Process synchronization (wait, signal), Process scheduling and priority management. **File:** File creation, deletion, and manipulation (open, read, write, close), File attributes and permissions, Directory operations (mkdir, rmdir,chdir). Error Handling: Common errors encountered with system calls, Error codes and how to interpret them, Best practices for robust error handling.	**8 Hrs.**

	Assignment 3: GRUB Configuration & Hard Disk Partitioning, SSD **Problem Statement:** Your organization is setting up a multi-boot environment with Linux and Windows, requiring proper GRUB configuration and disk partitioning for smooth operation. You have been assigned to: 1. Analyze the GRUB boot process and its role in loading the OS. 2. Customize the GRUB menu, setting the default OS, timeout, and adding custom boot parameters. 3. Simulate a boot failure scenario and apply recovery techniques to restore GRUB. 4. Partition a hard disk, implementing best practices for Linux installation, including swap space and EFI partition. 5. Perform a dual-boot setup with Linux and Windows, ensuring proper bootloader functionality. 6. Document troubleshooting steps for common GRUB issues, such as missing entries or boot loops.	
Module IV	**Shell Scripting**	**8 Hrs.**
	Introduction to Shell Scripting: Overview of shell scripting and its purpose,Types of shells (e.g., Bash, Zsh, Ksh, Csh), Differences between command line and shell scripts. **Basic Shell Commands:** Common Unix/Linux commands (ls, cp, mv, rm, cat,echo), Command-line arguments and options, Understanding standard input,output, and error streams. **Writing First Shell Script:** Script structure and syntax,Creating and executing a simple shell script, Using the shebang (#/!) for specifying the interpreter. User management. **Variables and Data Types:** Declaring and using variables, Variable scope and export, Special variables **Control Structures:** Conditional statements (if, else, elif,case), Looping constructs (for, while, until), Using break and continue in loops. **Functions:** Defining and calling functions, Passing arguments to functions, Returning values from functions. **Input and Output:** Reading user input with read, Redirecting input and output, using pipes to connect commands.	

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), "Operating System Principles", 8th edition, Wiley India Private Limited, New Delhi, ISBN: 978-8126509621.
2. William Stallings (2006), Operating Systems, Internals and Design Principles, 9th edition, Pearson Education, India, ISBN: 978-9352866717.

3. Maurice J. Bach, The Design of the UNIX Operating System, Prentice-Hall, 8th edition, Prentice-Hall software series, ISSN: 978-0132017991.

Reference Books

1. Andrew S. Tanenbaum (2007), "Modern Operating Systems", 3rd edition, Prentice Hall of India, ISBN: 978-8120339040.
2. Deitel & Deitel (2008), "Operating systems" , 3rd edition, Pearson Education, India, ISBN: 978-0131828278.

CIE

1. Self learning through group activity (10 Marks)
2. Online Quiz (5 Marks)

Relevant MOOCs

1. NPTEL course on, "Operating Systems Fundamentals", Prof. Santanu Chattopadhyay, IIT Kharagpur

https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc24_cs108/preview&sa=D&source=editors&ust=1727676932469729&usg=AOvVaw3r43hMlIHD5KfopuUmaHJl

Other Resources/Links

1. https://www.opensourceforu.com/
2. https://www.minix3.org/

1403209: Operating Systems Lab

Teaching Scheme: L: 02 Hrs./Week	**Credits**: 01	**Examination Scheme:** CIE(TW): 25 Marks ESE(OR): 25 Marks

Prerequisite: Fundamentals of programming

Course Objectives:
Course intends to prepare the students

1. To learn process and memory management techniques.
2. To learn disk scheduling and internals of storage management.
3. To know the usage of various system calls.
4. To understand shell scripting.

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

1. **Implement** and **analyse** different scheduling algorithms FCFS,SJF,RR and priority.
2. **Apply** different memory placement and replacement strategies for a given input requirements.
3. **Demonstrate** various internals of the Linux file system.
4. **Write** the shell scripts to manage the users and access rights.

List of Assignments

1.	**Assignment 1:** Containerization of a Web Application using Docker **Objective:** Containerize a simple web application using Docker, understand the container lifecycle, and explore best practices for optimizing containerized deployments. **Problem Statement:** Develop a lightweight and portable web application that needs to run consistently across multiple environments (development, testing, and production). Following are the functionalities you need to perform: i. Containerize a simple Python Flask web application using Docker. ii. Ensure that the application runs consistently across different environments. iii. Optimize the container by reducing image size and improving performance. iv. Deploy and manage the container using essential Docker commands.
2.	**Assignment 2:** Microkernel Simulation **Objective:** Write a simple microkernel simulation using C/Python to:i. Handle message passing between system services. ii. Simulate basic IPC (Inter-Process Communication). iii. Run the program and demonstrate IPC functionality.
3.	**Assignment 3:** GRUB Configuration & Hard Disk Partitioning. **Problem Statement:** Your organization is setting up a multi-boot environment with Linux and Windows, requiring proper GRUB configuration and disk partitioning for smooth operation. You have been assigned to:

	i. Analyze the GRUB boot process and its role in loading the OS. ii. Customize the GRUB menu, setting the default OS, timeout, and adding custom boot parameters. iii. Simulate a boot failure scenario and apply recovery techniques to restore GRUB. iv. Partition a hard disk, implementing best practices for Linux installation, including swap space and EFI partition. v. Perform a dual-boot setup with Linux and Windows, ensuring proper bootloader functionality. vi. Document troubleshooting steps for common GRUB issues, such as missing entries or boot loops.

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), "Operating System Principles" , 8th edition, Wiley India Private Limited, New Delhi, ISBN: 978-8126509621 .
2. William Stallings (2006), "Operating Systems, Internals and Design Principles" , 9th edition, Pearson Education, India, ISBN: 978-9352866717.
3. Maurice J. Bach, The Design of the UNIX Operating System, Prentice-Hall, 8th edition, Prentice-Hall software series, ISSN 0891-4516.

Reference Books

1. Andrew S. Tanenbaum (2007), "Modern Operating Systems" , 3rd edition, Prentice Hall of India, ISBN: 978-8120339040.
2. Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India, ISBN: 978-8131712894.

Relevant MOOCs

1. **NPTEL course on , "Operating Systems Fundamentals",** Prof. Santanu Chattopadhyay, IIT Kharagpur
https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc24_cs108/preview&sa=D&source=editors&ust=1727676932469729&usg=AOvVaw3r43hMlIHD5KfopuUmaHJl

Other Resources/Links

https://www.opensourceforu.com/
https://www.minix3.org/

1403210: Database Management System Lab

Teaching Scheme: P: 04 Hrs./week	**Credits**: 02	**Examination Scheme:** CIE(TW): 25 Marks ESE(PR): 25 Marks

Prerequisite: Database Management System

Course Objectives:
Course intends to prepare the students

1. To develop skills to handle SQL databases and implement PL/SQL code.
2. To develop skills to handle NoSQL databases.
3. To execute the process of software application development.

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

1. **Implement** the given relational schema, database queries, and PL/SQL programs for 2-tier architecture using MySQL.
2. **Implement** NoSQL queries and aggregate functions for given requirements using MongoDB.
3. **Develop** database applications using database connectivity.

List of Assignments

1.	Use an open source database tool to implement a structured database system for a Retail Store to manage products, customers and orders. Write SQL queries to perform DDL operations for table creation in the Retail Store database with constraints (Not Null, Primary, Foreign etc) and Modification using Alter command variations, and also perform basic DML operations (Insert, Select, Update, Delete), and executing various Select statement queries with different clauses for given schemas of Retail Store database.
2.	An University maintains a structured database to manage student enrollments, courses, instructors and departments. Write SQL queries using various JOIN types (Natural, Inner, Equi, Non-Equi, Outer, Left Outer, Right Outer), as well as Subqueries and Views to extract insights from the university database system.
3.	A Bank wants to automate its customer credit scoring system based on their financial standing. Let the credit score be computed on a scale of 0 to 5 by a PLSQL function based on the account balance and loan amount of any customer. (hint: if loan_amount is 50% of account balance then, credit_score: 3). Write a stored procedure that uses a cursor and calls the function with each customer name for computing credit scores of all bank customers. Customer(Cust_name, AccNo, Balance, city) Loan(Loan_no, branch_name, Amount) Borrower(Cust_name, Loan_no, CreditScore)
4.	A Company wants to track employee salary changes, maintain company-wide statistics, and log employment history efficiently using row-level triggers. Implement BEFORE and AFTER triggers on EMPLOYEE, COMPANY_INFO, and EMP_LOG tables using INSERT, UPDATE and

	DELETE operations. EMPLOYEE(Emp_Id, First_Name, Last_Name, Email, Phone_No, Hire_Date, Job_Profile, Salary, HRA) COMPANY_INFO(Emp_Count, Total_Salary_Expenses) EMP_LOG(Emp_Id, Old_Salary, New_Salary, Edit_Time, Job_Status)
5.	An institute maintains details of all teachers, including name, qualifications, department details, experience, salary structure, date of joining, appointement_nature and area of expertise. Design and implement MongoDB queries to perform CRUD operations on the teachers collection for various administrative tasks. Create the above collection, insert suitable documents and design updation and retrieval queries requiring comparison and logical operators, save() method, etc.
6.	Customers of an online marketplace frequently search for products and their orders, and the search becomes slow as the products and orders grow. Implement all types of indexes on the products and order MongoDB collections.
7.	The University wants to analyze course enrollments, faculty performance and student achievements using MongoDB aggregation pipelines. The university maintains a "courses" collections, which includes: Course details (title, department, credit hours, instructor) Student enrollments (student names, scores, pass/fail status) Faculty details (experience, designation, department) Design and implement aggregation queries to generate various reports using multiple aggregation stages with the given collection in MongoDB.
8.	Implement various database operations through suitable programming language.

Text Books

1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 2019, Seventh Edition, McGraw-Hill, ISBN 9780078022159

Reference Books

1. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide", 2020, O'Reilly Publications, ISBN: 978-1-449-34468-9
2. 2. S. K. Singh, "Database Systems: Concepts, Design and Application", 2013, Second Edition, Pearson Education, ISBN 978-81-317-6092-5

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04051X2: Multidisciplinary Minor (MDM-2)		
Teaching Scheme: L: 02 Hrs./week	**Credits**: 02	**Examination Scheme:** CIE: 20 Marks ISE: 20 Marks ESE: 60 Marks
Refer Annexure I		

04052X2:Multidisciplinary Minor (MDM-2)		
Teaching Scheme: P : 02 Hrs./week	**Credits:** 01	**Examination Scheme:** CIE (TW) : 25 Marks
Refer Annexure I		

04063XX: NPTEL / SWAYAM / MOOCs		
Teaching Scheme: Online 2 Hrs/ Week	**Credits:** 02	**Evaluation Scheme** ESE: 50 Marks
Refer Annexure II		

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1407201: Project Based Learning		
Teaching Scheme: P: 04 Hrs./week	**Credits**: 02	**Examination Scheme:** ESE(OR) : 50 Marks
Prerequisite: 1. Basic Subject Knowledge: Foundational understanding of the technology stack 2. Design thinking lab		

Course Objectives:
Course intends to prepare the students

1. To emphasize learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem-solving with social context.
3. To engage students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

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

1. **Understand** project lifecycle with relevance to real-world issues.
2. **Apply** development /design skills in the project in a practical context.
3. **Analyze** different complex problem breakdown processes.
4. **Assess** the effectiveness of the methods being used throughout the project.
5. **Design and develop** a comprehensive project that addresses a specific societal need.

Suggested Problem Statements(Not limited to this choose any)		
Sr No	Domain	Sample Problem Statement
1	Waste Management Optimization	Inefficient waste collection leads to overflowing bins and increased pollution.
2	Renewable Energy Monitoring	Limited visibility on renewable energy production affects efficiency.
3	Urban Air Quality Monitoring	Poor air quality in urban areas poses health risks.
4	Water Quality Testing	Contaminated water sources threaten public health.
5	Smart Traffic Lights	Traffic congestion causes delays and pollution.
6	Elderly Care Monitoring System	Elderly individuals living alone face health risks and emergencies.

7	Food Safety Tracking	Problem: Foodborne illnesses due to unsafe food handling practices.
8	Energy Consumption Management	Problem: High energy consumption leads to increased costs and carbon footprint.
9	Disaster Response App	Problem: Ineffective communication during natural disasters.
10	Personalized Learning Tools	Problem: One-size-fits-all education fails to meet diverse student needs.

Indicative/ Sample List of Tools (Students are allowed to use any latest tools / Not Limited to this):

1. Git/GitHub - Version control and collaboration.
2. Visual Studio Code - Integrated development environment (IDE).
3. AWS/Google Cloud/Azure - Cloud computing platforms.
4. TensorFlow/PyTorch/Scikit-learn - Machine learning libraries.
5. React/Angular/Django - Web development frameworks.

Text Books

1. Michael E. Auer "Project-Based Learning in the Computer Science Classroom", ISBN: 978-3-319-70663-0.
2. Richard DuFour, Rebecca DuFour, and Robert Eaker "Learning by Doing: A Handbook for Professional Learning Communities at Work" , Solution Tree, ISBN: 978-1-4166-0732-8.
3. Gary R. Morrison, Steven M. Ross, and Jerrold E. Kemp "Designing Effective Instruction" 6th Edition , John Wiley & Sons.ISBN: 978-1-118-20763-4.
4. Nell Dale and John Lewis "Computer Science Illuminated" Jones & Bartlett Learning, 7th Edition ISBN: 978-1-118-45306-7.

Paper References

1. Junior, E., et al. "Systematic literature review of Gamification and Game-based Learning in the context of Problem and Project Based Learning approaches." International Symposium on Project Approaches in Engineering Education. Vol. 9. 2019.
2. Malik, Khalid Mahmood, and Meina Zhu. "Do project-based learning, hands-on activities, and flipped teaching enhance student's learning of introductory theoretical computing classes?." Education and information technologies 28.3 (2023): 3581-3604.
3. Faizi, Jamilurahman, and Mohammad Sarosh Umar. "A conceptual framework for software engineering education: project based learning approach integrated with industrial collaboration." International Journal of Education and Management Engineering 11.5 (2021): 46.

Relevant MOOCs

1. NPTEL course on, "Compiler design", By Prof. Santanu Chattopadhyay, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc21_cs07/preview

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1409102: Entrepreneurship		
Teaching Scheme: L:01 Hrs./week	**Credits:** 01	**Examination Scheme:** CIE :25 Marks

Prerequisite:

Course Objectives:
Course intends to prepare the students

1. To enable students with the skills to identify target customers, segment markets.
2. To equip students to utilize tools for designing and developing effective business models.
3. To develop students' understanding of team dynamics.
4. To enhance understanding of core business principles.

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

1. **Design** innovative and sustainable business models.
2. **Develop** business strategies to foster business development. / Establish Business by considering all the requirements.

Course Contents

Module I	**Entrepreneurship in Practice** Team building, Shared leadership, role of good team, Collaboration tools and techniques, Marketing and sales, Positioning, Channels and strategies, Sales planning,Support, Project management, Planning and tracking, Business Regulation.Customer Segmentation.	**8 Hrs.**
Module II	**Economics and Management for Entrepreneurs** Customer identification, Market, Creative solution, Unique Value proposition Business Model Canvas, Types of business models, Risk identification, Business Plan documentation, Business Establishment Requirements.	**7 Hrs.**

Textbooks

1. Robert D. Hisrich,, "Advanced Introduction to Entrepreneurship", Elgar Advanced Introductions series, Extent: 296 pp, ISBN: 978- 1 78254 6153.
2. Henry Rwigema and Robert Venter, "Advanced Entrepreneurship", Oxford University Press, 2004 ISBN: 978- 0195780574.

Reference Books

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, "Entrepreneurship", 11th Edition, Published: July 20, 2020, ISSN: 978-9390113309.
2. Barbara J. Orser and Catherine J. Elliott, "Feminine Capital: Unlocking the Power of Women Entrepreneurs", Stanford University Press, Edition: 1st, DOI:10.1515/9780804794312, ISBN: 978-0804794312.

CIE Activities

1. Business Idea Documentation (10 M)
2. Presentation (5 M)

1409202: Entrepreneurship Lab		
Teaching Scheme: P: 02 Hrs./week	**Credits:** 01	**Examination Scheme:** CIE (TW) : 25 Marks
Prerequisite: NA		

Course Objectives:
Course intends to prepare the students
1. To enable students to explore the intersection of innovative strategies, economic principles, and management practices to drive entrepreneurial success.
2. To cultivate students' ability to analyze market dynamics and craft innovative strategies for sustainable business growth in a competitive landscape.
3. To provide students with tools and techniques for effective decision-making, resource allocation, and team management in entrepreneurial ventures.
4. To encourage students to incorporate sustainability and inclusivity into their entrepreneurial and managerial strategies, aligning with global economic trends.

Course Outcomes:
At the end of the course students will be able to
1. **Demonstrate** the ability to design and implement innovative strategies that integrate economic and managerial principles to solve complex business challenges.
2. **Analyze** market trends, economic policies, and business environments to identify opportunities and mitigate risks.

List of Assignments

1.	Create a report explaining key factors influencing the success or failure of market entry strategies for new entrepreneurs.
2.	Create and Present Your Own Business Model Canvas to outline the critical components: Value Proposition, Customer Segments, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure.
3.	Create and Present a report of your own business with an analysis of the business's impact on local economics, considering both positive and negative externalities, and proposing strategies for improvement.

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0408203: Collaborative Skills, Digital Ethics, and Cyber Security

Teaching Scheme: P: 02 Hrs./week	**Credits**: 01	**Examination Scheme:** CIE(TW) : 25 Marks

Prerequisite: Professional Development and Career Readiness

Course Objectives:
Course intends to prepare the students

1. Understand the significance of team skills and know how to acquire them.
2. Design, develop, and adapt to situations as individuals and as team members.

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

1. Empathize with and trust colleagues for improving interpersonal relations.
2. Demonstrate effective communication by respecting diversity and embracing good listening skills.
3. Distinguish the guiding principles for communication in a diverse, smaller, internal world.
4. Practice interpersonal skills for better social and professional relations with seniors, juniors, peers, and stakeholders.

Course Contents

Expt. No	Title/Problem Statement	Hrs.
1.	Trust and Collaboration Explain the Importance of Trust in Creating a Collaborative Team Agree to Disagree and Disagree to Agree – Spirit of Teamwork • Understanding Fear of Being Judged and Strategies to Overcome Fear	4 Hrs.
2.	Listening as a Team Skill Advantages of Effective Listening Listening as a Team Member and Team Leader. Use of active listening strategies to encourage sharing of ideas (full and undivided attention, no interruptions, no pre-think, use empathy, listen to tone and voice modulation, recapitulate points).	2 Hrs.
3.	Brainstorming Brainstorming as a Technique to Promote Idea Generation a. Brainstorming: Meaning and the Process b. Procedure for Conducting Brainstorming c. Importance of Using Brainstorming Technique d. Types of Brainstorming	2 Hrs.

4.	Learning and Showcasing the Principles of Documentation of Team Session Outcomes.	2 Hrs.
5.	Social and Cultural Etiquette Need for Etiquette (impression, image, earn respect, appreciation) • Aspects of Social and Cultural/Corporate Etiquette in Promoting Teamwork • Importance of Time, Place, Propriety and Adaptability to Diverse Cultures	2 Hrs.
6.	Digital Ethics Digital Ethics i. Digital Literacy Skills, ii. Digital Etiquette, iii. Digital Life Skills	2 Hrs.
7.	Cyber Security The Art of Protecting Secrets a. Understanding Encryption and Decryption and Its Different Types b. Art of Data Masking c. Firewall and Its Proper Use in Cyber Protection	2 Hrs.

Text Books:

1. Jill Ratliff, "Leadership Through Trust & Collaboration: Practical Tools for Today's Results-Driven Leader", Morgan James Publishing, 2020, ISBN: 978-1642798593
2. Joseph Dauda, "Cybersecurity and Digital Ethics: Principles of Cybersecurity", (Cybersecurity practices, technologies, and processes, e-book.

Reference Books :

1. Kelly, T., and Kelly, D., "Creative Confidence: Unleashing the Creative Potential Within Us All", Harper Collins Publishers India, 2013, ISBN: 978-0385349369.
2. Simon Sweeney, "English for Business Communication", 2nd Edition, Cambridge University Press, 2003, ISBN: 978-0521754491.
3. Sanjay Kumar and Pushpa Lata, "Communication Skills", Oxford University Press, 2011, ISBN: 978-0198069324.

Relevant MOOCs Course :

1. NPTEL Course on Leadership. https://nptel.ac.in/courses/122105021/9
2. Global Business Foundation Skills (GBFS) – Refer websites like https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

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0411102: Indian Constitution and Social Responsibility		
Teaching Scheme: L: 01 Hrs./Week	**Credits**: 01	**Examination Scheme:** CIE: 25 Marks
Prerequisite: Basic Knowledge of Civics and Governance, Ethical Reasoning and Social Awareness, Communication and Critical Thinking Skills.		

Course Objectives:
Course intends to prepare the students

1. An understanding of the principles of social responsibility, ethical citizenship, and the Indian Constitution.
2. The ability to analyze the role of individuals and institutions in fostering responsible citizenship, democracy, and social change.
3. Skills to evaluate ethical dilemmas and legal frameworks for making informed civic decisions.
4. Opportunities to design initiatives that promote social responsibility and active community participation.

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

1. Explain fundamental concepts of social responsibility, civic engagement, and constitutional law.
2. Apply ethical and legal principles to address community and global issues.
3. Analyze the relationship between fundamental rights, duties, and governance in India.
4. Develop community-driven projects that contribute to sustainable development and civic well-being.

Course Contents

Module I	**Introduction to Indian Constitution** Historical Background and Evolution of the Indian Constitution, Preamble and its significance, Fundamental Rights and Duties, Directive Principles of State Policy. **CIE Activities:** • **Debate:** Relevance of Fundamental Rights in Contemporary India • **Case Study:** Landmark Supreme Court Judgments	**10 Hrs.**
Module II	**Government Structure & Electoral System**	**10 Hrs**

	Separation of Powers: Legislature, Executive, and Judiciary, Federalism: Centre-State Relations, Parliamentary vs. Presidential System, Election Commission and Electoral Reforms. **CIE Activities:** • **Mock Parliament Session** • **Discussion:** Impact of Electoral Reforms on Indian Democracy	
Module III	**Social Responsibility & Citizenship** Definitions of Social Responsibility and Citizenship, Ethics and Moral Duties in Society, Individual vs. Collective Responsibility, Case Studies: Impactful Citizens and Social Movements. CIE **Activities:** • **Group Discussion:** What does responsible citizenship mean to you? • **Reflection Assignment:** Personal Social Responsibility	**8 Hrs**
Module IV	**Civic Engagement & Sustainable Development** Forms of Civic Engagement (Volunteering, Advocacy, Social Activism), Role of NGOs, Government, and Private Sectors, Sustainable Development Goals (SDGs), Corporate Social Responsibility (CSR). CIE **Activities:** • **Role-Playing Exercise:** Simulating a Town Hall Meeting • **Local Community Service Initiative**	**8 Hrs**

Text Books/Reference Books

1. Sen, Amartya. The Idea of Justice (2009) – Discusses fairness and ethics in society.
2. D.D. Basu, Introduction to the Constitution of India, LexisNexis, Latest Edition.
3. Granville Austin, The Indian Constitution: Cornerstone of a Nation, Oxford University Press.
4. Rawls, John. A Theory of Justice (1971) – Covers principles of justice and democracy.
5. United Nations Sustainable Development Goals (SDGs) – Official UN resources on social responsibility.
6. Sachs, Jeffrey. The Age of Sustainable Development (2015) – Insights into global responsibility.

Relevant MOOCs Course

1. NPTEL Course on, "Corporate Social Responsibility", Prof. Aradhna Malik, IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc24_mg86/preview
2. SWAYAM Course on "Community Engagement and Social Responsibility", Prof. Akshay Kumar Satsangi, Dayalbagh Educational Institute, Agra https://onlinecourses.swayam2.ac.in/ugc24_ge05/preview
3. SWAYAM "Constitutional Government & Democracy in India", Prof. Amitabha Ray, St. Xavier's College (Autonomous), Kolkata. https://onlinecourses.swayam2.ac.in/cec19_hs13/preview
4. NPTEL Course on "Constitution Law and Public Administration in India", Prof. Sairam Bhat, National Law School of India University. https://onlinecourses.nptel.ac.in/noc25_lw02/preview

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04132XX: Community Engagement project		
Teaching Scheme: P: 2 Hrs./ Week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic understanding of social and ethical responsibilities. Teamwork and communication skills acquired in prior coursework or group activities. Familiarity with problem-solving methodologies and project planning.

Course Objectives:
Course intends to prepare the students

1. Opportunities to engage with their local community, fostering empathy, teamwork, and problem-solving skills while contributing positively to their surroundings.
2. An understanding of the challenges faced by the local community and the role of engineering in addressing those challenges.
3. The ability to apply technical knowledge and skills to design solutions or interventions that create a positive impact on the community.
4. The skills to evaluate and critically analyze the outcomes of their engagement activities, deriving actionable insights for sustainable impact.

Course Outcomes:
At the end of the Course Students will be able to

1. **Identify and Analyze** community needs and challenges by engaging with stakeholders and evaluating real-world problems. (Remembering & analyzing)
2. **Design and Implement** practical, creative, and context-specific solutions using engineering principles to address community issues. (Creating & applying)
3. **Reflect and Evaluate** the effectiveness of their interventions and articulate lessons learned through reports and presentations. (Evaluating & Understanding)

Guidelines

A. Group Formation:

- Form a group of 3-4 students that share a similar interest in each batch, Duration: 24 hours (divided into manageable sessions or shifts).
- The group should be cohesive, sharing , caring, and contribute to the task assigned.
- The tasks carried out need to be maintained in the LOG book by each group.

B. Project Scope:

The CEP should focus on addressing a specific community or societal issue. Projects may fall under the following themes:

1. Education and Awareness:
   Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability,

mental health, or career planning for local stakeholders.

2. Technology for Social Good:
   Develop a simple prototype or solution that addresses a real-world problem (e.g., a water-saving device, simple mobile apps, or tools for community use).
3. Environmental Sustainability:
   Organize clean-up drives, tree plantations, recycling campaigns, or energy conservation initiatives.
4. Health and Wellness:
   Promote health through awareness programs on hygiene, nutrition, and exercise.
5. Skill Development:
   Teach basic computer or technical skills to students, staff, or the community.

C. Step-by-Step Execution Plan:

1. Planning Phase:

- Team Formation:
  Form teams of 3-4 students with a balance of skills and interests.
- Project Selection:
  Choose a project theme and define a clear objective that aligns with community needs.
- Proposal Submission:
  Submit a one-page project proposal outlining:
  Title of the project.
  Objective and expected outcome.
  Plan of execution (timeline and activities).
  Required resources (if any).
  Get approval from the designated faculty mentor.

2. Execution Phase (24 Hours):

- Day 1 Activities (First 12 Hours):
  Conduct initial outreach and engage with the community or target participants.
  Implement planned activities with close teamwork and documentation.
- Day 2 Activities (Second 12 Hours):
  Continue engagement and collect feedback from the participants.
  Begin summarizing the outcomes of the project.
- Best Practices:
  Maintain a positive attitude and open communication with the community.
  Respect cultural norms and values of the participants.
  Adapt your plan based on real-time needs or challenges.

3. Reporting Phase:

- Documentation:
  Create a detailed report containing:
  Title, objective, and scope of the project.
  Activities conducted and timeline.
  Outcomes and community feedback.
  Photos/videos of the activities (if permitted).
  Challenges faced and how they were addressed.
- Presentation:
  Each team will present their project to a panel of faculty members or peers, showcasing their efforts and outcomes.

Duration of presentation: 5-7 minutes per team.

D. Evaluation Criteria:

Projects will be evaluated based on:

- Relevance: How well the project aligns with community needs.
- Impact: The tangible and intangible benefits delivered to the community.
- Innovation: Creativity in the approach or solution provided.
- Teamwork: Collaboration and effective delegation within the group.
- Documentation & Presentation: Clarity, depth, and overall delivery of the report and presentation.

E. Guidelines for Conduct:

- Behavior: Students should display professionalism, punctuality, and respect.
- Safety: Follow all safety protocols during on-campus or fieldwork activities.
- Feedback: Collect feedback from participants to measure the success and identify areas for improvement.

F. Support and Supervision:

- Faculty mentors will be assigned to each group to guide them throughout the project.
- A resource or helpdesk will be available for logistical or technical support.

Reference Books:

1. Lina D. Dostilio "The Community Engagement Professional's Guidebook: A Companion to The Community Engagement Professional in Higher Education", 2019, Campus Compact, ISBN: 978-1945459184.
2. Alan Waterman, "Service-Learning: A Guide to Planning, Implementing, and Assessing Student Projects", 2015, Skyhorse, ISBN: 978-1632205704.
3. Mary Beckman, Joyce F. Long, "Community-Based Research: Teaching for Community Impact", 2016, Stylus Publishing, 1st Edition, ISBN: 978-1620363560.
4. Authors: IDEO.org., "Design Thinking for Social Innovation".
5. Lonnie R. Sherrod, Judith Torney-Purta, Constance A. Flanagan., "Handbook of Research on Civic Engagement in Youth", 2010, John Wiley & Sons, ISBN: 978-0470522745.

Websites and Online Resources:

UNESCO: Education for Sustainable Development

- Website: https://www.unesco.org
- Focus: Resources and case studies related to sustainability and community engagement.

EPICS (Engineering Projects in Community Service)

- Website: https://engineering.purdue.edu/EPICS
- Focus: Offers methodologies and tools for engineering students to work on real-world projects benefiting communities.

Ashoka: Innovators for the Public

- Website: https://www.ashoka.org
- Focus: Information on social entrepreneurship and community innovation projects.

Design for Change

- Website: https://www.dfcworld.com
- Focus: Templates, toolkits, and project ideas for implementing impactful community-based projects.

For Evaluation and Impact Assessment:

1. Community Tool Box (University of Kansas)
- Website: https://ctb.ku.edu
- Focus: Comprehensive resources for community engagement, project evaluation, and measuring outcomes.

2. UN SDG (Sustainable Development Goals) Knowledge Platform
- Website: https://sdgs.un.org/
- Focus: Guidance on aligning community engagement projects with UN Sustainable Development Goals (SDGs).

3. Campus Compact
- Website: https://www.compact.org/
- Focus: Resources on civic and community engagement for students and educators, with a focus on project assessment.

4. BetterEvaluation
- Website: https://www.betterevaluation.org
- Focus: Tools and frameworks to evaluate the impact of community projects effectively.

5. lan-Do-Check-Act Cycle (PDCA) – Deming Institute
- Website: https://deming.org/explore/pdsa
- Focus: Step-by-step guides for planning, implementing, and refining community projects.

Relevant MOOCs Course (Course name and Weblink)

1. Ecology and Society
- Instructor: Prof. Ngamjahao Kipgen, IIT Guwahati
- Description: This course delves into the dynamic relationships between human cultures and their ecological environments, focusing on human-environment interactions and sustainable development.
- Link: https://onlinecourses.nptel.ac.in/noc20_hs77/preview.

2. Basics of Health Promotion and Education Intervention
- Instructors: Dr. Arista Lahiri, Dr. Sweety Suman Jha (IIT Kharagpur), Dr. Madhumita Dobe, Dr. Chandrashekhar Taklikar (AIIH&PH, Kolkata)
- Description: This course provides a comprehensive understanding of health promotion and education interventions, covering planning, implementation, and evaluation strategies.
- Link: https://onlinecourses.nptel.ac.in/noc22_ge18/preview

3. A Hybrid Course on Water Quality – An Approach to People's Water Data
- Instructor: IIT Madras
- Description: This hybrid course emphasizes practical fieldwork, including water sample collection and analysis, engaging with communities to assess water quality.
- Link: https://elearn.nptel.ac.in/shop/iit-workshops/completed/a-hybrid-course-on-water-quality-an-approach-to-peoples-water-data/?v=c86ee0d9d7ed

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04132XX: Field Project (FP)		
Teaching Scheme: P: 2 Hrs./ Week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic understanding of core engineering concepts relevant to the chosen field of work.
Knowledge of teamwork, communication, and project planning.
Awareness of safety protocols and ethical considerations for fieldwork.

Course Objectives:
Course intends to prepare the students

1. Hands-on, real-world experience in applying engineering concepts through practical problem-solving and teamwork.
2. The ability to analyze real-world field situations by identifying key challenges and requirements.
3. The skills to apply engineering knowledge, tools, and techniques to develop effective solutions.
4. The capability to critically evaluate their fieldwork outcomes in terms of impact, feasibility, and sustainability.

Course Outcomes:
At the end of the Course Students will be able to

1. Assess field conditions and identify problems through observation and interaction with stakeholders. (Analyzing & remembering).
2. Develop and execute a practical, field-based solution or prototype aligned with the identified needs. (Creating & applying).
3. Reflect on and evaluate the project outcomes in terms of their technical, social, and ethical impact. (Evaluating & Understanding).

Guidelines

A. Group Formation:

- Form a group of 3-4 students that share a similar interest in each batch, Duration: 24 hours (divided into manageable sessions or shifts).
- The group should be cohesive, sharing and caring, contribute to the task assigned.
  The task carried out need to be maintained in the LOG book by each group.

B. Field Project Execution Guidelines

1. Team Formation and Topic Selection:
   Students form groups of 3-4.
   Select a project aligned with an engineering problem or theme, such as:
   - Environmental monitoring and solutions.
   - Designing small-scale engineering systems.
   - Infrastructure or community development.
   - Renewable energy solutions.

2. Proposal Submission:
   Prepare a proposal that includes:
   - Project title and objectives.
   - Problem statement and proposed solution.
   - Field location and timeline.
   - Required resources.

   Obtain faculty mentor approval.

3. Fieldwork (24 Hours):
- Conduct site visits, data collection, and stakeholder interactions.
- Design or develop the solution based on field observations.
- Ensure proper documentation of all activities.

4. Reporting and Presentation:
   Prepare a detailed report with:
   - Objectives, methodology, and field observations.
   - Design, implementation, and results.
   - Challenges faced and lessons learned.
   - Present the report and findings to faculty and peers.

Reference Books:

1. Stuart G. Walesh, "Engineering Your Future: The Professional Practice of Engineering", 2012, 4th Edition, John Wiley & Sons Inc, ISBN: 978-0470900444.
2. Richard Phillips, Jennifer Johns,"Fieldwork for Human Geography", 2012, 1st Edition, SAGE Publications Ltd, ISBN: 978-0857025876.
3. Garold D. Oberlender, "Project Management for Engineering and Construction", 2004, 3rd Edition, McGraw Hill, ISBN: 978-0071822312.
4. Daniel E. Williams, "Sustainable Design: Ecology, Architecture, and Planning", 2007, 1st Edition, John Wiley & Sons Inc., ISBN: 978-0471709534.
5. Mike W. Martin, Roland Schinzinger.,"Introduction to Engineering Ethics", 2019, McGraw-Hill Education, ISBN: 978-0072483116.

Websites and Online Resources:

W1. Engineering Projects in Community Service (EPICS)
- Website: https://engineering.purdue.edu/EPICS
- Focus: Resources for field-based projects benefiting communities.

W2. Community Tool Box
- Website: https://ctb.ku.edu
- Focus: Guidelines for project planning, stakeholder engagement, and evaluation.

W3. National Geographic Education – Fieldwork Resources
- Website: https://education.nationalgeographic.org/
- Focus: Tips for conducting fieldwork, documenting findings, and analyzing data.

W4. BetterEvaluation

- Website: https://www.betterevaluation.org
- Focus: Frameworks and tools for project evaluation and impact assessment.

W5. Design for Change (DFC)
- Website: https://www.dfcworld.com
- Focus: Step-by-step guidance for impactful, design-based field projects.

W6. PDCA (Plan-Do-Check-Act) Methodology
- Website: https://deming.org/explore/pdsa
- Focus: Tools for iterative project planning and improvement during field execution.

Relevant MOOCs Course (Course name and Weblink)

1. Project Management, By Prof. Ramesh Anbanandam , IIT Roorkee, https://onlinecourses.nptel.ac.in/noc24_mg01/preview.

2. Project Planning & Control, By Prof. Koshy Varghese, IIT Madras, https://onlinecourses.nptel.ac.in/noc19_ce30/preview.

3. Project Management: Planning, Execution, Evaluation and Control, By Prof. Sanjib Chowdhury, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc24_mg78/preview.

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04132XX: Co-curricular Activity		
Teaching Scheme: P: 2 Hrs./ Week	**Credits:** 01	**Examination Scheme:** CIE(TW): 25 Marks

Prerequisite: Basic understanding of core engineering concepts relevant to the chosen field of work.
Knowledge of teamwork, communication, and project planning.
Awareness of safety protocols and ethical considerations for fieldwork.

Course Objectives:
Course intends to prepare the students

1. An opportunity to acquire skills and competencies beyond the core curriculum.
2. A foundation for holistic personality development.
3. Preparation for future academic, professional, and personal growth.

Course Outcomes:
At the end of the Course Students will be able to

1. Demonstrate the ability to lead and participate in teams.
2. Develop several important life skills such as leadership, organization, confidence, time management, and socialization.
3. Improve self-confidence and decision-making abilities.
4. Experience the importance of community involvement.

Guidelines for Co-curricular Activities

As part of the implementation of autonomy with effective from Academic Year 2025-26 for the UG Co-curricular activities are included as credit courses in the curriculum. Accordingly, the number of credits is incorporated in the curriculum structure.

BACKGROUND

SCTR's Pune Institute of Computer Technology believes in wholistic development of student catering to the requirements of engineering attributes (program outcomes) prescribed by Washington Accord and NBA through the implementation of Outcome Based Education. There is a limited scope of attaining all the program outcomes through classroom and laboratory teaching learning process. To expand the scope of learning to acquire all the attributes, PICT proposes to institutionalize and formalize the ongoing extra and co-curricular activities which are being carried out by students by awarding due credits and a certificate at the time of their graduation in addition to the University degree certificate. The purpose of extracurricular activities is primarily the acquisition of skills and competencies in areas that are not directly part of the curriculum.

SCOPE

Co-curricular activity (CCA) is an activity, performed by students, that falls outside the realm of the normal academics of college or university education. Such activities are generally social, philanthropic, and often involve others of the same age. However, as part of autonomy and NEP 2020 guidelines some Co-curricular activity (CCA) is an activity, performed by students, that falls outside the realm of the normal academics of

college or university education. Such activities are generally social, philanthropic, and often involve others of the same age. However, as part of autonomy and NEP 2020 guidelines some of the credits are included in the curriculum as mandatory for CCA. CC Activities Include but not limited to Community Service Organizations (NCC,NSS), Cultural / Ethnic Organizations, Engineering Academic Honor Societies, Engineering Clubs/ Organizations, Orientation Programs, Health Related Organizations, Professional Engineering Societies – Student Chapters, Research(Voluntary Basis), Sports, educational activities that include, seminars, workshops, project competitions, hackathons, debate competitions, and mathematics, robotics, and engineering teams and contests.

A student can earn two credits per year and a maximum of 8 credits in 4 years.
The activity hours accumulated throughout the year shall be calculated by the Co-Curricular Activity Committee (CCAC) to fix the number of credits to be granted to students at the end of the year. (Note: 30 hours =1credit)

MODE OF IMPLEMENTATION

1. A committee called Co-Curricular Activity Committee (CCAC) consisting of Dean Student Affairs and all the Functional In-charges of various activities shall facilitate the activities.
2. Identification and inclusion of Co-Curricular Activities to be considered for the Credit System.
3. Mapping each activity to the program outcomes, design the assessment methodology.
4. Define the scope, methodology, number of hours required of each activity.
5. Announcement of activity calendar.
6. Registration and enrollment of interested students.
7. Allocation of faculty mentors to interested students based on the activity and expertise/interest.
8. Carry out the activities, submission of weekly reports in the form of a logbook.
9. Submission of detailed report in prescribed format mentioning all the activities carried out [Min. 30 Hrs.] along with certificates, mementoes, photographs etc.
10. Continuous internal evaluation of 25 marks

LIST OF VARIOUS CO-CURRICULAR ACTIVITIES

1. Art Circle
2. ADDICTION- Annual Social Gathering
3. Sports
4. Student Welfare & Discipline
5. National Service Scheme (NSS)
6. PICTOREAL
7. Debate Society DEBSOC
8. TEDx PICT
9. Model United Nations (MUN)
10. Game Development Club (Game Utopia)
11. PICT Coders League
12. Social media Cell
13. Entrepreneurship Development Cell
14. Smart India Hackathon (SIH)
15. Cyber Security Club
16. Training and Placement Cell
17. Alumni Association
18. Competitive Examination Guidance Cell
19. Impetus & Concepts (I&C)
20. TechFiesta (PICT International Hackathon)
21. ACM (PASC)
22. IEEE (PISB)
23. IEEE APS
24. CSI
25. ROBOTICS
26. Automobile Club
27. Universal Human Values (UHV) cell
28. PICT Finance club (PFISOC)
29. FOSS Club
30. Astro Club
31. Ethicraft Club
32. AWS Cloud Club
33. Defence Aspirant Club
34. Startup and Innovation Cell

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Annexure-1

Structure of Multi-Disciplinary Minor Courses

The structure for the multidisciplinary Minor courses is as follows.

			Teaching Scheme (Hours/Week)				Credits				Examination Scheme and Marks						
											Theory			Practical			
Sem	Course code	Name of the Course (Short forms)	L	P	T	Total	L	P	T	Total	CIE [20]	ISE [20]	ESE [60]	CIE TW	ESE (PR)	ESE (OR)	Total
3	03051X1	MDM-1	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
3	03052X1	MDM-1 Tut	-	-	1	1	-	-	1	1	-	-	-	25	-	-	25
4	04051X2	MDM-2	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
4	04052X2	MDM-2 Lab	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
5	05051X3	MDM-3	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
5	05052X3	MDM-3 Lab	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
6	06051X4	MDM-4	2	-	-	2	2	-	-	2	20	20	60	-	-	-	100
6	06052X4	MDM-4 lab	-	2	-	2	-	1	-	1	-	-	-	25	-	-	25
8	08053X5	MDM-5	-	-	2	2	-	-	2	2	-	-	-	50	-	-	50
		Total	8	6	3	17	8	3	3	14	80	80	240	150	0	0	550

Note: In course code X is basket number. #: is laboratory or tutorial as per course requirements.

1. Students are instructed to select one basket labeled as MD-1 to MD-9 based on applicable criteria in the last column of the table below.
2. Follow the registration process initiated by the institute/ department.
3. Once the course is registered, change of the basket/course in any of the further semester is not allowed.
4. The total credits will be the same for all the courses except MDM-5.
5. Departments may conduct MDM-5 in virtual mode for the smooth conduction of internship for the full duration.

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List of Multi-Disciplinary Minor Domains

Sr. No.	Multi-Disciplinary Minor Domains	SY		TY		B-Tech	Offered to students of BTech Program
		MDM-1	MDM-2	MDM-3	MDM-4	MDM-5	
		Sem-III	Sem-IV	Sem-V	Sem-VI	Sem-VII/VIII	
MD1	**Smart and Sustainable Systems (SSS)**	Fundamentals of Smart and Sustainable Systems (FSSS) & Tut	IoT for Smart and Sustainable Systems (ISSS) & Lab	Data Analytics for Smart and Sustainable Systems (DASSS) & Lab	Security for Smart and Sustainable Systems (SSS) & Smart and Sustainable Systems Development (SSD) Lab	Smart and Sustainable System (SSD) (MOOC)	**ALL**
MD2	**Financial Technology and Management (FTM)**	Finance and Management (FM)	Fundamentals of Financial Engineering (FFE) & Tut	Banking, Financial Services and Insurance (BFSI) & Tut	Fundamentals of Stock Market (FSM) & Tut	Fintech: Foundations & Applications (FFA) & Tut	**ALL**
MD3	**3D- Printing (3DP)**	3D- Printing (3DP)	3D modeling and Design (3MD) & Lab	Fundamentals of Additive Manufacturing (FAM)& Lab	3D Printing Materials and Processes (3DPMP)	Industry 4.0 and Digital Manufacturing (IDM)	**ALL**
MD4	**Electric Vehicles (EV)**	Electric Vehicles (EV)	EV foundation – Principles and Concepts (EVPC) & Lab	Advanced Motor Technologies and Power Electronics for EV(AMT) & Lab	EV Powertrain Dynamics and Control System(PDC) Tut/Lab	Intelligent EV Systems: AI IoT and Automation(IEV)	**ALL**
MD5	**Applied Mathematics for Engineering (AME)**	Applied Mathematics for Engineering (AME)	Linear Algebra with Python & Lab	Statistical Techniques and Numerical Methods with R & Lab	Fuzzy Logic and Graph Theory with Matlab/Python & Lab	Optimization Techniques & Lab	**ALL**
MD6	**Software Development (SD)**	Software Development (SD)	Data Structures and Algorithms (DSA) & Lab	Object Oriented Programming (OOP) &Lab	Database and Management Systems (DBMS) & Lab	Web Development (WD) & Lab	**E&TCE**
MD7	**Autonomous and Intelligent Systems (AIS)**	Autonomous and Intelligent Systems (AIS)	Digital Systems and Organization (DSO) & Lab	Smart System Engineering (SSE) & Lab	Embedded IoT Systems (EIS) & Lab	Autonomous Systems (AS) & Lab	**All except E&TCE**
MD8	**Embedded Systems- (ES)**	Embedded Systems (ES)	Fundamental of Microcontroller (FM) & Lab	Embedded Processors –I (EP -I) & Lab	Microcontrollers and IoT (MI) & Lab	Embedded Systems and RTOS (ES-RTOS) & Lab	**All Except E&TCE**
MD9	**AI & Machine Learning (AI-ML)**	AI & Machine Learning (AI-ML)	Statistical Data Analysis & Lab	Machine Learning (ML) & Lab	Natural Language Processing (NLP) & Lab	Artificial Intelligence (AI) & Lab	**E&CE**

Link: Detailed Syllabus

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Annexure -2

Guidelines for Open elective Courses

- Open Elective – I will be offered in third semester as foreign language as prescribed in the structure.
- Open Electives – II, III, IV will be offered through SWAYAM/NPTEL MOOCs of Equivalent Credits.
- Departments will prepare the baskets/list of courses to be offered at the start of every semester, Students may choose any one course from the basket with adhering to any one stream.
- Department shall appoint a faculty mentor to ensure monitoring and course registration smoothly. The load for faculty should be reflected in time table.
- Equivalent Teaching Scheme, credits and examination schemes are detailed in table below.
- End semester Evaluation: No separate examination is conducted by the institute.

			Teaching Scheme (Hours/Week)				Credits				Examination Scheme and Marks						
											Theory			Practical			
Sem	Course code	Name of the Course	L	P	T	Total	L	P	T	Total	CIE [20]	ISE [20]	ESE [60]	CIE TW	ESE P	ESE OR	Total
3	OE-I	Foreign Language Studies (FLS)	-	-	2	2	-	-	2	2	-	-	-	50	-	-	50
4	OE-II	MOOCs	-	-	2	2	-	-	2	2			50	-	-	-	50
5	OE-III	MOOCs	-	-	2	2	-	-	2	2	-	-	50	-	-	-	50
6	OE-IV	MOOCs	-	-	2	2	-	-	2	2	-	-	50	-	-	-	50

Guidelines for MOOCs

1. The department shall release a list of approved SWAYAM-NPTEL courses before the commencement of every semester.
2. Students shall register for the approved Courses as per the schedule announced by SWAYAM-NPTEL.
3. A student shall undergo the courses only from the list notified by the department through SWAYAM/NPTEL platform and complete all the assignments and examination requirements as specified by SWAYAM/NPTEL.
4. SWAYAM-NPTEL Courses are considered for transfer of credits only if the student concerned has successfully completed and obtained the SWAYAM-NPTEL Certificate.
5. The credit equivalence for SWAYAM-NPTEL Courses: 12 weeks – 3 credits; 8 weeks – 2 credits; 4 weeks – 1 credit.
6. Equivalent marks will be considered for awarding the grades as specified in examination rules and regulations. The weightage for assignments is 40%, while the weightage for the proctored examination will be 60% for award calculating SGPA/CGPA. Students must score a minimum of 40% of the total marks by combining both assignments and proctored examinations
7. A student must submit the original SWAYAM-NPTEL Course Certificates to the Head of the Department concerned, with a written request for the transfer of the equivalent credits. On verification of the SWAYAM-NPTEL Course Certificates and approval by the head of the department, credits will be awarded.
8. The Institute shall not reimburse any fees/expenses a student may incur for the SWAYAM-NPTEL Courses.
9. If the SWAYAM/NPTEL course calendar does not align with the institute's calendar, the department shall facilitate and conduct examination of the relevant course of equivalent credits in physical/virtual mode and award the credits accordingly.

Guidelines for Evaluation

Continuous Internal Evaluation: (Weightage for Attendance: 5, Activity Based Learning Evaluation: 15)

The department shall declare the set of all applicable activities such as Problem Based Learning, Quizzes, Small Project, field work, group discussion, but not limited to etc. The course coordinator, in consultation with course teachers, shall select any two activities suitable for the course from the list declared by the department and get the selected activities approved from HoD. The Course teacher shall get the activities carried out by students, evaluate the student performance based on the prescribed rubrics. Department shall prepare the rubrics for all the activities and display the same before the commencement of academics.

In-Semester Examination: Written examination shall be conducted for one hour duration on First Module for 20 marks.

End-Semester Examination: Written examination shall be conducted for two- and half-hour duration on Modules II, III, IV for 60 marks.