Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

Curriculum Structure and Syllabus

of

Second Year B. Tech. Computer Engineering (Regional Language)

(Regulations 2023)

Effective from Academic Year 2024-25

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

EOMS Policy

“We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

We shall strive for technical development of students by creating globally competent and sensible engineers, researchers, and entrepreneurs through Quality Education.

We are committed for Institute’s social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS).”

Course Approval Summary

Board of Studies - Department of Computer Engineering (Regional Language)

Sr.No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Data Structure	BCER23PC01	11	
2	Data Structure Laboratory	BCER23PC02	13	
3	Microprocessor Architecture	BCER23PC03	16	
4	Microprocessor Architecture Laboratory	BCER23PC04	18	
5	Data Exploration and Visualization Laboratory	BCER23VS03	48	
6	Advanced Data Structure	BCER24PC01	56	
7	Advanced Data Structure Laboratory	BCER24PC02	58	
8	Database Management System	BCER24PC03	60	
9	Database Management System Laboratory	BCER24PC04	62	
10	Community Engagement Project (CEP) Field Project (FP)	BCER24EL01	46	

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Board of Studies – Applied Science and Humanities

Sr.No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Statistical Data Analysis using R	BSH23OE04	20	
2	Advanced Materials and Characterizations	BSH23OE05	22	
3	Neural Network and Fuzzy Logic Control	BSH23OE06	35	
4	Business Studies for Engineer	BSH23EM01	50	
5	Universal Human Values	BSH23VE01	52	
6	Applied Mathematics (Suggested for Mechanical branch)	BSH24OE01	64	
7	Computational Techniques (Suggested for E&TC branch)	BSH24OE02	66	
8	Applied Mathematics (Suggested for Civil branch)	BSH24OE03	68	
9	Computational Techniques (Suggested for Computer and IT branches)	BSH24OE07	70	
10	Mathematical Optimization (Suggested for CSE -AIML branch)	BSH24OE08	72	
11	Designing Thinking & Innovation Management	BSH24EM02	76	
12	Project Management	BSH24EM03	78	
13	Fostering Entrepreneurship and Startups	BSH24EM04	80	
14	Business finance for Engineers	BSH24EM05	82	
15	Professional Development Training	BSH24AE05	84	
16	Constitution of India	BSH24VE02	85	

Board of Studies – Civil Engineering

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	E-Waste Management	BCI23OE01	33	
2	Total Quality Management	BCI23OE02	44	
3	Building Services and Maintenance	BCI23OE03	45	

Board of Studies – Electronics & Telecommunication

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Electrical Machines	BET23OE01	24	
2	Introduction to Signals and Systems	BET23OE02	26	
3	Biology for Engineers	BET23OE03	37	

Board of Studies – Mechanical Engineering

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Material Science	BME23OE01	28	
2	Drawing for Engineers	BME23OE02	29	
3	Fundamentals of Mechanical Components and Systems	BME23OE03	31	
4	Industry 4.0	BME23OE04	41	
5	Energy Storage Management	BME23OE05	42	

Board of Studies – Computer Science and Engineering (AIML)

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	AI for Financial Modelling	BCS23OE01	39	

Board of Studies – Computer Engineering

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Android App Development with Kotlin	BCE23OE03	46	

Approved by Academic Council:

Chairman, Academic Council
Pimpri Chinchwad College of Engineering

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CURRICULUM FRAMEWORK
(Regulations 2023)

LIST OF ABBREVIATIONS

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Programme Core Course
4	PEC	Programme Elective Course
5	MDM	Multidisciplinary Minor
6	OEC	Open Elective Course
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Entrepreneurship/Economics/Management Course
10	IKS	Indian Knowledge System
11	VEC	Value Education Course
12	ELC	Experiential Learning Courses
13	LLC	Liberal Learning Courses

COURSE WISE CREDIT DISTRIBUTION

Sr. No.	Type of Course	No. of Courses	Total Credits	
			No.	%
1	Basic Science Course (BSC)	8	14	9
2	Engineering Core Course (ECC)	5	12	8
3	Programme Core Course (PCC)	22	44	28
4	Programme Elective Course (PEC)	10	20	13
5	Multidisciplinary Minor (MDM)	6	14	9
6	Open Elective Course (OEC)	4	8	5
7	Vocational and Skill Enhancement Course (VSEC)	4	8	5
8	Ability Enhancement Course (AEC)	2	4	3
9	Entrepreneurship/ Economics/ Management Course (HSSM)	2	4	3
10	Indian Knowledge System (IKS)	1	2	1
11	Value Education Course (VEC)	2	4	3
12	Experiential Learning Courses	5	22	14
13	Liberal Learning Courses	2	4	3
	Total	**73**	**160**	**100**

SEMESTER-WISE COURSE DISTRIBUTION

Course Distribution: Semester Wise										
Sr. No.	Type of Course	No. of Courses / Semester								Total
		1	2	3	4	5	6	7	8	
1.	Basic Science Course (BSC)	4	4	-	-	-	-	-	-	**8**
2.	Engineering Core Course (ECC)	3	2	-	-	-	-	-	-	**5**
3.	Programme Core Course (PCC)	-	1	4	4	5	4	4	-	**22**
4.	Programme Elective Course (PEC)	-	-	-	-	2	4	2	2	**10**
5.	Multidisciplinary Minor (MDM)	-	-	1	1	2	1	1	-	**6**
6.	Open Elective Course (OEC)	-	-	2	1	1	-	-	-	**4**
7.	Vocational and Skill Enhancement Course (VSEC)	1	1	-	1	-	1	-	-	**4**
8.	Ability Enhancement Course (AEC)	1	-	-	1	-	-	-	-	**2**
9.	Entrepreneurship/ Economics/ Management Course (HSSM)	-	-	1	1	-	-	-	-	**2**
10.	Indian Knowledge System (IKS)	-	1	-	-	-	-	-	-	**1**
11.	Value Education Course (VEC)	-	-	1	1	-	-	-	-	**2**
12.	Experiential Learning Courses	-	-	1	-	-	-	2	2	**5**
13.	Liberal Learning Courses	1	1	-	-	-	-	-	-	**2**
Total		**10**	**10**	**10**	**10**	**10**	**10**	**9**	**4**	**73**

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SEMESTER-WISE CREDIT DISTRIBUTION

Credit Distribution: Semester Wise										
Sr. No.	**Type of Course**	**No. of Credits / Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course (BSC)	7	7	-	-	-	-	-	-	**14**
2.	Engineering Core Course (ECC)	7	5	-	-	-	-	-	-	**12**
3.	Programme Core Course (PCC)	-	2	8	8	10	8	8	-	**44**
4.	Programme Elective Course (PEC)	-	-	-	-	4	8	4	4	**20**
5.	Multidisciplinary Minor (MDM)	-	-	2	2	4	2	4	-	**14**
6.	Open Elective Course (OEC)	-	-	4	2	2	-	-	-	**8**
7.	Vocational and Skill Enhancement Course (VSEC)	2	2	2	-	-	2	-	-	**8**
8.	Ability Enhancement Course (AEC)	2	-	-	2	-	-	-	-	**4**
9.	Entrepreneurship/ Economics/ Management Course (HSSM)	-	-	2	2	-	-	-	-	**4**
10.	Indian Knowledge System (IKS)	-	2	-	-	-	-	-	-	**2**
11.	Value Education Course (VEC)	-	-	2	2	-	-	-	-	**4**
12.	Experiential Learning Courses	-	-	-	2	-	-	4	16	**22**
13.	Liberal Learning Courses	2	2	-	-	-	-	-	-	**4**
Total		**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**160**

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Curriculum Structure
Second Year B. Tech.
Computer Engineering
(Regional Language)

CURRICULUM STRUCTURE

Second Year B.Tech. (Computer Engineering (Regional Language)) Semester – III

Second Year Computer Engineering (Regional Language) (Regulations 2023) (With effect from Academic Year 2024-25)															
Semester III															
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**			**Evaluation Scheme and Marks**						
									FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**FA1**	**FA2**					
BCER23PC01	Data Structures	3			3	3	-	-	20	20	60	-	-	-	**100**
BCER23PC02	Data Structures Laboratory		2		2	-	4	-	-	-	-	50	50	-	**100**
BCER23PC03	Microprocessor Architecture	2			2	2	-	-	10	10	30	-	-	-	**50**
BCER23PC04	Microprocessor Architecture Laboratory		1		1	-	2	-		-	-	50	-	-	**50**
–	OE -Engineering Sciences	2			2	2	-	-	10	10	30	-	-	-	**50**
–	OE - Department Specific Open Elective	2			2	2	-	-	10	10	30	-	-	-	**50**
–	Multidisciplinary Minor 1[#]	2			2	2	-	-	10	10	30	-	-	-	**50**
BCER23VS03	Data Exploration and Visualization Laboratory		2		2	-	4	-		-	-	50	50	-	**100**
BSH23EM01	EEM-I-Business studies for engineer	2			2	2	-	-	10	10	30	-	-	-	**50**
BSH23VE01	Universal Human Values	2			2	2	-	-	20	30		-	-	-	**50**
Total		**15**	**5**	**0**	**20**	**15**	**10**	**0**	**90**	**100**	**210**	**150**	**100**	**-**	**650**

[#]Refer separate booklet for Multidisciplinary Minor (MDM Courses)

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**–Formative Assessment, **SA** – Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

Note: - Exit Policy: Available as a separate document

List of courses – Open Elective Engineering Sciences

Course Code	Department	Course Name	
BSH23OE04	AS&H	Statistical Data Analysis using R	Choose any one
BSH23OE05	AS&H	Advanced Materials and Characterizations	
BET23OE01	E&TC	Electrical Machines	
BET23OE02	E&TC	Introduction to Signals and Systems	
BME23OE01	MECH	Material Science	
BME23OE02	MECH	Drawing for Engineers	
BME23OE03	MECH	Fundamentals of Mechanical Components and Systems	
BCI23OE01	CIVIL	E-Waste Management	

List of courses – Open Elective Department Specific

Course Code	Department	Course Name	
BSH23OE06	AS&H	Neural Network and Fuzzy Logic Control	Choose any one
BET23OE03	E&TC	Biology for Engineers	
BCS23OE01	CSE(AI&ML)	AI for Financial Modelling	
BME23OE04	MECH	Industry 4.0	
BME23OE05	MECH	Energy Storage Management	
BCI23OE02	CIVIL	Total Quality Management	
BCI23OE03	CIVIL	Building Services and Maintenance	
BCE23OE03	COMP	Android App Development with Kotlin	

Second Year B.Tech. (Computer Engineering (Regional Language)) Semester – IV

Second Year Computer Engineering (Regional Language) (Regulations 2023) (With effect from Academic Year 2024-25) Semester IV															
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**			**Evaluation Scheme and Marks**						
									FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**FA1**	**FA2**					
BCER24PC01	Advanced Data Structures	2			2	2	-	-	10	10	30	-	-	-	**50**
BCER24PC02	Advanced Data Structures Laboratory		1		1	-	2	-		-	-	25	25	-	**50**
BCER24PC03	Database Management System	3			3	3	-	-	20	20	60	-	-	-	**100**
BCER24PC04	Database Management System Laboratory		2		2	-	4	-		-	-	50	50	-	**100**
-	OE – Applied Mathematics	2			2	2	-	-	10	10	30	-	-	-	**50**
–	Multidisciplinary Minor 2[#]	2			2	2	-	-	10	10	30	-	-	-	**50**
BCER24EL01	Community Engagement Project (CEP) Field Project (FP)		2		2	-	4	-		-	-	100	-	-	**100**
–	EEM-II	2			2	2	-	-	10	10	30	-	-	-	**50**
BSH24AE05	Professional Development Training *		2		2		4	-				100	-	-	**100**
BSH24VE02	Constitution of India	2			2	2	-	-	20	30	-	-	-	-	**50**
Total		**13**	**7**	**0**	**20**	**13**	**14**	**0**	**80**	**90**	**180**	**275**	**75**		**700**

[#]Refer separate booklet for Multidisciplinary Minor (MDM Courses)
***Practical will be held division wise and not batch wise

L-Lecture, **P**-Practical, **T**-Tutorial, **FA –** Formative Assessment, **SA –** Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

Note: - Exit Policy: Available as a separate document

List of courses – Open Elective: Applied Mathematics

Course Code	Department	Course Name	
BSH24OE01	AS&H	Applied Mathematics (Suggested for Mechanical branch)	Choose any one
BSH24OE02		Computational Techniques (Suggested for E&TC branch)	
BSH24OE03		Applied Mathematics (Suggested for Civil branch)	
BSH24OE07		Computational Techniques (Suggested for Computer and IT branches)	
BSH24OE08		Mathematical Optimization (Suggested for CSE -AIML branch)	

List of courses – EEM Course – II

Course Code	Department	Course Name	
BSH24EM02	AS&H	Designing Thinking & Innovation Management	Choose any one
BSH24EM03		Project Management	
BSH24EM04		Fostering Entrepreneurship and Startups	
BSH24EM05		Business finance for engineers	

Course Syllabus
Semester III

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Data Structures					Code: BCER23PC01	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
03	03	-	-	20	20	60	100

Prior knowledge of
Decision control structures, loop control structures, arrays, functions, and structure
is essential

Course Objectives:
This course aims at enabling students:
1. To explore various sorting techniques and the concept of data structures
2. To gain knowledge about different types of Linked Lists
3. To elaborate the concepts of Stack with respect to problem solving
4. To elaborate the concepts of Queue with respect to problem solving
5. To demonstrate the hash table along with hash functions and various collision resolution techniques

Course Outcomes:
After learning the course, the students will be able to:
1. Apply the concepts of Sorting methods to solve real life problems
2. Apply the concepts of Linked Lists for problem solving
3. Apply the concepts of Stack for real life problem solving
4. Apply the concepts of Queue for real life problem solving
5. Understand various hash functions and collision resolution techniques of a hash table

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Data Structures and Sorting Methods:** Types of Data Structures - Linear & Nonlinear, Static & Dynamic; Algorithms: Characteristics of Algorithms; Time and Space Complexity; Sorting Techniques: Insertion Sort, Shell Sort, Radix Sort, Quick Sort, Merge Sort;	9
II	**Linked List:** Dynamic Memory Management; Basics of Linked List, Comparison of sequential and linked organizations, Types of linked list: Singly linked list, doubly linked list, Circular linked list; Various operations (insertion, deletion, searching, updating and printing) for linked list manipulation; Generalized linked list; Polynomial operations using linked list;	9
III	**Stack:** Stack as an ADT; Stack representation using array and linked list; Operations on Stack; Applications of Stack: Recursion, Parenthesis Checking, Infix to Postfix and Prefix conversion; Evaluation of Prefix and Postfix evaluation.	9
IV	**Queue:** Queue as an ADT; Queue representation using array and linked list; Types of Queues: Linear Queue, Circular Queue, Priority Queue, Double Ended Queue; Operation on Queue; Applications of Queue: Job Scheduling,	9

	Josephus problem	
V	**Hashing:** Hashing: Concepts - Hash table, issues in hashing, hash functions- properties of good hash function; Hash functions: division, multiplication, digit extraction, mid-square, folding and universal methods; Collision resolution strategies- open addressing and chaining; Extendible Hashing; Skip List;	9
Total		**45**

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, “Fundamentals of Data Structures in C++”, University Press(India) Pvt. Ltd., 2nd Edition, 2008, ISBN-10: 8173716064/ ISBN-13:978-8173716065.
2. Varsha H. Patil, “Data Structures using C++”, Oxford University Press, 1st Edition, 2012, ISBN-10: 0-19-806623-6/ ISBN-13: 978-0-19-806623-1.

Reference Books:

1. Y. Langsam, M. Augenstin and, A. Tannenbaum, “Data Structures using C & C++,” Pearson Education India, Second Edition,2015, ISBN 10: 9332549311, ISBN 13: 978-9332549319.
2. Richard F. Gilberg; Behrouz A. Forouzan, “Data Structures, Pseudo code Approach with C,” Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 ISBN 13: 9788131503140.

e-sources:

1. http://nsm.iitm.ac.in/cse/services/pds/
2. https://nptel.ac.in/courses/106102064
3. https://www.w3schools.com/dsa/dsa_intro.php

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Data Structures Laboratory					Code: BCER23PC02	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
02	-	04	-	50	-	50	100

Prior knowledge of

Decision control structures, loop control structures, arrays, functions, and structure

is essential

Course Objectives:

This course aims at enabling students:

1. To explore various sorting techniques and the concept of data structures
2. To gain knowledge about different types of Linked Lists
3. To elaborate the concepts of Stack with respect to problem solving
4. To elaborate the concepts of Queue with respect to problem solving
5. To demonstrate the hash table along with hash functions and various collision resolution techniques

Course Outcomes:

After learning the course, the students will be able to:

1. Apply the concepts of Sorting methods to solve real life problems
2. Implement solution to various real-life problems using Linked List
3. Use Stack data structures to solve real life problems
4. Apply the concepts of Queue for solving real life problems
5. Apply various hash functions and collision resolution techniques for a hash table

Guidelines for Students:

- The laboratory assignments are to be submitted by students in the form of a journal.
- Journal consists of prologue, certificate, table of contents and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, Assessment grade/marks and assessor's sign, Theory Concept, algorithm, time complexity, sample input and expected output, conclusion).

Guidelines for Laboratory/Term Work Assessment:

- Continuous assessment of laboratory work is to be done based on overall performance and Laboratory performance of students.
- Suggested parameters for overall assessment include timely completion, performance, innovation, efficiency, punctuality, and neatness
- Each Laboratory assignment will be assessed based on parameters with appropriate weightage.

Guidelines for Laboratory Conduction

- All assignments are mandatory.
- Student should be encouraged for appropriate use of Hungarian notation, proper indentation, and comments.
- Use of open-source software is to be encouraged.
- Operating System recommended: - 64-bit Open-source Linux or its derivative.
- Programming tools recommended: - G++/GCC, Eclipse.
- Debugging of existing code is to be encouraged
- Facilitate instruction on GitHub and GitBash by faculty prior to commencement of lab assignments.

Detailed Syllabus

Suggested List of Assignments

Assignment No.	Assignment Title

1.	Consider a student database of SY COMP class (at least 15 records). Database contains different fields of every student like Roll No, Name and SGPA. a. Design a roll call list, arrange list of students according to roll numbers in ascending order using Insertion Sort b. Arrange list of students alphabetically using shell sort c. Arrange list of students to find out first ten toppers from a class using Radix sort
2.	Consider Employee database of PCCOE (at least 20 records). Database contains different fields of every employee like EMP-ID, EMP-Name and EMP-Salary. a. Arrange list of employees according to EMP-ID in ascending order using Quick Sort b. Arrange list of Employee alphabetically using Merge Sort
3.	Consider the playlist in a music player. Implement a playlist feature in music player application using singly linked list. Each song in the playlist is represented as a node in the linked list. Each node contains information about the song (such as title or artist or duration, etc.). The playlist should allow users to: a. Add songs b. Remove songs c. Display the entire playlist d. Play specific songs
4.	Implement a simple text editor application using a doubly linked list to manage the text buffer. Text editor should support the following functionalities: a. Insert text b. Delete text c. Display text d. Search text e. Print text in reverse
5.	Implement a navigation system for a delivery service using a circular linked list to represent routes. The navigation system should support the following functionalities: a. Add route b. Remove route c. Display route
6.	Consider two polynomial expressions of any degree. Design solution to perform addition of these two polynomials with suitable data structure and display results.
7.	Implement a browser history management system using a stack data structure to track the user's browsing history. The system should support the following functionalities: a. Add visited page b. Navigate back c. View current page d. Check if history is empty or not Assume no upper bound on number of pages visited
8	Write a program to convert infix expression to postfix, infix expression to prefix and evaluation of postfix and prefix expression.

9	a. Implement a restaurant waitlist system using the queue data structure. Restaurant waitlist provide following facility: a. Add Party to Waitlist b. Seat Party c. Display Waitlist b. Implement a checkout system for a supermarket to efficiently manage customer queues during peak hours. The system should support the following operations using a circular queue data structure: a. Customer arrival b. Customer checkout c. Close Checkout Counter d. View customer
10	Implement a job scheduling system for a manufacturing plant using a double-ended queue. The system needs to efficiently manage the processing of jobs on various machines throughout the plant. Each job has a Job_priority. The system should support the following operations: a. Add Job b. Remove Job c. Display Job d. Search Job
11	Consider an employee database of N employees. Make use of a hash table implementation to quickly look up the employer's id number.

References:

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, “Fundamentals of Data Structures in C++,” University Press (India) Pvt. Ltd., 2nd Edition, 2008, ISBN-10: 8173716064/ ISBN-13:978-8173716065.
2. Varsha H. Patil, "Data Structures using C++", Oxford University Press, 1st Edition, 2012, ISBN-10: 0-19-806623-6/ ISBN13: 978-0-19-806623-1.

Reference Books:

1. Richard F. Gilberg & Behrouz A. Forouzan, “Data Structures, Pseudo code Approach with C,” Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 / ISBN 13: 9788131503140.
2. Y. Langsam, M. Augenstin and A. Tannenbaum, “Data Structures using C,” Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1.
3. G.A.V. PAI, “Data Structures and Algorithms, Concepts, Techniques and Applications,” Tata McGraw-Hill, Volume1 1st Edition, 2017. ISBN-10: 0070667268/ ISBN-13: 978-0070667266.
4. Y. Langsam, M. Augenstin and, A. Tannenbaum, “Data Structures using C & C++,” Pearson Education India, Second Edition,2015, ISBN 10: 9332549311, ISBN 13: 978-9332549319.

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Microprocessor Architecture					Code: BCER23PC03	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	10	10	30	50

Course Objectives:

This course aims at enabling students:

1. To understand basic architectural features of processor.
2. To learn and distinguish the architecture and programmer's model of 80386DX processor
3. To identify the system level features and processes of processor.
4. To acquaint the learner with application instruction set and logic to build Assembly Language Programs (ALP).

Course Outcomes:

After learning the course, the students will be able to:

1. Elaborate the architectural components of 80386dx microprocessor.
2. Explain different instructions of 80386dx instruction set.
3. Describe advanced features of 80386dx microprocessor.
4. Discuss the different elements of cache memory.

Detailed Syllabus

Unit	Description	Duration (H)
I	Evolution of Intel processor architecture- 4 bit to 64 bit performance assessment. Introduction to 80386dx Processor - 80386dx Features and Architecture Basic Programming Model- Memory Organization and Segmentation, Operating modes. Registers - General Registers, Segment Registers, Flags Register Addressing modes and Formats- Immediate, Direct, Indirect, Register, Register indirect, Displacement and stack Case Study-80386dx addressing modes	9
II	Instruction Set- Data Movement Instructions, Binary Arithmetic Instructions, Decimal Arithmetic Instructions, Logical Instructions, Control Transfer Instructions, String and character translation Instructions, Flag Control Instructions. Case Study Intel 8086/80386dx Instruction Set Systems Architecture	8
III	Protected Mode - Systems Registers (Systems flags, Memory Management registers, Control registers, Debug registers, Test registers), System Instructions Global Descriptor Table, Local Descriptor Table, Interrupt Descriptor Table, GDTR, LDTR, IDTR. Format of Descriptor and Selector, Segment Translation, Page Translation, Combining Segment and Page translation.	7
IV	Introduction to Pentium Processor and Multicore processor Architecture and Features. Cache memory unit – Concept of cache memory, Mapping methods, Replacement Algorithms, Fetch and write mechanisms, Organization of a cache memory unit.	6

Total	30

Text Books:

1. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2014 ISBN 0-07-100462-9.
2. A. Ray, K. Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming & Interfacing", Tata McGraw Hill, 2016, ISBN 0-07-463841-6.
3. James Turley, "Advanced 80386 Programming Techniques", McGraw-Hill, 3rd edition , 2015 ISBN 10:0078813425, 13:978-0078813429.
4. Introduction to 64 bit Intel Assembly Language Programming for Linux, 2nd Edition, 2012, Ray Seyfarth, ISBN10:1478119209, ISBN-13: 9781478119203

Reference Books:

1. Ray Seyfarth, "Introduction to 64-bit Intel Assembly Language Programming for Linux", 2nd Edition, 2014, ISBN 10: 1478119209, ISBN-13: 9781478119203.
2. Jeff Duntemann, "Assembly Language Step-by-step: Programming with Linux", Wiley, 3rd Edition, 2009, ISBN 10 0470497025, ISBN-13: 978-0470497029.
3. Chris H. Pappas, William H. Murray, "80386 Microprocessor Handbooks", McGraw-Hill Osborne Media,2nd edition 2010 ISBN-10: 0078812429, 13: 978-0078812422.
4. Mohammad Rafiquzzaman, "Microprocessors: Theory and Applications: Intel and Motorola", 2nd edition 2013 Prentice Hall, ISBN 10:0966498011, 13:978:0966498011

e-sources:

1. http://intel80386.com/386htm/toc.html
2. Intel 80386 Programmer's Reference Manual https://css.csail.mit.edu/6.858/2014/readings/i386.pdf

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Microprocessor Architecture Laboratory					Code: BCER23PC04	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
01	-	02	-	50	-	-	50

Course Objectives:

This course aims at enabling students:

1. To understand basic architectural features of processor.
2. To become familiar with Instruction set of 80386 Microprocessor
3. To provide practical hands-on experience with Assembly language programming.
4. Develop and Test Assembly language program to use 80386 instructions set.

Course Outcomes:

After learning the course, the students will be able to:

1. Use the NASM Assembler tool for 64-bit assembly programming.
2. Apply appropriate instructions of 80386 processor for assembly language programming.
3. Apply different system features of 80386 processor for assembly language programming.
4. Compare 80386 and ARM Processor with Real time applications.

Guidelines for Students:

1. The laboratory assignments are to be submitted by students in the form of a journal.
2. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment.
3. Each assignment write-up should have Title, Objectives, Out comes, Theory- Concept in brief, Algorithm, Flowchart, Testcases, Conclusion.

Guidelines for Laboratory/Term Work Assessment:

1. Continuous assessment of laboratory work is based on overall performance and Laboratory assignments performance of student.
2. Each Laboratory assignment assessment will assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality, and neatness.

Guidelines for Laboratory Conduction

1. Operating System: 64-bit Open-source Linux or its derivative.
2. Programming Tools: Preferably using Linux equivalent or MASM/TASM/NASM/FASM.

Detailed Syllabus

Suggested List of Assignments

Assignment No.	Assignment Title
1.	Using the concepts of Macro, syscall , data section and text section, develop X86/64-bit program.
2.	Develop X86/64-bit program to accept a string and to display its length.
3.	Develop X86/64-bit program to count number of positive and negative numbers from the array.
4.	Using logic of Hex to BCD conversion, develop X86/64-bit program to convert 4 bit Hex number to equivalent BCD number. Display proper strings to prompt the user while accepting the input and displaying the result. (Wherever necessary, use 64-bit registers).
5.	Develop X86/64-bit program to perform non-overlapped block transfer without string specific instructions. Block containing data can be defined in the data segment.

6.	Develop X86/64-bit program to perform overlapped block transfer with string specific instructions Block containing data can be defined in the data segment
7.	Develop X86/64-bit program to detect protected mode and display the values of GDTR, LDTR, IDTR, TR and MSW Registers
8	Case Study: ARM Processor Architectures, Features and Difference between ARM and 80386, Real time applications of ARM Processor.

References:

Text Books:

1. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 4th Edition, 2018 .
2. Ray, K. Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming & Interfacing", Tata McGraw Hill, 2016.
3. James Turley, "Advanced 80386 Programming Techniques", McGraw-Hill, 3rd edition , 2015
4. Ray Seyfarth, "Introduction to 64-bit Intel Assembly Language Programming for Linux", 2nd Edition, 2012, ISBN 10: 1478119209, ISBN-13: 9781478119203.

Reference Books:

1. Jeff Duntemann, "Assembly Language Step-by-step: Programming with Linux", Wiley, 3rd Edition, 2009, ISBN 10 0470497025, ISBN-13: 978-0470497029.
2. Brey, Barry B, "8086/8088, 80286, 80386 and 80486 Assembly Language Programming", 3rd edition 2005 Prentice Hall,ISBN: 13: 9780023142475.
3. Chris H. Pappas, William H. Murray, "80386 Microprocessor Handbooks", McGraw-Hill Osborne Media,2nd edition 2004 ISBN-10: 0078812429, 13: 978-0078812422.
4. Mohammad Rafiquzzaman, "Microprocessors: Theory and Applications: Intel and Motorola", 2nd edition 2007 PrenticeHall, ISBN 10:0966498011, 13:978:0966498011.

e-sources:

1. http://intel80386.com/386htm/toc.html
2. Intel 80386 Programmer's Reference Manual https://css.csail.mit.edu/6.858/2014/readings/i386.pdf
3. https://aws.amazon.com/solutions/case-studies/arm-limited-case-study/

"Knowledge Brings Freedom"

Program :	**B. Tech. (Computer Engineering (Regional Language))**	**Semester: III**	
Course :	**Statistical Data Analysis Using R (OE – Engineering Sciences) (Offered by AS&H)**	**Code :**	**BSH23OE04**

Credits	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
				FA		**SA**	**Total**
	Lecture	**Practical**	**Tutorial**	**FA1**	**FA2**		
2	2	-	-	10	10	30	50

Prior knowledge of: Basics of Statistics and Probability
is essential.

Course Objectives: After completion of the course, students will have an adequate background, conceptual clarity, and knowledge of mathematical principles related to data, preprocessing techniques for data visualization, and statistical techniques for prediction and decision-making.

Course Outcomes:
After learning the course, the students should be able to:

1. **Understand** the data and different R packages related to data science and its access.
2. **Make use of** data pre-processing methods and generate quality data for analysis.
3. **Apply** different data visualization techniques to understand the data.
4. **Analyze** the data for decision-making using statistical methods.

Detailed Syllabus:

Unit	**Description**	**Duration [Hrs]**
I	**Fundamentals of R Software for Data** Introduction to Data: Definition, Types and Properties, R Packages for Data Science, Importing and Exporting Data in R Software, Accessing Databases with R Software.	**7**
II	**Data Wrangling** Pre-processing Data in R Software, Dealing with Missing Values in R Software, Data Formatting in R Software, Data Normalization in R Software, Binning in R Software, and Conversion of type of data	**7**
III	**Data Visualization** Data visualization for various data categories like Categorical, Numerical, or both using plots like histograms, Bar/ Line Chart, Box Plots (including group-by option), Scatter Plots, Mosaic Plot, etc., and their interpretations	8
IV	**Data Analysis** Sampling, Descriptive Statistics, Linear regression, and Multiple linear regression. Model evaluation using visualization, prediction, and decision-making.	8
	Total	30

Reference Books:

1. Montgomery and Runger, “Applied Statistics and Probability for Engineers”, Wiley, India, 6 Edition, ISBN: 9788126562947.
2. R. Johnson, “Probability and Statistics for Engineers”, Prentice India Ltd, 8 Edition, ISBN 13:978-8120342132.
3. S.P. Gupta, “Statistical Methods”, Paperback publication, 43 edition, ISBN: 9788180549892, 8180549895.
4. Victor A. Bloomfield, “Using R for Numerical Analysis in Science and Engineering”, CRC Press, First Edition, ISBN: 9781315360492

e-sources:

NPTEL Course lectures links:

1. https://www.youtube.com/watch?v=VVYLpmKRfQ8&list=PL6C92B335BD4238AB (Probability)
2. https://nptel.ac.in/courses/111104100 (Introduction to R software)
3. https://www.youtube.com/watch?v=WbKiJe5OkUU&list=PLFW6lRTa1g83jjpIOte7RuEYCwOJa-6Gz (Descriptive statistics using R software)

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: III	
Course :	Advanced Materials and Characterizations (OE – Engineering Sciences) (Offered by AS&H)	Code :	BSH23OE05

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	10	10	30	50

Prior knowledge of basic physics, chemistry and nanotechnologyis essential**.**

Course Objectives: This course aims at enabling students,
1. To learn the principles of advanced materials, technologies and characterizations.
2. To undertake research projects with applications of advanced materials.

Course Outcomes:
After learning the course, the students should be able to:
1. Interpret structure, properties and applications of advance engineering materials.
2. Explain the properties and requirements of materials for some advanced applications
3. Analyze structural, optical, elemental & morphological properties of the materials
4. Interpret electrochemical & thermal properties of the materials

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Engineering Materials** Polymer Composite eg. fiber- reinforced polymer (FRP) composites Advanced carbon materials eg. Graphene & CNT Alloys: a] Nano alloy eg. Cu-Ni nano alloy b] Memory alloy-Nitinol CdSe Thin films for solar cells.	7
II	**Materials for Special applications** Battery and Supercapacitor: working principles, components, Superconductors, material requirement and properties of electrodes, electrolytes and spacers, metallic, nonmetallic and ceramic superconductors, Applications, Gas Sensing: working principle and required material properties. Substrate Materials for quantum computer, Invar and Elinvar Materials: properties and applications, 2D materials: properties and their applications	7
III	**Structural, Optical, Elemental & Morphological Characterizations** X-Ray Diffraction and phase identification, indexing lattice parameter determination, Grain size analysis, EDAX, Electron microscopy, scanning electron microscopy, Transmission electron microscopy (TEM), Fourier Transform Infrared Spectroscopy, Band gap measurements-UV Vis- IR Spectroscopy	8
IV	**Electrochemical Characterization** Cyclic voltammetry: Instrumentation, current-potential relation applicable for Linear Sweep Voltammetry (LSV) and Cyclic Voltammetry (CV), interpretation of cyclic voltammograms, charging-discharging behaviors of supercapacitor and batteries. **Thermal Analysis techniques:** Thermo-gravimetric analysis (TGA),Differential thermal analysis (DTA) analysis, Thermal expansion measurements, Thermal conductivity measurements, Ionic conductivity measurements. Specific heat capacity measurements, Debye temperature measurements	8
	Total	**30**

Reference Books:

1. Elements of X-ray Diffraction, B.D. Culity and S.R. Stock, Pearson Publication, Third edition 2014.
2. Introduction to Fuel Cells, Electrochemistry and Materials, San Ping Jiang, Qingfeng Li, SpringerPublication, 2022.
3. Solid State Physics, S.O.Pilli, New age, International Publication Tenth edition 2022.
4. Introduction to Solid State Physics, C. Kittle, 8th edition Wiley, 2005.
5. Introduction to Superconductivity, Michael Tinkham, 2nd edition, Dover Publication 2004.
6. Electrochemical super capacitors, B. E. Conway, Springer, 1999.
7. Spectroscopy, G.R. Chatwal and S.K. Ananad, Himalaya Publications, 2016.

8. Introduction to Thermal Analysis, M.E. Brown, Kluwer academic Publishers, 2nd edition 2001.
9. Electrochemical Methods: Fundamentals and Applications, A, J Bard, Allen J. Bard, Larry R. Faulkner, Henry S. White, John Wiley & Sons, 31 May 2022.
10. Microscopy A Very Short Introduction by Srivastava, Oxford University Press, 2015.
11. Practical Guide to materials Characterization, Khalid Sultan, Wiley-VCH, 2023
12. Engineering Chemistry by Wiley India Pvt.Ltd,First edition 2011.
13. Introduction to Nanotechnology by Charles P. Poole, Frank Owens, John Wiley & Sons (2003)

e-sources:

1. https://archive.nptel.ac.in/courses/113/106/113106034/

Program :	**B. Tech. (Computer Engineering (Regional Language))**	**Semester: III**	
Course :	**Electrical Machines (OE – Engineering Sciences) (Offered by E&TC)**	**Code :**	**BET23OE01**

Credits	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**FA**		**SA**	**Total**
				FA1	**FA2**		
2	**2**	-	**-**	**10**	**10**	**30**	**50**

Prior knowledge of Fundamental knowledge of electromagnetism & electrical parameters.

is essential.

Course Objectives:

This course aims at enabling students,

1. To impart basic knowledge for conceptual understanding of DC machines.
2. To explore the construction and performance characteristics of three phase AC machines.
3. To explore the construction and performance characteristics of single-phase AC machines.
4. To relate the applications of electrical machines to practical and industrial scenarios.

Course Outcomes:

After learning the course, the students should be able to:

1. Describe the constructional features and working principles of DC Machines.
2. Explain the constructional features and operation of three phase induction motors
3. Explain the constructional features and operation single phase induction motors
4. Relate the applications of electrical machines to their respective fields of study and industrial applications.

Detailed Syllabus:

Unit	**Description**	**Duration [Hrs]**
I	**Introduction to Electrical Machines:** Overview of electrical machines and their significance, Classification of electrical machines, Fundamental principles: Faraday's Law, Lenz's Law, and Electromagnetic Induction. **DC Machines** Working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics, Necessity of a starter for DC motor, Speed control methods of DC shunt and DC series motor and industrial applications.	8
II	**Three phase induction motor** – constructional features, working principle, Rotating magnetic field, slip ring and cage types. slip, phasor diagram, expression for mechanical power and torque, torque-slip characteristics, starting torque, full load and pull-out torque, equivalent circuit. Industrial applications.	7
III	**Single phase induction motors:** Construction of single-phase induction motor, double field revolving theory. Types of single-phase induction motors: Split phase and shaded pole type induction motors, applications. Specifications of induction motors (KW rating, rated voltage, current rating, frequency, speed, class of insulation)	8
IV	**Special Purpose Motors:** Construction, principle of working, characteristics ratings and applications of Brush less D.C. motors, Stepper motors (permanent magnet and variable reluctance type only), Permanent Magnet motor (A.C. & D.C.), SRM Switch reluctance motor.	7
	Total	**30**

Text Books:

1. V. N. Mittal and Arvind Mittal,“Basic Electrical Engineering” , 2nd Edition. (McGraw-Hill),2010
2. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010

Reference Books:

1. J.B. Gupta, "Theory and Performance of Electrical Machines," S.K. Kataria & Sons.
2. A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, "Electric Machinery," McGraw-Hill Education.
3. D. C. Kulshreshtha, “Basic Electrical Engineering" , 1st Edition (Tata McGraw hill),2009
4. B. L. Theraja and A. K. Theraja S. Chand & Co. Pvt. Ltd. New Delhi, “A textbook of Electrical Technology Vol II”,2020

e-sources:

1. Electrical Machines – I-https://onlinecourses.nptel.ac.in/noc20_ee60/preview
2. Electrical Machines – I-https://archive.nptel.ac.in/courses/108/105/108105017/

Program :	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course :	Introduction to Signals and Systems (OE – Engineering Sciences) (Offered by E&TC))					Code :	BET23OE02
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge of Linear Algebra & Differential Calculus **is essential.**

Course Objectives:

This course aims at enabling students,

1. To develop an understanding of students related to signal representation, classification, and operations.
2. To build the understanding of analyzing and classifying the systems and their applications
3. To apply the basic concept of Fourier transform and Laplace transform to the systems

Course Outcomes:

After learning the course, the students should be able to:

1. Represent, classify, and perform the operation on signals
2. Classify the system and utilize convolution for system analysis
3. Apply the basics of Fourier transform to analyze the signal in frequency domain
4. Apply the basics of the Laplace transform to analyze the signal in a complex frequency domain.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Introduction to Signals**: Representation of Standard signals, Classification of signals: Continuous-time and discrete-time signals, Periodic Signals and non-periodic, Operations on signals: Time shifting, Time reversal, Time scaling, Amplitude scaling, Signal addition, Subtraction, Signal multiplication.	07
II	**Introduction to System**: System Definition and Application, Classification of Systems: Continuous-time and Discrete-time systems, Linear and Non-Linear systems, Time variant and Time-invariant systems, Stable and Unstable systems, Causal systems, and non-causal systems. Convolution sum using graphical method.	07
III	**Fourier Transform**: Fourier Transform (FT) representation of aperiodic continuous time (CT) signals, Evaluation of magnitude and phase response, FT of standard CT signals, Application of Fourier transform	08
IV	**Laplace Transform and Z Transform**: Definition of Laplace Transform (LT), ROC, Laplace transform of standard periodic and aperiodic functions, Inverse Laplace transform, Application of Laplace transforms.	08
	Total	**30**

Text Books:

1. A.V. Oppenheim, A.S. Willsky ―Signals and systems‖, Prentice-Hall signal processing series. 2nd Edition, 2015
2. A. Nagoor Kanni ―Signals and Systems‖, McGraw Hill, 2nd Edition, 2017

Reference Books:

1. B P Lathi ―Linear Systems and Signals‖, Oxford University Press, Third Edition, 2017
2. Simon Haykins and Barry Van Veen ―Signals and Systems‖, Wiley India, 2nd Edition. 2017
3. M.J. Roberts ―Signal and Systems‖, Tata McGraw Hill, Third Edition ,2019.
4. Charles Phillips ―Signals, Systems and Transforms‖, Pearson Education, 4th Edition. 2013
5. R. J. Beerends, H. G. ter Morsche ―Fourier and Laplace Transforms‖ Cambridge University Press, 2003.
6. Shaila Dinkar Apte, Signals and System, Cambridge University Press, Edition 1, 2018

Online courses Links:

1. https://onlinecourses.nptel.ac.in/noc23_ee14/preview
2. https://www.classcentral.com/course/engineering-iitbombay-signals-and-systems-part-1-2679

Program :	B. Tech. (Computer Engineering (Regional Language))			Semester: III/IV			
Course :	Material Science (OE – Engineering Sciences) (Offered by Mechanical Engineering)			Code :	BME23OE01		
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prerequisite : Nil

Course Objectives:

This course aims at enabling students,

1. To Aquitaine students about materials, their properties, and structure property relationship.
2. To create awareness about the importance of materials information in engineering.

Course Outcomes:

After learning the course, the students should be able to:

1. Compare different materials based on their structures.
2. Relate the structure of materials with their properties.
3. Understand the structure and properties of metals, polymers, ceramics and composites.
4. Explore advanced materials in engineering applications.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	Introduction to materials: Classification of materials, structure of materials :Atomic structure, crystal structure and microstructure, material properties: Physical, Mechanical, Electrical, Magnetic etc.	8
II	Metals: Ferrous, non ferrous, alloys, structure and properties of commonly used metals, applications of metals in engineering.	7
III	Polymers: Structure of polymers and their properties, Thermoplastic and thermosetting plastics, advanced polymers such as temperature resistant polymers, shape change polymers, conducting polymers Ceramics: Structure of ceramics and their thermal, electrical and magnetic properties, applications of ceramics in engineering.	8
IV	Composites: Classification of composite materials and their applications. Advanced materials-shape memory alloy, hydrogel, thermo responsive, photo responsive, magneto responsive, piezoelectric materials, Processing of advanced materials such as semiconductors.	7
	Total	**30**

Text Books:

1. Material Science and Engineering An Introduction, William D. Callister, Wiley Publication,10th Edition 2009.
2. Material Science and Metallurgy, Dr. V. D. Kodgire, Everest publishing house, 45th Edition, 2021.

Reference Books:

1. Materials for Engineering, John Martin, Woodhead Publishing Limited, CRC Press, 3 rd Edition, 2006.

Online Courses:

1. NPTEL Course : Nature and properties of materials (https://onlinecourses.nptel.ac.in/noc20_me13/course)
2. NPTEL Course : Properties of materials (https://onlinecourses.nptel.ac.in/noc20_mm13/course)

Program:	B. Tech. (Computer Engineering (Regional Language))	Semester :	III
Course :	Drawing for Engineers (OE – Engineering Sciences) (Offered by Mechanical Engineering)	Code :	BME23OE02

Teaching Scheme				Evaluation Scheme			
				FA			
Lecture	Practical	Tutorial	Credit	FA1	FA2	SA	Total
2	-	-	2	10	10	30	50

Prerequisite: Nil-

Course Objectives:

1. Develop imagination of physical objects for communication of Engineering Drawing.
2. Develop the interpretation and manual drawing skills.
3. Develop the physical realization of the dimension of the objects.

Course Outcomes*:

After learning the course, students will be able to

1. **Understand** the basics of Engineering Graphics and **apply** the concepts in real life applications
2. **Analyze** 3D engineering objects and draw orthographic projections
3. **Analyze** 2D views of engineering objects and draw isometric views
4. **Analyze** 3D objects and draw development of lateral surfaces of solid

Detailed Syllabus

Unit	Description	Duration (H)
I	**Part A: Introduction to engineering drawing** **Importance of engineering drawing to Civil, Electrical, Electronics, IT and Computer Engineers**, introduction to drawing instrument and their uses, drawing sheet layout and its sizes, types of lines and their applications, dimensioning terminology and methods **Part B: Projection of Points, Lines and Planes** Projection: Introduction to projection and different methods of projections, Projection of Point: Introduction, Point situated in all the quadrants. Projection of lines: Introduction, Projection of lines. Projection of Planes: Introduction, Types of planes, Projection of planes. **CPU circuit diagram, Electrical/Electronic board circuit diagram, Building floor plan**	8
II	**Orthographic projections** Orthographic projection of given real life components by first angle method of projection, types of sections.	7
III	**Isometric view** Isometric axes, scale, difference between isometric projection and isometric view, isometric view of simple solids and its dimensioning.	8
IV	**Development of lateral surface of solids** Development of lateral surfaces of prism, pyramid, cylinder and cone. 3D and 2D drawing of branch specific industrial products and its lateral surface development.	7
	Total	**30**

Text Books:

1. Engineering Drawing with an introduction to AutoCAD- Dhananjay A. Jolhe, Revised Edition 2017, Tata McGraw Hill publishing company Ltd. New Delhi, India
2. Engineering Drawing, Plane and solid geometry- N. D.Bhatt, 54th edition 2023, Charotor publication house.

Reference Books:

1. Engineering Drawing- M.B Shah and B.C Rana, 2nd edition 2009, Pearson Publications.

2. Engineering Graphics- P.J. Shah, Revised edition 2019, S Chand Publications.
3. Fundamentals of Engineering Drawing- Warren J. Luzzader, 11th edition 2015, Prentice Hall of India New Delhi.
4. A text book of Engineering Drawing- R.K. Dhawan, Revised Edition 2019, S. Chand and company ltd. New Delhi, India

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: III	
Course :	Fundamentals of Mechanical Components and Systems (OE – Engineering Sciences) (Offered by Mechanical Engineering)	Code :	BME23OE03

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prerequisites: Nil

Course Objectives:

This course aims at enabling students,

1. Impart knowledge of mechanical engineering and describe the scope of mechanical engineering with multidisciplinary industries.
2. Impart knowledge of basic concepts of thermodynamics and heat transfer applied to industrial applications.
3. Understand, identify and get exposure to latest trends in manufacturing processes and materials.
4. Describe the fundamentals of automobile systems and the emerging trends of electric vehicles, hybrid electric vehicles and solar vehicles..

Course Outcomes:

After learning the course, the students should be able to:

1. **Identify** different materials and manufacturing processes for different applications.
2. **Apply** the fundamentals of thermodynamics and heat transfer to real life applications.
3. **Identify** the basic mechanical elements and the power transmission drives based on their applications.
4. **Comprehend** automotive system for the combustion vehicle, EV's, HEV's and solar vehicles..

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Materials and Manufacturing Engineering** Classification of materials, their properties and applications, phase change material (PCM), composite material. Introduction to manufacturing processes: classification and applications, sheet metal working and forging. Introduction to industry 4.0.	8
II	**Thermal Engineering** Introduction to thermodynamics: concept of a system, types of systems, energy interactions: heat and work, laws of thermodynamics, entropy, and modes of heat transfer, thermal resistance, insulation. Applications of hydraulic turbines, centrifugal pumps, compressor, household refrigerator, window and split air conditioner.	7
III	**Fundamentals of Design Engineering** Introduction to mechanical engineering: use of mechanical engineering in day to day life and its interdisciplinary use, Introduction to design thinking. Machine elements, power transmission drives and mechanisms.	8
IV	**Automotive Engineering** Classification of automobile, specifications of two wheeler, four wheeler and multi axle vehicles, types of chassis layout and drives, working of I.C. Engine, gear boxes, clutch, brakes, drive train system. Emission standards. Concept and environmental importance of electric vehicles (EV), construction and working of EV, hybrid electric vehicles (HEV) and solar vehicles, challenges and future scope of EV's and HEV's.	7
	Total	**30**

Text Books:

1. Basic Mechanical Engineering- Basant Agarwal and C. M. Agarwal, Wiley publication, First edition, (2008).
2. Engineering Thermodynamics- P. K. Nag, Tata McGraw-Hill publishing Co. Ltd., Sixth edition, (2017).
3. Heat and mass transfer- R. K. Rajput, S Chand publication, Revised edition, (2007).
4. A Textbook of Automobile Engineering- Khalil U Siddiqui, New Age International Publishers, Fifth edition, (2012).

Reference Books:

1. Design of Machine Elements- V. B. Bhandari, Tata McGraw-Hill publishing Co. Ltd., Fourth edition, (2017).
2. Theory of Machine- S. S. Ratan, Tata McGraw-Hill publishing Co. Ltd., Fifth edition, (2019).
3. Thermal Engineering- Arora and Domkunwar, Dhanpat Rai and Sons, Sixth edition, (2013).
4. Elements of Workshop Technology- Hajra, Chaudhari Volume I, Media Promoters and Publishers, Mumbai, Fourteenth edition, (2008).
5. Elements of Workshop Technology- Hajra, Chaudhari Volume II, Media Promoters and Publishers, Mumbai, Twelfth edition, (2007).
6. Handbook of Industry 4.0 and SMART Systems- Diego Galar Pascual, Pasquale Daponte, Uday Kumar, CRC Press, First edition, (2019).
7. Industry 4.0 - Dr. Bhushan Kelkar, Neuflex Publication, First edition, (2019).
8. Automobile Engineering Volume I- Dr. Kripal Singh, Standard Publishers Distributors, Eleventh edition, (2008).
9. Automation, production systems computer integrated manufacturing- Mikell Groover, Pearson Publication, Fourth edition, (2014).
10. Automotive Electrical Equipment- P. L. Kohli, McGraw Hill Education (India) Pvt Ltd., First edition, (2001).

PCCOE
"Knowledge Brings Freedom"

Program:	B. Tech. (Computer Engineering (Regional Language))			Semester:		III	
Course:	E-waste Management (OE – Engineering Sciences) (Offered by Civil Engineering))			Code:		BCI23OE01	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA 1	FA 2		
2	2	-	-	10	10	30	50

Prior Knowledge:

1. Fundamentals of environmental science.
2. Fundamentals of sustainable development.

Course Objectives: This course aims at enabling students,

1. To impart the knowledge of issues and challenges of e-waste management.
2. To create awareness of potential health effects and risk associated with e-waste.
3. To build knowledge of e-waste legislation (policy and guidelines)and circular economy.
4. To get acquainted with recycling, recovering and disposal techniques.

Course Outcomes: After learning the course, the students should be able to:

1. Identify the issues and challenges of e-waste management for a sustainable environment.
2. Analyze potential health effects and risk assessment.
3. Illustrate e-waste laws and guidelines and apply a circular economy road map for an e-waste sustainable future.
4. Identify the e-waste recycling, recovery and disposal techniques and its significance for a sustainable future.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Electronic Waste Management – Issues and Challenges:** Introduction to e-waste, classification and composition, need to manage / recycle, E-waste generation in India and comparison with world scenario; facts & figures, estimation of waste electronic and electrical equipment (WEEE), economic assessment of E-waste (Rare earth minerals, precious metals), effluents (solid, liquid and gas) generated during recycling, quantification of health hazard due to informal recycling of E-Waste,(Case study-based learning)	7
II	**E-Waste-Environmental and Public health issue:** Characteristics of Hazardous Substances, toxicity concerns, potential health effects and symptoms of long-term exposure, case study of heavy metal contamination due to E-Waste recycling, Introduction to risk assessment, epidemiologic data analysis and parameter for determining exposure and disease (numerical), classification of potential carcinogens, dose-response assessment, Potency Factor for Carcinogens (numerical), Hazard Index (HI) and Hazard Quotient (HQ) (numerical)	8
III	**E-waste (Management & Handling) Rules / Guidelines and circular economy:** Regulatory frameworks in India, objectives of e-waste rules, hazardous and other wastes (Management and Transboundary Movement) Rules, 2016, application of rules to stakeholders, objectives of e-waste rules, India's stand on liberalizing import rules, UN Sustainable Development Goals (SDGs) and e-Waste, circular economy startup in India with a case study.	7

IV	**Recycling and Recovery of Metals from Electronic Waste and disposal techniques:** E-waste recycling machineries, recycling process of E-Waste, existing E-Waste recycling Techniques, case study/ examples (metal recovery process), mechanism of extraction of precious metal from leaching solution, recovery of precious metals from solutions by solvent extraction, extraction of precious and rare earth metals from End-of- Life (EOL) electronic products, disposal techniques, role and responsibility of extended producers' responsibility (EPR), E-waste economy in the organized and unorganized sector, Case study on recycling and precious metal recovery from e-waste.	8
Total		**30**

Text Books:

1. E-waste management challenges and opportunities in India,Varsha Bhagat Ganguly, Routledge India, 1st edition 2021.
2. E-waste Management and procurement of Environment, Dr. Suresh Kumar and Dr. Jitendra Kumar Pradhan, Authorpress, 2021 edition.
3. E-waste in India: Management, challenges and opportunities (Volume I & II), Dr. Suresh Kumar, Authorspress, September, 2021 edition.

Reference Books:

1. Fowler B, Electronic Waste – 1st Edition (Toxicology and Public Health Issues), 2017 Elsevier
2. Johri R., E-waste: implications, regulations, and management in India and current global best practices, The Energy and Resources Institute (TERI)TERI Press, New Delhi, 2008.
3. The Complete Technology Book on E-Waste Recycling (Printed Circuit Board, LCD, Cell Phone, Battery, Computers), ASIA PACIFIC BUSINESS PRESS Inc., 2015.

e-Resources

1. https://cpcb.nic.in/e-waste/
2. https://courses.iid.org.in/course/e-waste-recycling-business
3. https://www.suritex.co.in/
4. http://greenscape-eco.com/
5. https://onlinecourses.nptel.ac.in/noc20_ce12/preview
6. https://nielit.gov.in/gangtok/content/paid-course-e-waste-management
7. https://www.semanticscholar.org/paper/Electronic-waste-management-Hester Harrison/bc34471b0f9d94b0656b43df6b322116f2a7175c

"Knowledge Brings Freedom"

Program:	B. Tech. (Computer Engineering (Regional Language))	Semester: III	
Course :	Neural Network and Fuzzy Logic Control (OE – Department Specific) (Offered by AS&H)	Code :	BSH23OE06

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior Knowledge: Nil

Course Objectives:

This course aims to enable students to get acquainted with,

1. Knowledge of Neural Networks and its use for controlling real-time systems.
2. Knowledge about fuzzy set theory to solve various engineering problems.

Course Outcomes:

After learning the course, the students will be able to:

1. Compute feedforward Artificial Neural Network output using basic concepts related to Artificial Neural Network.
2. **Apply** backpropagation and optimizer algorithms to update weights of Neural Networks and application-based problem-solving.
3. Find fuzzification and defuzzification of crisp function using basic Fuzzy set theory concepts.
4. **Apply** a fuzzy logic control system to handle uncertainty and some engineering problems.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Architecture of Neural Network:** Introduction, Biological Neural Network, Artificial Neural Network The architecture of Artificial Neural Networks- Bias, Activation Function, Learning Methods, Learning rules, Types of Neural Networks: Single-layer, multi-layer, feed-forward, and recurrent neural networks.	7
II	**Neural Networks For Control:** Loss function, Weight initialization, Optimizers algorithms, Backpropagation Algorithm, Associative Memory Networks and their types, Discrete-time hop field networks	8
III	**Fundamental of Fuzzy Logic:** Fundamental of Fuzzy Logic: Classical sets, Fuzzy Sets, Membership function, Cardinality of fuzzy set, Fuzzy complement, Fuzzy Composition, properties and operation on Fuzzy sets, Fuzzy Relation, Fuzzification, Defuzzification	7
IV	**Fuzzy Logic Control:** Fuzzy Rule, Decision-making Logic, Linguistic variables Fuzzy Inference System: Mamdani FIS, Sugeno FIS Design of fuzzy controller, fuzzy optimization, applications of FIS to some real-life problem	8
	Total	**30**

Text Books:

1. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to
2. Machine Intelligence", Prentice Hall, NewDelhi, 2004.
3. Ross T. J., "Fuzzy logic with engineering applications (Vol. 2)", New York:
4. Wiley, 2004, ISBN: 9783030375478

Reference Books:

1. Jack M. Zurada, “Introduction to Artificial Neural Systems,” PWS Publishing Co., Boston, 2002.
2. Zimmerman H.J., “Fuzzy set theory and its Applications,” Kluwer Academic Publishers Dordrecht, 2001.
3. Driankov, Hellendroonb, “Introduction to fuzzy control,” Narosa Publishers,2001.
4. G Klir, B Yuan, “Fuzzy sets and fuzzy logic: Theory and application,” PHI, ISBN:
5. LauranceFausett, Englewood Cliffs, N.J., “Fundamentals of Neural Networks,” PearsonEducation, New Delhi, 2008.
6. B Yegnanarayana: Artificial Neural Networks for pattern recognition, PHI Learning Pvt. Ltd., 14-Jan-2009

E-sources:

Online course “Fuzzy Logic and Neural Network” by Prof. Dilip Kumar Pratihar, IIT Kharagpur. https://nptel.ac.in/courses/127/105/127105006/

Program:	**B. Tech. (Computer Engineering (Regional Language))**	**Semester:**	**III**
Course :	**Biology for Engineers (OE – Department Specific) (Offered by E&TC))**	**Code :**	**BET23OE03**

Teaching Scheme				**Evaluation Scheme**						
Credit	**Theory**	**Practical**	**Total**	**FA**		**SA**	**TW**	**PR**	**OR**	**Total**
				FA1	**FA2**					
2	2	0	2	10	10	30	-	-	-	50

Pre-requisite: Basics of Human Anatomy and physiology
Basics of Electronics Engineering

Objectives:

1. To introduce biological engineering principles, procedures needed to solve real-world problems.
2. To provide an overview of human anatomy and physiology in order to support biomedical engineering solutions.
3. To introduce biomedical sensors, signal processing and diagnostic systems.
4. To provide a basic knowledge of the applications of biological systems in relevant industries.

Outcomes:

After completing the course the students should be able :

1. to understand basics of human physiological system and its cell functioning
2. to understand human immune system and significance of microbiology
3. to map role of biology in designing industrial applications
4. to understand biomedical sensors, its interfacing and related to measurement systems.

Detailed Syllabus:

Unit	**Description**	**Duration (Hrs)**
I	**CELL PHYSIOLOGY :** Introduction to the cell biology – Cell size and shape - Chemical composition - Classification of cell and its properties, Cell cycle; Cell signaling, Transport across cell membrane; Introduction to Human physiology – Circulatory system - Respiratory system - Excretory system - Nervous system.	08
II	**IMMUNOLOGICAL SCIENCE:** Immune system and its types; Functional properties of antibodies; Helper T cells and T cell activation; Importance of Microbiology.	07
III	**BIOLOGY AND ITS INDUSTRIAL APPLICATION:** Introduction : Bioreactors, biocontrol, biofilters, biopolymers, bioenergy, biomaterials, biochips, Nano-Biomolecules and its various types: Principles and Application of Biosensor; Basics of Biochips – Bio fertilizer – Bioinformatics – Bio fuel.	07
IV	**INTRODUCTION TO BIOMEDICAL INSTRUMENTATION:** Need and Challenges in measurement of the parameters in living systems, Source of bioelectric potential: Resting and action potential, propagation of action potential, depolarization and re-polarization. Introduction to few important bio-potential such as Electrocardiogram(ECG), Electroencephalogram(EEG) and Electromygram (EMG).	08
	Total	**30**

Text Books:

1. Dr. Sohini Singh and Dr. Tanu Allen, “Biology for Engineers”, Vayu Education Of India, New Delhi, 2014.

2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, 2nd edition,Prentice Hall of India

Reference Books:

1. Arthur T. Johnson, "Biology for Engineers" CRC Press, 2011.
2. Goldsby RA, Kindt TK, Osborne BA and Kuby J (2003) Immunology, 5th Edition, W.H. Freeman and Company, New York.
3. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
4. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012
5. John G. Webster(Editor), Amit J. Nimunkar (Editor), Medical Instrumentation: Application and Design,5th edition Wiley publication
6. Joseph H. Carr, John M. Brown, Introduction to Biomedical equipment Technology, 4edition , Pearson publication

Program:	B. Tech. (Computer Engineering (Regional Language))						Semester: III
Course:	AI for Financial Modelling (OE – Department Specific) (Offered by CSE(AI&ML)						Code: BCS23OE01
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	10	10	30	50

Course Objectives:

1. To understand the essentials of financial modeling
2. To learn to build a simple financial model.
3. To perform the analyses of financial models and Apply AI/ML methods for forecasting
4. To use AI enabled platforms for finance tasks
5. To learn feature engineering, EDA and understanding with regards to financial data

.

Course Outcomes:

After learning the course, the students will be able to:

1. To learn the essentials of financial modeling.
2. To build financial models and perform the analysis .
3. To apply AI/ML methods for financial forecasting.
4. To use AI enabled tools and platforms for finance tasks.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Financial Basics:** Introduction to financial statements: The Accounting Equation, Balance Sheet, Income Statement, Cash Flow Statement. Excel Basics - Formatting, Reports and Charts, Introduction to the Excel Model – Functions and features, building a financial forecasting model using excel..	7
II	**Financial Modeling and analysis:** Introduction to financial modeling, Build an integrated financial statement model, modeling of sales, modeling of taxes and payments, modeling of payroll, modeling of external services, profit and loss analysis, cash flow analysis, debt modeling and its analysis, Equity modeling and analysis	8

III	**AI for Finance:** Introduction to AI, Need, Visualization, EDA, Preprocessing and Feature Engineering of Financial Data with Python. Introduction to Responsible AI in Finance. Financial forecasting – Case study: Stock data preparation–time series analysis: univariate or multivariate, tree-based machine learning techniques of stock prediction, stock price prediction using ANN/DNN/ LSTM. Case study: Predicting currency exchange rates with multi-layer perceptron OR Case study: Loan Approval Prediction using Gradient Boosting classifier	8
IV	**AI enabled tools for finance:** Use cases for finance professionals for ChatGPT and AI-enabled tools - FinGPT, Use Case of Getting a Specific Accounting treatment using Prompt Strategy. Introducing ChatPDF and analyzing financial statement, Creating your own chatbot on accounting policies, Creating Sample Financial Models for decision making.	7
Total		**30**

TextBooks:

1. Yves Hilpisch, “Artificial Intelligence in Finance: A Python-Based Guide”, O’Reilly Media Inc., July 2019, ISBN: 9781492055433
2. Jannes Klaas, “Machine Learning for Finance”, Packt Publishing, 2019, ISBN: 9781789136364

Reference Books:

1. Edward P.K.Tsang, “AI for Finance”, Routledge Taylor and Francis, 1st Edition, 2023, ISBN 9781032384436

e-sources:

1. https://www.udemy.com/course/python-and-machine-learning-in-financial-analysis/
2. https://www.udemy.com/course/ai-for-finance/

"Knowledge Brings Freedom"

Program :	B. Tech. (Computer Engineering (Regional Language))			Semester: III	
Course :	Industry 4.0 (OE – Department Specific) (Offered by Mechanical Engineering)			Code :	BME23OE04

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge of Basic programming skills, Mathematical skills i**s essential.**

Course Objectives:

This course aims at enabling students,

1. To introduce revolutions of manufacturing industry
2. To introduce technological advancement in modern manufacturing industries
3. To Introduce concepts of smart manufacturing, emphasizing Industry 4.0 in manufacturing industries

Course Outcomes:

After learning the course, the students should be able to:

1. Correlate the recent manufacturing trends and technological pillars of Industry 4.0.
2. Apply pillars of Industry 4.0 to the manufacturing industry.
3. Adapt the changes in existing manufacturing practices and relate the role of industrial robotics and sensors.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Industrial revolution and current state of industry:** Overview of industrial revolution, Introduction to Automation, hard automation, soft automation, classification of production system, adaptive control, overview of terminologies like CAD, CAM, CAE, CAPP etc.	06
II	**Introduction to Industry 4.0:** Introduction to industry 4.0, need for Industry 4.0, Framework for Industry 4.0, technological pillars in industrial 4.0, applications, challenges and scope for industry 4.0	08
III	**Technological developments in Industry 4.0:** Introduction to Smart Manufacturing, overview of big data and analytic techniques, cyber security, Internet of things (IoT), Industrial Internet of things (IIoT), Cloud computing, artificial intelligence.	08
IV	**Robotics and Sensors:** Introduction to technological components of Robot, classification of sensors and its applications in Manufacturing industry, Role of robots in Industry 4.0, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics	08
	Total	**30**

Text Books:

1. Nine pillars of technologies for Industry 4.0, W. Leong, IET publishers, 2020
2. Industry 4.0, A. Gilchrist, Apress Publication, 2016
3. Industrial Automation: Hands On, Lamb, Frank. , McGraw-Hill Professional, 2013

Reference Books:

1. C. Schröder, The Challenges of Industry 4.0 for Small and Medium-sized Enterprises, 2021.
2. Chua C. K., Leong K. F., Lim C. S., Rapid Prototyping, World Scientific, 2012.
3. A. Nayyar and A. Kumar, A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development-Springer International Publishing, 2020. https://doi.org/10.1007/978-3-030-14544-6
4. K. Kumar, D. Zindani, J. P. Davim, Industry 4.0: Developments towards the Fourth Industrial Revolution, Springer Singapore, 2019.

E-sources:

1. https://nptel.ac.in/courses/108105063

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: III	
Course :	Energy Storage Management (OE – Department Specific) (Offered by Mechanical Engineering)	Code :	BME23OE05

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge of Fundamentals of Engineering and basic sciences **is essential.**

Course Objectives:

This course aims at enabling students,

1. To explore energy storage systems' fundamentals, technologies, and applications.
2. To enable students to understand the principles of energy storage systems design.
3. To provide a general awareness of energy storage audit, safety, and management.

Course Outcomes:

After learning the course, the students should be able to:

1. Differentiate and select energy storage systems based on performance and safety.
2. Select material and analyze the energy storage in thermochemical form.
3. Analyze energy storage system with batteries/supercapacitors/fuel cells.
4. Perform audit of Energy storage systems

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Energy storage system:** Introduction, Need, Modes, Energy storage devices, Merits, and Demerits of different types of Storage, utilization, and system applications. **Performance:** Energy capture rate and efficiency, Discharge rate and efficiency, Dispatch ability and load flowing characteristics, Scale flexibility, durability, Cycle lifetime, mass.	8
II	**Thermochemical storage –** Types, Phase Change Materials (PCMs) and classifications, properties of the PCMs for different temperature ranges, Selection criteria of PCMs for heating and cooling in buildings, Application of PCM in energy storage. SHS mediums, Energy analysis of the latent heat storage based on different systems	7
III	**Energy Storage for transportation:** Mechanical Design and Packaging of Battery, Packs for Electric Vehicles, Advanced Battery-Assisted Quick Charger for Electric Vehicles, Charging Optimization Methods for Li-ion Batteries, Thermal run-away for battery systems, State of Charge and Health Estimation Over the Battery Lifespan, Recycling of Batteries from Electric Vehicles **Fuel cell**: Operational principle, types, hybrid fuel cell-battery systems, hybrid fuel cell-supercapacitor systems,	8
IV	**Energy Storage Management** Relationship between economic growth and energy use, Energy demand analysis in different economic sectors, increase energy conversion efficiencies by introducing energy storage, Energy audit of energy storage system, The carbon markets, Safety: Risks of fire, explosion, toxicity, Ease of materials, recycling, and recovery, Environmental consideration, and recycling	7
	Total	**30**

Text Books:

1. A. R. Pendse, “Energy Storage Science and Technology,” SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011.
2. Jiujun Zhang, Lei Zhang, Hansan Liu, Andy Sun, Ru-Shi Liu, “Electrochemical Technologies for Energy Storage and Conversion,” John Wiley and Sons, 2012.
3. Lithium-Ion Batteries Basics and Applications by Reiner Korthauer, Springer.
4. Fuel cells from fundamentals to applications by Supramaniam Srinivasan, Springer.

Reference Books:

1. Frank S. Barnes and Jonah G. Levine, Large Energy Storage Systems Handbook (Mechanical and Aerospace Engineering Series), CRC press (2011)
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt,” Energy Storage in Power Systems” Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016.
3. Pistoia, Gianfranco, and Boryann Liaw. The behavior of Lithium-Ion Batteries in Electric Vehicles: Battery Health, Performance, Safety, and Cost. Springer International Publishing AG, 2018.
4. E. Lipman, A. Z. Weber, Fuel Cells and Hydrogen Production, A Volume in the Encyclopedia of Sustainab Science and Technology, Second Edition, Springer reference.
5. Handbook of Energy Audit by Sonal Desai Publisher Tata McGraw Hill.

PCCOE "Knowledge Brings Freedom"

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester :	III
Course:	Total Quality Management (OE – Department Specific) (Offered by Civil)					Code:	BCI23OE02
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior Knowledge: Basic definitions of Quality and importance of Quality in industry for safety and durability.

Course Objectives: After Completing this course, student will have adequate background :

1. To understand the importance of Quality in construction.
2. To understand the need of Total Quality management & it's tools.
3. To understand role of ISO in quality management.

Course Outcomes: After learning the course, the students should be able to:

1. Articulate quality and quality ideas as presented by many gurus and philosophers after learning.
2. Illustrate different quality control tools.
3. Apply ISO concepts and the cost of quality to quality assurance.
4. Analyze various techniques of TQM.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Unit I: Quality in Construction** a) Quality – Various definitions and interpretation. Importance of quality on a project in the context of global challenges, Factors affecting quality, Reasons for poor quality & measures to overcome, Contribution of various Quality Gurus (Juran, Deming, Crossby, Ishikawa), b) Evolution of TQM- QC, TQC, QA, QMS, TQM.	7
II	**Unit II: TQM, Six Sigma and QC tools** a) TQM – Necessity, advantages, Quality Function Deployment (QFD), b) Six sigma – Importance, levels, Application of 6 Sigma, c) Implementation of 7 QC tools through case study.	8
III	**Unit III: Cost of Quality and ISO** a) Categories of cost of Quality, b) Study of ISO 9001 principles., Quality manual – Importance, contents, documentation, Corrective and Preventive actions, Conformity and NC reports.	7
IV	**Unit IV: Techniques in TQM Implementation** a) Benchmarking in TQM, Kaizen in TQM, b) '5-S techniques, Zero Defects, c) Quality Circle Concept and applications through Quality Circle Formation.	8
Total		**30**

Text Books:

1. Total Quality Management-- Dr. Gunmala Suri and Dr. Puja Chhabra Sharma—Biztantra.
2. Quality Control and Total Quality Management by P.L.Jain- Tata McGraw Hill Publ.
3. Total Quality Management - Dr. S.Rajaram and Dr. M. Sivakumar—Biztantra.
4. Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.

Reference Books:

1. Juran's Quality Handbook – Juran Publication. (2016 Edition)
2. Management –Principal, process and practices by Bhat – Oxford University Press.(2008)
3. Financial management by Shrivastava- Oxford University Press (6th Edition 2022)
4. Management Information Systems – Gordon B. Davis, Margrethe H. Olson – Tata McGraw Hill Publ. Co. (2022)
5. Total Project Management – The Indian Context - P.K.Joy Macmillan India Ltd.

Program:	B. Tech. (Computer Engineering (Regional Language))			Semester:	III		
Course:	Building Services and Maintenance (OE – Department Specific) (Offered by Civil Department)			Code:	BCI23OE03		
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior Knowledge: NA

Course Objectives: This course aims at enabling students,

1. To impart knowledge about the building services
2. To examine the purpose and type of building maintenance.

Course Outcomes: After learning the course, the students should be able to:

1. Understand different building services provisions.
2. interpret the fundamental concepts relevant to functional requirement of building.
3. Relate the knowledge of Acoustic and Fire Protection.
4. Choose diverse maintenance methodologies applicable to building and infrastructure services.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Building Services:** Definitions, Objective and uses of services, different types of building, Classification of based on Occupancy, FSI, Carpet area, built-up area, Standard of Accommodation, Classification of building services, Types of services and selection of appropriate services for given project**,** case studies.	7
II	**Escalator and Plumbing-** Classification of different types of escalators, Lift codes and Rules, Design Features of Escalator, Plumbing- Common Sanitary Fixtures, Layout of Sanitary Fixtures, Water Pipe Sizing in Buildings, Building Services Detailing, Rain Water Harvesting, Sanitation in buildings.	8
III	**Acoustics and Ventilation-** Material properties, acoustical design of assembly halls and buildings, noise and its control, measuring equipment, Ventilation- Ventilation systems, health and comfort ventilation, Fire protection and National Building Codes 2016- requirements, equipment and their applications, security systems.	8
IV	**Building Maintenance:** Role of maintenance in durability and serviceability of structures, Economic aspects of maintenance, Different types of maintenance and audits process. **Infrastructures services:** Different types of structures, infrastructure services, case studies.	7
	Total	**30**

Text Books:

1. Building Construction Dr. B. C. Punmia Laxmi Publications (P) Ltd., New Delhi
2. Building Construction P. C. Varghese PHI Learning (P) Ltd., New Delhi
3. Building repair and Maintenance Management P. S. Gahlot CBS Publishers & Distribution(P) Ltd.

Reference Books:

1. Building Science & Planning by S.V. Deodhar, Khanna Publishers.
2. Design and Practical Hand Book on Plumbing by C.R Mohan, VivekAnand, Standard Publishers Distributors.
3. Hand book of Designing and Installation of Services in High Rise Building Complexes, by V.K. Jain, Khanna Publ

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Android App Development with Kotlin (OE – Department Specific) (Offered by Computer Engineering)					Code: BCE23OE03	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	10	10	30	50

Prior knowledge of Basic programming knowledge **is essential**

Course Objectives:

1. To explore Kotlin programming language features.
2. To familiarize with the concepts of Kotlin.
3. To get acquainted with Android features, networks, and data handling techniques.
4. To develop an Android app with testing.

Course Outcomes:

After learning the course, the students will be able to:

1. Explore object-oriented programming with Kotlin.
2. Illustrate the concept of Kotlin fundamentals
3. Apply the network handling and Android UI techniques.
4. Deploy the Android application with testing.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Kotlin programming language** Introduction to Kotlin programming language, Setting up Android Studio development environment, Basics of Kotlin syntax and basic programming concepts, Variables, data types, and operators in Kotlin.	6
II	**Kotlin fundamentals** Conditional statements, Loops, Functions, parameters, Kotlin collections, Classes and objects, Properties, fields, and methods, Inheritance, polymorphism, and interfaces, Data classes and sealed classes.	9
III	**Android architecture, Android UI and Networking** Android Architecture, Activities and life cycle, Views, View groups, fragments and lifecycle, Working with RESTful APIs and JSON data, Using Retrofit and OkHttp for network communication, Implementing LiveData and ViewModel, Asynchronous programming.	9
IV	**Android App Development and Testing** Case study: Picture gallery, Developing an App, Unit testing and UI testing with Junit and Espresso, Preparing and publishing app to Google Play store	6
Total		**30**

Text Books:

1. Laurence PO, Hinchman-Dominguez A, G. Blake Meike, Dunn M. “Programming Android with Kotlin”, O’Reilly Media, Inc.; 2021. ISBN:9781492063001
2. Lim G. “Beginning Android Development With Kotlin” Greg Lim; 2020. ISBN:9811477973, 9789811477973

Reference Books:

1. Trivedi Hardik. “Android application development with Kotlin”, BPB Publications; 2020.
2. Fazio M. “Kotlin and Android Development featuring Jetpack”, Pragmatic Bookshelf; 2021.

e-sources:

1. https://developer.android.com/

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Data Exploration and Visualization Laboratory					Code: BCER23VS03	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
02	-	04	-	50	-	50	100

Prior knowledge of:

1. Linear algebra
2. Programming Skills

is essential

Course Objectives:

This course aims at enabling students

1. To learn how to manipulate datasets using Python libraries.
2. To apply data pre-processing techniques and interpret through various graphs.
3. To build a strong statistical and algorithmic foundation to infer insights.

Course Outcomes:

After learning the course, the students will be able to:

1. Demonstrate Data Science tools and Environment.
2. Apply pre-processing techniques and visualize the data using Python libraries.
3. Analyze different types of data modeling algorithms.
4. Summarize the report on the Data Science application.

Guidelines for Students:

1. Laboratory Instructors may design a suitable set of assignments for each topic. All topics should be addressed. For every topic, at least three lab assignments should be framed and approved during the module meeting.
2. For each laboratory assignment, it is essential for students to write the title, aim, topic theory, algorithm, mathematical background, and data set description (as applicable).
3. Laboratory Journal- Program codes with sample output of all performed assignments are to be submitted as softcopy.
4. Term Work –Term work is a continuous assessment that evaluates a student's progress throughout the semester. Laboratory Instructors may design rubrics to assess assignments and mini-projects.
5. Practical Examination should be conducted on a given list of topics.

Detailed Syllabus

Suggested List of Assignments

Assignment No.	Assignment Title
1.	**Data Science Tools and Environment, Python programming basics** • Introduction to the laboratory environment (e.g., Jupyter Notebook, Python IDEs) • Introduction to the Data Science • Python Programming for Data Science • Python Data Structures • Introduction to data manipulation libraries (e.g., Pandas, NumPy, MatPlotlib)
2.	**Data Acquisition and Cleaning** • Data importing from various sources (CSV, JSON, SQL databases) • Data scraping techniques (web scraping, API integration) • Data cleaning and preprocessing (handling missing values, outliers, etc.)
3.	**Data Visualization and Exploratory Data Analysis (EDA)** • Data visualization libraries (e.g., Matplotlib, Seaborn)

	• Exploratory Data Analysis techniques (summary statistics, data distribution analysis, correlation analysis)
4.	**Statistical / Algorithmic Data Modeling** • Hypothesis testing, probability distributions, etc. • Basics of classification and regression algorithms • Model evaluation techniques (performance metrics) • Hands-on exercises with sci-kit-learn library
5.	**Mini-Project Development and Presentation** • Development of Mini-Project and its presentations diverse examples of case studies in data science for Mini-project Predictive Maintenance in Manufacturing, Churn Prediction in Telecom Industry, Fraud Detection in Financial Transactions, Healthcare Predictive Analytics, etc.

References:

Reference Books:

- Grus Joel, Data Science from Scratch, O'Reilly Media Inc., ISBN: 9781491901427
- McKinney Wes, Python for Data Analysis, O' Reilly media, ISBN: 978-1-449-31979-3. 4. Python

Web reference:

1. https://onlinecourses.nptel.ac.in/noc22_cs32/
2. https://www.coursera.org/specializations/introduction-data-science
3. https://www.linkedin.com/learning/topics/data-science
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/basics-of-data-visualization-for-data-science
5. https://www.simplilearn.com/data-science-free-course-for-beginners-skillup?source=SidebarWidget_SkillUp
6. https://www.scaler.com/topics/course/python-for-data-science/
7. https://www.mygreatlearning.com/data-science/free-courses
8. https://www.mygreatlearning.com/data-visualization/free-courses

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Business Studies for Engineers (Offered by AS&H)					Code: BSH23EM01	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	10	10	30	50

Course Objectives:
This course aims at enabling students:

1. To help the students to gain understanding of various perspectives in the field of Strategic Management
2. To enable the students to pursue the modern management practices in business.
3. To provide the students an understanding about tools and techniques of economic principles in business management.

Course Outcomes:
After learning the course, the students will be able to:

1. **Explain** the concept of Management and Strategic Management with their implications.
2. **Illustrate** the Management Trends and Practices implied in Global Work Culture.
3. **Apply** the economic variables in general business atmosphere.
4. **Analyze** th**e** business expansion strategies abroad and key issues related to their operations.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Management & Strategic Management: Journey towards Goals** Concepts of Management, Definition of Management, Functions of Management, Levels of Management, Concept of Strategic Management, Strategic Management Process- Vision, Mission, Goals, Objectives, Hierarchy of Objectives, Situational Analysis / Internal and External Analysis Organizational Goals, Planning Through MBO- Practical Insights, Michael Porter 5 Forces Analysis, Balanced Score Card (BSC), BSC v/s MBO. Case Studies: Starbucks Corporation, TATA Steel.	7
II	**Management Trends and Practices - Let Us Explore** Comparative Management Styles and approaches - Japanese Management Practices, Organizational Creativity, and Innovation - Management of Innovation - Entrepreneurial Management - Benchmarking - Best Management Practices across the world, - Management of Diversity - Select cases of Domestic & International Corporations.	7
III	**Business Economics – The Road Map** Concept and Definition of Micro Economics and Macro Economics, Nature & Scope, Demand, Supply and Market equilibrium: Individual demand, Market demand, Individual supply, Market supply, Market equilibrium; Elasticity is of demand and supply; Price elasticity of demand, Income elasticity of demand, Cross price elasticity of demand, Elasticity of supply, Business cycle, Demographic Profile of Indian Population and Market, Urbanization	8
IV	**International Business –Let Us Go Global** Basic concept, Decision framework, Analyzing marketing opportunities –	8

	collection and analysis of marketing information, Modes of entering overseas markets, International Marketing process and techniques – direct exporting, Indirect exporting, counter trade, Licensing, Sub- contracting, Joint – ventures, Organization and control of international marketing operations, International tendering, Procurement for export; Export information system Global Business Environment, Innovation and International management, managing multinational market, Research Methods in International Business (RMIB).	
Total		**30**

Text Books:

1. George R. Terry, Stephen G. Franklin; Principles of Management, A.I.T.B.S. Publishers

Reference Books:

1. Dinesh Madan, Strategic Management A Complete Reference, Aldine CA
2. Nadar .E.Narayanan Vijayan S,, Managerial Economics, PHI learning
3. Charles W. L. Hill, International Business,Mc,Graw Hill.

e-sources: https://openstax.org/books/principles-management/pages/references

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: III	
Course:	Universal Human Values (VEC-1) (Offered by AS&H)					Code: BSH23VE01	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	20	30	-	50

Course Objectives:

This course aims at enabling students,

1. To 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 to lead their personal and professional lives in an ethical way.
3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior, and mutually enriching interaction with nature.

Course Outcomes:

After learning the course, the students should be able to:

1. **Understand** the relevance of 'Universal Human Values'.
2. **Interpret** the concepts of 'Self' & 'Body'.
3. **Apply** the sense of harmony in family and society.
4. **Take part** in maintaining coexistence with nature by integrating Universal Human Values into personal and professional lives.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Value Education:** ● Understanding Value Education ● Self-exploration as the Process for Value Education ● Continuous Happiness and Prosperity ● Right Understanding ● Current Scenario ● Method to fulfil the Basic Human Aspirations	3
	Practice Session: ● Sharing about Oneself ● Exploring Human Consciousness ● Exploring Natural Acceptance **Experiential Learning** • **Seva Activity**	3
II	**Harmony in the Human Being:** ● Human being as the Co-existence of the Self and the Body ● Needs of the Self and the Body ● The Body as an Instrument of the Self	3

	• Understanding Harmony in the Self • Harmony of the Self with the Body • Programme to ensure self-regulation and Health	
	Practice Session: • Exploring the difference of Needs of Self and Body • Exploring Sources of Imagination in the Self • Exploring Harmony of Self with the Body **Experiential Learning** • **Seva Activity** • **Health Awareness Programme.**	3
III	**Harmony in the Family and in Society;** • Harmony in the Family • 'Trust'—the Foundational Value in Relationship • 'Respect' – as the Right Evaluation • Values in Human-to-Human Relationship • Understanding Harmony in the Society • Vision for the Universal Human Order • Human Order Five Dimensions	4
	Practice Session: • Exploring the Feeling of Trust • Exploring the Feeling of Respect and Exploring Systems to Fulfil Human Goal **Experiential Learning** • **Seva Activity**	4
IV	**Harmony in Nature/Existence:** • Understanding Harmony in Nature, • Realizing Existence as Coexistence at All Levels • The Holistic Perception of Harmony in Existence **Implications of Holistic Understanding: A Look at Professional Ethics:** • Definitiveness of (Ethical) Human Conduct • A Basis for Humanistic Education • Humanistic Constitution and Universal Human Order, • Competence in Professional Ethics • Holistic Technologies • Production Systems and Management Models-Typical Case Studies • Strategies for Transition towards Value-based Life and Profession.	6
	Practice Session: • Exploring the Four Orders of Nature • Exploring Co-existence in Existence • Exploring Ethical Human Conduct • Exploring Humanistic Models in Education • Exploring Steps of Transition towards Universal Human Order **Experiential Learning Activity**	4

	• Health Awareness Programme/Waste Management Programme (Hospital Waste/Pharmaceutical Industrial Waste/Reduce Plastic Waste / E-Waste Management)	
Total		**30**

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2019, A Foundation Course in HUMAN VALUES and Professional Ethics- Presenting a universal approach to value education through self-exploration, Excel Books

Reference Books:

1. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
2. A. Nagaraj, 1999, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak,
3. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
4. E. G. Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
5. M. Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics and Human Values, Eastern Economy Edition, Prentice Hall of India Ltd.
6. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
7. L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

e-sources:

1. http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/
2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
3. https://youtu.be/OgdNx0X923I

Course Syllabus
Semester IV

<table>
<tr><td>Program:</td><td colspan="6">B. Tech. (Computer Engineering (Regional Language))</td><td colspan="2">Semester: IV</td></tr>
<tr><td>Course:</td><td colspan="6">Advanced Data Structures</td><td colspan="2">Code: BCER24PC01</td></tr>
<tr><td rowspan="3">Credit</td><td colspan="3">Teaching Scheme (Hrs./Week)</td><td colspan="4">Evaluation Scheme and Marks</td></tr>
<tr><td rowspan="2">Lecture</td><td rowspan="2">Practical</td><td rowspan="2">Tutorial</td><td colspan="2">FA</td><td rowspan="2">SA</td><td rowspan="2">Total</td></tr>
<tr><td>FA1</td><td>FA2</td></tr>
<tr><td>02</td><td>02</td><td>-</td><td></td><td>10</td><td>10</td><td>30</td><td>50</td></tr>
<tr><td colspan="8">Prior knowledge of
Linear Data Structures is essential</td></tr>
<tr><td colspan="8">Course Objectives:
This course aims at enabling students:
1. To understand tree data structures and corresponding operations
2. To apply the knowledge of Balanced Trees to solve real life problems
3. To solve real life problems using Graph data structures
4. To understand the concepts of multi-way and self-balanced search trees</td></tr>
<tr><td colspan="8">Course Outcomes:
After learning the course, the students will be able to:
1. Apply the concepts of Binary Trees for problem solving
2. Apply the concepts of advanced binary trees for various problem solving
3. Apply the concepts of Graphs for solving real life problems
4. Understand the concepts of advanced search trees.</td></tr>
<tr><td colspan="8">Detailed Syllabus</td></tr>
<tr><td>Unit</td><td colspan="6">Description</td><td>Duration (H)</td></tr>
<tr><td>I</td><td colspan="6">Introduction to Tree: Basic terminologies, representation using array and linked list, Introduction to Binary Tree; Properties of Binary Tree; Operations on Binary tree: Finding Height, Finding Leaf nodes, counting no of Nodes; Recursive and Nonrecursive traversals; Construction of Binary Tree from traversals; Binary Search tree (BST) as an ADT: Insertion, deletion and searching of a node from BST.</td><td>8</td></tr>
<tr><td>II</td><td colspan="6">Balanced Trees and Heap:
Threaded Binary tree (TBT): Creation and traversals on TBT. Max Heap and Min Heap using Binary Tree; Height balanced Tree: AVL Tree – insertion, deletion and searching on AVL Tree; Weight Balanced Tree;</td><td>7</td></tr>
<tr><td>III</td><td colspan="6">Introduction to Graph: Basic concept, Graph Storage Representation using Adjacency List and Adjacency Matrix; Traversals of Graphs: Depth First Search and Breadth First Search; Finding Minimum Spanning Tree using Prim’s and Kruskal’s algorithms; Topological Sorting, Finding Shortest Path using Dijkstra’s Algorithm;</td><td>8</td></tr>
<tr><td>IV</td><td colspan="6">Indexing and Multiway Trees: Indexing: Introduction, Indexing techniques; B-Tree, B+ Tree; Red Black Tree; AA Tree; Splay Tree;</td><td>7</td></tr>
<tr><td colspan="7">Total</td><td>30</td></tr>
</table>

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, “Fundamentals of Data Structures in C++”, University Press (India) Pvt. Ltd., 2nd Edition, 2008, ISBN-10: 8173716064/ ISBN-13:978-8173716065.
2. Varsha H. Patil, “Data Structures using C++”; Oxford University Press, 1st Edition, 2012, ISBN-10: 0-19-806623-6/ ISBN-13: 978-0-19-806623-1.

Reference Books:

1. Y. Langsam, M. Augenstin and, A. Tannenbaum, “Data Structures using C & C++”, Pearson Education India, Second Edition,2015, ISBN 10: 9332549311, ISBN 13: 978-9332549319.
2. Richard F. Gilberg, Behrouz A. Forouzan, “Data Structures, Pseudo code Approach with C”, Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 ISBN 13: 9788131503140.

e-sources:

1. http://nsm.iitm.ac.in/cse/services/pds/
2. https://nptel.ac.in/courses/106102064
3. https://www.w3schools.com/dsa/dsa_intro.php

PCCOE "Knowledge Brings Freedom"

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: IV	
Course:	Advanced Data Structures Laboratory					Code: BCER24PC02	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
01	-	02	-	25	-	25	50

Prior knowledge of

Decision control structures, loop control structures, arrays, Functions, structure, pointers, and linear data structure

is essential

Course Objectives:

This course aims at enabling students:

1. To understand tree data structures and corresponding operations
2. To apply the knowledge of Balanced Trees to solve real life problems
3. To solve real life problems using Graph data structures
4. To understand the concepts of multi-way and self-balanced search trees

Course Outcomes:

After learning the course, the students will be able to:

1. Apply the concepts of Binary Trees for problem solving
2. Apply the concepts of advanced binary trees for various problem solving
3. Apply the concepts of Graphs for solving real life problems
4. Apply the concepts of advanced search trees.

Guidelines for Students:

- The laboratory assignments are to be submitted by students in the form of a journal.
- Journal consists of prologue, certificate, table of contents and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, Assessment grade/marks and assessor's sign, Theory Concept, algorithm, time complexity, sample input and expected output, conclusion).

Guidelines for Laboratory/Term Work Assessment:

- Continuous assessment of laboratory work is to be done based on overall performance and Laboratory performance of students.
- Suggested parameters for overall assessment include timely completion, performance, innovation, efficiency, punctuality, and neatness
- Each Laboratory assignment will be assessed based on parameters with appropriate weightage.

Guidelines for Laboratory Conduction

- All assignments are mandatory.
- Student should be encouraged for appropriate use of Hungarian notation, proper indentation, and comments.
- Use of open-source software is to be encouraged.
- Operating System recommended: - 64-bit Open-source Linux or its derivative.
- Programming tools recommended: - G++/GCC, Eclipse.
- Debugging of existing code is to be encouraged
- Facilitate instruction on GitHub and GitBash by faculty prior to commencement of lab assignments.

Detailed Syllabus	
Suggested List of Assignments	
Assignment No.	**Assignment Title**
1.	Consider the Dictionary Implementations which allow for efficient storage and retrieval of key-value pairs using binary search trees. Each node in the tree store (key, value) pair. The dictionary should support the following operations efficiently: 1. Insert word (Handle insertion of duplicate entry) 2. Delete word 3. Search specific word 4. Display dictionary (Traversal) 5. Mirror image of dictionary 6. Create a copy of dictionary 7. Display dictionary level wise
2.	Implement a multiplayer game system that uses an AVL tree data structure to organize and manage player data efficiently. The multiplayer game supports multiple players participating simultaneously, and the AVL tree is used to store player information such as player_id and scores (key, value pair). The system should provide following operation: 1. Player Registration 2. Leaderboard Display 3. Remove player from game
3.	Consider the scenario of a maze. The maze is represented as a grid of cells, where each cell can be either open or blocked. Each cell in the maze represents a vertex. The goal is to find a path from the starting point to the goal within a given maze using DFS and BFS.
4.	Represent a graph of your college campus using adjacency list /adjacency matrix. Nodes should represent the various departments and links should represent the distance between them. Find a minimum spanning tree using Kruskal's algorithm or using Prim's algorithm.
5.	Consider the scenario of the supply chain management system. The supply chain involves multiple locations, such as suppliers, warehouses, distribution centers, and retail stores, connected by transportation networks. Find the shortest possible route using Dijkstra's algorithm to optimize transportation path and inventory management.
6.	a. Implement B-Tree of order three and perform following operations: 1. Insert 2. Level order display 3. Delete b. Implement the scenario of a file system which maintains directory structure using the Red-Black Tree. Each node in the tree represents a directory, and the tree is balanced to ensure efficient insertion, deletion, and display operations when navigating through the file system.

References:

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", University Press (India) Pvt. Ltd., 2nd Edition, 2008, ISBN-10: 8173716064/ ISBN-13:978-8173716065.
2. Varsha H. Patil, Data Structures using C++; Oxford University Press, 1st Edition, 2012, ISBN-10: 0-19-806623-6/ ISBN-13: 978-0-19-806623-1.

Reference Books:

1. Aho V Alfred, Hapcroft E John, Ullman D Jeffry, Data Structures and Algorithms, 1st Edition, Pearson Education, 2002.
2. Y. Langsam, M. Augenstin and, A. Tannenbaum, "Data Structures using C & C++" , Pearson Education India, Second Edition,2015, ISBN 10: 9332549311, ISBN 13: 978-9332549319.
3. Richard F. Gilberg; Behrouz A. Forouzan, "Data Structures, Pseudo code Approach with C", Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 ISBN 13: 9788131503140.

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: IV	
Course:	Database Management System					Code: BCER24PC03	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
03	03	-	-	20	20	60	100

Prior knowledge of
basic Mathematics
is essential

Course Objectives:
This course aims at enabling students:
1. To make students understand the fundamental concepts of database management.
2. To make students familiar with building database design.
3. To make students familiar with the basic issues of transaction processing and concurrency control.
4. To make students understand different SQL queries and concepts.
5. To make students understand different NOSQL and MongoDB concepts.

Course Outcomes:
After learning the course, the students will be able to:
1. Design E-R Model for given requirements and convert the same into database tables
2. Use SQL to write queries for given requirements
3. Implement normalization techniques, to construct optimized relational database designs
4. Analyze and implement transaction management strategies
5. Apply principles of NoSQL and MongoDB databases to perform the operations on databases

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Database System and ER Modeling:** Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.	9
II	**SQL:** SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Updating, SQL DML Queries: SELECT Query and clauses, Views: Creating, Dropping, Updating using Indexes, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, SQL Functions, Nested Queries,	9
III	**Relational Database Design:** Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints,	9

	Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, 2NF, 3NF, BCNF.	
IV	**Database Transaction Management:** Transaction concept, Transaction states, ACID properties, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Lock-based, Time-stamp based Deadlock handling, Recovery methods: Shadow- Paging and Log-Based Recovery	9
V	**NoSQL Databases**: Introduction to Distributed Database System- Advantages, disadvantages, CAP Theorem. Types of Data: Structured, Unstructured data & Semi-Structured Data; NoSQL Database: Introduction, need, Features, Types of NoSQL Databases: Key-value store, document store, graph, wide column stores; BASE Properties, Data Consistency model ACID Vs BASE, Comparative study of RDBMS and NoSQL, MongoDB (with syntax and usage): CRUD Operations, Indexing, Aggregation, MapReduce, Replication, Sharding.	9
Total		**45**

Text Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, 7th Edition, 2020 ISBN 978-0-07-802215-9.
2. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2014 ISBN: 9788176569644.
3. Connally T, Begg C., "Database Systems- A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2010, ISBN 81-7808-861-4.
4. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN 10: 0321826620, 2013, ISBN 13: 978-0321826626.

Reference Books:

1. C. J. Date, "An Introduction to Database Systems", Addison-Wesley, 8th Edition, 2004, ISBN 0321189566. S. K. Singh, "Database Systems: Concepts, Design and Application", Pearson Education, 2009, ISBN 9788177585674.Kristina Chodorow, Michael Dierolf, "MongoDB: The Definitive Guide", O‟Reilly Publications, 3rd Edition, 2019 ISBN 9781491954461.
2. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereo Pty Limited, 2011, ISBN 1743045743, 9781743045749.

e-sources: http://w3schools.org/

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: IV	
Course:	Database Management System Laboratory					Code: BCER24PC04	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
02	-	04	-	50	-	50	100

Course Objectives:

This course aims at enabling students:

1. To make students familiar with building good database design.
2. To make students understand different SQL queries and concepts.
3. To make students understand different NoSQL-MongoDB queries

Course Outcomes:

After learning the course, the students will be able to:

1. Design E-R Model for given requirements, convert the same into database tables and propose the optimized database design
2. Use SQL to write queries for given requirements.
3. Apply principles of NoSQL and MongoDB databases to perform the operations on databases.

Guidelines to Instructor for laboratory Conduction:

1. Instructor must frame assignments on all concepts covered in Group A and Group B.
2. Instructor will design the queries which demonstrate the use of concepts specified in the assignment.
3. Operating System recommended: - 64-bit Open-source Linux or its derivative.
4. Programming tools recommended: - MYSQL, MongoDB, ERD plus, ER Win etc.

Guidelines for Laboratory/Term Work Assessment:

1. Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student.
2. Each Laboratory assignment submitted by students will be assessed and marks will be assigned by the instructor based on parameters mentioned in predefined rubrics. Average of marks obtained by students for each assignment will be considered to assign final TW marks.
3. Practical examination will be on assignments given in Group A and Group B

Detailed Syllabus

Suggested List of Assignments

GROUP A - SQL

Assignment No.	Assignment Title
1.	Decide a real time application and formulate a problem statement for the application to be developed. Propose a Conceptual Design using ER features using tools like ERD plus, ER Win etc. (Identifying entities, relationships between entities, attributes, keys, cardinalities, generalization, specialization etc.) Convert the ER diagram into tables on paper and propose an optimal database design using different normalization concepts.
2.	**MySQL Database Operations** Implement SQL queries to familiarize students with essential SQL commands in MySQL - to create a new user, create a table considering different data types, Insert, Select, Update, Delete, Drop, Alter, distinct, describe, Truncate command.
3.	**Implementing Data Constraints in MySQL** Implement sql queries to provide students with hands-on experience in implementing various data constraints using SQL commands in MySQL. (NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, and DEFAULT)

4.	**Exploring SQL Computations done on Table Data and Built-in Functions in MySQL** Implement sql queries for different SQL concepts for SQL computation (arithmetic operators, logical operators, pattern matching, IN and NOT IN predicates, and MySQL built-in functions).
5.	**Exploring SQL Grouping, Database Views** Implement SQL queries for different SQL concepts such as grouping data, using the GROUP BY clause, employing the HAVING clause, applying the EXISTS/NOT EXISTS operators, Creating and using Database Views.
6	**Subqueries, Join Operations and Set Operations** Write SQL queries to demonstrate the different SQL concepts like subqueries, performing various join operations, and using set operators in MySQL.
7	**Nested Queries** Implement SQL queries to demonstrate the nested queries in SQL using MySql.
GROUP B - NoSQL Database	
8.	**MongoDB Queries:** Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators etc)
9.	**MongoDB - Aggregation and Indexing:** Design and Develop MongoDB Queries using aggregation and indexing with suitable examples using MongoDB.
10.	**MongoDB - Map reduce operations:** Implement Map reduces operation with a suitable example using MongoDB.

References:

Text Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, 7th Edition, 2020 ISBN 978-0-07-802215-9.
2. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2014 ISBN: 9788176569644.
3. Connally T, Begg C., "Database Systems- A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2010, ISBN 81-7808-861-4.
4. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN 10: 0321826620, 2013, ISBN 13: 978-0321826626.

Reference Books:

1. C. J. Date, "An Introduction to Database Systems", Addison-Wesley, 8th Edition, 2004, ISBN 0321189566. S. K. Singh, "Database Systems: Concepts, Design and Application", Pearson Education, 2009,ISBN 9788177585674.Kristina Chodorow, Michael Dierolf, "MongoDB: The Definitive Guide", O‟Reilly Publications, 3rd Edition, 2019 ISBN 9781491954461.
2. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereo Pty Limited, 2011, ISBN 1743045743, 9781743045749.

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: IV	
Course :	Applied Mathematics (OE – Applied Mathematics) (Suggested for Mechanical branch) (offered by AS&H)	Code :	BSH24OE01

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge of

1. Univariate Calculus
2. Multivariate Calculus

is essential.

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Statistical techniques and Probability theory for Data Analysis.
2. Partial differential equations applied to mechanical engineering problems such as mechanical vibrations and heat transfer.
3. Laplace Transform and Inverse Laplace Transform applied to solve linear differential equations.

Course Outcomes:

After learning the course, the students should be able to:

1. **Apply** descriptive statistical techniques for measures of variability of numerical data, Curve fitting, Correlation and Regression.
2. **Make predictions** for the numerical data using probability theory and hypothesis testing.
3. **Apply** variable separation method to solve wave, transport, one and two-dimensional heat flow equations.
4. **Solve** the mass spring system and similar problems using Laplace and Inverse Laplace Transform.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Statistics:** Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.	7
II	**Probability Distributions:** Probability, Theorems on Probability, Mathematical Expectation, Binomial, Poisson, and Normal Distributions. **Hypothesis Test:** z-test, t-test, Chi-Square test, ANOVA Test.	8
III	**Applications of Partial Differential Equations:** Solution to One dimensional Wave, Heat and Transport equation, Two-dimensional heat flow equation using Method of separation of variables.	7
IV	**Laplace Transform:** Introduction, Laplace Transform of some standard and special functions, Region of convergence and Properties, properties and theorems of Laplace Transformation.Inverse Laplace Transform, Application of Laplace Transform to solve LDE.	8
	Total	**30**

Text Books:

1. Peter O'Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13:9781337274524.
2. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.

Reference Books:

1. Erwin Kreyszig, “Advanced Engineering Mathematics” Wiley Eastern Ltd.,10 Edition, ISBN 13: 9780470458365
2. B. S. Grewal , “Higher Engineering Mathematics”, Khanna Publication, 42 Edition, ISBN 13:9788174091955.
3. N. P. Bali, Manish Goyal, “ A textbook of Engineering Mathematics”, 9th Edition, ISBN 16:978-8131808320
4. H.K. Das, “Advanced Engineering Mathematics”, S Chand & Company Ltd, 22 edition, ISBN 9352533836.

e-sources:

1. NPTEL Course lectures links:

https://nptel.ac.in/courses/111/105/111105038/ (P.D.E)

https://onlinecourses.nptel.ac.in/noc20_ma13/ (Advanced Engineering Mathematics)

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: IV	
Course :	Computational Techniques (OE – Applied Mathematics) (Suggested for E&Tc branch) (offered by AS&H)	Code :	BSH24OE02

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge:

1. Univariate Calculus
2. Multivariate Calculus is essential

is essential

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Statistical techniques, Probability theory, and hypothesis techniques.
2. Numerical techniques to approximate solutions for interpolation, integration and ordinary differential equations.

Course Outcomes:

After learning the course, the students should be able to:

1. **Apply** statistical methods like variability, curve fitting, correlation and regression analysis for prediction of a given data.
2. **Analyze** the data using probability theory and distributions.
3. **Make predictions** for the numerical data using hypothesis testing.
4. **Compute** approximate solution for interpolation, integration and ordinary differential equations using numerical methods.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Statistics:** Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.	7
II	**Probability Distributions:** Probability, Theorems on Probability, Random Variable, Probability mass function, Mathematical Expectation, Probability distributions: Binomial, Poisson, and Normal..	8
III	**Sampling Distribution:** Introduction and Types, Population vs Sample **Hypothesis Tests:** Level of significance, Confidence interval, p-Test, z-test, t-test, Chi-Square test, ANOVA Test.	7
IV	**Numerical Methods:** **Interpolation:** Finite Differences, Newton's and Lagrange's interpolation formula. **Numerical Integration:** Trapezoidal and Simpson's rule **Ordinary differential equations:** Euler's, Modified Euler's and Runge-Kutta fourth order methods	8
	Total	**30**

Text Books:

1. Peter V. Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13:9781337274524.
2. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.

Reference Books:

1. M. D. Greenberg , “Advanced Engineering Mathematics”, Pearson Education, 2 Edition, ISBN 13:9780486492797.
2. B. S. Grewal , “Higher Engineering Mathematics”, Khanna Publication, 42 Edition, ISBN 13:9788174091955.
3. N. P. Bali, Manish Goyal, “ A textbook of Engineering Mathematics”, 9th Edition, ISBN 16:978-8131808320
4. H.K. Das, “Advanced Engineering Mathematics”, S Chand & Company Ltd, 22 edition, ISBN 9352533836.

e-sources:

NPTEL Course lectures links:

Probability Theory for Data Science - Course (nptel.ac.in) (Statistics, Probability and Hypothesis testing)

Numerical methods - Course (nptel.ac.in) (Numerical Methods)

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: IV	
Course :	Applied Mathematics (OE – Applied Mathematics) (Suggested for Civil branch) (offered by AS&H)	Code :	BSH24OE03

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge:

1 Univariate Calculus

2 Multivariate Calculus is essential

is essential

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Statistical techniques, Probability theory, and hypothesis techniques.
2. Higher level mathematics and their applications in E&TC Engineering.

Course Outcomes:

After learning the course, the students should be able to:

1. **Apply** descriptive statistical techniques for measures of variability of numerical data, Curve fitting, Correlation and Regression.
2. **Make predictions** for the numerical data using probability theory and hypothesis testing.
3. **Compute** approximate solution for interpolation, integration and ordinary differential equations using numerical methods.
4. **Examine** the vector fields using concepts of vector differentiation and Integration.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Statistics:** Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.	7
II	**Probability Distributions:** Probability, Theorems on Probability, Mathematical Expectation, Binomial, Poisson and Normal Distribution **Hypothesis Test:** z-test, t-test, Chi-Square test, ANOVA Test.	8
III	**Numerical Methods:** **Interpolation:** Finite Differences, Newton's and Lagrange's interpolation formula **Numerical Integration:** Trapezoidal and Simpson's rule **Ordinary differential equations:** Euler's, Modified Euler's and Runge-Kutta fourth order methods	7
IV	**Vector Differentiation:** Introduction, Vector differential operators, Gradient, Divergent, Curl, Directional Derivatives, Solenoidal and Irrotational fields, Scalar Potential. **Vector Integration and Applications:** Introduction to Line, Surface and Volume Integration of vectors, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem, Application to problems in Electro-Magnetic fields.	8
	Total	**30**

Text Books:

1. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190
2. Peter O'Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13: 9781337274524

Reference Books:

1. M. D. Greenberg , “Advanced Engineering Mathematics”, Pearson Education, 2 Edition, ISBN 13: 9780486492797
2. S.R.K. Iyengar, Rajendra K. Jain, “Advanced Engineering Mathematics”, Alpha Science International, Ltd,4
3. Edition, ISBN 13: 9781842658468
4. B. S. Grewal , “Higher Engineering Mathematics”, Khanna Publication, 42 Edition, ISBN 13: .9788174091955
5. N. P. Bali, Manish Goyal, “ A textbook of Engineering Mathematics”, 9th Edition, ISBN 16:978-8131808320

e-sources:

NPTEL Course lectures links:

https://nptel.ac.in/courses/111/105/111105090/ (Probability)

https://onlinecourses.nptel.ac.in/noc20_ma13/ (Advanced Engineering Mathematics)

V-lab (IIT-Bombay) link: http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: IV	
Course :	Computational Techniques (OE – Applied Mathematics) (Suggested for Comp and IT branch) (offered by AS&H)	Code :	BSH24OE07

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge of
1. Univariate Calculus
2. Multivariate Calculus

is essential.

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Statistical techniques, Probability theory, and hypothesis techniques.
2. Different mathematical approaches for optimization.

Course Outcomes:

After learning the course, the students should be able to:

1. **Apply** statistical methods like variability, curve fitting, correlation and regression analysis for prediction of a given data.
2. **Analyze** the data using probability theory and distributions.
3. **Make predictions** for the numerical data using hypothesis testing.
4. **Solve** transportation and assignment problems using optimization techniques..

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Statistics:** Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.	7
II	**Probability Distributions:** Probability, Theorems on Probability, Random Variable, Probability mass function, Mathematical Expectation, Probability distributions: Binomial, Poisson, and Normal.	8
III	**Sampling Distribution:** Introduction and Types, Population vs Sample **Hypothesis Tests:** Level of significance, Confidence interval, p-Test, z-test, t-test, Chi-Square test, ANOVA Test.	7
IV	**Transportation Problems:** Introduction, Mathematical model of transportation problem, Methods of finding initial solutions: North-west Corner rule, Least cost method, VOGEL‟s approximation method, Optimality of initial solution using MODI Method. **Assignment Problems:** Introduction, Mathematical model of Assignment problem, solutions to Assignment problems using Hungarian method.	8
	Total	**30**

Text Books:

1. Peter O'Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13:9781337274524.
2. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.

Reference Books:

1. M. D. Greenberg , “Advanced Engineering Mathematics”, Pearson Education, 2 Edition, ISBN 13:9780486492797.
2. B. S. Grewal , “Higher Engineering Mathematics”, Khanna Publication, 42 Edition, ISBN 13:9788174091955.
3. N. P. Bali, Manish Goyal, “ A textbook of Engineering Mathematics”, 9th Edition, ISBN 16:978-8131808320
4. H.K. Das, “Advanced Engineering Mathematics”, S Chand & Company Ltd, 22 edition, ISBN 9352533836.

e-sources:

NPTEL Course lectures links:

Probability Theory for Data Science - Course (nptel.ac.in) (Statistics, Probability and Hypothesis testing)

https://nptel.ac.in/courses/110/106/110106059/(Transportation&AssignmentsProblems)

Program :	B. Tech. (Computer Engineering (Regional Language))	Semester: IV	
Course :	Mathematical Optimization (OE – Applied Mathematics) (Suggested for CSE(AIML) branch) (offered by AS&H)	Code :	BSH24OE08

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior knowledge of

1. Univariate Calculus
2. Multivariate Calculus

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Different mathematical approaches for optimization.
2. Commonly used tools and techniques in network analysis.

Course Outcomes:

After learning the course, the students should be able to:

1. **Formulate** and solve linear programming models using graphical, Simplex method.
2. **Solve** transportation and assignment problems using optimization techniques.
3. **Analyze** the project network problems and their solutions using critical path method to optimize models.
4. **Apply** variants of numerical methods to find optimal solutions for constrained, unconstrained problems.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Linear Programming (LP):** Introduction, formulation of Linear Programming problems, Graphical solution method, multiple optimal solutions, Unbounded solutions, Infeasible solutions, Simplex Method.	8
II	**Transportation Problems:** Introduction, Mathematical model of transportation problem, methods of finding initial solutions: North-west Corner rule, Least cost method, VOGEL"s approximation method, Optimality of initial solution using MODI Method. **Assignment Problems:** Introduction, Mathematical model of Assignment problem, solutions to Assignment problems using Hungarian method.	7
III	**Network Analysis:** Network Diagram, Project Management: PERT and CPM, Critical path analysis, Project scheduling with uncertain activity time, and Project time-cost	8
IV	**Unconstrained optimization:** One-dimensional search methods, Gradient-based methods, Conjugate direction and quasi-Newton methods, **Constrained Optimization:** Lagrange theorem	7
	Total	**30**

Text Books:

1. Rao S. S., Engineering Optimization Theory and Practice, Willy Eastern Ltd.4th Edition, ISBN: 978-0-470- 18352-6
2. Taha Hamdy, Operation Research: An Introduction, Pearson Education,9th Edition, ISBN:0134444019

Reference Books:

1. Sharma S.D.Operation Research, Kedarnath Ramnath & Co.Edition, ISBN: 9380803389
2. Peter. O'Neil, "Advanced Engineering Mathematics," Thomson Learning,7 Edition, ISBN 13: 9781337274524
3. Hira Gupta, "Operation Research," S.Chand Publication, ISBN(13): 9788121909686.
4. Sharma J.K."Operations Research-Theory and Applications," Trinity Press,6 Edition, ISBN:9789385935145

e-sources:

NPTELCourselectureslinks:

https://nptel.ac.in/courses/111/102/111102012/(LPP)

https://nptel.ac.in/courses/110/106/110106059/(Transportation&AssignmentsProblems)

Program:	B. Tech. (Computer Engineering (Regional Language))			Semester: IV			
Course:	Community Engagement Project (CEP)/ Field Project (FP)			Code: BCER24EL01			
Credit	Teaching Scheme			Evaluation Scheme			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	100	-	-	100

Prior knowledge of
Basic programming knowledge
is essential

Course Objectives:
This course aims at enabling students:
1. To identify and analyze environmental issues faced by local communities.
2. To identify the use of technology for societal needs.
3. To design and implement innovative solutions using computer engineering principles to address identified problems.
4. To work in a team with individual contributions to the project development.

Course Outcomes:
After learning the course, the students will be able to:
1. Apply their computer engineering knowledge to analyze communities' real-world environmental problems.
2. Design real-world applications by considering suitable requirements.
3. Implement real-world applications using suitable tools and technology.
4. Work in a team with individual contributions to the development of the project.
5. Communicate and demonstrate technical information effectively through project reports, presentations, and interactions with community members and mentors.

Guidelines:

The purpose of this course is to empower students with the knowledge, skills, and mindset needed to leverage technology for addressing environmental and societal needs. Through a hands-on approach, students will learn to identify, analyze, and solve environmental issues faced by local communities using computer engineering principles. By designing and implementing innovative solutions, students will not only gain technical proficiency but also develop teamwork, collaboration, and communication skills essential for making a positive impact on communities and the environment.

Team Formation, Guide Allocation, and Project Identification:
- 2-4 students can form a team within the same or different disciplines.
- Students are expected to explore and understand environmental challenges that communities face, such as pollution, waste management, water scarcity, resource depletion, climate change, energy transition, natural disasters, biodiversity loss, land degradation, etc.
- The project coordinator, in consultation with a panel of experts, assigns project guides from the same program to provide guidance and support to the teams throughout the project.
- The identified problem statement addressing environmental challenges must be registered with the project coordinator by the team after consulting with their respective project guide.
- Field visits are encouraged to identify the problem statements.

Collaborative Work and Progress Reporting:
- Each student on the team must work collaboratively and contribute significantly to the design and development of solutions for registered problem statements, focusing on environmental challenges faced by the community.
- Students should work at least 4 hours per week and shall meet their assigned project guide regularly (at least twice a week) and report the progress of the project work, emphasizing the application of community engineering principles.
- Students are expected to Incorporate suggestions from the earlier review.

Documentation and Reporting:

- Students shall maintain a record of all meetings, remarks given by the guide/reviewers, and progress of the work in the project diary, presented during each review presentation.
- For the final assessment, students shall complete the project report in all aspects, including formatting, duly signed by the project guide, Head of the Department.

Data Submission and Additional Outputs:

- Students shall submit all data related to project work in soft copy to their guides, including the project report, A3 size poster, presentation, paper, etc., focusing on community engineering solutions.

Mode of Evaluation:

Review-I - Problem Identification: (Within the first month of Semester VI) (Weightage: 50%)

- Students must identify a specific problem statement related to community engineering projects.
- The problem statement should be relevant to environmental science/study-related societal needs and address a real-world issue.
- A brief presentation outlining the identified problem and its significance should be submitted. The presentation should include the background of the problem, literature review, proposed solution approach, and initial findings or developments.
- Students should be prepared to present their progress to a review committee.

Review-II – (Weightage: 50%) (at the end of semester IV)

Solution Development:

- Projects will be evaluated based on the effectiveness of the solution designed and developed using fabrication, coding, modeling, product design, process design, or other relevant processes for identified problem statement.

Outcome Evaluation:

- The project outcome will be assessed regarding its technical feasibility, economic viability, societal impact, and environmental sustainability.
- A detailed report covering the problem identification, literature review, methodology, progress made, challenges faced, and future plan should be submitted.
- Teams must prepare an e-document, uploaded along with a plagiarism check report, detailing their project work and findings.
- Each team member must submit their report, highlighting their individual contributions with a brief abstract of the total work in the initial part of the document. Reports must be unique, and the review will be based on individual contributions.

Program:	**B. Tech. (Computer Engineering (Regional Language))**					**Semester: IV**	
Course:	**Designing Thinking & Innovation Management (Offered by AS&H)**					**Code: BSH24EM02**	
Credit	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**FA**		**SA**	**Total**
				FA1	**FA2**		
2	**2**	**-**	**-**	**10**	**10**	**30**	**50**

Course Objectives:

This course aims at enabling students:

1. To introduce the students to the concept of Design Thinking and its relevance in innovation
2. To equip students with the core concepts, frameworks, and techniques of Innovation management and itsapplications.
3. To help students to understand design thinking as a creative problem-solving approach

Course Outcomes:

After learning the course, the students will be able to:

1. **Explain** the Design Thinking approach for competitive advantage
2. **Develop** an understanding for Innovation Function.
3. **Demonstrate** strategic foresight for the business models
4. **Apply** the techniques of Internet Business Design for business growth

Detailed Syllabus

Unit	**Description**	**Duration (H)**
I	**Introduction to Design Thinking:** Meaning of Design Thinking, Design thinking for competitive advantage, The Need for Creative and Design, Why design needs entrepreneurial mindset, combining entrepreneurial and design thinking, Opportunity Assessment - "How do we source and identify opportunities?" and "Which opportunities should we invest time and money in?" Three dimensions of Opportunity Assessment - Product-Market fit, Product-Company fit, and Product-Business fit. "Go/No-Go" recommendation to invest and initiate.	7
II	**Innovation Function:** Concept of Innovation, Characteristics of innovation, Sources of innovation, Types of innovation, Levels of Innovation, Evolution of innovation management, Organizations and Innovation Process, Diffusion of Innovation, Effective innovation management,Performance evaluation, Risk Management in Innovation.	7
III	**Business Challenges and Design Thinking Solutions Paradigm Shift:** The seven steps of design thinking, First Mover and late mover Advantage, Five Cs of Opportunity Storytelling, Strategic Foresight, Sensing, Value Redefinition, ExperienceDesign, Humanization, Prototyping, Business Model Design	8
IV	**Internet Business Design:** Digital/Internet Business Model, Design of Services and Customer Experience. Service sector – IDEO, Lego, E-commerce market players design thinking strategies. Design Thinking and IoT Toward Sustainable Design Thinking. Managing Future Technologies, and minimizing risk of failure.	8
Total		**30**

Text Books:

1. Robert Curedale, Design Thinking Process and Methods,5th Edition.

Reference Books:

1. Walter Brenner, Falk Uebernickel, Design Thinking for Innovation, Springer Link, 2016.
2. Christian Müller-Roterberg, Handbook of Design Thinking, Kindle Direct Publishing, ISBN: 978-1790435371
3. Anuja Agarwal, Design Thinking: A framework for applying Design Thinking in Problem Solving, CL India

e-sources:

1. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Busine Press, 2009.
2. https://www.designdisciplin.com/the-story-of-design-thinking/
3. https://online.hbs.edu/blog/post/what-is-design-thinking

PCET's Pimpri Chinchwad College of Engineering
PCCOE
"Knowledge Brings Freedom"

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: IV	
Course:	Project Management (Offered by AS&H)					Code: BSH24EM03	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Course Objectives:

This course aims at enabling students:

1. To help the students gain understanding regarding the concept of projects and Project Management
2. To enable the students to know the key components of project management including time, cost & Risk
3. Recognize issues in a realistic project scenario to understand design thinking as a creative problem-solving approach

Course Outcomes:

After learning the course, the students will be able to

1. **Explain** how to initiate, define, and organize a project.
2. **Develop** an understanding of the triple constraints to manage the project.
3. **Apply** appropriate approaches to plan execute and evaluate new projects.
4. **Analyze** and mitigate the risk associated with various projects.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Introduction to Project Management:** Concept and Definition of Project, Characteristics of Project, Concept and definition of Project Management, Functions of Project Management, Importance of Project Management, who is a Project Manager, Roles & Responsibilities of Project Manager. Understanding the Phases in the Lifecycle of Projects and their Significance, Different types of Projects: Industrial, Telecommunication, Research and more, Project Selection Methods: Agile method, Waterfall, Methods, Scrum Model & Kanban Model, Jira Model	7
II	**The Triple Constraint in Project Management:** The concept of the Triple Constraint in Project Management: Scope, Cost and Time, Project Cost Management: Concept, Consideration, five types of Costs involved in a project, Cost Management process, Project Time Management and methods of Time estimation, Communications Management in Project, Work Breakdown Structure (WBS). Case studies based on Mega Projects of the World**.**	7
III	**Planning and Execution of Project:** Developing a Mission, Vision, Goals of the project. Concept and definition of Project Planning. Importance of Project Planning. Concept of Project Execution, Phases of Project Execution, Project Evaluation; The Review Technique – Planning and Scheduling of Activity, Networks - Concept of PERT/CPM, Assumptions in PERT Modeling – Time- cost, Trade-offs, HRM issues in Project Management & How they can be tackled, Reasons for Failures of Project, Case Study with respect to different Domains	8
IV	**Project Monitoring and Risk Management:** Concept of Project Monitoring, How to Building a Suitable Monitoring; Control System, Concept of Conflict Management, Concept & Definition of Risk and Risk Management, Concept of Risk Matrix Analysis,	8

	Strategies to Manage Risks, An Overview of Useful Techniques and Tools Used in Project Management. Case Studies with respect to different Domains.	
Total		**30**

Text Books:

1. Joseph Heagney, Fundamentals of Project Management, American Management Association, 2012

Reference Books:

1. Erik W Larson, Clifford Gray, Rohit Joshi; Project Management-The managerial process, MacGraw Hill Publication, 2021
2. Punmia, Project Management with CPM /PERT, Laxmi Publications, 2001
3. Robert L Kimmons, Project Management Basics, Taylor & Francis Ltd, 2018
4. N. D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

e-sources:

1. https://www.entrepreneur.com/
2. http://dst.gov.in/scientific-programme/t-d-tdb.htm
3. https://www.youtube.com/

Program:	B. Tech. (Computer Engineering (Regional Language))					Semester: IV	
Course:	Fostering Entrepreneurship and Start ups (Offered by AS&H)					Code: BSH24EM04	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Course Objectives:

This course aims at enabling students:

1. To inculcate an entrepreneurial mindset into the minds of young professionals
2. To enable the students to evaluate challenges relating to new ventures.
3. To provide the students an understanding about different skills for founding, leading & managing startups

Course Outcomes:

After learning the course, the students will be able to:

1. **Develop** and cultivate skills required for entrepreneurship.
2. **Identify** new venture opportunities in today's Business world.
3. **Analyze** strategic choices in relation to the growth of new ventures
4. **Evaluate** Startup opportunities and key factors supporting the Start up culture in India.

Detailed Syllabus

Unit	Description	Duration (H)
I	**The Entrepreneurial Perspective:** Why to become entrepreneur, Characteristics of an Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Distinction between Entrepreneur and Manager The entrepreneurial decision process, Role of entrepreneur in economic development, future of entrepreneurs, Concept of Business Opportunity, Business Opportunities Identification Process.	7
II	**Creating & Starting Ventures:** Concept of business idea, Sources of new idea generation, Methods of Idea generation, Creative problem solving, Product planning and development, Business Structure, creating a Business Plan, Market Size Analysis, Legal issues, and Regulations to set up a business, Business Patents, Trademarks, Copy rights, Trade secrets, Licensing.	7
III	**Managing and Growing a New Business Venture:** Attractiveness of a new entry opportunity- Entry strategy for new entry exploitation- risk reduction strategies for new entry exploitation, Growth Strategies – economic implications of growth, overcoming pressures on existing financial resources, human resources, management of employees and entrepreneur's time, Sustaining a Business turbulence, Government incentives & Schemes.	8
IV	**The Startup Ecosystem in India:** Meaning of Startup, Types of Start-ups, The Rise of The Startup Economy, Startup Policy, Startup opportunities, and financial support for Start-ups. Recent initiatives including Start up India, Make in India, Digital India, and Policies for technology Start-ups, E- commerce Startups, Tech Support and Proto type Development centers. Start up Infrastructures: Co – Working Space, Market development initiatives.	8

Total	30

Text Books:

1. C. B. Gupta and N. P. Srinivasan, Entrepreneurial Development, Sultan Chand & Sons, New Delhi, 2008

Reference Books:

1. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, Cengage Learning, 2016.
2. Peter F. Drucker, Innovation and Entrepreneurship.
3. Satish Taneja, S.L.Gupta, Entrepreneurship Development New Venture Creation
4. Donald F Kuratko, Jeffrey S. Hornsby, New Venture Management: The Entrepreneur's Road Map, 2e, Routledge
5. Vasant Desai ,Dynamics of Entrepreneurship Development,

e-sources:

1. https://www.entrepreneur.com/
2. http://dst.gov.in/scientific-programme/t-d-tdb.htm
3. https://www.youtube.com/

Program:	**B. Tech. (Computer Engineering (Regional Language))**					**Semester: IV**	
Course:	**Business Finance for Engineers (Offered by AS&H)**					**Code: BSH24EM05**	
Credit	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**FA**		**SA**	**Total**
				FA1	**FA2**		
2	**2**	**-**	**-**	**10**	**10**	**30**	**50**

Course Objectives:

This course aims at enabling students

1. The inculcate the knowledge of the core concepts of business finance and its importance in managing a business
2. To improve students 'understanding of the time value of money concept and the role of finance in the current competitive business scenario.

Course Outcomes:

After learning the course, the students will be able to:

1. **Explain** the concept of Business Finance and financial planning.
2. **Apply** the concept of capitalization in Business Organizations.
3. **Analyze** Financial markets and the role of financial institutions in Business Development.
4. **Evaluate** the role of Financial System in Business

Detailed Syllabus

Unit	**Description**	**Duration (H)**
I	**Business Finance:** Concept of Business Finance, Objective and Scope, Significance of Finance, principles of business finance, Finance Function, Business finance v/s corporate finance, Source of Finance. Meaning of financial planning, steps in financial planning, significance of financial planning, essential features of a good financial plan, Personal financial planning, Types of financial plan.	7
II	**Capitalization:** Amount of Capitalization, Over Capitalization, Under Capitalization, Venture Capital Funds, Policies and Procedures adopted by Venture Capitalists, Venture Capital in India,Guidelines for Venture Funds.	7
III	**Financial Markets, Institutions, and instruments:** Introductions to Financial Markets – Nature – Functions and Types of Financial markets, Different Financial Instruments, Sources of financing - Shares, Debentures, Term Loans,Lease; Hire Purchase, Retained Earnings, Public Deposits, Bonds, Trade Credit.	8
IV	**Constituents of the Financial System:** Merchant Banks - Role; Functions of Merchant Banking; Lease Financing - Essential Elements of Leasing, Types of Leases, Merits and Demerits of Lease Financing; Mutual Funds - Definition, Types of Mutual Funds, Significance of Mutual Funds; VentureCapital - Meaning of Venture Capital, Method of Venture Financing, Disinvest Mechanism, Importance of Venture Capital, Initiative in India.	8
Total		**30**

Text Books:

1. Srivastava, R.M. Essentials of Business Finance, Himalaya Publishing House, Kalyani Publications

Reference Books:

1. Gordon, E. & Natarajan, K. Financial Markets and Institutions, Himalaya Publishing House.
2. Khan and Jain, Financial Management, Tata McGraw Hill, 2008
3. Singh, Preeti. Investment Management. Himalaya Publishing House,
4. Kale, N.G. Business Organization. Manisha Publications.

e-sources:

1. https://www.youtube.com/watch?v=TgF2XvjquUU&list=PLLy_2iUCG87CXY2B6fPex1SOIqxzzD5Wj
2. https://www.youtube.com/watch?v=CCQwz_Gwo6o
3. https://www.youtube.com/watch?v=OT5RdoJAkhY&list=PLPjSqITyvDeUTeAOGhip_ubjN3y8oqT13

Program :	**B. Tech. (Computer Engineering (Regional Language))**			**Semester: IV**			
Course :	**Professional Development Training**			**Code :**	**BSH24AE05**		
Credits	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**TW**	**OR**	**PR**	**Total**
2	-	4	-	100	-	-	100

Prior knowledge: Basic Mathematics & English

Course Objectives:

This course aims at enabling the students

1. To enhance the logical reasoning skills of the students and improve the problem-solving abilities.
2. To improve the overall professional development of students.

Course Outcomes:

After learning the course, the students will be able to:

1. **Apply** mathematical concepts to solve diverse numerical problems encountered in engineering, spanning arithmetic, algebra, geometry, and statistics.
2. **Employ** deductive reasoning, interpret data, and discern patterns to navigate complex logical puzzles and analytical challenges typical of engineering aptitude tests and professional scenarios.
3. **Identify** grammatical nuances, enhancing their verbal and written communication prowess essential for effective engineering discourse.

Detailed Syllabus:

Unit	**Description**	**Duration [Hrs]**
I	**Numerical Ability-I** HCF & LCM and Number System, Geometry, Ages, Allegations and Mixtures, Averages, Clocks and Calendars, Equations, Percentages, Profit and Loss, Ratios and Proportion, Series and Progressions, Time, Speed and Distance, Time and Work.	24
II	**Numerical Ability-II** Permutations and Combinations, Probability, Mean, Median, Mode, Standard Deviation, and Variance, Data Interpretation, Graphical Data Interpretation, Pie Charts, Tabular Data Interpretation, Simple Arithmetic Operations, Interest and Compound Interest, Linear equations, Quadratic equations, Triplets, Trigonometry	12
III	**Logical Reasoning** Clocks and Calendar, Direction sense, Family tree, Syllogism, Seating arrangement, Team formation, Coding and Decoding, Number Series and Letter Series, Ranking and Arrangements, Game-Based Aptitude.	12
IV	**Verbal Ability & Reading Comprehension** Subject-Verb Agreement, Articles and Other Determiners, Prepositions, Tenses, Parts of Speech, Active and Passive Voice, Direct and Indirect Speech, Conjunctions, Sentence Selection, Contextual Vocabulary, Error Spotting and Sentence Correction, Sentence Completion, Synonyms and Antonyms, Reading Comprehension, Jumble words & sentences.	12
	Total	60

Text Books:

1. Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.
2. ETHNUS, Aptimithra, 2013, 1stEdition, McGraw-Hill Education Pvt.Ltd.

Reference Books:

1. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.
2. M. Tyra, Quicker Maths, 2018, 5th edition, 2018, BSC publishing company Pvt. Lt.

Program:	**B. Tech. (Computer Engineering (Regional Language))**					**Semester: IV**	
Course:	**Constitution of India (VEC-2)**					**BSH24VE02**	
Credit	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**FA**		**SA**	**Total**
				FA1	**FA2**		
02	**02**	**-**	**-**	**20**	**30**	**-**	**50**

Course Objectives:

This course aims at enabling students:

1. To acquaint the students with legacies of constitutional development in India and help those to understand the mostdiversified legal document of India and philosophy behind it.
2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. To channelize students' thinking towards basic understanding of the constitutional principles and statutoryinstitutions.

Course Outcomes:

After learning the course, the students will be able to

1. **To Identify** and explore the basic features and modalities about Indian constitution.
2. **To Differentiate** and relate the functioning of Indian Parliamentary System at the center and state level.
3. **To Understand** the administrative structure of various branches of government.
4. **To Examine** different aspects of Indian Legal System and its related bodies.

Detailed Syllabus

Unit	**Description**	**Duration (H)**
I	**Introduction to Constitution**: Meaning & Constitutionalism, Introduction to Constitution: Meaning of the constitution law and constitutionalism, making of constitution, Salient features and characteristics of the Constitution of India, Preamble, Fundamental Rights, Directive Principles of State Policy, Fundamental Duties and ıslegal status, Citizenship.	7
II	**System of Government- Center & State level and local level:** Structure and Function of Central Government, President, Vice President, Prime Minister, Cabinet, Parliament, Supreme Court of India, Judicial Review, Federal structure, and distribution of legislative and financial powers between the Union and the States, local self-government.	7
III	**Government: Union & State:** Executive & Legislature, composition, powers and functions, Local Self Governments – Panchayat Raj Institutions & Urban Local Bodies (Municipalities). Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women	8
IV	**Constitution Functions**: Indian Federal System and its characteristics, Federal structure & distribution of legislative and financial powers between the Union and the States. Center& State Relations, President's Rule, Constitutional Amendments and powers, Constitutional Functionaries, Emergency Provisions, Assessment of working of the Parliamentary System in India.	8
Total		**30**

Text Books:

1. E 1. Durga Das Basu, ―Introduction to the Constitution of India ―, Prentice Hall of India, New Delhi,24th edition,2020, ISBN-109388548868
2. Clarendon Press, Subhash C, Kashyap, ― Our Constitution: An Introduction to India's Constitution andconstitutional Law‖, NBT, 5th edition, 2014, ISBN-9781107034624

Reference Books:

1. Maciver and Page, ―Society: An Introduction Analysis ―, Laxmi Publications, 4th edition, 2007, ISBN-100333916166
2. PM Bhakshi, ―The constitution of India‖, Universal Law Publishing - An imprint of Lexis Nexis, 14th edition,2017, ISBN-108131262375
3. Indian Constitution by Subhash C. Kashyap, National Book Trust, New Delhi.
4. Constitution of India and Professional Ethics, Dr. G. B. Reddy & Mohd. Suhaib, Dreamtech Press.

Vision and Mission of Computer Department

Department Vision

To be a premier Computer Engineering program by achieving excellence in Academics and Research for creating globally competent and ethical professionals.

Department Mission

- M1: To develop technologically competent and self-sustained professionals through contemporary curriculum.
- M2: To nurture innovative thinking and collaborative research, making a positive impact on society.
- M3: To provide state-of-the art computing environment and learning opportunities through Center of Excellence.
- M4: To foster leadership skills and ethics with holistic development.