SHIVAJI UNIVERSITY, KOLHAPUR
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शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
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Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SU/BOS/Sci & Tech/ 315 **Date: 16/05/2025**

To,

The Principal / Director,
All Concerned Affiliated Colleges / Institutions,
Shivaji University, Kolhapur.

Subject: Regarding revised syllabus of **B. Tech. Part - II (Sem– III - IV)** degree **Programme (Affiliated College)** under the Faculty of Science and Technology as per NEP 2020.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of Question paper and equivalence of B. Tech. Part - II (Sem - III & IV) under the Faculty of Science & Technology as per NEP 2020.

No.	Course Syllabus
1	Civil Engineering
2	Mechanical Engineering
3	Mechanical and Mechatronic Engineering (Additive Manufacturing)
4	Electrical Engineering and Technology
5	Electrical and Computer Engineering
6	Electronics and Telecommunication Engineering
7	Electronics & Computer Science Engineering
8	Computer Science and Engineering
9	Artificial Intelligence & Machine Learning (AIML)
10	Data Science (DS)
11	Artificial Intelligence & Data Science (AIDS)

This Syllabus, shall be implemented from the academic year **2025-26** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website **www.unishivaji.ac.in NEP-2020@suk (Online Syllabus)**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2025 & March / April 2026. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
Dy. Registrar

Copy to: for Information and necessary action

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	7	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	8	P.G.Admission Section, /P.G Seminar Section
4	OE 4 Exam Section,	9	Computer Centre,/IT Cell
5	Eligibility Section,	10	Internal Quality Assorance Cell (IQAC)

Shivaji University
Kolhapur

Revised Syllabus
as per
National Education Policy-2020
(NEP-2.0)

S. Y. B. Tech.
Computer Science and Engineering

To be Implemented from
Academic Year 2025-26

First Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.1 Rule: Award of Degree

If a student passes all the courses of first year and earns the requisite number of credits, the student will become entitled to Undergraduate Certificate (One year or two semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Certificate. However, for the award of one year UG Certificate in Major with 44 credits, an additional 8 credits are required to earn.

[II] First Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.
3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant

industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from relevant industrial practices conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute.

The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

Direct Second Year Entry: Teaching Methodology, Assessment and Evaluation

[I] For the students admitted directly into the second year of a programme (at the entry level) from a different programme, earning of an additional 2 credits is mandatory.

[II] As per R. R. B. Tech. 13.3 Rule, For direct second year admitted students (at entry level) to concern programme, the earning of additional 2 credits is mandatory. It is required to conduct examination and evaluation for same at institute level at the time of third semester ESE examination. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

[III] Examination scheme:

Students admitted directly into the second year of a programme from another programme are required to complete a 2-credit entry-level course as per the prescribed curriculum. This course should be completed at their own pace to ensure alignment with the programme foundational requirements. End Semester Examination (ESE) of 100 marks will be conducted at the institute level. It is mandatory to organize the examination and evaluate the performance of such students at the institute level during the third semester ESE. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

Open Elective Courses: Teaching Methodology, Assessment and Evaluation

Open Elective (OE) courses other than faculty of Science and Technology through Massive Open Online Courses (MOOCs) allowing students to engage with a broad spectrum of ideas and knowledge areas. The OE courses are likely to be available online and can be completed at the student's own pace within a set timeframe. For OE course, students are required to visit to the website https://swayam.gov.in for registration and create an account. Afterward, students should Login the account and join the course assigned by the course coordinator and follow the instructions to compete the course. Minimum 25 students can register for one OE course in the concerned institute. There will be only one course coordinator for one OE course.

1. **For Semester-III,** OE theory course of 3 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.
2. **For Semester-III,** OE practical lab course of 1 credit consists of In Semester Evaluation/Continuous Assessment (ISE/CA) of 25 Marks and End Semester Examination-Practical Oral Examination (ESE-POE) of 25 Marks. Course Coordinator assigned by Institute should complete the selected course practical through expert of that course.
3. **For Semester-IV,** OE theory course of 2 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester

Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.

4. The Mid Semester Examination (MSE) of 30 Marks based on selected OE Course will be conducted by Concerned Departmental Course Coordinator. The course expert of concerned faculty should set question paper of MSE and evaluate the same.
5. Online submitted assignments by students using SWAYAM platform for concerned OE course will be used for In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks by Concerned Departmental Course Coordinator appointed for particular course by Principal of the Institute. Assignments may be of varied in nature for OE course.
6. The setting of ESE question paper of Concerned OE Course should be done through course expert of concerned faculty as per University rules and is responsibility of Institute/ Departmental Course Coordinator.
7. Student may get failure in the said OE course or the examination may get delayed by SWAYAM, in either cases, ESE of the said course will be conducted as per the University rules.

Note: One OE course is to be floated by the institute for 60 intake.

Second Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.2 Rule: Award of Degree

If a student passes all the courses of first year, second year and earns the requisite number of credits, the student will become entitled to Undergraduate Diploma (Two years or four semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Diploma certificate. However, for the award of two years UG Diploma Certificate in Major with 88 credits, an additional 8 credits from Exit Courses are required to earn.

[II] Second Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.

3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from

relevant industrial practices conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

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Exit Course for Computer Science and Engineering After 1st Year

- As part of the NEP 2020 Revised Syllabus, for the First Year B. Tech Exit, students must earn a total of 8 additional credits. This includes 6 credits from online SWAYAM NPTEL courses and 2 credits from Virtual Lab performance.
- Students must complete two SWAYAM NPTEL courses (12-week duration) from the provided list and successfully perform two Virtual Labs from the specified list.
- Each SWAYAM NPTEL course carries 3 credits, while each Virtual Lab is worth 1 credit.

Sr. No.	Name of NPTEL Course
1	An Introduction to Programming Through C++
2	Computer Networks and Internet Protocol
3	Discrete Mathematics
4	Problem Solving Through Programming In C
5	Programming In Modern C++
6	The Joy of Computing Using Python

Sr. No.	Name of Virtual Lab
1	Computer Programming Lab
2	Data Structures Lab
3	Problem Solving Lab
4	Python Programming Lab

Examination Scheme

- Swayam NPTEL Course Certificate Should be submitted to Department — 6 Credits
- Lab Experiments Report must be prepared and submitted to department — 2 Credits

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Direct Second Year Additional 2 Credits Course				
Sr. No.	**Semester**	**Subject**	**Credit**	**Examination Scheme**
1	III	C Programming	2	In Semester Evaluation has 50 Marks Internal Evaluation will be done for 50 Marks. Internal Examiner can use any of the following parameter to assess Students. • Descriptive Test of 50 Marks. • POE Examination on Given Experiments
Students have to complete course in Online/Offline Mode for given syllabus content. In Semester Evaluation will be done for 2 credits				

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SHIVAJI UNIVERSITY, KOLHAPUR

Department of Computer Science and Engineering Revise Syllabus as per NEP 2020
Direct Second Year Additional Credit Course

Year and Semester	Direct Second Year Admitted Students Course for 2 Additional Credits.				
Course Category	Engineering Science (ESC)				
Title of Course	C Programming			Course Code	CSE-DSY-AC
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	--	--	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50		50	

Course Pre-Requisite	Basics of Operating System, Basic Math Skills, Basic Problem-Solving Skills.	
Course Objective	1	Mastering Fundamentals of C Programming
	2	Understanding Program Flow
	3	Effective Problem-Solving Skills to develop programming logic in C
	4	Debugging and Error Handling in C
Course Outcomes	After completion of this course Students will be able to	
	CO1	Understand basic Programming concepts.
	CO2	Apply programming logic using Conditional and Looping statements in C.
	CO3	Understand fundamentals of Arrays and Strings in C.
	CO4	Understand User Defined Functions and User Defined Data Types in C
	CO5	Understand Dynamic Memory Allocation

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<u>In Semester Evaluation has 50 Marks</u> Internal Evaluation will be done for 50 Marks. Internal Examiner can use any of the following parameter to assess Students. Descriptive Test of 50 Marks or POE Examination on Given Experiments

Unit No.	Title and Content of Unit
1	**Overview and fundamentals of Programming**
	Basic Structure of C Program, Executing a C Program, Character Set, C Tokens, Keywords and Identifiers, Constants, Data Types, Variable Declaration and Initialization. Formatted Input and Output statements in C (getchar(), putchar(), scanf(), printf())
2	**Operators and Expressions**
	Operators in C Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operator, Conditional Operator (? :), Bitwise Operators, Special Operators Type Conversion in Expression, Mathematical Functions.
3	**Decision Making: Branching and Looping**
	Decision Making Statements: Simple if, The if... else Statement, Nesting of if... else statements, The else if ladder, The Switch Statement. Loping Statements: The While Statement, The Do Statement, The FOR Statement. Jumps in Loop (break and continue statement)
4	**Arrays and Strings in C**
	Introduction to Array, One Dimensional Array – Declaration and Initialization, Two-Dimensional Array – Declaration and Initialization. Introduction to String in C, Reading and Writing String (gets (), puts (), scanf(), printf()), String Functions: strlen(), strcmp(), strcpy(), strcat(),
5	**User Defined Functions**
	Introduction, Multifunction Program, Elements of User Defined Function (Function Declaration, Function Call, Function Definition), Categories of Functions (Function with and Without Return value, Function with and Without Arguments), Recursion, Passing array to Functions.
6	**Structures and Pointers**
	What Are Pointers? Pointer Variables, The Pointer 0perators, Pointer Expressions, Pointers and Arrays, Arrays of Pointers, Pointers to Functions and structures, Dynamic Allocation Functions. Structures, Arrays of Structures, Passing Structures to Functions, Structure Pointers, Arrays and Structures Within Structures, Unions, Bit-Fields, Enumerations, using sizeof to Ensure Portability, typedef.

Guidelines for Practical Performance	
Students Should be able to perform experiments on following topics.	
Exp. No.	Title of Experiment/ Problem Statement
1	Formulate areas of different Geometric shapes and design C program for same.
2	Illustration various Mathematical functions in C
3	Demonstration of Operators in C
4	Using Decision Making Statements in Programming Logic
5	Using Looping Statements in Programming Logic
6	Implementation of One-Dimensional Array.
7	Implementation of Two-Dimensional Array
8	Performing various String Operations in C
9	Implementation of function with all categories.
10	Demonstrate Recursive Function
11	Implementation of Structures.
12	Implementation of Pointers and Dynamic Memory Allocation.

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Programming with ANSI C	E Balguruswamy	Mc Graw Hill
02	Let Us C	Yashwant Kanitkar	BPB Publication

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	The C Programming Language	Kernighan and Richie	(PHI)/Pearson Education
02	Complete 'C' Reference	--	Herbert Schildt

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Second Year B. Tech. Computer Science and Engineering Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk.	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	CSE2101	Discrete Mathematical Structures	3	--	--	3	3	30	10	60	100
2	PCC	CSE2102	Data Structures Using C	3	--	--	3	3	30	10	60	100
3	PCC	CSE2103	Computer Networks	3	--	--	3	3	30	10	60	100
4	EL	CSE2104	Data Structures Using C Lab	--	--	4	4	2	--	50	25	75
5	MDM	CSE2105	Multi-disciplinary Minor – 01	2	--	--	2	2	30	10	60	100
6	OE	CSE2106	Open Elective -01	3	--	--	3	3	30	10	60	100
7	HSSM	CSE2107	Employability Enhancement Skills-I	2	--	--	2	2	--	50	--	50
8	PCC	CSE2108	Computer Networks Lab	--	--	2	2	1	--	50	25	75
9	HSSM	CSE2109	Business English	--	02	--	2	2	--	50	--	50
10	OE	CSE2110	Open Elective -01 Lab	--	--	2	2	1	--	25	25	50
			Total	16	02	08	26	22	150	275	375	800

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	--	--	--	06	04	--	02
Semester Credits	--	--	10	--	06	--	04	02	--
Cumulative Sum	16	16	10	--	06	06	08	02	02
PROGRESSIVE TOTAL CREDITS: 44+22 =66									

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Second Year B. Tech. Computer Science and Engineering Semester – IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk.	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	CSE2201	Operating System	3	--	--	3	3	30	10	60	100
2	PCC	CSE2202	Object Oriented Programming	2	--	--	2	2	30	10	60	100
3	PCC	CSE2203	Automata Theory	3	1	--	4	4	30	10	60	100
4	MDM	CSE2204	Multi-disciplinary Minor – 02	2	--	--	2	2	30	10	60	100
5	OE	CSE2205	Open Elective -02	2	--	--	2	2	30	10	60	100
6	HSSM (AEC)	CSE2206	Soft Skills	--	2	--	2	2	-	25	25	50
7	HSSM (EEMC)	CSE2207	Employability Enhancement Skills-II	2	--	--	2	2	-	25	--	25
8	VSEC	CSE2208	Operating System Lab	--	--	2	2	1	--	50	--	50
9	HSSM (VEC)	CSE2209	Object Oriented Programming Lab	--	--	4	4	2	-	50	25	75
10	VSEC	CSE2210	Mini Project-I Lab	--	--	2	2	1	--	25	25	50
11	BSC	CSE2211	Environmental Science	2	--	--	2	Audit	30	10	60	100
12	VSEC	CSE2212	Computer Maintenance Technology	--	--	2	2	1		50	--	50
			Total	16	03	10	29	22	180	285	435	800+100 (Audit)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	10	--	06	06	08	02	02
Semester Credits	--	--	09	--	04	03	06	--	-
Cumulative Sum	16	16	19	--	10	09	14	02	02
PROGRESSIVE TOTAL CREDITS: 66 + 22 = 88									

List of Open Elective Courses

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk.	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	Open Elective	Semester 3										
		CSE2106	Advanced Computer Graphics	3	--	--	3	3	30	10	60	100
		CSE2110	Advanced Computer Graphics-Lab	--	--	2	2	2	--	25	25	50
2		Semester 4										
		CSE2205	Computer Organization & Architecture	2	--	--	2	2	30	10	60	100

Abbreviations

Abbreviation	Definition	Abbreviation	Definition
L	Lecture	BSC	Basic Science Courses
T	Tutorial	ESC	Engineering Science Courses
P	Practical	PCC	Programme Core Course
MSE	Mid Semester Evaluation	PEC	Programme Elective Course
ISE/CA	In Semester Evaluation/Continuous Assessment	OE	Open Elective
ESE	End Semester Evaluation (For Laboratory, End Semester Performance)	MDM	Multi-Disciplinary Minor
		VSEC	Vocational and Skill Enhancement Course
		HSSM	Humanities Social Science and Management
		EL	Experimental Learning
		CCA	Co-curricular and Extracurricular Activities

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SHIVAJI UNIVERSITY, KOLHAPUR

Department of Computer Science and Engineering Revised Syllabus as per NEP 2020

Second Year Bachelor of Technology 3rd Semester

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Discrete Mathematical Structures			Course Code	CSE2101
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamentals of mathematics: -Sets, Functions, Algebraic operations.	
Course Objective	1	To introduce students to fundamental concepts in discrete mathematics, including Sets, relations, Functions, Algebraic Systems, Graphs, Groups, lattices and logic and use mathematically correct terminology and notations.
	2	To understand and critically analyse, formulate and solve the mathematical problems and proofs
	3	To cultivate students' ability to solve complex problems using discrete mathematical methods and algorithms.
	4	To design and implement experiments on Discrete Structures – Truth tables of statement formula, set operations, tree traversal techniques and explore applications of discrete mathematics in computer science, cryptography, and other fields.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Explain the basic concepts of discrete mathematical structures
	CO2	Demonstrate the applications of discrete structures in different fields of computer science.
	CO3	Make use of concepts of discrete mathematical structures to solve the problems.
	CO4	Apply the mathematical proofs and techniques to prove the theorems in computer science.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		2	1							
CO2	3	2		2	2							2
CO3	2	1	3	2	2							1`
CO4	2	2		2	1							1
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	Mathematical Logic	7 Hrs
	Statements & Notations, Connectives, Statement Formulas & truth table, Well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological Implications, functionally complete set of connectives, other connectives, Normal Forms	
2	Set Theory	5 Hrs
	Basic concepts of set theory, Operations on Sets, Ordered pairs & n-tuples, Cartesian product	
3	Relation and Ordering	6 Hrs
	Relations, Properties of binary relations, Matrix & Graph Representation of Relation, Partition & covering of Set, Equivalence Relations, Composition of Binary Relation, POSET & Hasse Diagram, Functions, Types of Functions, Composition of functions.	
4	Algebraic Systems	7 Hrs
	Algebraic Systems: Examples & General Properties, Semi groups & Monoids, Groups: Definitions & Examples, Subgroup & Homomorphism.	
5	Lattice and Boolean Algebra:	7 Hrs
	Lattice as partially ordered sets, Lattice as Algebraic Systems., Special Lattices., Boolean Algebra: Definitions & examples, Boolean Functions., Representation & Minimization of Boolean Functions.	
6	Graph Theory:	7 Hrs
	Basic concepts of graph theory., Paths, Reachability & Connectedness, Matrix, Representations of Graphs., Storage Representation & Manipulations of Graphs. PERT & Related technologies.	

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	"Discrete Mathematical Structures with Application to Computer Science"	J. P. Tremblay & R. Manohar	MGH International
02	Discrete Mathematics and its Applications	Kenneth H. Rosen	(AT&T Bell Labs) (mhhe.com/rosen)

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Discrete Mathematics	Semyour Lipschutz	Marc Lipson (MGH), Schaum's outlines
02	Discrete Mathematical Structures	Bernard Kolman, Robert Busby, S. C. Ross and Nadeemur- Rehman	Pearson Education

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Data Structures using C			Course Code	CSE2102
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamentals of C Programming	
Course Objective	1	Introduce fundamentals of Data Structures
	2	Review of the nature of data and its storage requirements.
	3	Design of storage and operations for different types of data.
	4	Assessment of complexity of data structures.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Identify the appropriate data structure for specific application
	CO2	Select appropriate searching and Sorting algorithms.
	CO3	Apply Data Structures to solve a complex problem.
	CO4	Analyse the performance of different data structures

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2		3									
CO4	2			3								
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme

- Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 %
- Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units).
- No compulsory passing for MSE.
- ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Basic of Data Structures** Pointers: Introduction to Pointers, Pointer Arithmetic, Dynamic Memory Allocation (Malloc and Calloc) Structures: Array of Structures, Passing Structures to Function, Structure and Pointers Data structure: Definition, Types of data structures, Data Structure Operations Algorithms: Complexity, Time and Space complexity	7 Hrs
2	**Searching and Sorting** Searching: Linear search, Binary search, Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort.	7 Hrs
3	**Stacks and Queues** Stack: Definition and operations, Array representation of stack, applications of Stack Queue: Definition and operations, Array representation of queue, applications of Queue, Circular Queue, Priority Queue.	6 Hrs
4	**Linked Lists** Definition, Representation, Operations, Implementation, Applications of Singly, Doubly and Circular linked lists. Linked representation of stack and Queue.	7 Hrs
5	**Trees** Terminology, Representation, Binary tree, Traversal methods, Binary Search Tree, AVL Search Tree, B tree and B+ tree. Heaps- Operations and their applications, Heap sort.	6 Hrs
6	**Graphs** Basic concept of graph theory, storage representation. Graph Traversal Techniques: BFS and DFS. Graph Representation using Sparse Matrix.	6 Hrs

Textbooks			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	**Programming in ANSI C**	**E. Balagurusamy**	**Tata McGraw Hill**
02	**Schaum's Outlines Data Structures**	**Seymour Lipschutz**	**MGH**

Reference Books			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	**Data Structure using C**	**A. M. Tanenbaum, Y. Langsam, M. J. Augenstein**	**PHI**
02	**Data Structures A Pseudo code Approach with C**	**Richard F. Gilberg and Behrouz A. Forouzon**	**2nd Edition**

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Computer Networks			Course Code	CSE2103
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamentals of C Programming	
Course Objective	1	To provide a strong foundation in computer network concepts, architectures, and protocols.
	2	To explore advanced topics, including client-server programming, IPv6, and multimedia communication.
	3	To develop hands-on expertise with networking tools and software.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Demonstrate understanding of basic and advanced networking concepts and protocols.
	CO2	Implement and analyse data link and MAC sublayer functionalities.
	CO3	Develop network layer functionalities and design and configure IPv4 and IPv6 addressing schemes.
	CO4	Analyse transport layer services and develop client-server network applications using socket programming.
	CO5	Configure and simulate application-layer services.
	CO6	Explain and implement multimedia networking and streaming protocols.

CO-PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1								
CO2	2	3	2	1	3							
CO3	2	1	2	2	2							
CO4	3		2		2							
CO5	2	2	3	2	2							
CO6	2	1		2	1							
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and contents	Hours
01	Introduction to Computer Networks Overview of OSI layer Model and TCP/IP protocol model, Addressing, Underlying technologies for LANs, WANs.	04
02	Data Link Layer and Medium Access Control Sub layer Data Link Layer: Design issues for Data Link Layers, Framing methods, Error control: detection and correction, Flow control, Elementary Data Link protocols, sliding window Protocols, Go back n, Selective repeat Medium Access Control Sub layer: Static and Dynamic channel allocation, Multiple Access protocols ALOHA, CSMA, Collision Free Protocols	07
03	Network Layer and Internet Protocol Network Layer: IPv4 Addresses: Classful Addressing, Class less Addressing, Delivery, Forwarding and routing; Routing methods: shortest path, Link state; Congestion prevention policies Internet Protocol: IP Datagram format, Fragmentation and reassembly models, ARP, RARP, ICMP, IGMP; IPv6: Addressing, Packet Format	07
04	Transport Layer and Socket Programming TCP and UDP: Features, Segment Format, Flow Control; Introduction to Sockets: Socket Addressing, Elementary System Calls; Client-Server Programming: Connection-Oriented and Connectionless Models	07
05	Application Layer Domain Name System (DNS): Name Resolution, Messages, Records, Remote Login (TELNET, SSH) and File Transfer (FTP, TFTP); HTTP: Architecture, Persistent vs. Non-Persistent Connections, Proxy Servers; Email Protocols: SMTP, POP3, IMAP	07
06	Multimedia Networking and Advanced Topics Streaming Protocols: RTP, RTCP, SIP, VoIP; Basics of Multimedia Networking: Real-Time Streaming (Audio/Video)	07

Textbooks			
Sr. No.	**Title**	**Author**	**Edition/Publication**
01	Computer Networks	Andrew S. Tanenbaum	5th Edition, Pearson
02	TCP/IP Protocol Suite	Behrouz A. Forouzan	4th Edition, McGraw-Hill

Reference Books			
Sr. No.	**Title**	**Author**	**Edition/Publication**
01	Computer Networking A Top-Down Approach	James F. Kurose, Keith W. Ross	8th Edition, Pearson
02	Unix Network Programming	W. Richard Stevens	Volume 1, 3rd Edition, Pearson Education
03	Internetworking with TCP/IP	Douglas Comer	Volume 1, 6th Edition, Pearson Education

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	Experimental Learning (EL)				
Title of Course	Data Structures using C Lab			Course Code	CSE2104
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	04	04	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	25	75	

Course Pre-Requisite	Fundamentals of C Programming	
Course Objective	1	Introduce fundamentals of Data Structures
	2	Review of the nature of data and its storage requirements.
	3	Design of storage and operations for different types of data.
	4	Assessment of complexity of data structures.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Identify the appropriate data structure for specific application
	CO2	Select appropriate searching and Sorting algorithms.
	CO3	Apply Data Structures to solve a complex problem.
	CO4	Analyse the performance of different data structures

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2		3									
CO4	2			3								
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<u>In Semester Evaluation/ Continuous Assessment has 50 Marks</u> Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. <u>End Semester Evaluation has 25 Marks</u> External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed.	
Exp. No.	**Title of Experiment/ Problem Statement**
1	Dynamic Memory Allocation: Malloc and Calloc functions in c
2	Array of Structures, Passing Structures to Function, Structure and Pointers
3	Searching: Linear and Binary Search
4	Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort
5	Implementation of Stack using Array
6	Implementation of Linear and Circular Queue using array
7	Implementation of Single Linked List or Doubly Linked List • Inserting Node at Beginning, Random and Last Position • Deleting Node from Beginning, Random and Last Position • Searching Given Node • Displaying Nodes
8	Implementation of Stack and Queue using Linked List
9	Implementation of Binary Search Tree Traversing Techniques (In order, Preorder and Postorder)
10	Implementation of Graph 1. Depth First Search, 2. Breadth First Search

Textbooks			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	Programming in ANSI C	E. Balaguruswamy	Tata McGraw Hill
02	Schaum's Outlines Data Structures	Seymour Lipschutz	MGH

Reference Books			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	Data Structure using C	A. M. Tanenbaum, Y. Langsam, M. J. Augenstein	PHI
02	Data Structures A Pseudo code Approach with C	Richard F. Gilberg and Behrouz A. Forouzon	2nd Edition

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	Multi-disciplinary Minor – 01				
Title of Course	Data Structures using C (MDM-01)			Course Code	CSE2105
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamentals of C Programming	
Course Objective	1	Introduce fundamentals of Data Structures
	2	Review of the nature of data and its storage requirements.
	3	Design of storage and operations for different types of data.
	4	Assessment of complexity of data structures.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Identify the appropriate data structure for specific application
	CO2	Select appropriate searching and Sorting algorithms.
	CO3	Apply Data Structures to solve a complex problem.
	CO4	Analyse the performance of different data structures

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2		3									
CO4	2			3								
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Basic of Data Structures**	3 Hrs
	Data structure: Definition, Types of data structures, Data Structure Operations Algorithms: Complexity, Time and Space complexity	
2	**Searching and Sorting**	6 Hrs
	Searching: Linear search, Binary search, Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort.	
3	**Stacks and Queues**	5 Hrs
	Stack: Definition and operations, Array representation of stack, applications of Stack. Queue: Definition and operations, Array representation of queue, applications of queue.	
4	**Linked Lists**	5 Hrs
	Definition, Representation, Operations, Implementation, Applications of Singly and Doubly Linked List	
5	**Trees**	4 Hrs
	Terminology, Representation, Binary tree, Traversal methods, Binary Search Tree, AVL Search Tree, B tree and B+ tree	
6	**Graphs**	4 Hrs
	Basic concept of graph theory, storage representation. Graph Traversal Techniques: BFS and DFS. Graph Representation using Sparse Matrix.	

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Programming in ANSI C	E. Balaguruswamy	Tata McGraw Hill
02	Schaum's Outlines Data Structures	Seymour Lipschutz	MGH

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Data Structure using C	A. M. Tanenbaum, Y. Langsam, M. J. Augenstein	PHI
02	Data Structures A Pseudo code Approach with C	Richard F. Gilberg and Behrouz A. Forouzon	2nd Edition

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	OE				
Title of Course	Open Elective-1 Advanced Computer Graphics			Course Code	CSE2106
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	--
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamentals of Computer Graphics
Course Objective	1 To expose students to the various transformation techniques and projections
	2 To make students understand different algorithms concerned with scanning, filling, windowing and clipping on graphical objects
	3 To make the students aware of generation of curves and surfaces
Course Outcomes	After completion of this course Students will be able to
	CO1 Understand 2D & 3D Transformation techniques
	CO2 Implement Bresenham's line and circle drawing algorithms
	CO3 Implement windowing & clipping
	CO4 Implement Bezier curves
	CO5 Understand Computer Animation
	CO6 Understand illumination models and surface rendering methods

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											1
CO2	1	1	1									1
CO3	1	1	1	1								1
CO4	1				3	2	2	1	1	1	1	2
CO5	1	1			1							
CO6	1	1			1							
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Transformations** Basic 2D & 3D transformations - Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, rotation about an arbitrary axis in space, Affine and Perspective Geometry, Orthographic projections and Axonometric projections	7 Hrs
2	**Raster Scan Graphics** Bresenham's line and circle drawing algorithms, Scan Conversion techniques: RLE, Frame Buffer, Scan converting polygons: Edge fill and Seed fill algorithms, Anti-aliasing and Halftoning	7 Hrs
3	**Viewing and clipping** Introduction, Windowing and View-porting, Introduction to clipping, Point clipping, and line clipping: Sutherland - Cohen line clipping algorithm	4 Hrs
4	**Curves and Surfaces** Curve Representation, Non-parametric and parametric curves, representation of space curves, Cubic Spline, Parabolic Blended curves, Bezier curves and B-spline curves, Z- buffer, Warnock algorithm	8 Hrs
5	**Computer Animation** Introduction, Key frame animation, Construction of an animation sequence, Motion control methods, Procedural animation, Key- frame animation vs. Procedural animation, Introduction to Morphing, Warping techniques, Three-dimensional morphing	6 Hrs
6	**Illumination models and surface rendering methods** Light sources, Basic illumination models, Displaying light intensities, Polygon Rendering methods, Ray tracing methods, Radiosity lighting model, Introduction to Blender	7 Hrs

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Mathematical elements for Computer Graphics	David F. Rogers, J. Alan Adams	(MGH Int.) For Unit 1 & 4
02	Procedural elements for Computer Graphics	David F. Rogers	(MGH International) For Unit 2 & 3
03	Computer Graphics	Rajesh Maurya	WILEY India For Unit 5
04	Computer Graphics C Version second edition	Donald D. Hearn, M. Pauline Baker	Pearson For Unit 6

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Computer Graphics (second Edition)	Zhigang Xiang & Roy Plastock	Schaum's Outline Series, TMGH
02	Computer Graphics Using OpenGL	F.S. Hill Jr. Stephen M. Kelley	Pearson

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	(Humanities Social Science and Management (HSSM)				
Title of Course	Employability Enhancement Skills-I			Course Code	CSE2107
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	--	50	

Course Objective	1	To enable the students to understand the skills required for effective communication at different levels of an organization.
	2	To enhance listening, note and presentation skills.
	3	To build communication skills among the students required for Digital Platforms.
	4	To build Business Correspondence Skills among the students.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Understand the skills required for effective communication at different levels of an organization.
	CO2	Enhance themselves with good listening, note taking and presentation skills.
	CO3	Build good communication skills among the students required for Digital Platforms.
	CO4	Efficiently Manage with Business Correspondence Skills among the students.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									2	3		1
CO2									2	3		1
CO3									2	3		1
CO4									2	3		1
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic.

Unit No.	Title and Content of Unit	Hours
1	**Behavioural Skills** Expectation Setting: Creating a focused and responsible learning environment, Personal Strength Analysis/Strength Blindness: Self -awareness and confidence building, Perception Management: Display Professionalism at the institute and work place Ethics, Values& Etiquette Increased social initiations relationships and networks Acceptance of peers from different cultures and social groups and work with them. Collaboration with team to prioritize the common goal and compromise Individual priorities.	5 Hrs
2	**English Reading Ability** Functional English: Greetings & Self Introduction Asking & responding to questions Sharing information with others Formal & Informal communication Speak and provide information about workplace Reading: Self, Work, Environment	5 Hrs
3	**Financial and Legal Literacy** Discuss the significance of using financial products and services safely and securely. Explain the importance of managing expenses, income, and savings. Explain the significance of approaching the concerned authorities in time for any exploitation as per legal rights and laws	4 Hrs
4	**Essential Digital Skills** Show how to operate digital devices and use the associated applications and features, safely and securely, Discuss the significance of using internet for browsing, accessing social media platforms, safely and securely.	4 Hrs
5	**Essential Skills for Success** Building basic skills to navigate life and career. Self-Awareness, articulating personal values, Value-based decision making, Dilemma situations. Identify sources and types of stress (positive / negative stress), Managing stress (long-term / short-term), Handling rejection and building resilience, Identify day wasters.	4 Hrs
6	**Getting Ready for Apprenticeship & Jobs** Create a biodata, Use various sources to search and apply for jobs Discuss the significance of dressing up neatly and maintaining hygiene for an interview Discuss how to search and register for apprenticeship opportunities	4 Hrs

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Communication Skills	Fillip Learning - FL	
02	Communication for Business: A Practical Approach	Taylor, Shirley	Pearson Education
03	Corporate Communication	C.S. Raydu	HPH
04	The Art and Science of Business Communication-Skills, Concepts, Cases and Applications	P. D. Chaturvedi and Mukesh Chaturvedi (2017)	4th Edition, Pearson Education
05	Critical Thinking: An Introduction to Analytical Reading and Reasoning	Wright, L.	Oxford University Press

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Business Communication	Rai & Rai	HPH
02	Corporate Communication	S. P. Sharman, Bhavani H.	VBH
03	Basic Business Communication: Concepts, Applications and Skills	Rajkumar	Excel Books

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Computer Networks Lab			Course Code	CSE2103
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	25	75	

Course Pre-Requisite	Fundamentals of C Programming	
Course Objective	1	To provide a strong foundation in computer network concepts, architectures, and protocols.
	2	To explore advanced topics, including client-server programming, IPv6, and multimedia communication.
	3	To develop hands-on expertise with networking tools and software.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Demonstrate understanding of basic and advanced networking concepts and protocols.
	CO2	Implement and analyse data link and MAC sublayer functionalities.
	CO3	Develop network layer functionalities and design and configure IPv4 and IPv6 addressing schemes.
	CO4	Analyse transport layer services and develop client-server network applications using socket programming.
	CO5	Configure and simulate application-layer services.
	CO6	Explain and implement multimedia networking and streaming protocols.

CO-PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1								
CO2	2	3	2	1	3							
CO3	2	1	2	2	2							
CO4	3		2		2							
CO5	2	2	3	2	2							
CO6	2	1		2	1							
Level of Mapping as: Low 1, Moderate 2, High 3												

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 10 to 12 Experiments should get performed.	
Exp. No.	**Title of Experiment/ Problem Statement**
1	Study and Installation of Cisco packet tracer tool.
2	Design of LAN or network topologies using Cisco packet tracer tool.
3	Implementing Framing methods (Character count, Bit Stuffing, Character Stuffing).
4	Implementation of error detection codes (CRC, Hamming codes).
5	Simulation of data link layer protocols (Stop-and-Wait, Sliding Window).
6	Programs to understand IP addressing, classful & classless addressing.
7	Simulate working of DHCP, ARP and FTP using Cisco packet tracer tool.
8	Development of client-server applications using TCP/UDP sockets.
9	Capturing and analysing application layer protocols using Wireshark.
10	Study of multimedia protocols (RTP, SIP) and streaming services.

Textbooks			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	Computer Networks	Andrew S. Tanenbaum	5th Edition, Pearson
02	TCP/IP Protocol Suite	Behrouz A. Forouzan	4th Edition, McGraw-Hill

Reference Books			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	Computer Networking: A Top-Down Approach	James F. Kurose, Keith W. Ross	8th Edition, Pearson
02	Unix Network Programming	W. Richard Stevens	Volume 1, 3rd Edition, Pearson Education
03	Internetworking with TCP/IP	Douglas Comer	Volume 1, 6th Edition, Pearson Education

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	(Humanities Social Science and Management (HSSM)				
Title of Course	Business English			Course Code	CSE2109
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	02	--	02	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	--	50	

Course Pre-Requisite	Knowledge of functional grammar and vocabulary in English	
Course Objective	1	Develop basic skills to deal with people in business situations
	2	Write and read basic business reports, letters, e-mails etc
	3	Expand vocabulary related to general business situations
	4	Develop confidence to deal with people and basic issues in the business world
Course Outcomes	After completion of this course Students will be able to	
	CO1	Communicate with others in practical, business-oriented situations
	CO2	Express themselves in English with greater fluency, accuracy and confidence
	CO3	Enhance the skills of listening, speaking, pronunciation skills, as well as business vocabulary
	CO4	Acquire the communicative competencies crucial for appropriate workplace behaviour

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					1			2		3		2
CO2					2			2		3		2
CO3					2			2		3		1
CO4					1			2		2		2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<u>In Semester Evaluation/ Continuous Assessment has 50 Marks</u> • Parameters for In Semester Evaluation could be: Attendance, Assignments, Presentation, etc. • Lab File should be prepared and should be assessed continuously during academic.

Unit No.	Title and Content of Unit	Hours
1	Vocabulary building and Reading comprehension	5 Hrs
	Synonyms and antonyms, Reading techniques and comprehension skills, Prefixes and Suffixes, Idioms and phrases, One-word substitution	
2	Getting acquainted with professional culture	4 Hrs
	First day at work, Induction program, Company hierarchy	
3	Verbal Etiquettes	4 Hrs
	Group Discussion, Meeting, Dining, Telephone, Interview, Video Conferencing	
4	Written Etiquettes	4 Hrs
	Resume Writing, E Mail Writing, Report Writing, Minutes of Meeting	
5	Public speaking and Presentation Skills	5 Hrs
	Preparing and conducting presentation, Body language, Overcoming stage fear, Best practices	
6	Miscellaneous	4 Hrs
	Handling Complains, Negotiation Skills, Business Etiquettes	

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Technical Communication	Ashraf Rizvi	Tata McGraw Hill, 2005
02	Technical English	Dr. M. Hemamalini	Wiley, 2014

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	English for Technical Communication	K. R. Laxminarayan	SCITECH 2nd Edition 2014

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	OE				
Title of Course	Open Elective-1 Advanced Computer Graphics Lab			Course Code	CSE2110
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	25	25	50	

Course Pre-Requisite	Fundamentals of Computer Graphics	
Course Objective	1	To expose students to the various transformation techniques and projections
	2	To make students understand different algorithms concerned with scanning, filling, windowing and clipping on graphical objects
	3	To make the students aware of generation of curves and surfaces
Course Outcomes	After completion of this course Students will be able to	
	CO1	Understand 2D & 3D Transformation techniques
	CO2	Implement Bresenham's line and circle drawing algorithms
	CO3	Implement windowing & clipping
	CO4	Implement Bezier curves
	CO5	Understand Computer Animation
	CO6	Understand illumination models and surface rendering methods

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											1
CO2	1	1	1									1
CO3	1	1	1	1								1
CO4	1				3	2	2	1	1	1	1	2
CO5	1	1			1							
CO6	1	1			1							
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<u>In Semester Evaluation/ Continuous Assessment has 25 Marks</u> Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. <u>End Semester Evaluation has 25 Marks</u> External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 08 to 10 Experiments should get performed.	
Exp. No	Title of Experiment/ Problem Statement
1	Study of basic graphics functions defined in “graphics.h “
2	Draw A Circle, Arc, Ellipse & Rectangle
3	2D Translation, Rotation & Scaling
4	3D Translation, Rotation & Scaling
5	Bresenham’s Line Drawing Algorithm
6	Bresenham’s Circle Drawing Algorithm
7	Mid-Point Line Drawing Algorithm
8	Polygon Filling
9	Line clipping
10	Study of OPENGL & Blender 3D Software
11	DDA Line Drawing Algorithm

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Mathematical elements for Computer Graphics	David F. Rogers, J. Alan Adams	(MGH Int.) For Unit 1 & 4
02	Procedural elements for Computer Graphics	David F. Rogers	(MGH International) For Unit 2 & 3
03	Computer Graphics	Rajesh Maurya	WILEY India For Unit 5
04	Computer Graphics C Version second edition	Donald D. Hearn, M. Pauline Baker	Pearson For Unit 6

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Computer Graphics (second Edition)	Zhigang Xiang & Roy Plastock	Schaum's Outline Series, TMGH
02	Computer Graphics Using OpenGL	F.S. Hill Jr. Stephen M. Kelley	Pearson

शिवाजी विद्यापीठ, कोल्हापूर
SHIVAJI UNIVERSITY, KOLHAPUR

Department of Computer Science and Engineering Revised Syllabus as per NEP 2020

Second Year Bachelor of Technology 4th Semester

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Operating System			Course Code	CSE 2201
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Computer Network, Data Structure	
Course Objective	1	To make the students understand basic concepts of operating system
	2	To expose the students to various functions of the Operating system and their usage
	3	Architecture and algorithms of process scheduling and memory management.
	4	Algorithms of buffer cache management and Internal File system organizations in UNIX
Course Outcomes	After completion of this course Students will be able to	
	CO1	Explain basic concepts of operating system and their structures to compare various operating systems using various OS parameters.
	CO2	Use deadlock handling and Memory management techniques with suitable method to handle a deadlock and memory management.
	CO3	Develop appropriate solution to solve critical section problem by using accurate operating system algorithm
	CO4	Illustrate internal representation of files and relevant algorithms.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	2	2									
CO3	2	2	2									
CO4	2											
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Introduction and Process Management** Overview: Introduction to Operating Systems, Operating System structure, Operating System Services, Architecture of the UNIX OS, Introduction to System Concepts, Types of Operating Systems - Batch Processing System, Multiprogramming System, The Time-Sharing System, The Real Time Operating System, Distributed operating system. Process concept: Basic concepts, Processes and programs, Implementing processes, Process States, Process Control Block, Context switch, Operations on processes, Inter-process communication, Threads.	7 Hrs
2	**Processes Synchronization and Scheduling** Processes Synchronization: Background, Process synchronization, Race condition, Critical Section, Synchronization approaches, Classic process synchronization problems, Semaphores, Monitors Process Scheduling: Scheduling criteria, Types of Schedulers, Scheduling algorithms, Multiple-Processor scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling	7 Hrs
3	**Deadlock** System model, deadlock characterization, methods for handling deadlocks, deadlock preventions, deadlock avoidance, deadlock detection, deadlock recovery.	6 Hrs
4	**Buffer Cache** Buffer Headers, Structure of the Buffer Pool, Scenarios for Retrieval of a Buffer, Reading and Writing Disk Blocks, Advantages and Disadvantages of Buffer Cache.	6 Hrs

Unit No.	Title and Content of Unit	Hours
5	**Internal Representation of Files and system calls** I-nodes, Structure of the Regular File, Directories, Conversion of a Pathname to I-node, Super Block, I-node Assignment to a New File, Allocation of Disk Blocks. System Calls: Open, Read, Write, File and Record Locking, Adjusting the position of FILE I/O-LSEEK, Close, File Creation, Creation of Special Files, Change Directory and Change Root, Change Owner and Change Mode, Stat and Fstat, Pipes, Dup, Mounting and Un-mounting File Systems, Link, Unlink.	7 Hrs
6	**Memory Management** Memory Management Strategies: Background, swapping, contiguous and non-contiguous memory allocation, paging, structure of the page table, Segmentation. Virtual Memory Management: Background, demand paging, copy-on write, page replacement, Thrashing	6 Hrs

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Operating Systems –A Concept Based approach.	Dhananjay M. Dhamdhere	TMGH, 3rd Edition
02	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin & Grege Gagne	Wiley
03	The design of Unix Operating System	Maurice J. Bach	PHI

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Operating System: Concepts and Design	Milan Milenkovic	TMGH
02	Linux System Programming	Robert Love	SPD, O' REILLY

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Object Oriented Programming			Course Code	CSE2202
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Object Oriented Programming	
Course Objective	1	To learn the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design.
	2	To learn the syntax and semantics of the C++ programming language
	3	To understand the concept of data abstraction and encapsulation, how to design C++ classes for code reuse, how to implement copy constructors and class member functions, to overload functions and operators in C++.
	4	To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
	5	To learn how to design and implement generic classes with C++ templates and how to use exception handling in C++ programs
Course Outcomes	After completion of this course Students will be able to	
	CO1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
	CO2	Design object-oriented solutions for small systems involving multiple objects.
	CO3	Use virtual and pure virtual function and complex programming situations.
	CO4	Apply object-oriented software principles in problem solving.
	CO5	Analyse the strengths of object-oriented programming
	CO6	Develop the application using object-oriented programming language (C++).

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1								
CO2	1	2	1	1								1
CO3	2	1	2	2								
CO4	2	1		1								1
CO5		1		1								
CO6			1									1
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Fundamentals of Object-Oriented Programming** Introduction to object-oriented programming, Need of object-oriented programming, Fundamentals concepts or features of object-oriented programming, Namespaces, Benefits of OOP, C++ as object-oriented programming language. C++ Programming- C++ programming Basics, Data Types, Structures, Enumerations, control structures, Arrays and Strings, Class, Object, class and data abstraction, Access specifiers, separating interface from implementation. Functions- Function, function prototype, accessing function and utility function, Constructors and destructor, Types of constructors, Static members: variable and functions, inline function, friend function.	5 Hrs
2	**Inheritance and Pointers** Inheritance- Base Class and derived Class, protected members, relationship between base Class and derived Class, Constructor and destructor in Derived Class, Overriding Member Functions, Class Hierarchies, Public and Private Inheritance, Types of Inheritance, Ambiguity in Multiple Inheritance, Virtual Base Class, Abstract class, Friend Class, Nested Class. Pointers: declaring and initializing pointers, indirection Operators, Memory Management: new and delete, Pointers to Objects, this pointer, Pointers Vs. Arrays, accessing Arrays using pointers, Arrays of Pointers, Function pointers, Pointers to Pointers, Pointers to Derived classes, Passing pointers to functions	5 Hrs
3	**Polymorphism** Polymorphism- Introduction to Polymorphism, Types of Polymorphism, Operator Overloading- concept of overloading, operator overloading, Overloading Unary Operators, Overloading Binary Operators, Data Conversion, Type casting (implicit and explicit), Pitfalls of Operator Overloading and Conversion, Keywords explicit and mutable. Function overloading, Run Time Polymorphism- Pointers to Base class, virtual function and its significance in C++, pure virtual function and virtual table, virtual destructor, abstract base class.	5 Hrs

Unit No.	Title and Content of Unit	Hours
4	**Files and Streams** Data hierarchy, Stream and files, Stream Classes, Stream Errors, Disk File I/O with Streams, File Pointers, and Error Handling in File I/O, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, memory as a Stream Object, Command-Line Arguments, Printer output.	4 Hrs
5	**Exception Handling** Exception Handling- Fundamentals, other error handling techniques, simple exception handling- Divide by Zero, Multiple catching, re-throwing an exception, exception specifications, user defined exceptions, processing unexpected exceptions, constructor, destructor and exception handling, exception and inheritance.	3 Hrs
6	**Templates & Standard Template Library (STL)** Templates- The Power of Templates, Function template, overloading Function templates, and class template, class template and Nontype parameters, template and friends Generic Functions STL: Introduction to STL, STL Components, Containers- Sequence container and associative containers, container adapters, Application of Container classes: vector, list	5 Hrs

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	C++ How to Program	Deitel	Pearson Education
02	Object-Oriented Programming in C++	Robert Lafore	Sams Publishing

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	C++-The complete reference	Herbert Schildt	McGraw Hill Professional
02	The Object-Oriented Thought Process	Matt Weisfeld	Third Edition Pearson
03	Object-Oriented Programming with C++	E. Balagurusamy	Graw-Hill

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	Programme Core Course (PCC)				
Title of Course	Automata Theory			Course Code	CSE2203
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	01	--	04	04
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Prerequisite: Basic Mathematical Concepts, Sets, graphs. Course Objectives:	
Course Objective	1	To introduce students to the mathematical foundations of computation, the theory of formal languages and grammars.
	2	Understand and conduct mathematical proofs for computations.
	3	Understand the use of automata theory in Compliers & System Programming.
	4	To analyse and design finite automata, pushdown automata, grammars & Turing machines.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Understand basic concepts of Regular Language and Regular Expressions.
	CO2	Select appropriate abstract machine to recognize a given formal language.
	CO3	Generate complex languages by applying Union, Intersection, Complement, Concatenation and Kleene * operations on simple languages.
	CO4	Apply parsing concepts for syntax analysis.
	CO5	Be familiar with thinking analytically and intuitively for problem solving situations in related areas of theory in computer science.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2		2	3								
CO4	2			3								
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme

- Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 %
- Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units).
- No compulsory passing for MSE.
- ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	Introduction to Automata Theory: Central Concepts of Automata theory, Recursive Definitions, Regular expressions and regular languages Deterministic Finite Automata (DFA), Non- Deterministic Finite Automata (NFA), Epsilon- NFA.	7 Hrs
2	Non-determinism Automata and Kleene's Theorem Nondeterministic finite automata, NFA with null transition, Equivalence of FA's, Kleene's Theorem (Part I & Part II), Minimal Finite Automata, NFA to DFA Conversion, Minimization of DFA, Role of Lexical Analyser.	6 Hrs.
3	Context free Grammars Definition, Union, Concatenation and Kleene *'s of CFLs, Derivations Using a Grammar, Parse Trees, simplified normal forms-Ambiguity and Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring. Syntax Analysis Phase of Compilers: Role of Parser	5 Hrs.
4	Pushdown Automata Introduction to Pushdown Automata, Properties of Pushdown Automata, Equivalence of CFG's & PDA's, Parsing with Pushdown Automata-Top-down parsing, bottom-up parsing, Applications of Pushdown Automata.	7 Hrs
5	Context Free Languages Formal Definition of CFLs, Properties of Context-Free Languages, Applications of Context-Free Languages, Non-Context-Free Languages, Pumping Lemma- Introduction to the Pumping Lemma, Pumping Lemma for Context-Free Languages.	7 Hrs.
6	Turing machines Definition, TM as language acceptors, computing partial function with a TM, combining Turing machines, multi-tape TMs and Universal TM.	7 Hrs.

Text books			
Sr. no.	Title	Author	Edition/Publication
01	Introduction to Languages & the Theory of Computations	John C. Martin	Tata McGraw Hill
02	Discrete Mathematical Structures with applications to Computer Science	J. P. Trembley & R. Manohar	MGH

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Introduction to Automata Theory, Languages and computation	John E. Hopcraft, Raje, Motwani, Jeffrey D. Ullman	Pearson Edition
02	Introduction to theory of Computations	Michael Sipser	Thomson Books/Cole
03	Theory of Computation	Vivek Kulkarni	OXFORD Higher Education

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	Multi-disciplinary Minor – 02				
Title of Course	Object Oriented Programming (MDM-02)			Course Code	CSE2204
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	C Programming	
Course Objective	1	To learn the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design.
	2	To learn the syntax and semantics of the C++ programming language
	3	To understand the concept of data abstraction and encapsulation, how to design C++ classes for code reuse, how to implement copy constructors and class member functions, to overload functions and operators in C++.
	4	To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
	5	To learn how to design and implement generic classes with C++ templates and how to use exception handling in C++ programs
Course Outcomes	After completion of this course Students will be able to	
	CO1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
	CO2	Design object-oriented solutions for small systems involving multiple objects.
	CO3	Use virtual and pure virtual function and complex programming situations.
	CO4	Apply object-oriented software principles in problem solving.
	CO5	Analyse the strengths of object-oriented programming
	CO6	Develop the application using object-oriented programming language (C++).

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1								
CO2	1	2	1	1								1
CO3	2	1	2	2								
CO4	2	1		1								1
CO5		1		1								
CO6			1									1
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Fundamentals of Object-Oriented Programming** Introduction to object-oriented programming, Need of object-oriented programming, Fundamentals concepts or features of object-oriented programming, Namespaces, Benefits of OOP, C++ as object-oriented programming language. C++ Programming- C++ programming Basics, Data Types, Structures, Enumerations, control structures, Arrays and Strings, Class, Object, class and data abstraction, Access specifiers, separating interface from implementation. Functions- Function, function prototype, accessing function and utility function, Constructors and destructor, Types of constructors, Static members: variable and functions, inline function, friend function.	5 Hrs
2	**Inheritance and Pointers** Inheritance- Base Class and derived Class, protected members, relationship between base Class and derived Class, Constructor and destructor in Derived Class, Overriding Member Functions, Class Hierarchies, Public and Private Inheritance, Types of Inheritance, Ambiguity in Multiple Inheritance, Virtual Base Class, Abstract class, Friend Class, Nested Class. Pointers: declaring and initializing pointers, indirection Operators, Memory Management: new and delete, Pointers to Objects, this pointer, Pointers Vs. Arrays, accessing Arrays using pointers, Arrays of Pointers, Function pointers, Pointers to Pointers, Pointers to Derived classes, Passing pointers to functions	5 Hrs
3	**Polymorphism** Polymorphism- Introduction to Polymorphism, Types of Polymorphism, Operator Overloading- concept of overloading, operator overloading, Overloading Unary Operators, Overloading Binary Operators, Data Conversion, Type casting (implicit and explicit), Pitfalls of Operator Overloading and Conversion, Keywords explicit and mutable. Function overloading, Run Time Polymorphism- Pointers to Base class, virtual function and its significance in C++, pure virtual function and virtual table, virtual destructor, abstract base class.	5 Hrs

Unit No.	Title and Content of Unit	Hours
4	**Files and Streams** Data hierarchy, Stream and files, Stream Classes, Stream Errors, Disk File I/O with Streams, File Pointers, and Error Handling in File I/O, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, memory as a Stream Object, Command-Line Arguments, Printer output.	4 Hrs
5	**Exception Handling** Exception Handling- Fundamentals, other error handling techniques, simple exception handling- Divide by Zero, Multiple catching, re-throwing an exception, exception specifications, user defined exceptions, processing unexpected exceptions, constructor, destructor and exception handling, exception and inheritance.	3 Hrs
6	**Templates & Standard Template Library (STL)** Templates- The Power of Templates, Function template, overloading Function templates, and class template, class template and Nontype parameters, template and friends Generic Functions STL: Introduction to STL, STL Components, Containers- Sequence container and associative containers, container adapters, Application of Container classes: vector, list	5 Hrs

Textbooks

Sr. no.	Title	Author	Edition/Publication
01	C++ How to Program	Deitel	Pearson Education
02	Object-Oriented Programming in C++	Robert Lafore	Sams Publishing

Reference Books

Sr. no.	Title	Author	Edition/Publication
01	C++-The complete reference	Herbert Schildt	McGraw Hill Professional
02	The Object-Oriented Thought Process	Matt Weisfeld	Third Edition Pearson
03	Object-Oriented Programming with C++	E. Balagurusamy	Graw-Hill

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	OE				
Title of Course	Open Elective-2 Computer Organization & Architecture			Course Code	CSE2205
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamentals of Computer	
Course Objective	1	To provide a high-level overview of Computer organization
	2	To discuss the basic of I/O addressing and access
	3	To make the students aware of overall design and architecture of computer and its organization
	4	To analyse performance issues in processor and memory design of a digital computer
Course Outcomes	After completion of this course Students will be able to	
	CO1	Recapitulate the history of computer system and the basic concepts of computer architecture and organization
	CO2	Understand the concept of I/O organization
	CO3	Apply the different algorithms to perform arithmetic operations
	CO4	Articulate the design issues in the development of processor
	CO5	Conceptualize instruction level parallelism
	CO6	Understand the concept of memory techniques

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2										1	1
CO2	1											1
CO3			1	1								1
CO4		1	2	1	1						1	1
CO5		1										1
CO6	1											1
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Computer Evolution and Performance** Evolution of computer – Mechanical Era: Babbage's Difference Engine, Generations of Computer, Difference between RICS and CISC	4 Hrs
2	**Input and Output Organization** Accessing I/O devices, Direct Memory Access (DMA), Buses: Synchronous Bus and Asynchronous Bus, Interface Circuits, Standard IO Interface	4 Hrs
3	**Arithmetic** Addition and Subtraction of Signed Numbers, Multiplication of Positive numbers, Signed Operand Multiplication, Integer Division, IEEE 754 Floating Point Format	4 Hrs
4	**The Processing Unit** Some fundamental Concepts, Execution of complete Instruction, Multiple bus organization, Hardwired control, Micro programmed Control	4 Hrs
5	**Pipelining** Role of Cache Memory, Pipeline Performance. Data Hazards: Operand Forwarding, Handling Data Hazards	5 Hrs
6	**Computer Memory System** Some Basic Concepts, Types of Memories: ROM and RAM, Cache Memories: Mapping functions, Replacement Algorithms, Example of Mapping	5 Hrs

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Computer Architecture and Organization	John P Hayes	(MGH) 3rdEdition
02	Computer Organization	Carl Hamacher, ZvonkoVranesic and SafwatZaky	Tata McGraw Hill. 5thEdition

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Computer Systems Organization & Architecture	John D. Carpinelli	Pearson Education

Year and Semester	Second Year B. Tech (Computer Science and Engineering) Semester IV				
Course Category	Humanities Social Science and Management (HSSM) AEC				
Title of Course	Soft Skills			Course Code	CSE2206
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	02	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	25	25	50	

Course Pre-Requisite	English Language, Professional Communication Skills.	
Course Objective	1	To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
	2	To develop and nurture the soft skills of the students through individual and group activities.
	3	To expose students to right attitudinal and behavioural aspects and to build the same through activities
	4	To encourage the all-round development of students by focusing on soft skills.
Course Outcomes	After completion of this course Students will be able to	
	CSE2206.1	Demonstrate effective communication through verbal/written communication and improved listening skill.
	CSE2206.2	Exhibit effective communication in group discussion/meetings/interviews, prepare & presentations.
	CSE2206.3	Demonstrate effective communication in multi-disciplinary and heterogeneous teams through the knowledge of team work, inter-personal relationships, conflict management and leadership quality.
	CSE2206.4	Write precise briefs or reports and technical documents.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								2	3	3		
CO2								3	3	3	2	2
CO3								2	3	3	2	2
CO4								2	3		2	2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks **Parameters for In Semester Evaluation could be: Attendance, Tutorials, Group Discussion, Seminar, Power point Presentation on technical or non-technical topics, and LSRW Activities etc. Assignment should be given and should be assessed continuously during academic.** **End Semester Evaluation has 25 Marks** **External Oral Examination**

Unit No.	Title and Content of Unit	Hours
1	**Understanding Communication Skills** **Understanding Communication Skills: Verbal Communication - Effective Communication - Active listening – Articulation Paraphrasing – Feedback Non- Verbal Communication- Body Language of self and others- LSRW Skills**	4Hrs
2	**Behavioral Skills /Self Development:** **Behavioral Skills /Self Development: SWOT Analysis, Confidence improvement, values, positive attitude, positive thinking and self-esteem.**	4Hrs
3	**Leadership and Team Building** **Leadership and Team Building, Culture and Leadership- Salient Features of Corporate Culture, Leadership Styles, Leadership Trends, Team Building- Team Development Stages, Types of Teams, Attributes of a successful team – Barriers involved**	4Hrs
4	**Developing Writing skills** **Developing Writing skills, E-mail writing, report writing, resumes writing, practice.**	4Hrs
5	**Stress and Time Management** **Stress and Time Management** **Stress in Today's Time- Identify the Stress Source, Signs of Stress, Ways to Cope with Stress. Healthier Ways to Combat Stress, Steps to be taken in the Organizations: Open communication, Time Management, working towards Your Goals, Smart Work, Prioritize your Tasks**	5 Hrs
6	**Professional Skill** **Professional Skill** **Ethics, Etiquette and Mannerism-All types of Etiquette (at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office (PRO)'s Etiquettes) Technology Etiquette: Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette. Dressing Etiquettes: for Interview, offices and social functions. Ethical Values: Importance of Work Ethics, Problems in the Absence of Work Ethics.**	5 Hrs

Guidelines for Tutorial Performance (ISE/CA)
ISE/CA- In Semester Evaluation/Continuous Assessment: ✓ **The instructor shows videos to enhance skills supporting career aspects and discussion about same videos. Multiple set of observations based on videos can be prepared by students.** ✓ **Multiple set of activity-based assignments can be prepared to allow multiple skills exposure for example a group task encouraging discussions, team building, value sharing, leadership and role play all at the same time. Every student must be given adequate opportunity to participate actively in each activity.** ✓ **Each student will write one report based on visit / project / business proposal etc.** ✓ **Faculty may arrange one or more sessions from following: Yoga and Meditation. Stress management, relaxation exercises, and fitness exercises. Time management and personal planning sessions.** ✓ **The student must prepare the journal in the form of report elaborating the activities performed in the lab. Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, punctuality, neatness, enthusiasm, participation and contribution in various activities-SWOT analysis, presentations, team activity, event management, group discussion, Group exercises and interpersonal skills and similar other activities/ assignments.**

Sr. No.	Title of Assignment
01	Communication Skills
02	SWOT Analysis
03	Positive attitude
04	Leadership and team building
05	Developing writing skills: Email, report & resume
06	Stress management
07	Time management
08	Ethic and etiquettes
09	Ethical values
10	Group Discussion
11	Power point Presentation on technical or non-technical topics

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Soft Skills- Know Yourself and Know the world	Dr. K. Alex	S. Chand & Company Pvt. Ltd.
02	Soft Skills – An Integrated Approach to Maximize Personality,	Gajendra Singh Chauhan, Sangeeta Sharma	WILEY INDIA
03	Developing Communication Skills	Krishna Mohan and Meera Banerji	MacMillan India Ltd., Delhi
04	Essentials of Effective Communication	Ludlow and Panthon	Prentice Hall of India

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	An Approach to Communication Skills	Indrajit Bhattacharya	Delhi, Dhanpat Rai
02	English for Business Communication	Simon Sweeney	Cambridge University Press

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	(Humanities Social Science and Management (HSSM) EEMC				
Title of Course	Employability Enhancement Skills-II			Course Code	CSE2207
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	25	--	25	

Course Pre-Requisite	Employability Enhancement Skills-II	
Course Objective	1	To enable the students to understand, Interpret & use formal and technical communication.
	2	To enhance and apply the concept in productivity & quality management in day-to-day work to improve productivity & quality.
	3	Utilize basic Employability skills and tools to take benefit of connection in the industry.
	4	To build communication skills among the students required for Digital Platforms.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Demonstrate proficiency in critical thinking by analysing complex problems and proposing effective solutions.
	CO2	Exhibit creativity through the development of innovative projects and solutions.
	CO3	Display heightened emotional intelligence by managing stress, communicating empathetically, and resolving conflicts constructively.
	CO4	Showcase collaborative skills by actively participating in group activities, contributing to team goals, and communicating ideas effectively.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3		3								
CO2		2				1						
CO3						3	2					
CO4					3			3				
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<u>In Semester Evaluation/ Continuous Assessment has 50 Marks</u> Parameters for In Semester Evaluation could be: Attendance, Assignments, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. • Lab File should be prepared and should be assessed continuously during academic.

Unit No.	Title and Content of Unit	Hours
1	**Problem Solving:** Problem Solving, Critical thinking and decision making, Creative thinking, Group Dynamics & Decision-Making Techniques, Customer Centricity - Types of customers, Responding effectively to customers	4 Hrs
2	**Inter-Personal & Inter-Organisational Communication** Inter-Personal & Inter-Organisational Communication, Emotional Intelligence & Stress Management, Teamwork, Work efficiency, Team collaboration, Conflict management	4 Hrs
3	**Maintaining Efficiency at Workplace** Factors affecting productivity, Improving Productivity, Basic provisions on safety and Health, Self-Awareness, articulating personal values, Value-based decision making, Dilemma situations.	4 Hrs
4	**Entrepreneurial Mindset:** Opportunity recognition, Creativity and innovation, Conception and ideation, Identify the customer, Self-confidence and resilience, Competition analysis, Leadership and team spirit, Serving the society, Taking ownership	5 Hrs
5	**Preparation to the world of work** Career Plan: Identify the difference between job and career, Job roles available in respective trades. Career Pathways: Awareness of industries, and the respective professional pathways Search and apply for a job: Awareness of higher education, up skilling (short-term) options Steps involved in online application for Instructor course, Apprenticeship and different jobs in popular site like theindiajobs.com, naukri.com, monsterindia.com, Govt. website	5 Hrs
6	**Getting Started with LinkedIn:** Introduction to LinkedIn, Setting up your profile. Connecting to companies and influencers, highlighting your skills, managing recommendations and endorsement, Effective job searching in LinkedIn	4 Hrs

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	The Art and Science of Business Communication-Skills, Concepts, Cases and Applications	P. D. Chaturvedi and Mukesh Chaturvedi (2017)	4th Edition, Pearson Education
02	Critical Thinking: An Introduction to Analytical Reading and Reasoning	Wright, L.	Oxford University Press
03	Think Smarter: Critical Thinking to Improve Problem-Solving and Decision-Making Skills	Kallet, M.	Wiley

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Emotional Intelligence 2.0. Talent Smart	Bradberry, T., & Greaves, J.	
02	Mindset: The New Psychology of Success	Dweck, C. S.	Ballantine Books
03	Soft Skills for Managers	Chakravarthi T. Kalyana and Chakravarthi T. Latha	Biztantra Publications, 2014
04	Communication Skills	Kumar Sanjay and Pushp Lata	2nd Edition, Oxford University Press

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	Vocational and Skill Enhancement Course (VSEC)				
Title of Course	Operating System Lab			Course Code	CSE2208
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	--	50	

Course Pre-Requisite	Computer Network, Data Structure	
Course Objective	1	Understand and Install Operating Systems.
	2	Apply UNIX Commands for System and File Management.
	3	Implement CPU Scheduling and Process Management Techniques.
	4	Solve Synchronization and Deadlock Problems.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Students will be able to install different operating systems and configure their settings, gaining foundational knowledge in OS installation procedures and system setup.
	CO2	Students will demonstrate proficiency in using basic UNIX utility commands for file and directory management, as well as managing file access permissions, enhancing their command-line skills for system administration.
	CO3	Students will implement various CPU scheduling algorithms and manage UNIX processes, from creation to termination, improving their understanding of process scheduling and control in operating systems.
	CO4	Students will develop programs to address synchronization issues and apply deadlock avoidance strategies for deadlock management.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	1										
CO3	2	2										
CO4	2	1										
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic.

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 08 to 10 Experiments should get performed.	
Exp. No.	**Title of Experiment/ Problem Statement**
1	Installation of various Operating System.
2	Demonstration of basics of UNIX utility commands.
3	Demonstration of File and Directory management Commands
4	Demonstration of various File access and permission Commands.
5	Implementation of CPU Scheduling Algorithms.
6	Implementation of various operations on Files (Create, Open, Read, Write, Append)
7	Demonstration of UNIX Process Management – from process creation to process termination.
8	Write a program to simulate producer-consumer problem using semaphores.
9	Write a program based on Banker's algorithm for Deadlock Avoidance.
10	Implementation of Shell Scripts.

Textbooks			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin & Grege Gagne	Wiley
02	The design of Unix Operating System	Maurice J. Bach	PHI

Reference Books			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	Unix concepts & administration	Sumitabh Das	Tata McGrow Hill,

Year and Semester	Second Year B. Tech - Semester III - Computer Science and Engineering				
Course Category	VEC				
Title of Course	Object Oriented Programming Lab			Course Code	CSE2209
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	04	04	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	25	75	

Course Pre-Requisite	Object Oriented Programming	
Course Objective	1	To learn the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design.
	2	To learn the syntax and semantics of the C++ programming language
	3	To understand the concept of data abstraction and encapsulation, how to design C++ classes for code reuse, how to implement copy constructors and class member functions, to overload functions and operators in C++.
	4	To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
	5	To learn how to design and implement generic classes with C++ templates and how to use exception handling in C++ programs
Course Outcomes	After completion of this course Students will be able to	
	CO1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
	CO2	Design object-oriented solutions for small systems involving multiple objects.
	CO3	Use virtual and pure virtual function and complex programming situations.
	CO4	Apply object-oriented software principles in problem solving.
	CO5	Analyse the strengths of object-oriented programming
	CO6	Develop the application using object-oriented programming language (C++).

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1								
CO2	1	2	1	1								1
CO3	2	1	2	2								
CO4	2	1		1								1
CO5		1		1								
CO6			1									1
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks **Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc.** **Lab File should be prepared and should be assessed continuously during academic.** **End Semester Evaluation has 25 Marks** **External Practical Examination with Performance and Oral Examination**

Experiment List: Minimum 12 to 15 Experiments should get performed:	
Sr. no.	**Experiment Name**
1	Implement a program to define a Student class with attributes like name, roll number, and marks. Implement member functions to input and display student details.
2	Implement a program to create a Complex class to represent complex numbers. Implement member functions for addition, subtraction, and display of complex numbers
3	Develop a simple banking system with classes for Account, Savings Account, and Checking Account. Implement features such as deposit, withdrawal, and account statement.
4	Implement a Rectangle class with attributes for length and width. Include constructors, a destructor, and member functions to calculate the area and perimeter
5	Implement a Program to find out area of different shapes using function overloading
6	Implement a program to create student class from which derive test class and from test class derive the result class
7	Implement a class hierarchy for a simple library system with a base class Library item. And derived classes Book and Magazine.
8	Implement a program to perform multiple inheritances for Educational Institute database.
9	Implement a program to perform Hybrid Inheritance.
10	Implement a program to overload all unary and binary operators.
11	Implement a program to overload relational operators.
12	Program to overload insertion and extraction operators.
13	Implement a program to create a base class Shape with a virtual function area (). Derive two classes Circle and Rectangle from Shape and implement the area() function in each derived class

Sr. no.	Experiment Name
14	Implement a program to create a base class Employee with a virtual function calculateSalary(). Derive two classes Fulltime Employee and Part Time Employee and Implement the calculateSalary() function in each derived class.
15	Implement a program to write user input data to a file and then read it back from the file
16	Implement a program that uses try, catch, and throw to handle division by zero exceptions. Create a custom exception class InvalidAgeException and use it to validate the age input for a Person class.
17	Implement program using template function to find the maximum of two numbers. Create a program that demonstrates the use of STL containers (vector, list, map) for basic operations.

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	C++ How to Program	Deitel	Pearson Education
02	Object-Oriented Programming in C++	Robert Lafore	Sams Publishing

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	C++-The complete reference	Herbert Schildt	McGraw Hill Professional
02	The Object-Oriented Thought Process	Matt Weisfeld	Third Edition Pearson
03	Object-Oriented Programming with C++	E. Balagurusamy	Graw-Hill

Year and Semester	Second Year B. Tech - Semester IV - Computer Science and Engineering				
Course Category	Vocational and Skill Enhancement Course (VSEC)				
Title of Course	Mini Project-I Lab			Course Code	CSE2210
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	25	25	50	

Course Pre-Requisite	Knowledge of software engineering and C/C++/Python	
Course Objective	1	To expose the students to solve the real-world problems.
	2	To utilize the techniques. Skills and modern Engineering tools for building the project.
	3	To follow the methods and tasks as per SDOLC Approach
Course Outcomes	After completion of this course Students will be able to	
	CO1	Define the problem statement.
	CO2	Organize, Plan and prepare the detailed project activities.
	CO3	Construct Flowchart, System Architecture based on the project description
	CO4	Implement the solution for their problem.
	CO5	Demonstrate project management principles during project work
	CO6	Demonstrate capabilities of oral communication and self-learning in a group, which leads to lifelong learning.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	2	3									
CO4	2	2	2	3								
CO5											3	
CO6							2	2	3	3		2
Level of Mapping as: Low 1, Moderate 2, High 3												

In Semester Evaluation (ISE)/Continuous Assessment (CA)		
The review/ progress monitoring committee shall be constituted by head of departments of each institute. The progress of mini project to be evaluated on continuous basis, minimum two reviews.		
In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.		
Distribution of ISE/ CA marks shall be as below:		Marks
1	Marks awarded by guide/supervisor	10
2	Marks awarded by review committee	10
3	Quality of Project report	05

Guidelines for Mini Project
✓ Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. ✓ The Mini Project topic should be based on the any one subject concept that students have studied for their Academic Year. ✓ Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor/head of department/internal committee of faculty members ✓ In the Synopsis they have to state Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution. They have to implement project using C, C++ and Python languages. ✓ Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning. ✓ Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.

Guidelines for Assessment of Mini Project Lab	
1	Report should be prepared as per the guidelines issued by the Shivaji University, Kolhapur
2	Mini Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and External Examiners preferably from industry or research organizations having experience of more than five years approved by head of Institution.
Mini Project shall be assessed based on following points;	
1	Quality of problem and Clarity
2	Innovativeness in solutions, Cost effectiveness and Societal impact
3	Full functioning of working model as per stated requirements
4	Effective use of skill sets & programming languages learnt.
5	Contribution of an individual's as member or leader
6	Presentation and ability to explain the project.

Year and Semester	Second Year B. Tech Semester IV (Common to All Branches of Engineering)				
Course Category	Basic Science Courses (BSC)				
Title of Course	Environmental Science			Course Code	CSE2212
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	Audit
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Objective	1	Understand the scope & multidisciplinary nature of Environmental Studies	
	2	Get acquainted with the problems associated with natural resources and their conservation	
	3	Familiarize the environmental & social problems with global concern	
	4	Recognize the importance of Biodiversity with respect to Western Ghats	
Course Outcomes	After completion of this course Students will be able to		Blooms Taxonomy
	CO1	Understand the importance of Environmental Studies and recognize significance of ecosystem	II
	CO2	Classify the values of natural resources with associated problems for sustainable lifestyles	II
	CO3	Describe the social and global environmental issues	II
	CO4	Make aware of Pollution issues with its mitigation measures	II
	CO5	Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats	II
	CO6	Acquaint with the role of environmental laws and regulations in conservation efforts	I

Unit No.	Title and Content of Unit	Hours
1	**Nature of Environmental Studies and Importance of ecosystems.** • Definition, scope and importance. • Multidisciplinary nature of environmental studies • Need for public awareness. • Ecosystem • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Food chains, food webs and ecological pyramids • Introduction, types, characteristics features, structure and function of the following ecosystem a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) • Degradation of the ecosystems and it's impacts.	6 Hrs
2	**Natural Resources and Associated Problems** • Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. • Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. • Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. • Food resources: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems. • Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy. • Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	6 Hrs

Unit No.	Title and Content of Unit	Hours
3	**Social Issues and the Environment** • Human population growth and impact on environment. • Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment. • Environmental movements- Chipko Movement, Appiko Movement, Silent Valley Movement. • Resettlement and rehabilitation of people; its problems and concerns. • Water conservation, rain water harvesting. • Disaster management: floods, earthquake, cyclone, tsunami and landslides, Case studies.	4 Hrs
4	**Environmental Pollution** • Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Global warming, acid rain, ozone layer depletion. • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management, control & rules, • Role of an individual in prevention of pollution	5 Hrs
5	**Biodiversity and its conservation:** • Introduction- Definition: genetic, species and ecosystem diversity. • Bio-geographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • India as a mega- diversity nation. • Western Ghat as a biodiversity region. Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, • Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity.	5 Hrs
6	**Environmental Protection-Policies and practices** • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • National and International Conventions and agreements on environment.	4 Hrs

Field work: (Field work is equal to 4 lectures) **10 marks**

Note - The ISE/CA is carried out through the Field work and Report writing.

- **Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain**
- **Visit to a local polluted site-Urban/Rural/Industrial/Agricultural**
- **Study of common plants, insects, birds.**
- **Study of simple ecosystems-pond, river, hill slopes, etc.**

References:

Reference Books	
1	Raut P.D., Environmental Studies, Shivaji University Press, 2021
2	Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p
3	Hawkins R.e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
4	Heywood, V.H. & Watson, R.T.1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
5	Jadhav, H. & Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
6	McKinney, M.L. & School. R.M.1196, Environmental Science Systems & Solutions, Web enhanced edition, 639p
7	Mhaskar A.K., Master Hazardous, Techno-Science Publications (TB)

Question Paper Format (S.Y. B. Tech) NEP2020

Environmental Science **End Semester Examination** **Marks – 60 Marks**

All Questions are compulsory Q1 to Q4		
Q.1	Attempt Any Three Questions	15 Marks
A	Unit 1	5
B	Unit 2	5
C	Unit 3	5
D	Unit 1 to 3 (Any one)	5
Q.2	Attempt Any Three Questions	15 Marks
A	Unit 4	5
B	Unit 4	5
C	Unit 4	5
D	Unit 4	5
Q.3	Attempt Any Three Questions	15 Marks
A	Unit 5	5
B	Unit 5	5
C	Unit 5	5
D	Unit 5	5
Q.4	Attempt Any Three Questions	15 Marks
A	Unit 6	5
B	Unit 6	5
C	Unit 6	5
D	Unit 6	5

Year and Semester	Second Year B. Tech Semester IV				
Course Category	VSEC				
Title of Course	Computer Maintenance Technology			Course Code	CSE2212
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	--	50	

Course Pre-Requisite	Basics of Operating System, Basic Computer knowledge, Basic Problem-Solving Skills.	
Course Objective	1	To understand the construction and working of Input & Output devices
	2	To Know the Troubleshooting and preventive maintenance of PC.
	3	Troubleshoot peripherals and networks.
	4	Select processors required for relevant systems.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Identify different types of computer systems.
	CO2	Perform formatting, partitioning and Hard disk installation.
	CO3	Troubleshoot common motherboard problems.
	CO4	Test power supplies.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										3
CO2	2	3										3
CO3	2	3										2
CO4	2	3										2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Practical, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic.

Guidelines for Practical Performance	
Faculty can create Experiment list based on following listed topics. Minimum 10 to 12 Experiments should get performed along with flow chart and Execution.	
Exp. No.	**Title of Experiment/ Problem Statement**
1	Desktop/laptop/server type identification and its specification
2	Identification and cleaning of Components
3	Preventive Maintenance of PC
4	Perform Internal socket connections
5	Perform BIOS settings
6	Installation of Windows Operating System
7	Installation of Unix family Operating System
8	Peripheral devices cleaning
9	Installation of local and Network printer
10	Share devices, files and folders
11	Installation of scanner
12	Set Input/output devices
13	Connect devices to external port
14	Networking devices connection
15	Fiber optic cable construction
16	Connection of Switches/Hub
17	Setup wired network environment
18	Setup wireless I/O devices
19	Fault diagnostics
20	Component replacement

Textbooks			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	The Complete PC Upgrade And maintenance Guide	Minasi, Mark	BPB Publication, New Delhi
02	Hardware Trouble Shooting and Maintenance	B. Govindarajalu	Tata McGraw Hill

Reference Books			
Sr. no.	**Title**	**Author**	**Edition/Publication**
01	The computer hardware installation, interfacing troubleshooting and maintenance	James, K.L.	PHI Learning, New Delhi, 2014, ISBN: 978-81-203-4798-4
02	PC Upgrade & Repair Bible	--	Wiley India

Equivalence of Subjects between CBCS and NEP for S. Y. B. Tech (Sem-III & IV)

Name of Programme : Computer Science and Engineering
Class : S. Y. B. Tech Semester : III

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	Applied Mathematics			Not Equivalent
2	Discrete Mathematics & Structures	Discrete Mathematical Structures	100 Percent Equivalent	
3	Data Structures	Data Structures Using C	100 Percent Equivalent	
4	Microprocessors			Not Equivalent
5	C programming	Data Structures Using C Lab	50 Percent Equivalent	
6	Soft Skills			Not Equivalent
7	Computer Networks - I	Computer Networks	50 Percent Equivalent	
8		Computer Networks Lab	50 Percent Equivalent	
9		Multi-disciplinary Minor – 01		Not Equivalent
10		Open Elective -01		Not Equivalent
11		Employability Enhancement Skills-I		Not Equivalent
12		Business English		Not Equivalent

Class : S. Y. B. Tech Semester : IV

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	Automata Theory	Automata Theory	100 Percent Equivalent	
2	Computer Organization and Architecture			Not Equivalent
3	Operating System-I	Operating System	100 Percent Equivalent	
		Operating System Lab		
4	Software Engineering			Not Equivalent
5	Object Oriented Programming	Object Oriented Programming	100 Percent Equivalent	
		Object Oriented Programming Lab	100 Percent Equivalent	
6	Mini Project	Mini Project-I Lab	100 Percent Equivalent	
7	Computer Networks-II			Not Equivalent
8	Environmental Studies	Environmental Science	90 Percent Equivalent	
		Multi-disciplinary Minor – 02		Not Equivalent
		Open Elective -02		Not Equivalent
		Soft Skills		Not Equivalent
		Employability Enhancement Skills-II		Not Equivalent
		Computer Maintenance Technology		Not Equivalent

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Exit Course for Computer Science and Engineering After 2nd Year

- As part of the NEP 2020 Revised Syllabus, for the Second Year B. Tech Exit, students must earn a total of 8 additional credits. This includes 6 credits from online SWAYAM NPTEL courses and 2 credits from Virtual Lab performance.
- Students must complete two SWAYAM NPTEL courses (12-week duration) from the provided list and successfully perform two Virtual Labs from the specified list.
- Each SWAYAM NPTEL course carries 3 credits, while each Virtual Lab is worth 1 credit.

Sr. No.	Name of NPTEL Course
1	Introduction to Database Systems
2	Introduction To Internet of Things
3	Programming in Modern C++
4	Programming In Java
5	Real Time Operating System
6	Advanced Computer Networks

Sr. No.	Name of Virtual Lab
1	Computer Organization Lab
2	Artificial Intelligence I Lab
3	Cryptography Lab
4	Python Programming Lab: Advanced Topics

Examination Scheme

- Swayam NPTEL Course Certificate Should be submitted to Department — 6 Credits
- Lab Experiments Report must be prepared and submitted to department — 2 Credits