Maharashtra Institute of Technology

Chhatrapati Sambhajinagar

An Autonomous Institute Affiliated to

Dr. Babasaheb Ambedkar Marathwada University,

Chhatrapati Sambhajinagar, Maharashtra (India)

Second Year B. Tech Syllabus

(Computer Science and Engineering)

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(Revised NEP 2020 Based Curriculum for S.Y. B. Tech students WEF 2025-26)

WEF AY 2025-26

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Abbreviations used in this document

AEC	Ability Enhancement Course
CIE	Continuous Internal Examination
CSE	Computer Science and Engineering
ELC	Experiential Learning Course
ESE	End-Semester Examination
HSSM	Humanities Social Science & Management
ISE	In-Semester Examination
L	Theory Lecture
MDM	Multidisciplinary Minor
MIT	Maharashtra Institute of Technology
MNCC	Mandatory Non Credit Course
NEP	National Education Policy 2020
OEC	Open Elective Course
P	Practical
PCC	Program Core Course
S3	Semester -III
S4	Semester -IV
SLH	Self-Learning Hours
T	Tutorial
TA	Teacher Assessment
VEC	Value Education Course
VSEC	Vocational and Skill Enhancement Course
WEF	With Effect From

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Second Year B. Tech (Computer Science and Engineering) Curriculum Structure
(Revised NEP 2020 Based Curriculum for S.Y. B. Tech students WEF 2025-26)

Semester-III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	$ SLH	Credits	ISE -I	ISE -II	CIE	TA	ESE/ Oral	Total
Orientation Program (2 Days)															
1	PCC	CSE204	Discrete Mathematics and Linear Algebra	3	-	-	3	3	3	15	15	10	10	50	100
2	PCC	CSE202	Data Structures	3	-	-	3	3	3	15	15	10	10	50	100
3	PCC	CSE203	Digital Electronics and Computer Architecture	3	-	-	3	3	3	15	15	10	10	50	100
4	MDM#	***212	Multidisciplinary Minor Course-1	2	-	-	2	2	2	15	15	10	10	50	100
5	OEC	OEC241A TO OEC241G	Open Elective Course -1@	2	-	-	2	2	2	15	15	10	10	50	100
6	HSSM	HSM201 / HSM202	Engineering Economics and Management / Innovation and Entrepreneurship	2	-	-	2	2	2	-	15	15	20	-	50
7	VEC	VEC201 / VEC202	Universal Human Values / Environmental Studies	1	-	2	3	1	2	-	15	15	20	-	50
8	ELC	ELC221	Community Engagement Project	-	-	4	4	-	2	-	-	-	50	-	50
9	PCC	CSE223	Data Structures Laboratory	-	-	2	2	-	1	-	-	-	25	25	50
10	PCC	CSE224	Digital Electronics and Computer Architecture Laboratory	-	-	2	2	-	1	-	-	-	25	25	50
S3				**16**	**-**	**10**	**26**	**16**	**21**	**75**	**105**	**80**	**190**	**300**	**750**

$ SLH: Self-Learning Hours per week – assessment included in CIE/TA **** MDM Course Code as per option**

 # Student has to choose any one MDM Vertical as per eligibility criteria mentioned in Table 1 at semester III. Courses of each Multidisciplinary Minor Vertical are given in Table 2. Student cannot change the MDM Vertical in the subsequent semesters, and it is compulsory to successfully complete all MDM courses.

Important Note: Mandatory bridge course "Computer Fundamentals" is to be completed by the lateral admitted students those who are having earlier qualification other than Computer Science & Engineering or allied branch/discipline.

@ Open Elective-1 Course Basket:

Course Code	Course Title	Name of Dept offering the Course
OEC241A	Introduction to Sociology	Basic Sciences & Humanities
OEC241C	Professional Ethics and Corporate Social Responsibility	Civil Engineering
OEC241D	Constitution of India	Electrical Engineering
OEC241E	Electrical, Fire and Vehicle Safety	Electrical Engineering
OEC241F	Emotional Intelligence	Mechanical engineering
OEC241G	Building Planning	Civil Engineering

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Semester-IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	$ SLH	Credits	ISE -I	ISE -II	CIE	TA	ESE/ Oral	Total
1	PCC	CSE251	Operating System	3	-	-	3	3	3	15	15	10	10	50	100
2	PCC	CSE252	Object Oriented Programming in Java	3	-	-	3	3	3	15	15	10	10	50	100
3	PCC	CSE253	Theory of Computations	3	-	-	3	3	3	15	15	10	10	50	100
4	MDM	***262	Multidisciplinary Minor Course-2	2	-	-	2	2	2	15	15	10	10	50	100
5	OEC	OEC291A TO OEC291H	Open Elective Course -2@	2	-	-	2	2	2	15	15	1	10	50	100
6	HSSM	HSM201 / HSM202	Engineering Economics and Management / Innovation and Entrepreneurship	2	-	-	2	2	2	-	15	15	20	-	50
7	VEC	VEC201 / VEC202	Universal Human Values / Environmental Studies	1	-	2	3	1	2	-	15	15	20	-	50
8	VSEC	VSE271	Professional English	-	-	2	2	-	1	-	-	-	25	-	25
9	PCC	CSE273	Object Oriented Programming in Java Laboratory	-	-	2	2	-	1	-	-	-	25	25	50
10	PCC	CSE274	Operating System Laboratory	-	-	2	2		1	-	-	-	25	25	50
11	AEC	AEC275	Career Readiness Skills	-	-	2	2	-	1	-	-	-	25	-	25
S4				**16**	**-**	**10**	**26**	**16**	**21**	**75**	**105**	**80**	**190**	**300**	**750**

$ SLH: Self-Learning Hours per week – assessment included in CIE/TA **** MDM Course Code as per option**

@Open Elective-2 Course Basket:

Course Code	Course Title	Name of Department Offering the Course
OEC291A	Smart Agriculture Practices	Agricultural Engineering
OEC291B	Solid Waste Management	Civil Engineering
OEC291C	Data Communication	Computer Science and Engineering
OEC291D	E-Waste Management	Electronics and Computer Engineering
OEC291E	Programmable Logic Controller	Electrical Engineering
OEC291F	Information and Knowledge Management	Emerging Science and Technology
OEC291G	Renewable Energy Resources	Mechanical Engineering
OEC291H	Plastic Recycling	Plastic and Polymer Engineering

As per the NEP 2020 guidelines, **Honor Degree** courses are offered by Department (Major Discipline), whereas the Minor Degree courses (referred as **Double Minor**) are offered by **another** department. **Honor Degree or Double Minor Degree is** Optional. The students those who fulfills the eligibility norms can enroll for it. The course curriculum and guidelines are given in a **separate Information Booklet, available at the Department.**

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Students may opt for Exit after successful completion of Second Year provided s/he earns 8 additional credits through coursework (VSEC) and/or Internship/OJT during the summer vacation. S/he will be awarded a 2-Year UG Diploma in Computer Science and Engineering. Details are available at the Department.

EXIT Courses After IV Semester:

Sr. No.	Course Code	Course Name	Credits
1	EX-CSE201	Advanced JAVA	03
2	EX-CSE202	Advanced JAVA Laboratory	01
3	EX-CSE203	Internship/ Mini Project	04

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Multidisciplinary Minor (MDM) Details

(In continuation of Pattern 2023-24)- wef AY 2025-26 (From Second Year Onwards)

Table 1: Mandatory Multi-disciplinary Minor (MDM) Option selection Matrix

Sr. No.	B. Tech Program → / MDM Verticals ↓	Agri	AIDS	Civil	CSD	CSE	EED	ECE	ETC	MECH	MTX	PPE
1	Computer Engineering	✓	X	✓	X	X	✓	X	✓	✓	✓	✓
2	Mechanical Engineering	✓	✓	✓	✓	✓	✓	✓	✓	X	X	✓
3	Civil Engineering	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓
4	Electronics Engineering	✓	✓	✓	✓	✓	✓	X	X	✓	X	✓
5	Electrical Engineering	✓	✓	✓	✓	✓	X	✓	✓	✓	X	✓
6	Agricultural Engineering	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Plastic and Polymer Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X

X indicates that students from the discipline (mentioned in the column) are not allowed to opt the option of MDM vertical (Mentioned in the row)

✓ indicates that students from the discipline (mentioned in the column) are allowed to opt the option of MDM vertical (Mentioned in the row)

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Note:

1. Student has to choose any one MDM Vertical as per eligibility criteria mentioned in Table 1 at semester III.
2. Multidisciplinary Minor Verticals offered by department are given in Table 2.
3. Student cannot change the MDM Vertical in the subsequent semesters and it is compulsory to successfully complete all MDM courses in the same vertical.
4. Student has to follow the instructions as per the Head of Department/Course Teacher of Offering Department.
5. Student has to take care while filling the examination form and appearing the examination in the opted MDM.

Table 2: Multidisciplinary Minor Verticals and Curriculum Structure

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Computer Engineering (Offered by Computer Science and Engineering Department)	1	III	CSE212	Computer Architecture	2	-	-	2	2
	2	IV	CSE262	Introduction to Artificial Intelligence	2	-	-	2	2
	3	V	CSE311	Linux Operating System	3	-	-	3	3
	4	V	CSE336	Linux Operating System Laboratory	-	-	2	2	1
	5	VI	CSE362	Fundamentals of Machine Learning	3	-	-	3	3
	6	VI	CSE387	Fundamentals of Machine Learning Laboratory	-	-	2	2	1
	7	VII	CSE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Table 2: Multidisciplinary Minor Verticals and Curriculum Structure ...

Multidisciplinary Minor Verticals	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Mechanical Engineering (Offered by Mechanical Engineering Department)	1	III	MED212	Industrial Engineering	2	-	-	2	2
	2	IV	MED262	Fundamentals of Engineering Design	2	-	-	2	2
	3	V	MED311	Energy Management	3	-	-	3	3
	4	V	MED336	Energy Management - Lab	-	-	2	2	1
	5	VI	MED361	Metrology & Quality Control	3	-	-	3	3
	6	VI	MED386	Metrology and Quality Control - Lab	-	-	2	2	1
	7	VII	MED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Civil Engineering (Offered by Civil Engineering Department)	1	III	CED212	Fundamentals of Civil Engineering	2	-	-	2	2
	2	IV	CED262	Climate Change Studies	2	-	-	2	2
	3	V	CED311	Smart Cities and Technologies	3	-	-	3	3
	4	V	CED336	Smart Cities and Technologies Lab	-	-	2	2	1
	5	VI	CED361	Software Applications in Civil Engineering	3	-	-	3	3
	6	VI	CED386	Software Applications in Civil Engineering Lab	-	-	2	2	1
	7	VII	CED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Table 2: Multidisciplinary Minor Verticals and Curriculum Structure ...

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Electronics Engineering (Offered by Electronics and Computer Engineering Department)	1	III	ECE212	Electronic Devices	2	-	-	2	2
	2	IV	ECE262	Introduction to Digital Electronics	2	-	-	2	2
	3	V	ECE311	Embedded System Application	3	-	-	3	3
	4	V	ECE336	Embedded System Application Lab	-	-	2	2	1
	5	VI	ECE361	Communication Systems	3	-	-	3	3
	6	VI	ECE386	Communication Systems Lab	-	-	2	2	1
	7	VII	ECE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Electrical Engineering (Offered by Electrical Engineering Department)	1	III	EED212	Electrical Machines	2	-	-	2	2
	2	IV	EED262	Electrical Measurement	2	-	-	2	2
	3	V	EED311	Transmission and Distribution of Electrical Power	3	-	-	3	3
	4	V	EED336	Transmission and Distribution of Electrical Power Lab	-	-	2	2	1
	5	VI	EED361	Testing and Maintenance of Electrical Equipment	3	-	-	3	3
	6	VI	EED386	Testing and Maintenance of Electrical Equipment Lab	-	-	2	2	1
	7	VII	EED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Table 2: Multidisciplinary Minor Verticals and Curriculum Structure ...

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Agricultural Engineering (Offered by Agricultural Engineering Department)	1	III	AED212	Environmental Impact Assessment	2	-	-	2	2
	2	IV	AED262	Climate Change in Agriculture	2	-	-	2	2
	3	V	AED311	Introduction to Agrotech and Sustainability	3	-	-	3	3
	4	V	AED336	Agri-Data Analysis Lab	-	-	2	2	1
	5	VI	AED361	IoT and Automation in Agriculture	3	-	-	3	3
	6	VI	AED386	Sensor and Drone Application Lab	-	-	2	2	1
	7	VII	AED437	GIS and RS in Agriculture Lab	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Plastic and Polymer Engineering (Offered by Plastic and Polymer Engineering Department)	1	III	PPE212	Introduction to Polymer Science and Technology	2	-	-	2	2
	2	IV	PPE262	Polymer Materials	2	-	-	2	2
	3	V	PPE312	Polymer Processing and Testing	3	-	-	3	3
	4	V	PPE337	Polymer Processing and Testing Laboratory	-	-	2	2	1
	5	VI	PPE362	3D Printing with Polymers	3	-	-	3	3
	6	VI	PPE387	3D Printing with Polymers Laboratory	-	-	2	2	1
	7	VII	PPE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Syllabi of MDM Courses of Semester III & IV is available in Seperate booklet.

Semester-III
Detail Course Curriculum

Second Year B. Tech Syllabus
(Computer Science and Engineering)

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: CSE204 Course: Discrete Mathematics and Linear Algebra **Teaching Scheme:** Theory: 03 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II:15Marks Continuous Internal Evaluation: 10Marks Teacher Assessment:10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Students required the knowledge of all basic concepts related to linear algebra, calculus.
Objectives	• To study basics of logic and set theory • To understand notion of functions and relations • To study fundamental principles of counting • To understand the importance of linear algebra in Engineering & technology.
Unit-I	**Set Theory** Basic concepts of set theory, Operations on Sets, the power set. Finite, infinite and uncountable infinite sets, Cardinality of finite sets, principle of inclusion and exclusion **(06 Hrs)**
Unit-II	**Propositional Logic** Introduction to Logic. Propositional Logic, Truth tables, Predicates and Quantifiers, Propositional equivalence, Mathematical Proofs. Infinite sets, well ordering. Mathematical Induction. **(06 Hrs)**
Unit-III	**Relation and Function** **Relations**: Ordered pairs and n-tuples, Product Sets and Partitions, Relations and Digraphs, Matrix of Relation, Properties of Relations, Equivalence Relations & Partitions, Manipulation of Relations, Composition of Relations, Transitive Closure of a relation, Partial order relation, Hasse Diagrams, Recurrence relations **Functions:** Definition, Composition of functions, Types of Functions, Invertible Function, Pigeonhole Principle with Simple Applications. **(08 Hrs)**
Unit-IV	**Combinatorics and Probability** The Basics of Counting, rule of Sum and Product, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Algorithms for generating Permutations and Combinations. Discrete Probability. Conditional Probability. **(6 Hrs)**
Unit-V	**Matrix** Rank of Matrix,'echelon form, homogeneous and non-homogeneous linear equations, Linear Transformation; Orthogonal transformation. Linear dependence and independence of vectors, Eigen values and Eigen vectors of a Matrix. **(07 Hrs)**
Unit-VI	**Vector Differentiation** Scalar and vector point function, Derivative of a vector point function, Gradient of scalar function , Directional derivative, Divergence and Curl of vector point function, Solenoidal and irrotational vector field and scalar potential function. **(06 Hrs)**

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Textbooks / Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Elements of Discrete Mathematics	C. L. Liu	Tata McGraw-Hill	3rd
	2.	Discrete Mathematics and its Applications	Kenneth H. Rosen	Tata McGraw-Hill	7th
	3.	Combinatorics: Topics, Techniques, Algorithms	Peter J. Cameron	Cambridge University Press	
	4.	Concrete Mathematics	Ronald Graham, Donald Knuth, and Oren Patashni	Pearson Education Publishers	2nd
	5	Advanced Engineering Mathematics.	H. K. Dass	S. Chand And Co. Ltd	18th Edition
	6	Applied Mathematics	P. N. Wartika & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	9th Edition

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: CSE204 Course:Discrete Mathematics and Linear Algebra **Teaching Scheme:**Theory: 03Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II:15Marks Continuous Internal Evaluation: 10Marks TeacherAssessment:10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Course Outcomes

CO1: Demonstrate use of logical arguments, proof techniques and set theory principles

CO2: Illustrate type, properties and solution of relations and functions.

CO3: Use the fundamental counting principles to determine the number of outcomes for a specified problem.

CO4:Apply the knowledge of matrix and Vector calculus for mathematical problems.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-
Average	3	1	-	-	-	-	-	-	-	-	-
Mapping Strength	3	1	-	-	-	-	-	-	-	-	-

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	1	-	-
CO2	1	-	-
CO3	1	-	-
CO4	1	-	-
Average	1	-	-

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Course Category: PCC Course Code: CSE202 **Course: Data Structures** Teaching Scheme: Theory: 3 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	'C' programming language for the implementation of data structures.
Objectives	• To understand the concept of ADT and data structures. • To learn linear data structures- stack, queue, linked list. • To apply nonlinear data structures tree and graph for solving real-world problems. • To understand sorting, searching algorithms and hashing techniques.
Unit-I	**Introduction to Data Structures:** Concept of Data and Information, Abstract Data types- basics, importance, Data Structures- Definition, classification, implementation aspects and memory representation, examples, applications. Introduction to linear data structure- Array and its operations. **(06 Hrs)**
Unit-II	**Stacks and Queues:** Stack- definition, terminology, memory representation, operations on stack- push, pop, peek, empty, full, implementation using arrays. Applications of stack- recursion, polish and reverse-polish notations- conversion and evaluation. Queues- definition, terminology, memory representation, operations on queue, implementation using array, Types of queues and their applications. **(07 Hrs)**
Unit-III	**Linked Representation:** Concept of Dynamic Memory Allocation. Linked List- definition, memory representation, importance, types- singly linked list, doubly linked list, circular linked list, Operations on linked lists. Applications of linked list- polynomial manipulation. **(06 Hrs)**
Unit-IV	**Trees:** Tree- Basic terminology. Binary tree- definition, types- complete, almost complete, strictly binary tree. Binary search tree- definition, operations- insertion, deletion, traversal- in-order, pre-order, post- order, level-order, search. Height Balanced Tree (AVL)-Importance, rotations- left, right, left-right, right- left, constructing an AVL tree. Introduction to B tree, B+ tree, threaded binary tree. **(07 Hrs)**
Unit-V	**Graphs:** Graphs- Basic terminology, representing graphs in memory. Graph Traversals-Breadth First Search, Depth First Search. Minimum Spanning Tree- definition, constructing minimum spanning tree- Kruskal's algorithm, Prim's Algorithm. **(07 Hrs)**

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Unit-VI	**Sorting and Searching:** Sorting: Bubble sort, selection sort, insertion sort, heap sort, radix sort. Searching: Linear search, binary search. Hashing- concept, examples, collision, resolving collision. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Data Structures using C and C++	Augenstein and Tenenbaum Langsam.	Prentice Hall	2nd
2.	Data Structures Using C	Reema Thareja	Oxford University Press	2nd
3.	Data Structures and Algorithm Analysis in C	Mark Allen Weiss	Pearson Education	2nd
4.	Data Structures and Program Design in C	Robert L. Kruse, Bruce P. Leung.	Prentice Hall	2nd
5.	Data Structures, Algorithms and Object-Oriented Programming	Gregory L. Heilman	Tata McGraw-Hill	2nd

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: PCC202 **Course: Data Structure** Teaching Scheme: Theory- 3 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Course Outcomes	CO1: Explain the usage and importance of various data structures in solving problems. CO2: Illustrate the principles and operations of stacks, queues, and linked lists using relevant scenarios. CO3: Use concepts of graphs and trees to analyze and solve computational problems.. CO4: Apply appropriate sorting and searching algorithms to solve problems.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	–	–	–	–	–	–	–
CO2	3	2	2	-	–	–	–	–	–	–	–
CO3	2	3	-	2	–	–	–	–	–	–	–
CO4	3	2	-	2	–	–	–	–	–	–	–
Average	3	2	2	2	–	–	–	–	–	–	–
Mapping Strength	3	2	2	2	–	–	–	–	–	–	–

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	–	–
CO2	2	–	–
CO3	2	–	–
CO4	2	–	–
Average	2	–	–

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: CSE203 **Course: Digital Electronics and Computer Architecture** Teaching Scheme: Theory: 03 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Basic Electronics
Objectives	• To introduce fundamental concepts of digital electronics, logic gates and number systems. • To understand the functionality and design of Combinational and Sequential Circuits • To gain understanding of 8086 microprocessor architecture, functionality and assembly language programming. • To understand the basic concepts of computer architecture.
Unit-I	**Fundamental of Digital Systems:** Digital Signal, Digital circuit, Basic & Universal logic gates, EX-OR & EX-NOR operations, examples of IC gates, Boolean algebra, Simplification of Boolean expressions. **(06 Hrs)**
Unit-II	**Number Systems:** Introduction to number systems, Binary, octal decimal, hexadecimal, binary arithmetic, Number system conversion, one's & two's complement arithmetic, Codes & its types, Binary to gray and gray to binary code conversion. **(06 Hrs)**
Unit-III	**Combinational and Sequential Circuit:** Sum of product (SOP) form, Product of sum (POS) form, Representation of logical function, Simplification of logical functions, Minimization using K- Map (Upto 4 variables). Half Adder, Full Adder, Half Sub-tractor, Full sub-tractor, Multiplexers (MUX), De-multiplexers (DEMUX). Introduction to flip-flop. **(06 Hrs)**
Unit-IV	**Assembly language Programming with 8086:** Introduction to Microprocessor, Comparison of microprocessor & micro-controller, 8086 microprocessor architecture, Machine language Instruction Formats, Instruction Set: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Assembly language programs. **(07 Hrs)**
Unit-V	**Basic Concepts of Computer Architecture:** Organization and Architecture, Structure and Function, A Brief History of Computers, Designing for Performance, Two Laws that Provide Insight: Amdahl's Law and Little's Law Amdahl's Law Little's Law, Basic Measures of Computer Performance, Calculating the Mean. **(07 Hrs)**

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Unit-VI	**Memory Management:** Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design, Semiconductor Main Memory, DDR DRAM, Flash Memory, Newer Nonvolatile Solid-State Memory Technologies, Magnetic Disk, RAID, Solid State Drives, Optical Memory, Magnetic Tape. **(07 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Modern Digital Electronics	R.P. Jain	Tata McGraw Hill	4th
2.	Microprocessors and Interfacing	Douglas Hall	McGraw-Hill Publication	4th
3.	Advanced Microprocessors & Peripherals	A.K. Ray & K. M. Bhurchandi	Tata McGraw Hill	2nd
4.	Digital Design	M. Morris R. Mano and Michael D. Ciletti	Prentice Hall	5th
5.	Computer Organization and Architecture: Designing for Performance	William Stallings	Pearson Education India. 2010.	8th
6.	Computer Organization and Design	D. A. Patterson and J. L. Hennessy	Morgan Kaufmann, 2008	4th

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Course Category: **PCC** Course Code: CSE203 **Course: Digital Electronics and Computer Architecture** Teaching Scheme: Theory- 3 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Course Outcomes

CO1: Explain various number systems, codes and formulate digital functions using Boolean algebra.

CO2: Implement combinational and sequential circuits using digital components.

CO3: Describe 8086 microprocessor and its configurations.

CO4: Design memory units for given specifications using the concepts of computer architecture.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	–	–	–	–	–	–	–	–
CO2	3	2	2	–	–	–	–	–	–	–	–
CO3	2	2	1	–	–	–	–	–	–	–	–
CO4	3	2	2	–	–	–	–	–	–	–	–
Average	**2**	**2**	**2**	–	–	–	–	–	–	–	–
Mapping Strength	**2**	**2**	**2**	–	–	–	–	–	–	–	–

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	–	–
CO2	2	–	–
CO3	2	–	–
CO4	2	–	–
Average	2	–	–

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Basic Sciences and Humanities

Course Category: **OEC** Course Code: **OEC241A** Course: **Introduction to Sociology** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Communication Skills, critical thinking skills.
Objectives	The objective of this course is to let the students: 1. Describe foundational sociological theories and concepts. 2. Apply sociological perspectives to analyze social phenomena relevant to engineering contexts. 3. Evaluate the impact of social factors on engineering practices and outcomes. 4. Analyze ethical issues related to engineering in society. 5. Develop critical thinking skills for assessing social implications of engineering projects. 6. Communicate effectively about sociological issues within engineering communities.
Unit-I	**Introduction to Sociology:** Definition and subject matter of sociology, Sociology as a science and its nature, Sociology as a means to establish social harmony, Scope of sociology and early thinkers, perspectives in sociology, functionalist perspective, conflict perspective, interactionist, sociology and other social sciences, society, evolution of societies, agrarian society, hunter-gatherer society, feudal society, information society, tribal society, industrial societies, postindustrial society. **(05 Hrs)**
Unit-II	**Socialization and Culture:** Definition and importance of socialization in shaping individual identity and behaviour, Primary socialization: Family, peers. Secondary socialization: School, media, religion, and other social institutions, workplace, Cultural Norms, Values, and Symbols. **(04 Hrs)**
Unit-III	**Social Structure and Inequality:** Social stratification and mobility, Race, class, gender, and intersectionality, social institutions (family, education, economy, politics), Social institutions, need of an institution, characteristics of institution, kinds of institutions, functions of institutions, primary institutions, difference between institution & community: social stratification, gender stratification. **(04 Hrs)**
Unit-IV	**Social Change and Globalization:** Social change, theories of change types of theories of change, evolutionary, functionalist, conflict, factors of social change, resistance to change, Globalization and its consequences, social movements and activism. **(04 Hrs)**
Unit-V	**Sociological Research Methods:** Ethical Considerations in Sociological Research, Informed consent, confidentiality and anonymity, avoiding harm to participants, Research ethics review processes, Qualitative and Quantitative Research Methods, Ethnography, Participant observation, Interviews, Focus groups, Case studies, Surveys, Experiments, Content analysis, Secondary data analysis. **(04 Hrs)**

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Unit-VI	**Engineering for Social Equity:** Sociology of technology, Engineering ethics and social responsibility, Sociotechnical systems and their impacts, Introduction to the concept of the Bottom of the Pyramid (BoP) and its significance in global engineering. Ethical considerations in designing products and services for BoP markets. Innovative design approaches for affordability, accessibility, and sustainability in BoP contexts. Strategies for designing inclusive and equitable sociotechnical systems that prioritize human well-being and social justice. Sociological dimensions of emerging technologies (e.g., AI, biotechnology, renewable energy). **(05 Hrs)**

	Sr. No.	Title	Author	Publication	Edition
References	1.	Sociology and Economics for Engineers	Premvir Kapoor	Khanna Book Publishing (2018)	1st
	2.	Principles of Sociology - I	Dr. S.R Myneni	Allahabad law agency	2nd

Course Outcomes:

After completion of the course, students should be able to-

CO1	Recall and define key sociological theories and concepts.
CO2	Explain how socialization shapes individual behaviour and beliefs.
CO3	Apply sociological perspectives to social structures and inequalities.
CO4	Analyze the relationship between engineering practices and societal structures.
CO5	Evaluate social factors influencing engineering decision-making.
CO6	Propose strategies for integrating sociological considerations into engineering design and implementation.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1						3					2
CO2						3					2
CO3						3					2
CO4						3					2
CO5						3					2
CO6						3					2

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Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Civil Engineering

Course Category: **OEC** Course Code: **OEC241C** Course: **Professional Ethics and Corporate Social Responsibility** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	No general prerequisites required
Objectives	1. To develop an understanding of professional ethics in different organizational contexts. 2. To identify, analyze, and resolve ethical issues in business decision-making. 3. To develop various corporate social Responsibilities and practices ine professional life
Unit-I	**Professional Ethics and Business:** The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights and Duties of Business. **(04 Hrs)**
Unit-II	**Professional Ethics in the Marketplace:** Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy Professional Ethics and the Environment: Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control; Ethics of Conserving Depletable Resources **(04 Hrs)**
Unit-III	**Professional Ethics of Consumer Protection:** Markets and Consumer Protection; Contract View of Business Firm's Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer Privacy. **(04 Hrs)**
Unit-IV	**Introduction to Corporate Social Responsibility:** Concept, Scope & Relevance and Importance of CSR in Contemporary Society. CSR and Indian Corporations- Legal Provisions and Specification on CSR , A score card, Future of CSR **(04 Hrs)**
Unit-V	**Exploring the Dualities of Business Sustainability:** Potential Business Benefits-Triple bottom line, Human resources, Risk management, Supplier relations, Criticisms and concerns of business, Motives, Misdirection **(04 Hrs)**
Unit-VI	**Role of Business in Sustainable Development:** Sustainable Development, Role of Business in Sustainable Development, Sustainability Terminologies, Government Role in improving Sustainability Reporting KYOSEI, Triple Bottom Line (TBL), Sustainability Reporting, Benefits of Sustainability Reporting, Global Reporting Initiative (GRI) - Sustainability Reporting Guidelines UN Global Compact- Ten Principles, 2000, Sustainability Indices, Sustainability Reporting Framework in India, Challenges in Mainstreaming Sustainability Reporting **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Business Ethics: Texts and Cases from the Indian Perspective	Ananda Das Gupta	Springer	1st
2	Business Ethics: Concepts and Cases	Manuel G. Velasquez.	Pearson	8th
3	Corporate Social Responsibility in India	Bidyut Chakrabarty	Routledge	1st

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Course Category: OEC
Course Code: **OEC241C**
Course: **Professional Ethics and Corporate Social Responsibility**

Course Outcomes:

After completion of the course, students should be able to-

CO1	Understand the fundamental principles of business ethics and identify ethical dilemmas in business scenarios
CO2	Analyze various market structures and their ethical implications, including the environmental considerations related to pollution and resource
CO3	Discuss the ethical responsibilities of businesses towards consumers, focusing on advertising practices, privacy issues, and consumer protection theories
CO4	Describe the concept and significance of corporate social responsibility its application in Indian corporations
CO5	Analyze the potential benefits and criticisms of business sustainability
CO6	Explain the role of businesses in sustainable development and interpret the various sustainability reporting frameworks and their challenges.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	-	-	-	-	-	-	3	-	2	-	-
CO2	-	-	-	-	-	3	2	-	-	-	-
CO3	-	-	-	-	-	-	3	-	2	-	-
CO4	-	-	-	-	-	2	3	-	-	-	-
CO5	-	-	-	-	-	3	-	-	-	-	2
CO6	-	-	-	-	-	3	2	-	-	-	2

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Syllabus of Second Year B.Tech. (All Branches) **(Semester III)**
Open Elective-1 offered by the Department of Electrical Engineering

Course Category: OEC Course Code: **OEC241D** Course: **Constitution of India** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	No general prerequisites required
Objectives	1. To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it. 2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System. 3. To channel students' thinking towards a basic understanding of the constitutional principles and statutory institutions.
Unit-I	**Introduction to Constitution:** Meaning and Concept of Indian Constitution; Nature of Constitution; Brief Idea of Indian Constitution [Parts, Articles and Schedule]. **(03 Hrs)**
Unit-II	**Silent Features of Indian Constitution:** Written and Enacted Constitution; The longest and most detailed Constitution of the World; Rigidity and Flexible Constitution; Parliamentary system of Government; Federal system with unitary bias; Adult Franchise; Single Citizenship; Sovereign, Democratic, Republic; Secularism; Directive Principles of State Policy; Independent Judiciary; Fundamental Rights; Fundamental Duties. **(06 Hrs)**
Unit-III	**Fundamental Rights:** - Concept of State (Art. -12); Right to Equality (Art. -14 to 18); Right to Freedom (Art. -19 to 22); Right against Exploitation (Art. -23 & 24); Right to Religion (Art. -25 to 28); Right of Minorities (Art. -29 & 30); Constitutional Remedies (Art.-32). Fundamental Duties (Art.-51 A). **(05 Hrs)**
Unit-IV	**Directive Principles of State Policy (DPSPs):** Meaning and Significance of Directive Principles; Classification/ Principles of D.P.S.P.; Relationship between F.Rs. and D.P.S.P. **(04 Hrs)**
Unit-V	**Executives** Union Government the President, Council of Ministers and Prime Minister. State Government The Governor, Council of Ministers and Chief Minister. **(04 Hrs)**
Unit-VI	**Election Commission:** Election Commission: Role and Functioning; Chief Election Commissioner and Election Commissioners; State Election Commission: Role and Functioning; Institute and Bodies for the welfare of SC/ST/OBC and women. **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
References	1	Constitution of India, Bare Act.	Govt. of India.	Govt. of India.	49th
	2	Our Constitution (An Introduction of Indians Constitution and Constitutional Law	Subhash C. Kashyap	National Book Trust,	5th
	3	Introduction to the Constitution of India	Basu D.D.	Lexis Nexis	21st
	4	Indian Prime Minister	Sharma L.N.	Macmillan Company of India,	-
	5	Union Executive	Jain H.M.	Chaitanya Publishing House,	1st
	6	Framing of Indian Constitution	Dr. S.N. Busi	New Age International Publisher	1st

Course Outcomes:

After completion of the course, students should be able to-

CO1	Explain the historical background and key features of the Indian Constitution
CO2	Analyze the fundamental rights and duties outlined in the Indian Constitution.
CO3	Describe the roles and functions of constitutional bodies such as the Parliament and Judiciary.
CO4	Evaluate the significance of amendments and their impact on the Constitution's framework.
CO5	Assess the role of the Indian Constitution in promoting democracy and social justice
CO6	Demonstrate the ability to apply constitutional knowledge in discussing civic rights and responsibilities.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	1					3	2	3			
CO2	1					3	2	3			
CO3						3	2	3			
CO4	1					2	3	3			1
CO5	1					2	3	3			
CO6	1					3	2	3			1

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Syllabus of Second Year B.Tech. (All Branches) (Semester III)

Open Elective-1 offered by the Department of Electrical Engineering

Course Category: **OEC** Course Code: **OE241E** Course: **Electrical, Fire and Vehicle Safety** Teaching Scheme: Theory: 02 Hrs/week. Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In- Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisites	1. Basic understanding of physics and chemistry concepts 2. Familiarity with engineering principles, including circuit theory 3. Knowledge of automotive technology, including vehicle components and systems.
Course Objectives	1. Develop a comprehensive understanding of electrical safety principles and hazards. 2. Analyze the causes and dynamics of fires and implement preventive measures. 3. Examine safety protocols and regulations pertaining to vehicle electrical systems. 4. Acquire practical skills in identifying, mitigating, and responding to safety risks.
Unit-I	**Introduction to Electrical safety and Safety Management:** General Background of Electricity, General Safety Provisions in Indian Electricity Rules, OSHA Standards on Electrical Safety, Basic Electrical Safety Rule as per OSHA, Terms and Definitions, Objectives of Safety and Security Measures, Effect of Electrical Current on the Human Body, Case studies highlighting real-world examples of electrical fires and their consequences. **(05 hrs)**
Unit-II	**Electrical Shocks and their Prevention:** Primary and Secondary Electric shocks, Occurrence of Electric Shock, Possibility of Getting Electric Shock, Severity of Electric Shock, Medical Analysis of Electric Shock and Its Effects, AC Shocks Versus DC Shocks, Lightning Strokes on Overhead Transmission Lines, Prevention of Shocks, FIRST AID, Removal of Contact with Live Conductor, Artificial Respiration, Schafer's Prone Pressure Method, Accident Management and Safety Management. **(04 hrs)**
Unit-III	**Introduction to Electrical Fire and Prevention:** Introduction, Terms and definition, causes of initiation of fires, types of Fires Class A Fires, Class B fires, Class C Fires, Class D fires, Class E Fires, Fire Extinguishing techniques, Fire Hazard Analysis, Prevention of Fires, Fire protection and loss prevention, step after occurrences of fires. **(04 hrs)**
Unit IV	**Fire Extinguisher and Fire Fighting System:** Introduction, types of Fire Extinguisher, Water Fire Extinguisher, Foam Extinguishers, Dry Powder and Carbon dioxide Extinguisher, Maintenance of Fire Extinguishers. Introduction to Fire Fighting System, types and Application, Fire Detection and Alarm System, Water spray system. **(04 hrs)**
Unit-V	**Introduction to Electric Vehicle and Safety:** Electric Vehicle Architecture, Major Components, Types of Batteries, Lithium-Ion Batteries, Hazards in Electric Vehicle, Electric Motor safety, Power Electronics Circuits Safety, Safety at Charging Station. Case studies illustrating incidents of vehicle fires and lessons learned for prevention. **(05 hrs)**

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Unit VI	**Review of Indian Electricity Rules and Acts:** Introduction, Scope of IE Act and IE Rules, Classification of Electrical Installation, Electrical Safety general Requirements as per IE Rules. Indian Electricity Act, Rules regarding First AID and Fire Fighting System, safety Requirement of Electric Vehicle as per BIS standards. **(04 hrs)**				
References	**Sr. No**	**Title**	**Author**	**Publication**	**Edition**
	1.	Electrical Safety, Fire Safety Engineering & Safety Management	S Rao	Khanna Publishers	2nd
	2.	Principle of Electrical Safety	Peter E.Sutherland	Willey Publication	1st
	3.	Electric Vehicle Technology Explained	James Larminie	John Wiley and sons	1st
	4.	Electric Vehicle Technology and Policy in India	Vishal Garg	Applied Science Publishers	10th
	5.	Practical Guide to Electrical Safety	R K Jain	Nabhi Publication	1st

Course Outcomes:

After completion of the course, students should be able to-

CO1	Understand basic electrical safety provisions and OSHA standards.
CO2	Study the causes, severity, and prevention of electric shocks, including first aid and accident management techniques.
CO3	Identify causes and types of electrical fires and understand fire prevention and protection strategies.
CO4	Understand battery location and design considerations for electric vehicles.
CO5	Explore electric vehicle components, battery types, associated hazards, and safety measures at charging stations.
CO6	Understand the scope of the Indian Electricity Act and Rules, safety requirements for electrical installations, and standards for electric vehicles.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2						1				1
CO2	2	1									
CO3	2						1				
CO4	1			1							
CO5	2	1		2							
CO6	2	2					1				1

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Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Mechanical Engineering

Course Category: **OEC** Course Code: **OEC241F** Course: **Emotional Intelligence** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	-
Objectives	1. To introduce the concept, models and components of emotional intelligence. 2. To understand the significance of emotional intelligence in self-development and building effective relationships.
Unit-I	**Introduction to Emotional Intelligence (EI):** Definition, Components of EI, Introduction to emotions, Development of emotions and emotional maturity, Power of emotions, Importance of EI in personal life, EQ and IQ, Introduction to theories of EI, Models of emotions. **(5 Hours)**
Unit-II	**Understanding of Emotions:** Basics of emotion, Classification of emotions, Relationship between mood and emotion, The role of emotion and organizational health, control of emotions, and Impulse control, Marshmallow Experiment- Negative and Positive Emotions, Emotion and Health, The Emotional Brain & Amigdala Hijack **(4 Hours)**
Unit-III	**Emotional Intelligence Competencies:** Self-awareness, Self-regulation, Social-skills, Relationship management, EI and motivation, Emotional competence, Developing EI. **(4 Hours)**
Unit-IV	**Managing Emotions:** Emotional intelligence and psychological adjustment, Issues in Anxiety, Stress, Depression, and Anger, Empathy, Self-esteem and management, Building a successful career using EI, Handling stress and pressure in the workplace. **(4 Hours)**
Unit-V	**EI Practice at Workplace:** EI and decision making, EI and personality, work frustrations, EI and work performance, EI and leadership, EI and job stress, EI and information processing, EI and communication, EI and conflict of resolution, role of EI in job interviews, career advancements and workplace interactions. **(5 Hours)**
Unit-VI	**Emotional Intelligence and Team Work:** Applying Emotional Intelligence in Engineering Projects, Team dynamics and emotional intelligence, Case studies and group activities. Emotional Quality Management. **(4 Hours)**

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	Sr. No.	Title	Author	Publication	Edition
References	1	Emotional Intelligence: Why It can Matter More Than IQ	Daniel Goleman	Bantam Books	2nd
	2	Emotional Intelligence At Work: A Professional Guide	Daliph Singh	Response Books: New Delhi	1st
	3	Emotional Intelligence in Everyday Life: A Scientific Inquiry	Ciarruchi, J., Forgas, J. and Mayer, John.	Psychology Press: Philadelphia, PA	1st
	4	Emotional Intelligence 2.0	Travis Bradberry	Talent smart Service	1st

Course Outcomes:

After completion of the course, students should be able to-

CO1	Recall the basic concepts, components, and theories of EI.
CO2	Explain the development and influence of emotions and emotional maturity in personal and organizational settings.
CO3	Describe the core competencies of EI and their role in self and relationship management.
CO4	Apply EI techniques for managing stress, anger, empathy, and psychological well-being.
CO5	Utilize EI to improve workplace performance, decision-making, leadership, and conflict resolution.
CO6	Integrate the EI principles in team-based engineering projects and evaluate its role in group dynamics and project success.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	2	-	1	2	1	-
CO3	-	-	-	-	-	2	-	2	2	2	-
CO4	-	-	-	-	-	2	-	3	2	2	-
CO5	-	1	1	-	-	2	-	3	3	3	1
CO6	-	1	2	-	-	1	1	2	3	3	2

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) **(Semester III)**
Open Elective-1 offered by the Department of Civil Engineering

Course Category: **OEC** Course Code: **OEC241G** Course: **Building Planning** Teaching Scheme: Theory – 2 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Continuous Internal Assessment: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	The students should have knowledge of basic science and Engineering drawing.
Objectives	By the end of this course, students will be able to: 1. Understand the principles of building planning with respect to climate, orientation, and sustainability. 2. Interpret and apply building byelaws and procedures as per NBC 2016. 3. Identify and evaluate traditional, modern, and sustainable construction materials. 4. Explain plumbing, drainage, electrification systems, and rainwater harvesting methods. 5. Understand ventilation, air conditioning, and thermal insulation systems in buildings. 6. Prepare functional line plans of typical public buildings as per planning standards.
Unit-I	**Principles of building planning**: Significance sun diagram, wind diagram, orientation, factors affecting, and criteria under Indian condition, concept of green building: aspect at planning level, construction stage and operational level. **(04 Hrs)**
Unit-II	**Building planning byelaws**: Objectives, principles, overview of National Building code of India (NBC 2016). Planning of residential building: different rooms and their sizes. Procedure of building permission, types of drawings required, significance of commencement, completion or occupancy certificate **(04 Hrs)**
Unit-III	**Construction Materials:** Importance of materials in construction, Classification: traditional, modern, and sustainable materials. Common **Traditional Materials**: Cement: Types, properties, uses, Concrete: Ingredients, mix proportions, and applications, Bricks & Blocks: Types, strength, and suitability, Steel: Grades, properties, and reinforcement uses, Timber: Types, properties, and preservation, Aggregates: Coarse and fine aggregates, grading, and selection. **Modern Materials**: Glass, aluminium, plastics, composites, and polymers. **Sustainable materials**: Green building materials: fly ash bricks, recycled aggregates, bamboo, geopolymer concrete **(5 Hrs)**
Unit-IV	**Plumbing Systems:** Various materials like stoneware, Metallic Pipes, Cement Pipes, Plastic Pipes, various types of traps, sanitary fittings, septic tank, concept of plumbing & drainage plan, rainwater harvesting need, advantage, Roof Top Rainwater Harvesting, Recharging Technique, Roof Top Water Filter, Recharge pits. **Electrification:** Conduits wiring types, requirements & location of various points, Earthing: its method and types. **(4Hrs)**

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Unit-V	**Ventilation:** Definition, necessity, functional requirements, various system & selection criteria. Air conditioning: Purpose, classification, principles, various systems. **Thermal Insulation:** General concept, Principles, Materials, Methods, Computation of Heat loss & heat gain in Buildings **(4 Hrs)**
Unit-VI	**Planning of public buildings:** Schools, Hospital, Library, Shopping centres. Draw single line plan of above-mentioned buildings in suitable scale. **(5 Hrs)**

Text Books (T), Reference Books (R), and E-resources (E)

Sr. No.	Title	Author	Publication	Edition
T1.	Building Planning and drawing	Swamy Kumara Rao, Kameshwara A.	Charotar Publications,	4th
T2.	Building drawing	Shah M.G. Kale, M.& Patki SY	Tata McGraw-Hill	4th
T3.	Planning and designing of buildings	Y.S. Sane	P.V.G. Prakashan	4th
R1.	Building Science and Planning	Deodhar S.V	Khanna Publishers, N. Dehli	5th
R2.	The Idea of Green Building	Jain A.K.,	Khanna Publishers, N. Dehli,	1st
R3.	SP 7- National Building Code Group 1 to 5	---	B.I.S. New Delhi	2016
E1	https://nptel.ac.in/courses/105107156			
E2	http://nptel.ac.in/courses/105102088			
E3	http://nptel.ac.in/courses/105105200			

Course Outcomes: After completion of the course, students should be able to-

CO1	Explain principles of building planning, sun/wind diagrams, orientation, and green building concepts for Indian conditions. (Understanding).
CO2	Apply building byelaws and NBC 2016 in residential planning and explain building permission procedures. (Apply).
CO3	Classify traditional, modern, and sustainable construction materials and describe their properties and uses. (Understanding)
CO4	Describe plumbing, drainage, electrification, and rainwater harvesting systems for buildings. (Understanding)
CO5	Explain ventilation, air conditioning, and thermal insulation principles and systems. (Understanding)
CO6	Prepare single line plans of public buildings like schools, hospitals, libraries, and shopping centres (Apply).

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1			2	2			1	
CO2	2	3	3	1		2	2		1	2	
CO3	3	2	2			2	3			1	
CO4	2	2	2		2	3	3	1		1	
CO5	2	2	2	1	2	3	3	1		2	
CO6	2	3	3	2	3	-	-	1	2	2	

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III/IV)	
Course Category: HSSM Course Code: HSM201 Course: Engineering Economics and Management Teaching Scheme: Theory – 2 Hrs./week Self-Learning Hours – 2 Hrs./week	Credits: 2-0-0 In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks

Prerequisite	No special prerequisite required
Objectives	1. To introduce students to the fundamental principles of industrial management. 2. To familiarize students with various aspects of industrial operations. 3. To provide students with knowledge of real-world industrial management challenges.
Unit-I	**Introduction to Engineering Economics:** Introduction to Economics, Importance, and scope of economics in engineering. Economic analysis and its role in project management, Overview of economic principles and concepts relevant to engineering, Micro - and macro- economics, economics of growth and development, Demand, and supply analysis. **(05 Hrs.)**
Unit-II	**Cash Flow and Time Value of Money** Interest rates, compounding, and discounting, Present value and future value analysis, Equivalent annual cost analysis. Cash Flow – Diagrams, Categories & Computation, Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis, Calculating Rate of Return, Incremental Analysis. **(05 Hrs.)**
Unit-III	**Elements of Managerial Economics** Cost & Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. **(04 Hrs.)**
Unit IV	**Business Organization:** Concept of organization, Elements of Organization, Types of Business organization, Principles of Organization, Organization structure **(04 Hrs)**
Unit V	**Management Concept** Management, Administration, Organization, Managerial skills, Evolution and development of Management Thought, Principles of Management, Functions of Management, Levels of Management **(04 Hrs.)**
Unit VI	**Human Resource Management** Introduction, Definitions, and concept of HRM, Functions and objectives of HRM, Manpower Planning, Recruitment and selection, Training and development, Compensation Management. **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
Textbook /Reference Books	1.	Industrial Organization and Engineering Economics	T. R. Banga & S. C. Sharma	Khanna Publishers	24th
	2.	Industrial Engineering & Management	O. P. Khanna	Dhanpatrai Publications	8th
	3.	Essentials of Management	Harold Koontz (Author), Heinz Weihrich	McGraw-Hill Education	5th
	4.	Human Resource Management: Text and Cases	K Aswathappa, Sadhna Dash	Tata McGraw-Hill	10th
	5.	Marketing Management	G. Shainesh, Philip Kotler	McGraw-Hill Education	8th Indian

Course Outcomes:

After completion of the course, students should be able to-

CO1	Explain the concept of economics
CO2	Calculate present value, future value of single cash flow and annuities using appropriate formulas
CO3	Understand cost and cost control
CO4	Recognize the functions and objectives of Human Resource Management in a business context
CO5	Identify and describe the key elements and types of business organizations
CO6	Explain the principles of management and the various levels within an organization

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3										
CO2	3										
CO3	3	2									
CO4	3										
CO5	3	1									
CO6	3										

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III/IV)

Course Category: **HSSM** Course Code: **HSM202** Course: **Innovation and Entrepreneurship** Teaching Scheme: Theory – 2 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks

Prerequisite	No special prerequisite required
Objectives	• Develop awareness about entrepreneurs and entrepreneurship. • Describe the functions and characteristics of entrepreneur and entrepreneurship. • Discuss the concept of innovation and entrepreneurship • Identify concepts, principles, and strategies with reference to social entrepreneurship and social innovation.
Unit-I	**Introduction to Entrepreneurship** Introduction, the concept of entrepreneur, entrepreneurship and social entrepreneurship, the definition of entrepreneurship, four types of entrepreneurship and entrepreneur, the importance of entrepreneurship, characteristics of entrepreneurship **(04 Hrs)**
Unit-II	**Innovation and Entrepreneurship** Definition of Innovation, Fundamentals of Innovation, Types of innovation - Incremental, Disruptive, and Radical, The Innovation Process: from idea to execution The Innovation-Entrepreneurship Relationship, Entrepreneurial mindset, Corporate Entrepreneurship, Social Impact Innovation. **(04 Hrs)**
Unit-III	**Creativity and Innovation** Foundations of Creativity and Innovations, Creative thinking process, Developing a creative mindset, overcoming creative blocks, Exploring Types of Innovation through Case Studies **(04 Hrs)**
Unit-IV	**Entrepreneurship Development Process** Introduction, the process of entrepreneurship development, objectives of the entrepreneurship development program, the process of entrepreneurship development, entrepreneurship development, and start-up India, Indian entrepreneurship development challenges. **(04 Hrs)**
Unit-V	**Entrepreneurship as Innovation and Problem Solving** Entrepreneurs as problem solvers, innovations, and entrepreneurial ventures – global and Indian role of technology – e-commerce and social media, social entrepreneurship – concept. **(05 Hrs)**
Unit-VI	**Social Entrepreneurship and Social Innovation** Understanding Social Entrepreneurship and Social Innovation, The Social Entrepreneurial Mindset and Skills, Identifying Social Needs and Opportunities Social Enterprise Models, Funding Sources for Social Enterprises and Innovations, Impact Investing, and Social Venture Capital **(05 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
Text books/ Reference books	1.	Entrepreneurship	Robert Hisrich and Michael Peters	Tata McGraw–Hill	11th
	2.	Entrepreneurial Development	Vasant Desai	Himalaya Publishing House	1991
	3.	Entrepreneurship – Strategies and Resources	Marc J Dollinger	Marsh Publications	4th
	4.	The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail	Christensen, C.M.	Harvard Business Review Press	2016
	5.	Social Entrepreneurship: What Everyone Needs to Know	Bornstein, D., & Davis, S	Oxford University Press	2010
	6.	Impact Investing: Transforming How We Make Money While Making a Difference	Bugg-Levine, A., & Emerson, J.	Wiley	2011
MOOC Courses Links	1	https://onlinecourses.swayam2.ac.in/cec24_mg08/preview			
	2	https://onlinecourses.nptel.ac.in/noc20_mg35/preview			
	3	https://onlinecourses.nptel.ac.in/noc21_mg63/preview			
Weblinks	1	https://ebooks.inflibnet.ac.in/hsp15/chapter/chapter-1/			
	2	https://ocw.mit.edu/collections/entrepreneurship/			
	3	https://www.youtube.com/playlist?list=PLb5SyhPhDyTci1Isuhn2Dj1zxqLyENLW5			
	4	https://www.youtube.com/watch?v=0Hv-sMeNKGQ			
	5	https://digitalleadership.com/blog/the-innovation-entrepreneurship-relationship/			

Course Outcomes:

After completion of the course, students should be able to-

CO1	Understand the fundamental of concepts of entrepreneurship and innovation.
CO2	Explain the basic theories and concepts that underlie the study of innovation, Entrepreneurship and Social Entrepreneurship.
CO3	Explain the importance of innovation in entrepreneurial ventures
CO4	Develop hypothetical innovative entrepreneurial ventures

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1		2	2	2		3	3	2	3	2	2
CO2		2	2	2	2	3	3				
CO3						3	3	2	3	2	2
CO4						2	3	3	2	3	3
Average		2	2	2	2	2.75	3	2.33	2.67	2.33	2.33

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Syllabus of Second Year B.Tech. (All Branches) **(Semester III/IV)**

Course Category: VEC Course Code: **VEC201** Course: **Universal Human Values** Teaching Scheme: Theory – 1 Hr./week , Practical – 2 Hrs/week Self-Learning Hours – 1 Hr./week	**Credits: 1-0-1** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks

Prerequisites	Nil
Objectives	This course aims at enabling students, 1. To appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings. 2. To facilitate the development of a holistic perspective among students to lead their personal and professional lives in an ethical way. 3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior, and mutually enriching interaction with nature.
Unit-I	**Introduction to Value Education** • Understanding Value Education • Self-exploration as the Process for Value Education • Continuous Happiness and Prosperity - the Basic Human Aspirations and their Fulfilment • Right Understanding, Relationship and Physical Facility • Happiness and Prosperity - Current Scenario • Method to Fulfil the Basic Human Aspirations **(3 Hrs.)**
Unit-II	**Harmony in the Human Being** • Understanding Human being as the Co-existence of the Self and the Body • Distinguishing between the Needs of the Self and the Body • The Body as an Instrument of the Self • Understanding Harmony in the Self • Harmony of the Self with the Body • Programme to Ensure self-regulation and Health **(2 Hrs.)**
Unit-III	**Harmony in the Family** • Harmony in the Family - the Basic Unit of Human Interaction 'Trust' - the Foundational Value in Relationship • 'Respect' - as the Right Evaluation Values in Human-to-Human Relationship **(2 Hrs.)**
Unit-IV	**Harmony in the Society** • Other Feelings, Justice in Human-to-Human Relationship • Understanding Harmony in the Society • Vision for the Universal Human Order **(2 Hrs.)**

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Unit-V	**Harmony in the Nature (Existence)** • Understanding Harmony in the Nature • Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature • Realizing Existence as Co-existence at All Levels • The Holistic Perception of Harmony in Existence **(2 Hrs.)**
Unit-VI	**Implications of the Holistic Understanding - a Look at Professional Ethics** • Basis for Universal Human Values • Definitiveness of (Ethical) Human Conduct • Professional Ethics in the light of Right Understanding • A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order • Holistic Technologies, Production Systems and Management Models Typical Case Studies • Strategies for Transition towards Value-based Life and Profession **(2 Hrs.)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	A foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Book Pvt, Ltd	3rd
2.	Science and Humanism	P.L. Dhar, RR Gaur	Commonwealth Publishers	1990
3.	Jeevan Vidya: Ek Parichaya	Nagaraj	Jeevan Vidya Prakashan, Amarkantak	1999
4.	Human Values	A. N. Tripathy	New Age International Publishers	2003
5.	Fundamentals of Ethics for Scientists & Engineers	E. G. Seebauer & Robert L. Berry	Oxford University Press	2000
6	Engineering Ethics and Human Values	M. Govindrajan, S. Natrajan & V.S. Senthil Kumar	Eastern Economy Edition, Prentice Hall of India Ltd.	---
7	Foundations of Ethics and Management	B. P. Banerjee	Excel Books	2005
8	Indian Ethos and Modern Management	B. L. Bajpai	New Royal Book Co., Lucknow.	2004 Reprinted 2008

List of Practical

1. **Introduction to Value Education (4 hrs)**
   PS1 Sharing about Oneself
   PS2 Exploring Human Consciousness
   PS3 Exploring Natural Acceptance
2. **Harmony in the Human Being (6 hrs)**
   PS4 Exploring the difference of Needs of Self and Body
   PS5 Exploring Sources of Imagination in the Self

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	PS6 Exploring Harmony of Self with the Body **3. Harmony in the Family and Society (6 hrs)** PS7 Exploring the Feeling of Trust PS8 Exploring the Feeling of Respect PS9 Exploring Systems to fulfil Human Goal **4. Harmony in the Nature (Existence) (4 hrs)** PS10 Exploring the Four Orders of Nature PS11 Exploring Co-existence in Existence **5. Implications of the Holistic Understanding – a Look at Professional Ethics (6 hrs)** PS12 Exploring Ethical Human Conduct PS13 Exploring Humanistic Models in Education PS14 Exploring Steps of Transition towards Universal Human Order. **PS – Problem Statement**
e-resources	• http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/ • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw • https://youtu.be/OgdNx0X923I • https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php • https://fdp-si.aicte-india.org/download.php#1/

Course Outcomes:

After completion of the course, students should be able to-

CO1	Demonstrate the relevance of Universal Human Values
CO2	Develop an understanding about human being as co-existence of Self and Body
CO3	Apply the learnings to ensure harmony in family and society
CO4	Model coexistence with nature by integrating Universal Human Values for ethical personal and professional lives.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1							3	2	2	1	2
CO2							3	2			1
CO3								1	1	1	1
CO4							3	2	2	2	3

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) **(Semester III/IV)**

Course Category: VEC Course Code: **VEC202** Course: **Environmental Studies** Teaching Scheme: Theory – 1 Hr./week , Practical – 2 Hrs/week Self-Learning Hours – 1 Hr./week	**Credits: 1-0-1** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks

Prerequisite	Understanding of the concept of Environment
Objectives	• To study about the environment and ecosystems. • To study about different types of natural resources. • Knowledge and concept of biodiversity and its conservation. • Basic knowledge and concept of causes, effect and control of different types of environmental pollution. • To study population growth and its impact on environment
Unit-I	**Introduction to environmental studies and natural resources** Definition, scope and importance and Need for public awareness. Natural resources: Forest resources: Use and over-exploitation, deforestation. Timber extraction. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. **(02 Hrs)**
Unit-II	**Food, energy and land resources** Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. **(02 Hrs)**
Unit-III	**Ecosystems** Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystems: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **(02 Hrs)**
Unit-IV	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India.

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	Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. **(02 Hrs)**
Unit-V	**Environmental Pollution** Definition, Cause, effects and control measures of : a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards Role of an individual in prevention of pollution. **(03 Hrs)**
Unit-VI	**Social Issues and the Environment** From Unsustainable to Sustainable development. Urban problems related to energy. Climate change, global warming, acid rain, ozone layer depletion Environment Protection Act. Public awareness. **(02 Hrs)**
List of Practical	1. Study of a local hilly area to document environmental assets. 2. Study of a forest area as an environmental asset. 3. Study assignment on sustainable development goal, 'No Hunger'. 4. Case study on landslide. 5. Poster making on food chain, food web and ecological pyramids. 6. Study of hotspots of biodiversity in India as a mega diversity nation. 7. Assignment on causes, effects and control measures of urban and industrial wastes. 8. Working out a plan of roof top rainwater harvesting for a house. 9. Case study on resettlement and rehabilitation of people because of developmental activities such as dams, mining, etc. 10. Visit to local polluted site.

	Title	Author	Publication	Edition
Textbooks/ Reference Books	Environmental Biology	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner	2001
	The Biodiversity of India	Bharucha Erach	Mapin Publishing Pvt. Ltd., Ahmedabad	Edition 1
	Global Biodiversity Assessment	Heywood, V.H & Waston	Cambridge Univ. Press	1995
	Environmental Protection and Laws	Jadhav, H & Bhosale, V.M.	Himalaya Pub. House, Delhi	Edition 1
	Fundamentals of Ecology	Odum, E.P.	W.B. Saunders Co. USA,	Edition 1
	Environmental Science	Miller T.G. Jr	Wadsworth Publishing Co.	Edition 1

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Course Code: **VEC202**
Course: **Environmental Studies**

Course Outcomes:

After completion of the course, students should be able to-

CO1	Memorize different natural resources and need to conserve them.
CO2	Illustrate growing food and energy needs by maintaining land resources.
CO3	Interpret different types of ecosystems and their functions.
CO4	Relate Biogeographical classification to conservation of biodiversity in India.
CO5	Identify Cause, effects and control measures of Environmental Pollution.
CO6	Evaluate the role of public awareness in sustainable development.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1						1					
CO2	1				2	1					
CO3			1			1	2				
CO4	1	2			1	1					
CO5					2	1					
CO6						2			1		

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III)

Course Category: ELC Course Code: **ELC221** Course: **Community Engagement Project** Teaching Scheme: Practical: 04 Hrs/Week	**Credits: 0-0-2** Teacher Assessment: 50 Marks

Course Description	The "Community Engagement Project" course is designed to provide students with field-based learning experiences that integrate their theoretical knowledge of major discipline of engineering with real-life socio-economic issues. Students will engage in projects that address community needs, enhancing their understanding of the role of engineering in society and developing their problem-solving and communication skills.
Objectives	1. To expose students to socio-economic issues and challenges in society. 2. To apply theoretical knowledge to develop practical solutions to real-life problems. 3. To enhance students' communication, teamwork, and project management skills. 4. To foster a sense of social responsibility and ethical awareness among students.
Implement ation guidelines	1. A group of four students, under the guidance of faculty mentors, conduct a Socioeconomic Survey of the nearby area/ habitation. They will interact with people and conduct the survey using a structured questionnaire. 2. The group of students will choose a topic related to their subject area relevant to their major discipline and conduct a Project which includes data collection and analysis and a conclusion/ solution on a selected problem. 3. Students should submit a project report duly signed by the mentor. 4. Assessment should be done by a mentor continuously (Rubrics based)
Assessment Methodology	1. **Field Work and Engagement (40%)** o Quality and effectiveness of community engagement. o Depth of data collection and analysis. o Ability to identify and understand community issues. 2. **Project Implementation (30%)** o Creativity and feasibility of proposed solutions. o Effectiveness of implementation. o Adaptation and problem-solving during implementation. 3. **Reports and Documentation (20%)** o Documentation of data, process, and outcomes. o Reflection on personal learning and project impact. 4. **Presentation (10%)** o Clarity and effectiveness of oral presentation. o Ability to communicate project findings and solutions. o Engagement with audience and response to questions.

Suggested Reading Materials and Resources:

1. **Book:** "The Community Engagement Professional in Higher Education" by Lina D. Dostilio
2. **Web Resources:** IEEE Xplore Digital Library for research papers on community engagement projects. Also, refer websites of NGOs and community organizations for case studies and project ideas.

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Rubrics for Assessment:

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Inadequate (1)
Field Work and Engagement	Thorough and insightful engagement with the community. Extensive data collection and deep understanding of issues.	Effective engagement with the community. Adequate data collection and good understanding of issues.	Satisfactory engagement with the community. Basic data collection and understanding of issues.	Limited engagement with the community. Incomplete data collection and understanding of issues.	Minimal or no engagement with the community. Poor or no data collection and understanding of issues.
Project Implementation	Innovative and highly feasible solutions. Effective implementation with positive impact.	Creative and feasible solutions. Good implementation with noticeable impact.	Basic but feasible solutions. Satisfactory implementation with some impact.	Limited creativity in solutions. Ineffective implementation with minimal impact.	No feasible solutions. Poor or no implementation with no impact.
Reports and Documentation	Comprehensive and clear reports. Thorough documentation of process and outcomes. Reflective insights.	Clear and detailed reports. Good documentation of process and outcomes. Some reflective insights.	Adequate reports. Basic documentation of process and outcomes. Limited reflective insights.	Incomplete or unclear reports. Inadequate documentation of process and outcomes. Minimal reflective insights.	Poor or no reports. No documentation of process and outcomes. No reflective insights.
Presentation	Highly effective and engaging presentation. Clear communication of findings and solutions.	Effective presentation. Clear communication of findings and solutions.	Satisfactory presentation. Basic communication of findings and solutions.	Unclear or disorganized presentation. Limited communication of findings and solutions.	Poor or no presentation. Unable to communicate findings and solutions.

Course Outcomes:

After completion of the course, students should be able to-

CO1	Identify and analyze socio-economic issues in the community
CO2	Apply engineering principles to propose and implement feasible solutions to community problems
CO3	Collaborate effectively in teams to achieve project goals
CO4	Communicate project findings and solutions effectively through written and oral forms
CO5	Reflect on the social impact of projects and recognize the role of engineers in society

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1		3				2					
CO2	3		3		2	2					
CO3								3		2	
CO4									3		
CO5						2	3				2

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)	
Course Category: PCC Course Code: CSE223 **Course: Data Structures Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	Credits: 0-0-1 Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks

Objectives	• To implement the basic data structures- stack, queue, linked list. • To implement tree traversal techniques and operations on binary search tree. • To implement graph traversal techniques. • To implement sorting and searching algorithms.
List of Practical	1. Array based implementation of stack. 2. Array based implementation of queue. 3. Implementation of Singly linked list operations. 4. Implementation of doubly linked list operations. 5. Implementation of stack and queue using linked list. 6. Implementation of Binary tree traversals. 7. Implementation of operations on BST. 8. Implementation of BFS and DFS. 9. Implementation of Selection sort. 10. Implementation of linear and binary search.

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: PCC Course Code: Course: Data Structure Lab Teaching Scheme: PR- 2 Hrs./week	Credits: 1-0-0

Course Outcomes	CO1: Apply fundamental concepts of data structures to solve computational problems logically. CO2: Develop and implement data structures such as stacks, queues, and linked lists using appropriate coding skills.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	–	–	–	–	–	–	–
CO2	-	3	3	2		–	–	–	–	–	–
Average	3	2.5	3	2	–	–	–	–	–	–	–

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	–	–
CO2	2	–	–
CO3	2	–	–
CO4	2	–	–
Average	2	–	–

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Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: CSE224 **Course: Digital Electronics and Computer Architecture Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	Credits: 0-0-1 Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks

Objectives	• To demonstrate the concept logic gates, design of combinational and sequential logic circuits. • To use addressing modes & instruction set to implement different assembly language programs.
List of Practical	1. Implementation of Boolean expression using AND, OR, NOT, NAND and NOR logic gates. 2. Realization of Half & Full Adder using logic gates. 3. Realization of Half & Full Subtractor using logic gates. 4. Design & Implement 8:1 Multiplexer and 1:8 De-multiplexer using logic gates. 5. Demonstrate the working of flip-flop. 6. Write an Assembly language program to print the string in 8086. 7. Write an Assembly language program for 8-bit & 16-bit addition in 8086. 8. Write an Assembly language program for 8-bit &16-bit logical operation in 8086. 9. Write an Assembly Language Program for 8-bit multiplication & 16-bit division in 8086. 10. Write an Assembly Language Program for finding smallest number from an array in 8086. 11. Case study on memory Management. **Note: A minimum of 10 practical's Should be performed.**

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Syllabus of Third Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: CSE224 **Course: Lab : Digital Electronics and Computer Architecture** Teaching Scheme: Theory- 3 Hrs./week	Credits: 0-0-1

Course Outcomes	**CO1**: Simulate and interpret digital electronic circuits. **CO2**: Apply the instruction set of 8086 microprocessor for assembly language programming.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	–	2	–	–	–	–	–	–
CO2	2	2	2	–	2	–	–	–	–	–	–
Mapping Strength	**2**	**2**	**2**	–	2	–	–	–	–	–	–

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	–	–
CO2	2	–	–
Average	**2**	–	–

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Semester-IV
Detail Course Curriculum

Second Year B. Tech Syllabus
(Computer Science and Engineering)

(Revised NEP 2020 Based Curriculum for S.Y.B.Tech students WEF 2025-26)

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester IV)

Course Category: **PCC** Course Code: CSE251 Course: Operating System **Teaching Scheme:** Theory: 03 Hrs/week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Mark In Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs

Prerequisites	C Programming, Data Structures, Computer Organization
Objectives	1. To learn the fundamentals of Operating System. 2. To study different components of OS. 3. To understand an overview of the different Types and Structures of OS. 4. To provide understanding of important system resources and their management policies
Unit-I	**Introduction** Operating System Objectives and Functions: The OS as a User/Computer Interface, OS as a resource manager. Evolution of Operating system: Batch System, multiprogramming, time sharing, multitasking, distributed, handheld Computer System, Embedded OS, Real Time, Smart Card OS. Operating System Structure: Monolithic Systems, layered Systems. Micro Kernels, Exokernels. System Calls and Shell. **(06 Hrs.)**
Unit-II	**Process Management** Process concept. Process states (two state, five state), Process Description, PCB.CPU scheduling- scheduling criteria, Scheduling Algorithms. Thread: Process and "threads, Thread functionality, User level and Kernel level threads. Process Synchronization Principle of concurrency, Race condition. Critical Sections/Regions Mutual Exclusion, Sleep and wakeup, Producer consumer problem, Semaphore, Monitors, Message Passing. Dining Philosopher Problem, Readers, and writers' problem. **(07 Hrs.)**
Unit-III	**File Systems** Overview: File, File Management System, File System Architecture, File Management Functions. File Organization and access, File System Layout. File Directories, File Sharing. Secondary Storage Management: File Allocation, Disk space management. File System Consistency and Performance. **(07 Hrs.)**
Unit-IV	**Memory Management** Memory Management Requirements, Relocation, Protection, Sharing, Logical Organization, Physical Organization. Memory Partitioning: Fixed, Dynamic Partitioning, Relocation Fragmentation, Swapping. Managing free Memory: Memory management with bitmap, linked list. Paging: Basic Method, Structure of pageTable. Segmentation: Basic Method. Virtual Memory: Demand Paging, Page replacement Algorithms- optimal, FIFO, LRU, Allocation of Frames, Thrashing. **(07 Hrs.)**

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Unit-V	**Device Management** Principles of I/O Hardware: I/0 devices, Device Controllers. Principle of I/O software, I/0 Software Layers, Disk: Disk hardware -Magnetic CDs, DVDs Disk, RAID, Disk Formatting, Disk Scheduling Algorithms, Clocks. **(06 Hrs.)**
Unit-VI	**Deadlock and Case study** Deadlock, System model, Characterization, Deadlock Prevention, Deadlock avoidance - Bankers Algorithm for single and multiple resources, Deadlock detection and recovery, Case study of Window 10- History of Windows, Case study of Linux- History of Linux. **(06 Hrs.)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Operating System Concepts	Abraham Silberschatz, Peter Galvin	Addison Wesley	Sixth
2.	Modern Operating Systems	Andrew S. Tanenbaum	Prentice Hall	Third
3.	Operating System Design & Implementation	Andrew S. Tanenbaum	Pearson Education	Second
4.	Operating systems	William Stallings	Prentice hall	Fourth

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Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester III)

Course Category: **PCC** Course Code: CSE251 Course: Operating System **Teaching Scheme:** Theory: 03 Hrs/week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Course Outcomes	**CO1:** Describe the objectives, structure, and evolution of operating systems. **CO2**: Explain process management, CPU scheduling, and process synchronization mechanisms. **CO3**: Apply file and memory management techniques to optimize system functionality. **CO4:** Apply disk scheduling algorithms and deadlock handling strategies to improve system performance.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	–	–	–	–	–	–	–	–	1
CO2	3	3	2	2	–	–	–	–	–	–	1
CO3	3	3	2	2	–	–	–	–	–	–	1
CO4	3	3	2	2	–	–	–	–	–	–	1
Average	3	2.75	1.5	1.5	–	–	–	–	–	–	1
Mapping Strength	3	3	2	2	–	–	–	–	–	–	1

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1		–	3
CO2		–	3
CO3		–	3
CO4		–	3
Average		–	3

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Syllabus of Second Year B. Tech. Computer Science and Engineering (Semester IV)

Course Code: CSE252 Course: Object Oriented Programming in Java **Teaching Scheme:** Theory: 03 Hrs/week Self learning Hours: 03 Hrs./week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs

Prerequisites	Programming in C Language and Data Structures
Objectives	1. To learn Object Oriented concepts in Java 2. To study inheritance, polymorphism concepts 3. To understand exception and multithreading
Unit-I	**Introduction to OOP and JAVA** Features of Java, Difference Between Procedural Oriented and Object Oriented approach, Java Virtual Machine, Data Types, Variables, Operators, Control Statements, String and Arrays in Java. (6 Hrs)
Unit-II	**OOP in Java** Class Fundamentals, Introducing Methods, Declaring Objects, Accessing Class Members, Method Overloading, Constructors, Constructor Overloading, Static Members, Access Modifiers, this reference, introducing final. (7 Hrs)
Unit-III	**Inheritance** Inheritance in Java, Super and Sub Class, defining a Subclass, Types of Inheritance, Method Overriding, using super, Finalizers, Abstract Class and Methods, Visibility Controls, using final with Inheritance. (7 Hrs)
Unit-IV	**Interfaces and Packages** Interface in Java, Defining Interfaces, Extending and Implementing Interfaces. Polymorphism, Packages: Defining Packages, Class path Variable, Creation of Package, Importing Packages. (7 Hrs)
Unit-V	**Exception Handling** Exception Handling Fundamentals, Java's Built-in Exceptions, try catch and finally, throw, throws keywords, User Defined Exceptions. (6 Hrs)
Unit-VI	**Multi Threading** Definition of a Thread, States of a Thread, Common Thread methods, Creation of a Thread, Creation of Multiple Threads, Thread Priorities, Synchronization. (6 Hrs)

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	Sr. No.	Title	Author	Publication	Edition
Textbooks / Reference Books	1.	Java: The Complete Reference	Herbert Schildt	McGraw Hill Education	11th
	2.	Programming with Java	E Balagurusawmy	McGraw Hill Education	6th
	3.	Java: How to program	Paul Deitel and Harvey Deite	Pearson Prentice Hall	10th
	4.	Object Oriented Programming in Java	Dr. G. T. Thampy	Dreamtech	4th

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Syllabus of Third Year B.Tech. (Computer Science and Engineering) (Semester V)

Course Category: **PCC** Course Code: CSE252 **Course: Object Oriented programming in Java** Teaching Scheme: Theory- 3 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Course Outcomes	**CO1**: Describe Procedure Oriented Programming and object oriented programming concepts **CO2:** Demonstrate the basic programming constructs like control structures, constructors, string handling **CO3:** Apply inheritance, interface and abstract classes for given problem **CO4**: Apply exception handling to avoid abnormal termination of program and multithreading concepts to develop inter process communication.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1				-	-	-	-	-	1
CO2	1	2	2	-	3	-	-	-	-	-	1
CO3	1	2	2	2	3	-	-	-	-	-	1
CO4	1	2	3	2	3	-	-	-	-	-	1
Average	1.5	1.75	2.3	2	3	-	-	-	-	-	1
Mapping Strength	2	2	2	2	3	-	-	-	-	-	1

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	-	-
CO2	2	-	-
CO3	3	-	-
CO4	3	-	-
Average	2	-	-

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester IV)	
Course Category: **PCC** Course Code: CSE253 **Course: Theory of Computation** Teaching Scheme: Theory: 03 Hrs./week **Self Learning Hours**: 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.
Prerequisite	Discrete Mathematical Structure
Objectives	• To learn about fundamental concepts of finite automata and formal language • To design grammars and recognizers for different formal languages • To create background for designing compiler • To learn about the theory of computability and complexity.
Unit-I	**Introduction to Finite Automata:** Definition of deterministic finite automata, non-deterministic finite automata, Finite Automat with output and their conversions, Language acceptability, Recursive definition, NFA with e-moves, Conversion of NFA and DFA, Equivalence and minimization of Automata. **(08 Hrs)**
Unit-II	**Regular Expressions and Languages:** Regular Expressions, Finite automata and Regular Expression, Algebraic laws for RE, Conversion of regular expression to finite automata, Ardens Theorem, Pumping lemma for Regular languages, Applications of pumping lemma, Closure properties of regular languages, , Applications of Regular Expressions. **(06 Hrs)**
Unit-III	**Context Free Grammar and Language:** Definition, Ambiguous grammar, Removal of ambiguity, Chomsky hierarchy, Left linear, Right linear grammar, Inter-conversion between left linear and right linear regular grammar, Applications of Context-Free Grammars, Definition of context free languages, Simplification of CFG, Normal forms of CFG: CNF, GNF **(06 Hrs)**
Unit-IV	**Pushdown Automata:** Formal definitions -Deterministic Pushdown automata (DPDA) & Non-deterministic Pushdown automata (NPDA), Acceptance by PDA, Pumping lemma for CFL, Applications of PDA ,The model of linear bounded Automata. **(06 Hrs)**
Unit-V	**Turing Machines:** Definition, Computing with Turing machine, Extensions of Turing machines, Random access Turing machines, Non-deterministic Turing machines, The Church's Turing Hypothesis, Universal Turing Machines, The Halting Problem, Unsolvable problems about Turing machines. **(07 Hrs)**

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Unit-VI	**Decidability and Recursively Enumerable languages** Definition of algorithm, Decidability, Decidable language, Undecidable language, Recursive and recursively enumerable languages, Non recursively Enumerable Languages, The diagonalization Language, Universal Language, Post correspondence problem, Undecidable problems for context free grammars, Markvo algorithm. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Introduction to Automata Theory Languages, and Computation	John E. Hopcroft , Rajeev Motwani , Jeffrey D. Ullman	Pearson Education	3rd
2.	Theory of Computer Science: Automata, Languages and Computation	K.L.P. Mishra, N. Chandrasekaran	PHI	3rd
3.	Introduction to Languages and Theory of Computation,	John C. Martin	McGraw Hill	4th
4.	Introduction to the Theory of Computation	Michael Sipser	CENGAGE Learning	3rd
5.	Formal Languages and Automata Theory	Basavaraj S. Anami, Karibasappa K. G.	Wiley Publication	--

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester IV)

Course Category: **PCC** Course Code: CSE253 **Course: Theory of Computation** Teaching Scheme: Theory- 3 Hrs./week **Self Learning Hours:** 03 Hrs./week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Course Outcomes	CO1: Explain various mathematical constructs in theory of computation. CO2: Convert one form of automata/grammar/language into another form. CO3: Construct parses tree, context free grammar and regular expression for language accepted by automata. CO4: Prove the language is Regular, context free or not using pumping lemma. CO5: Analyze decidability –Undecidability of problem. CO6: Design Various models of computation.

CO PO Mapping

CO1	3	2	-	-	–	–	–	–	–	–	–
CO2	3	-	2	-	–	–	–	–	–	–	–
CO3	2	-	2	-	–	–	–	–	–	–	–
CO4	-	2	-	2	–	–	–	–	–	–	–
CO5	-	2	-	2	–	–	–	–	–	–	–
CO6	-	-	3	-	–	–	–	–	–	–	–
Average	3	2	2	2	–	–	–	–	–	–	–
Mapping Strength	3	2	2	2	–	–	–	–	–	–	–

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	–	–
CO2	2	–	–
CO3	2	–	–
CO4	2	–	–
CO5	2		
CO6	2		
Average	2	–	–

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) **(Semester IV)**
Open Elective-2 offered by the Department of Agricultural Engineering

Course Category: OEC Course Code: **OEC291A** Course: **Smart Agriculture Practices** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisites	Fundamentals of agriculture and basic sciences knowledge required
Course Objectives	• To understand the concept and importance of smart agriculture. • To learn about the technologies and practices used in smart agriculture. • To explore the impact of smart agriculture on productivity and sustainability. • To develop practical skills in using smart agriculture technologies.
Unit-I	**Introduction to Smart Agriculture:** Definition and scope of smart agriculture Benefits and challenges of smart agriculture: productivity, reduced resource wastage (water, fertilizers, etc.), improved decision-making through data analysis, and enhanced sustainability. Challenges include high initial costs, technological complexity, and the need for training and education. **(04 Hrs)**
Unit-II	**Data Analytics in Agriculture** Basics of data analytics: Data analytics involves the process of collecting, processing, and analyzing data to extract useful information and insights. **(04 Hrs)**
Unit-III	**Precision Agriculture:** Principles and components of precision agriculture. Technologies used in precision agriculture: GPS for location-based data, GIS for spatial analysis, and remote sensing for monitoring crop health and environmental conditions. Precision agriculture applications: Variable rate technology allows for the precise application of inputs (fertilizers, pesticides) based on localized conditions, and site-specific management tailors farming practices to the specific needs of different areas within a field. **(05 Hrs)**
Unit-IV	**Smart Irrigation Systems:** Introduction to smart irrigation: Benefits and challenges of smart irrigation: Benefits include water savings, improved crop yields, and reduced labor costs. Challenges include high initial costs and the need for proper maintenance and monitoring. **(04 Hrs)**
Unit-V	**Smart Crop Management:** Crop monitoring and management practices: Smart agriculture technologies such as drones, sensors, and data analytics are used to monitor crop health, detect diseases and pests, and optimize crop management practices. Crop health monitoring using smart technologies: Sensors and drones can be used to monitor crop health indicators such as leaf color, temperature, and humidity. Crop modeling and forecasting: Data from sensors and other sources can be used to develop crop models that predict yields, water requirements, and optimal planting times. These models help farmers make informed decisions about crop management. **(05 Hrs)**

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Unit-VI	**Case Studies and Practical Applications:** Real-world examples of smart agriculture practices: Case studies from around the world showcase how smart agriculture technologies are being used to improve farming practices, increase yields, and enhance sustainability. **(04 Hrs)**

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1	Precision Agriculture Basics	Ancha Srinivasan	CRC Press	1st
2	Internet of Things in Agriculture: Smart Agriculture	Ramesh K Sitaraman	Springer	1st
3	Data Analytics in Agriculture	Pierre C. Robert	Wiley	1st
4	Smart Agriculture: IoT, Robotics, and Big Data in Agriculture	Liege University	Elsevier	1st

Course Outcomes:

After completion of the course, students should be able to-

CO1	Explain the concept, scope, benefits, and challenges of smart agriculture
CO2	Apply basic data analytics techniques for agricultural applications
CO3	Demonstrate the principles, components, and applications of precision agriculture technologies (GPS, GIS, remote sensing)
CO4	Analyze the design, benefits, and limitations of smart irrigation systems
CO5	Evaluate smart crop management practices using IoT, drones, and sensor-based technologies for disease/pest detection and yield forecasting
CO6	Interpret real-world case studies to assess the impact of smart agriculture practices on productivity and sustainability

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	-	-	-	2	2	-	-	1	-
CO2	2	3	-	2	3	-	-	-	-	1	-
CO3	3	2	2	2	3	2	3	-	-	1	-
CO4	2	2	2	2	2	2	3	-	-	1	-
CO5	2	3	2	3	3	2	3	-	-	2	-
CO6	2	2	-	2	2	2	3	-	2	3	-

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Civil Engineering

Course Category: OEC Course Code: **OEC291B** Course: **Solid Waste Management** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Basic concepts of economics
Objectives	• Understanding the principles and functional elements of SWM • To know the way of generation of different kind of solid waste. • Effectively handling and shortening of waste for recycle and energy transformation • Adopting suitable and efficient method of processing to get minimum disposable matter • Choosing the appropriate method of disposal and essential requirements to proceed for disposal such a way that final residual matter should not cause any effect over lives and environment • Handling hazardous Waste and getting it stabilized
Unit-I	**Introduction to Solid Waste Management** Need and Objectives, Waste Management Hierarchy, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, types, Composition, Sampling and characteristics Quantities, Physical, chemical and Biological properties **(04 Hrs)**
Unit-II	**Generation of Solid Waste** Factors affecting, Storage and collection: General considerations for waste storage at source, Types of collection Systems, Transfer station: Meaning, Necessity, Transportation of solid waste: Means and Methods, Routing of vehicles **(04 Hrs)**
Unit-III	**Segregation & Material Recovery** Objectives, Stages of segregation, sorting operations, Guidelines for sorting for materials recovery, E waste management, Biomedical waste management **(05 Hrs)**
Unit-IV	**Waste Processing** Processing technologies: Composting, thermal conversion technologies incineration, treatment of biomedical wastes. Energy recovery from solid waste: Parameters affecting energy recovery, Bio-methanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options **(05 Hrs)**
Unit-V	**Disposal** Terminology, Origin of domestic solid wastes, Quantity of refuse & transportation of refuse, economics of refuse collection. Solid waste in industries, agricultural waste –

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	its effect on environment. Solid waste handling methods, treatment & disposal of solid wastes. Sanitary landfills lechates and latest methods. Integrated Solid Waste Management **(04 Hrs)**
Unit-VI	**Hazardous Waste Management:** Types of hazardous waste (such as nuclear, biomedical and industrial waste), problems and issues related to HWM, Need for HWM, Legislations on management and handling of HW, Hazardous Characteristics, reduction of wastes at source, Recycling and reuse, labelling and handling of hazardous wastes, incineration, solidification & stabilization of hazardous waste **(04 Hrs)**

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1	Solid Waste Technology & Management,	Christensen, H. T.	Wiley	2010, Volume 1 & 2
2	The Practical Handbook of Compost Engineering	Haug, T. R.	Lewis Publishers	1993
3	Landfill Bioreactor Design & Operation	Reinhart, R. D. and Townsend, G. T.	CRC Press, 1997	1st
4	Handbook Of Solid Waste Management	Tchobanoglous, G. and Kreith, F.	McGraw Hill, 2002	2nd
5	Integrated Solid Waste Management: Engineering Principles and Management Issues	Tchobanoglous, G., Theisen and Vigil	McGraw Hill	1993

Course Outcomes:

After completion of the course, students should be able to-

CO1	Describe the characteristics of solid waste
CO2	Explain the type of collection system of solid waste
CO3	Categorize the stages of segregation of waste
CO4	Compare the waste processing techniques
CO5	Summarize the disposal terminology of solid waste
CO6	Explain the Hazardous waste management

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	1										
CO2		2	3			2	2				1
CO3				3	3						
CO4		1		2							
CO5			3	2		2					
CO6		2	2						1		

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) **(Semester IV)**
Open Elective-2 offered by the Department of Computer Science Engineering

Course Category: OEC Course Code: **OEC291C** Course: **Data Communication** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisites	Networking basics, Operating system, Internet, Wireless Communication
Objectives	• Understand data communication principles through practical examples and case studies. • Evaluate the efficiency of data communication protocols by analyzing their asymptotic runtime complexity and identifying recurrence relations. • Analyze and compare the effectiveness of different data communication methods, aiding in the selection of the most suitable solutions for particular contexts.
Unit-I	**Introduction** Data Communications, Networks, Network Types, Internet History, Protocols and Standards Protocol Layering, TCP/IP Protocol suite, The OSI model, Addressing. **(04 Hrs)**
Unit-II	**Data and Signals** Data and Signals: Analog and Digital, Periodic Analog Signal, Digital Signals, Transmission Impairment, Data Rate limits, Performance. **(04 Hrs)**
Unit-III	**Digital and Analog Transmission** Digital Transmission: Digital to Digital Conversion, Analog to Digital Conversion, Transmission Modes, Analog Transmission: Digital to Analog Conversion, Analog to Analog Conversion. **(04 Hrs)**
Unit-IV	**Bandwidth Utilization and Switching** Bandwidth Utilization: Multiplexing, Spread Spectrum, Transmission Media: Guided Media, Unguided Media, Switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks, Structure of a switch **(05 Hrs)**
Unit-V	**Error Detection and Correction** Introduction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum Data Link Control: Data Link Control: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocol. **(05 Hrs)**
Unit-VI	**Multiple Access and LANs** Multiple Access: Random Access, Controlled Access, Channelization Wired LANs: Ethernet, Wireless LANs: IEEE 802.11 and Bluetooth **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
Textbooks /Reference Books	1.	Data Communications and Networking	Behrouz A. Forouzan	McGraw-Hill Forouzan Networking Series	4th
	2.	Digital and Analog Communication Systems.	Leon W. Couch	Pearson	8th
	3.	Computer Networks and Internet	Douglas E. Comer	Pearson	5th

Course Outcomes:

After completion of the course, students should be able to-

CO1	Describe OSI & TCP/IP reference models
CO2	Understand the basic concept of Signals and computer networks
CO3	Apply Analog and Digital Transmission
CO4	Illustrate Various switching networks and transmission media
CO5	Analyse the concepts of various protocols of Error Detection and Correction
CO6	Interpret types of multiple Access

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	1	2	1								
CO2	1	2	1								
CO3	2	2									
CO4	2	1	1								
CO5	2	1									
CO6	1	1									

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Electronics and Computer Engineering

Course Category: OEC Course Code: **OEC291D** Course: **E-Waste Management** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisites	Knowledge of Reduce, Reuse and Reuse
Objectives	• To understand scenario of E-waste • Discuss key elements of E-waste management • Understand key terms related with E-waste • To reduce the adverse effects of E-waste on human health, the environment, planetary resources and aesthetics.
Unit-I	**Introduction** E-Waste, Indian and global scenario of e-Waste, Growth of Electrical and Electronics industry in India, E-waste generation in India, Composition of e-waste, E-waste pollutants, Possible hazardous substances present in e-waste, Environmental and Health implications. Concept of E-waste management. **(04 Hrs)**
Unit-II	**E-waste hazardous** Regulatory regime for e-waste in India, The hazardous waste (Management and Handling) rules 2003, E-waste management rules 2015, Regulatory compliance including roles and responsibility of different stakeholders – producer, manufacturer, consumer etc, Extended producer responsibility (EPR).Estimation and recycling of E waste in metro cities of India. **(04 Hrs)**
Unit-III	**End of life management of E-waste** Historic methods of waste disposal – dumping, burning, landfill; Recycling and recovery technologies sorting, crushing, separation; Life cycle assessment of a product – introduction; Case study – optimal planning for computer waste. **(04 Hrs)**
Unit-IV	**Environmentally Sound E-waste Management** Emerging recycling and recovery technologies, Guidelines for environmentally sound management of e-waste, Environmentally sound treatment technology for e-waste, Guidelines for establishment of integrated e-waste recycling and treatment facility, Case studies and unique initiatives from around the world. **(04 Hrs)**
Unit-V	**E-Waste Rules** E-waste (Management and Handling) Rules,2011 and E-Waste (Management) rules 2016 –Salient features and its likely implication, Government assistance for TSDF's. **(04 Hrs)**

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Unit-VI	**The International legislation** The Basel Convention, The Bamako Convention, The Rotterdam Convention, Waste Electrical and Electronic Equipment (WEEE), Directives of the European Union, Restrictions of Hazardous Substances (RoHS) directives **(06 Hrs)**				
Textbooks/ References	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	T1	E-waste: implications, regulations, and management in India and current global best practices	Johri R.	TERI Press, New Delhi.	2008
	T2	Electronics Waste (Toxicology and Public Health issues)	Fowler B.	Elsevier	2017
	R1	Electronics Waste Management	Hester R.E. and Harrison R.M.	Royal Society of Chemistry	2009
E-resources	https://onlinecourses.nptel.ac.in/noc25_ce15				

Course Outcomes:

After completion of the course, students should be able to-

CO1	State key terms of E-waste
CO2	Distinguish the role of various national and internal act and laws applicable for e-waste management and handling.
CO3	Apply various concept learned under e waste management hierarchy
CO4	Analyze the e-waste management measures proposed under national and global legislations.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1						2	2				
CO2						2					
CO3						2	2				
CO4						2	2				

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Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Electrical Engineering

Course Category: OEC Course Code: **OEC291E** Course: **Programmable Logic Controller** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Basic understanding of electrical circuits and industrial automation concepts. Familiarity with programming languages or logic diagrams.
Objectives	1. To know the architecture of PLC 2. Understanding of PLC programming, ladder logic. 3. To understand the operation of PLC in process control
Unit-I	**PLC Fundamentals** Architectural Evolution of PLC, Block diagram of PLC's, Applications and Types, specifications, Manufacturers. **(04 Hrs)**
Unit-II	**Selection of PLC components** Power supply, CPU, I/Os List , Communication bus Various ranges available in PLC's)I/O list selection Open-Circuit and Short-Circuit Tests Types of Inputs & outputs / Source Sink Concepts, Wiring of the I/O devices. **(06 Hrs)**
Unit-III	**Programming instructions arithmetic and logical** Programming instruction: AND, OR, AND-before-OR, OR-before-AND, NO / NC contacts, Edge detection instructions. Set / Reset, Elementary data type **(04 Hrs)**
Unit-IV	**PLC Functions**: Timer function, Counter function, Arithmetic function, Number comparison functions, Numbering systems and number conversion function, **(04 Hrs)**
Unit V	**Analog PLC operations**: Different PLC operations, applications of PLCs: Stepper motor control, speed control of D.C. motor, water level control, Traffic control, Temperature control. **(04 Hrs)**
Unit VI	**HMI:** Architecture, types and specifications, Interfacing and Networking with PLC, **SCADA**: Introduction, features and applications. **(04Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Programmable Logic Controllers	John W. Webb, Ronald A. Reis	Prentice Hall of India Private	5th
2.	Programmable Logic Controllers: Programming Methods and Applications	John R. Hackworth, Fredrick D. Hackworth Jr	Pearson	5th
3.	Programmable Logic Controllers	William Bolton	Elsevier	4th
4.	Handbook of industrial automation	Richard L. Shell and Ernest L. Hall	McGraw Hill	2000

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Course Code: **OEC291E**
Course: **Programmable Logic Controller**

Course Outcomes:

After completion of the course, students should be able to-

CO1	Understand the basics of PLC programming
CO2	Identify the different parameters of PLC
CO3	Simplify different process control applications through ladder logic.
CO4	Analyze different functions of PLC
CO5	Write PLC based program with SCADA for various industrial applications

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	1		1	1						2
CO2	2	3			2				1		
CO3	3	2		2					1		2
CO4	3			2	2				1		
CO5	2	3		2	2				1		1

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Syllabus of Second Year B.Tech. (All Branches) **(Semester IV)**
Open Elective-2 offered by the Department of Emerging Science and Technology

Course Category: OEC Course Code: **OEC291F** Course: **Information and Knowledge Management** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Computer Fundamentals
Objectives	• To understand the importance of information and knowledge management in organizations. • To Gain knowledge of various theories and models related to information and knowledge management. • To Learn techniques for capturing, organizing, and sharing information and knowledge effectively
Unit I	**Introduction to Information and Knowledge Management:** Information and Knowledge Management, Data Sources and Types, Methods of Data Collection, Challenges in Managing Digital Information, Organizational Data Management, Attributes of Data, The Data Lifecycle, Data Sharing and Reuse, Planning for Data Management, Aspects of Data Management **(04 Hrs)**
Unit II	**Information Documentation and Analysis:** Organizing Information Using Organizational Systems and Conventions, Database Utilization for Content Organization and Analysis, Managing Information Throughout the Analysis Process, Comparison Between Raw and Analyzed Data Management, Techniques to Facilitate Analysis. **(04 Hrs)**
Unit III	**Information Storage** Identifying and Managing Secure and Private Information, Policies for Information Security, Short-term Storage Solutions, Practical Aspects of Storage and Backup, Best Practices to Avoid Information Loss, Preserving and Archiving Information, Long-term Storage and Preservation Strategies, including File Formats and Media Selection. **(05 Hrs)**
Unit IV	**Information Architecture and Retrieval** Information Architecture, Types of Information Architecture, Constructing Information Architecture for Analytics, Information Governance and Security Measures, Frameworks for Information Governance, Considerations for Data Privacy and Compliance, Best Practices for Information Security, Methods for Information Access and Retrieval. **(04 Hrs)**
Unit V	**Information Publishing and Reuse** Sharing and Publishing Information, Objectives of Publicly Sharing Information, Intellectual Property Rights and Licensing for Datasets, Ethical Considerations in

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	Information Management, Assessing the Impact of Publicly Shared Information. **(05 Hrs)**
Unit VI	**Knowledge Systems** Developing Reliable, Scalable, and Maintainable Knowledge Systems, Understanding Knowledge Systems Reliability, Factors Affecting Reliability (Hardware Faults, Software Errors, Human Errors), Importance of Reliability and Scalability in Knowledge Management, Load and Performance Description in Knowledge Systems, Coping Strategies for Handling Load, Considerations for Maintainability, Operability, and Complexity, Overview of Data Models and Query Languages (Relational Model vs. Document Model). **(04 Hrs)**

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Information Management: Strategies for Gaining a Competitive Advantage with Data	William McKnight	Elsevier	2014
2.	Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking	Foster Provost and Tom Fawcett	O'Reilly Media Inc.	2nd
3.	The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling	Ralph Kimball and Margy Ross	Wiley	3rd
4.	Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology	Steven H. Spewak and Steven C. Hill	Wiley	2nd
5.	Knowledge Management in Theory and Practice	KimizDalkir	The MIT Press	3rd

Course Outcomes:

After completion of the course, students should be able to-

CO1	Identify various types of data and articulate the challenges associated with managing digital information effectively
CO2	Analyze data storage requirements and propose appropriate storage solutions, considering security, privacy, and long-term preservation
CO3	Evaluate different data architectures and design data retrieval strategies to ensure efficient access and integration
CO4	Synthesize principles of information ethics and develop comprehensive plans for data publication, sharing, and reuse

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	1	2									1
CO2		2									
CO3		3		2							
CO4		3	1	2							1

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Mechanical Engineering

Course Category: **OEC** Course Code: **OEC291G** Course: **Renewable Energy Resources** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Basic understanding of concepts of physics and thermodynamics.
Objectives	• To create awareness amongst students on sources of energy, energy crisis and the alternates available. • To get exposure on recent advances in energy in the contemporary world.
Unit-I	**Introduction** Introduction to types of non-conventional energy sources, Energy Scenario in India and world, Review of energy consumption pattern in various sectors in India, Introduction to energy policies and programmes in India like International Solar Alliance, National Solar Mission etc., Introduction to global climate change concerns like: Clean Development Mechanism [CDM], Carbon Fund Concept of Carbon credit, Various international protocols. **(04 Hrs.)**
Unit-II	**Solar Energy Systems** Solar radiations, Types of solar radiation collectors, Estimation and measurement of solar energy, Characteristics of Photovoltaic cells, Solar cell arrays , Applications of Solar Heating & Cooling System like Solar still, Solar cooker, Solar pond, Solar passive heating and cooling systems: Trombe wall, Solar power plant, Solar furnaces. **(05 Hrs.)**
Unit-III	**Biofuels** Review of Indian edible and non-edible oil sources, Examples of biodiesel crops in India, Storage and Characterization of biodiesel, Environmental and health effects of biodiesel, R&D in biodiesel Energy Generation from Waste Types: Biochemical Conversion: Sources of energy generation, Industrial waste, agro-residues; Aerobic & Anaerobic treatments, Factors affecting bio digestion. **(05 Hrs.)**
Unit-IV	**Wind Energy Systems** Basic principles of wind energy conversion, Site selection criteria, Wind data and energy estimation in India, Wind energy conversion systems, Horizontal and Vertical axis wind machines, Applications of wind energy, Environmental aspects, Wind Energy Program in India. **(04 Hrs.)**
Unit-V	**Geothermal Energy** Structure of earth, Geothermal Regions, Hot springs. Hot Rocks, Hot Aquifers. Analytical methods to estimate thermal potential. Harnessing techniques, Electricity generating systems. Direct Energy Conversion: Nuclear Fusion: Fusion, Fusion reaction, P-P cycle, Carbon

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	cycle, Deuterium cycle, Condition for controlled fusion, Fuel cells and photovoltaic. Thermionic & thermoelectric generation, MHD generator. **(04 Hrs)**
Unit-VI	**Introduction to new energy technology** Hydrogen production - water splitting - electrolytic methods Chemical cycle - photo splitting - photo galvanic - photo chemical. Application of Hydrogen Fuel for Vehicle, Introduction to Magneto Hydro Dynamic system (MHD) and Electro gas dynamics (EGD): principles and types. **(04 Hrs)**

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Solar Energy-Principles of Thermal Collection & Storage	S. P. Sukhatme	TMH Publishing Co., New Delhi.	4th
2.	Non-Conventional Energy Sources	G. D. Rai:	Khanna publisher, New Delhi	6th
3.	Non-Conventional Energy Resources	B.H.Khan	TMH New Delhi	3rd
4.	Technology and Application of Biogas	Srivatsava, Shukla and Ojha	Jain Brothers, New Delhi	1993
5.	Renewable Energy Resources-Basic Principles and Applications	G.N.Tiwari and M.K.Ghosal	Narosa Publications	2004
6.	Biogas systems: Principles and Applications	Mital K.M	New Age International Publishers	1996
7.	Engine for biogas	Klaus Von Mitzlaff	FriedrVielveg and Sohn Braunschweig	1988
8.	Wind Power Plants: Theory & Design	Desire Le Gouriers:	Pergamon Press	1982

Additional References

1. https://isolaralliance.org/publications/annual-reports
2. https://mnre.gov.in/img/documents/uploads/file_f-1618564141288.pdf
3. https://mnre.gov.in/knowledge-center/publication

Course Outcomes: After completion of the course, students should be able to-

CO1	Recall the basic principle of energy conversion for different alternative energy sources
CO2	Summarize the main components of energy systems
CO3	Apply the basic concept and knowledge for the performance analysis of different alternative energy systems.
CO4	Comparison of various alternative energy sources and systems based on various parameters.
CO5	Evaluate alternative energy systems based on design aspect/criteria.
CO6	Compile the data of alternative energy sources to meet future energy demand

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	2									
CO2	2		2								
CO3	2		2								
CO4	2		2								
CO5	2	2									
CO6	2										

Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Plastic and Polymer Engineering

Course Category: OEC Course Code: **OEC291H** Course: **Plastic Recycling** Teaching Scheme: Theory: 02 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Basic knowledge of polymeric materials, additives and their properties.
Objectives	• To learn the basic concepts used in the recycling of polymers.
Unit-I	**Significance of Recycling** Introduction and classification of waste. Global polymer production and consumption. Global polymer waste composition, quantities and disposal, Identification of polymer for recycling. **(04 Hrs)**
Unit-II	**Recycling Process** Collection, sorting and segregation of waste, Use of advanced technologies such as artificial intelligence in sorting, recycling methods: primary, secondary, tertiary and quaternary recycling, land filling. **(05 Hrs)**
Unit-III	**Recycling Equipment/Machinery** Equipment for primary and secondary recycling: shredder, granulator, pulverizer, shredder, cutter. Classification and types of reactors for tertiary recycling, use of x-ray photoelectron spectroscopy (XPS) in recycling, international standards in recycling. **(04 Hrs)**
Unit-IV	**Recycling Techniques of Various Plastic and Rubber Products** PE/PP packaging films and woven sacks, PET bottles and films, PVC products, fiber reinforced plastics (FRP), and rubber products, PP batteries. **(04 Hrs)**
Unit-V	**Recycling of Plastics from Urban Waste** Physiochemical, mechanical and rheological characteristics of recycled plastics, hydrolytic treatment of plastics waste containing paper, mixed plastic waste and its processing, recycling extrusion and additives used in polymer recycling. **(05 Hrs)**
Unit-VI	**Recycled Plastics End Use Applications** Use of recycling plastics in food packaging, Use of recycled plastics in construction and architecture. Single use plastics recycling, healthcare plastic waste recycling **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
Text books/ Reference books	1.	Plastics Fabrication and Recycling	Manas Chanda and Salil K. Roy	CRC Press	4th 2007
	2.	Recycling of Polymers	Raju Francis	Wiley-VCH	1st 2016
	3.	Mixed Plastic Recycling Technology	B. Hegberg, G. Brenniman	Noyes Data Corporation	1st 1992
	4.	Feedstock Recycling and pyrolysis of waste plastics	John Schiers & W. Kaminsky	John Wiley and Sons	1st 2006

Course Outcomes:

After completion of the course, students should be able to-

CO1	Illustrate the sources of plastic waste.
CO2	Select proper waste disposal & separation method.
CO3	Analyze various methods Of plastics recycling.
CO4	Elaborate the recycled plastics applications

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2				2	2				
CO2		2	3		3						
CO3		3									
CO4			3								2

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: HSSM Course Code: **HSM201** Course: **Engineering Economics and Management** Teaching Scheme: Theory – 2 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks
Refer Semester III Syllabus (earlier pages)	

Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: HSSM Course Code: **HSM202** Course: **Innovation and Entrepreneurship** Teaching Scheme: Theory – 2 Hrs./week Self-Learning Hours – 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks
Refer Semester III Syllabus (earlier pages)	

Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: VEC Course Code: **VEC201** Course: **Universal Human Values** Teaching Scheme: Theory – 1 Hr./week , Practical – 2 Hrs/week Self-Learning Hours – 1 Hr./week	**Credits: 1-0-1** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks
Refer Semester III Syllabus (earlier pages)	

Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: VEC Course Code: **VEC202** Course: **Environmental Studies** Teaching Scheme: Theory – 1 Hr./week , Practical – 2 Hrs/week Self-Learning Hours – 1 Hr./week	**Credits: 1-0-1** In Semester Examination-II: 15 Marks Continuous Internal Assessment: 15 Marks Teacher Assessment: 20 Marks
Refer Semester III Syllabus (earlier pages)	

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) **(Semester IV)**

Course Category: VSEC Course Code: **VSE271** Course: Professional English Teaching Scheme: Practical: 02 Hrs./Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Knowledge of the English Language, Knowledge of LSRW techniques
Objectives	1. To understand the concept of effective communication. 2. To make use of the principles of business etiquette in professional behavior 3. To utilize different strategies of reading and listening for effective communication 4. To understand various forms of communication and demonstrate knowledge of surroundings during different communication situations. 5. To construct an appropriate format of business documents and build a positive image as an effective communicator. 6. To apply professional etiquette in professional life and inculcate the habit of standard behavior
List of Exercises	1. Self-Introduction in formal situations. 2. Team Formation: Different stages of Team building 3. Book Review (English book) with PPT presentations 4. Enhancing Listening Skills: TED talks or audio lectures on theory syllabus topics 5. Mock Group discussions. 6. Formal PPT presentations 7. Mock Interviews (techniques and etiquette) 8. Cover letter and resume writing (format, styles, and strategies) 9. Telephonic conversation (Interview & Formal situations) 10. Professional email communication.

References

Sr. No.	Title	Author	Publication	Edition
1.	Effective Technical Communication	M. Ashraf Rizvi	McGraw Hill Education	1st
2.	Communication Skills	Sanjay Kumar, Pushp Lata	Oxford University Press	1st
3.	How to Succeed in Group Discussions & Personal Interviews	Dr. S. K. Mandal	Jaico Publishing House	1st
4.	Excellence in Business Communication,	John Thill, Courtland Bovee	Pearsons	12th

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	5.	The ACE of Soft Skills: Attitude, Communication and Etiquette for Success	Gopalswamy Ramesh	Pearson Education	1st
	6.	Master of Business Etiquette	Cyrus M. Gonda	Embassy Books	2017

Course Outcomes:

After completion of the course, students should be able to-

CO1	Demonstrate effective verbal and non-verbal communication skills in formal and professional contexts
CO2	Apply appropriate business and professional etiquette in oral and written communication
CO3	Develop critical listening and reading skills to comprehend, and respond effectively to academic and professional content
CO4	Prepare professional documents using standard formats and develop a positive professional image

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	-	-	-	-	-	-	1	2	3	-	-
CO2	-	-	-	-	-	-	3	2	3	-	-
CO3	-	-	-	-	-	-	1	1	2	-	-
CO4	-	-	-	-	-	-	1	2	3	-	-
Average	-	-	-	-	-	-	**1.5**	**1.75**	**2.75**		-
Mapping Strength	-	-	-	-	-	-	**2**	**2**	**3**		-

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester IV)	
Course Category: PCC Course Code: CSE273 **Course: Object Oriented Programming in Java Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	Credits: 0-0-1 Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks
Objectives	To implement object-oriented concepts using Java language
List of Practical	**1. Write a program to demonstrate Java basics:** use of data types, operators, control structures (if-else, switch, loops). **2. Implement string and array operations:** reverse a string, find frequency of characters, sort an array, search elements 3. **Create a class with fields and methods:** implement constructor overloading, static members, and access modifiers 4. Develop a Java application demonstrating inheritance and method overriding. 5. Create an abstract class Shape with abstract method area() and derive classes Circle, Rectangle. 6. Implement an interface Vehicle and create classes Car and Bike that implement it. 7. Write a program to create a package and import classes from it. Implement user-defined exception handling. 8. Create a multithreaded program to print numbers in ascending and descending order using two threads. 9. **Write a program to perform file operations**: create, read, write, append text files using FileReader, FileWriter, and BufferedReader classes. 10. **Develop a Swing-based GUI calculator** that supports basic arithmetic operations with event handling using ActionListene

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Faculty of Science & Technology
Syllabus of Third Year B.Tech. (Computer Science and Engineering) (Semester V)

Course Category: **PCC** Course Code: CSE273 **Course: Object Oriented programming in Java Laboratory** Teaching Scheme: Practical- 2 Hrs./week	Credits: 0-0-1 Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks

Course Outcomes	**CO1:** Apply object-oriented programming principles to develop Java programs using classes, inheritance, polymorphism, interfaces, and packages. **CO2:** Develop robust and interactive Java applications by implementing multithreading, exception handling, file I/O operations, and user-friendly graphical interfaces using Swing and event-driven programming.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	2	-	2	-	2	2	2	-	1
CO2	1	2	2	1	2	-	2	2	2	-	1
CO3	-	-	-	-	-	-	2	2	2	-	1
Average	1	2	2.0	1.0	1	-	2	2	2	-	1
Mapping Strength	1	2	2.0	1.0	1	-	2	2	2	-	1

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	2	–	–
CO2	2	–	–
CO3	2	–	–
Average	2	–	–

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Computer Science and Engineering) (Semester IV)	
Course Category: PCC Course Code: CSE274 **Course: Operating System Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	Credits: 0-0-1 Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks
Objectives	• Student should be able to install windows or Linux OS. • Students should be able to simulate or implement resource management algorithms.
List of Practical	1. Installation of windows/Linux OS. 2. Hands on Unix/Linux basic commands. 3. Implementation of FCFS CPU scheduling algorithms. 4. Implementation of SJF CPU scheduling algorithms. 5. Implement producer consumer problem with bounded buffer solution with Semaphore. 6. Write a program illustrating various file handling functions. 7. Write a program for copying content of one file to other. 8. Implementation of various memory allocation algorithms, (First fit, best fit and Worst fit). 9. Implementation of FIFO page replacement algorithms. 10. Implementation of FCFS Disk Scheduling algorithm.

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Syllabus of Third Year B.Tech. (Computer Science and Engineering) (Semester V)

Course Category: **PCC** Course Code: CSE274 **Course: Operating Systems Laboratory** Teaching Scheme: Practical:2 Hrs./week	Credits: 0-0-1 Teacher Assessment: 25 Marks End Semester oral Examination: 25 Marks

Course Outcomes

CO1: Execute basic Unix/Linux commands to manage files, directories, and system processes, and demonstrate the installation of Windows/Linux operating systems.

CO2: Implement various operating system algorithms related to process scheduling, memory management, file handling, and inter-process communication using appropriate programming tools.

CO3: Demonstrate professional ethics, teamwork, punctuality, and documentation skills in lab activities.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	2	2	2	-	1
CO2	3	3	3	2	-	-	2	2	2	-	1
CO3	-	-	-	-	-	-	2	2	2	-	1
Average	3	2.5	3	2			2	2	2	-	1
Mapping	2	2	3	2		-	2	2	2	-	1

CO PSO Mapping

COs	PSO I	PSO II	PSO III
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
Average	-	-	2

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: AEC Course Code: **AEC275** Course: **Career Readiness Skills** Teaching Scheme: Practical: 02 Hrs./week	**Credits: 0-0-1** Teacher Assessment: 25 Marks
Prerequisite	-
Objectives	1. Equip engineering graduates with the essential technical and soft skills necessary to succeed in the professional world. 2. Empower students to effectively market themselves through resume building, cover letter writing, and professional networking. 3. Prepare students for the job search process by providing strategies for job market research, effective job search techniques, and interview preparation. 4. Foster a mindset of continuous learning and career development to ensure long-term success and adaptability in the evolving engineering landscape.
Unit-I	**Understanding Career Readiness** • Overview of campus placements and industry expectations as what industries look for in candidates. **Employability Skills** • Hard skills (technical skills specific to the profession) and soft skills (interpersonal skills, communication, problem-solving), Importance of a balance between both types of skills for career success • Communication skills: Verbal and written communication, active listening. • Teamwork and collaboration: Group activities, role-plays. • Problem-solving and critical thinking: Case studies, puzzles, brain teasers **(04 Hrs.)**
Unit-II	**Career Exploration** Exploring Job Profiles and Opportunities • Researching job profiles within the student's engineering domain: Roles, responsibilities, required skills. • Understanding industry trends and demand: Emerging technologies, market needs. • Utilizing online resources: Job portals, industry reports, professional networks. **(04 Hrs.)**
Unit-III	**Career Planning** Setting Short-term and Long-term Goals • Identifying personal strengths, interests, and values. • Setting SMART goals (Specific, Measurable, Achievable, Relevant, Time-bound). • Developing a career roadmap: Short-term goals (internships, skill development) and long-term goals (career progression, specialization). **(04 Hrs.)**
Unit-IV	**Professional Branding- Profile Building Skills** • Crafting a professional online presence: Professional networking platforms (e.g. LinkedIn), personal websites. • Elevator pitch: Crafting a compelling self-introduction. • Building a strong resume: Resume writing workshop, examples and templates. **(04 Hrs.)**

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Unit-V	**Internship and Project Opportunities** • Finding Internship and project Opportunities • Researching and identifying potential internships and Projects. • Crafting effective internship applications: Cover letters, emails. • Interview preparation: Mock interviews, common interview questions. **(04 Hrs.)**
Unit-VI	**Co-curricular Activities** • Hackathons and Project Competitions • Understanding the significance of participation. • Selecting appropriate events: Themes, formats. • Team formation and project management: Agile methodologies, timelines. **(04 Hrs.)**

	Sr. No.	Title	Author	Publication	Edition
Text books/ Reference books	1.	What Color Is Your Parachute? 202X: A Practical Manual for Job-Hunters and Career-Changers	Richard N. Bolles	Ten Speed Press	--
	2.	The Start-Up of You: Adapt to the Future, Invest in Yourself, and Transform Your Career	Reid Hoffman and Ben Casnocha	Crown Business	--
	3.	Designing Your Life: How to Build a Well-Lived, Joyful Life	Bill Burnett and Dave Evans	Knopf	--
	4.	How to Win Friends and Influence People	Dale Carnegie	Simon & Schuster	--
	5	The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change	Stephen R. Covey	Simon & Schuster	--
Additional References	LinkedIn Learning, Coursera, edX, Khan Academy, Codecademy				

Activities:

1. Skills Assessment Workshop: Students assess their hard and soft skills, discuss within groups, and create a skills matrix.
2. Problem-Solving Challenge: Teams brainstorm solutions to a complex engineering problem, present their solutions, and discuss their decision-making process.
3. Industry Trends Research: Students research industry trends and create visual presentations summarizing their findings.
4. Job Profile Analysis: In pairs, students analyse job profiles, compare and contrast them, and present their analysis to the class.
5. Goal Setting Workshop: Students set SMART goals, create action plans, and receive feedback from peers.
6. Resume Building Workshop: Students learn about resume writing best practices, review sample resumes, and draft their own resumes with guidance and feedback.

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7. LinkedIn Profile Development: Students update their LinkedIn profiles, receive peer feedback, and ensure completeness and professionalism.
8. Elevator Pitch Competition: Students craft and deliver elevator pitches, compete for the most compelling presentations, and receive feedback.
9. Internship Application Workshop: Students draft effective internship applications, review each other's materials, and receive guidance on researching opportunities.
10. Mock Interview Marathon: Students participate in mock interviews, rotate through different scenarios, and receive feedback on their interview skills.
11. Hackathon Preparation Workshop: Students learn about hackathons, form teams, brainstorm project ideas, and begin planning for participation.
12. Project Competition Bootcamp: Students prepare for project competitions, form teams, brainstorm ideas, and develop prototypes or proposals for submission.

Evaluation guidelines

1. Resume Building Exercise
2. Mock Interview Performance
3. Elevator Pitch Presentation
4. Hackathon or Project Competition Participation
5. LinkedIn Profile Assessment

Course Outcomes:

After completion of the course, students should be able to-

CO1	Demonstrate effective verbal, non-verbal, and written communication skills suitable for academic and professional settings
CO2	Apply problem-solving, critical thinking, and logical reasoning techniques to address engineering and real-life challenges
CO3	Identify and align personal strengths, interests, and career goals with emerging industry opportunities
CO4	Build a professional profile through resume writing, cover letter preparation, LinkedIn presence, and effective participation in interviews and group activities

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	–	–	–	–	–	–	–	2	3	3	2
CO2	-	-	-	2	2	1	–	1	2	2	2
CO3	–	-	1	1	1	3	1	2	2	2	2
CO4	–	-	-	1	2	2	1	2	3	3	3

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(Faculty of Science & Technology) Department of Emerging Science and Technology Syllabus of S. Y. B. Tech. Computer Science and Engineering (Bridge Course)	
Course: Computer Fundamentals	
Objectives	• Develop programming logic and hands-on skills using C and Python. • Build interactive web interfaces using HTML, CSS, and JavaScript. • Introduce programming language concepts and paradigms.
Course Outcomes	CO1: Explain the fundamental concepts of programming logic, problem-solving techniques, and the working principles of compiled and interpreted languages. CO2: Develop basic programs in C and Python using appropriate syntax, control structures, functions, arrays, and data structures. CO3: Design static and interactive webpages using HTML, CSS, and JavaScript. CO4: Compare and contrast programming paradigms and language constructs across C and Python.
Unit-I	**Programming Logic and Fundamentals** Introduction to Programming Languages, Compilation v/s Interpretation Algorithms, Flowcharts, Pseudocode, Problem Solving Techniques, Flowcharts for login systems, billing programs, Pseudocode for decision-making problems. **(04 Hrs)**
Unit-II	**C Programming Basics** Syntax, Data Types, Variables, Operators, Control Structures: if, switch, loops, Functions, Arrays, Basic C programs, Menu-driven programs using switch-case. **(05 Hrs)**
Unit-III	**Python Programming Basics** Python basics - syntax, variables, data types, Python code using loops, conditionals, and functions, file handling (open, read, write) using Python, Working with data structures like lists, tuples, sets, and dictionaries. **(05 Hrs)**

Unit-IV	**Web Development – HTML, CSS** HTML Documents, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags, Elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls. CSS: Selectors, Box Model, Colors, Layout. **(05 Hrs)**
Unit-V	**Web Development – JavaScript** JavaScript: Syntax, Variables, Functions, Events, DOM Manipulation and Validation, Building a personal webpage with styling, Form validation, JS event to change content on button click. **(04 Hrs)**
Unit -VI	**Principles of Programming Languages** Procedural v/s Object-Oriented Programming, Language Levels: High-level v/s Low-level, Compilation, Interpretation, Tokens, Overview of Programming Paradigms, Comparison of Python and C syntax for same problem. **(03 Hrs)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Let Us C	Yashavant Kanetkar	BPB	Seventeenth
2.	Python for Everybody: Exploring Data in Python 3	Dr. Charles R. Severance	CreateSpace Independent	First
3.	HTML and CSS: Design and Build Websites	Jon Duckett	Wiley	First
4.	Programming Language Concepts	Peter Sestoft	Springer	First

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