SNJB's

Late Sau. Kantabai Bhavarlalji Jain

College of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

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ESTD - 1928

SNJB

Curriculum and Evaluation Scheme for Second Year B. Tech. in Computer Engineering with Multidisciplinary Minor

To be implemented for 2024-28 Batch

(With Effect from Academic Year 2025-26)

CHAIRMAN
BOARD OF STUDIES COMPUTER ENGINEERING
SNJB's
LSKBJ COLLEGE OF ENGINEERING
Chandwad Dist.Nashik

Chandwad (Nashik) Pin-423101

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LSKBJ COLLEGE OF ENGINEERING
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Vision of the Institute

Transform young aspirant learners towards creativity and professionalism for societal growth through quality technical education.

Mission of the Institute

1. To transfer the suitable technology, particularly for rural development.
2. To enhance diverse career opportunities among students for building a nation.
3. To acquire the environment of learning to bridge the gap between industry and academics.
4. To share values, ideas, and beliefs by encouraging faculty and students for the welfare of society.

Vision of the Computer Engineering Department

To empower young generations for significant contributions in the field of computer engineering through excellence in knowledge, technical education, and innovation to cater the industrial demands and societal needs.

Mission of the Computer Engineering Department

1. To achieve academic excellence by inculcating basic and latest knowledge in which new ideas flourish.
2. To undertake collaborative training which offers opportunities for long-term interaction with academia and industry.

Program Outcomes (POs) for an engineering graduate:

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

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

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

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

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

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

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

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

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

language, and learning differences

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

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

Program Specific Outcomes

1. **Professional Skills-**The ability to understand, analyze, and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.
2. **Problem-Solving Skills-** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
3. **Successful Career and Entrepreneurship** - The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur and a zest for higher studies.

Table 1: Abbreviations

Abbreviation	Meaning
CIE	Continuous Internal Evaluation
MSE	Mid Semester Examination
SEE	Semester End Examination
BSC	Basic Science Courses
ESC	Engineering Science Courses
VSEC/VSC	Vocational and Skill Enhancement Courses
VEC	Value Education Courses
AEC	Ability Enhancement Courses
PCC	Program Core Courses
PEC	Program Elective Courses
MDM	Multidisciplinary Minor
OE/OEC	Open Elective - other than a particular program
EEM	Entrepreneurship/Economics/ Management Courses (HSSM)
ELC	Research Methodology
	Community Engagement Project (CEP)/ Field Project (FP)
	Project
	Internship/ On Job Training (OJT)
IKS	Indian Knowledge System
CC/CCC	Co-Curricular Courses
HOC	Honor Courses
EXT	Exit Courses
DMC	Double Minor Courses
HRC	Honor with Research Courses
SIP	Student Induction Program
L	Lecture
T	Tutorial
P/PR	Practical
TH	Theory
Lab	Laboratory
TW	Term Work
OR	Oral
CE	Civil Engineering
CS	Computer Engineering
ME	Mechanical Engineering
AD	Artificial Intelligence and Data Science Engineering
ET	Electronics and Telecommunication Engineering

GENERAL COURSE STRUCTURE

A. Definition of Credit:

Table 2: Credit Definition

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: (B.Tech. or Equivalent) in Tech. with Multidisciplinary Minor:

In the light of the fact that a typical NEP Compliant Model Four-year Undergraduate degree program in Technology has about 176 credits, the total number of credits proposed for the four-year B.Tech. in **Computer Engineering** with Multidisciplinary minor degree is kept as **172.**

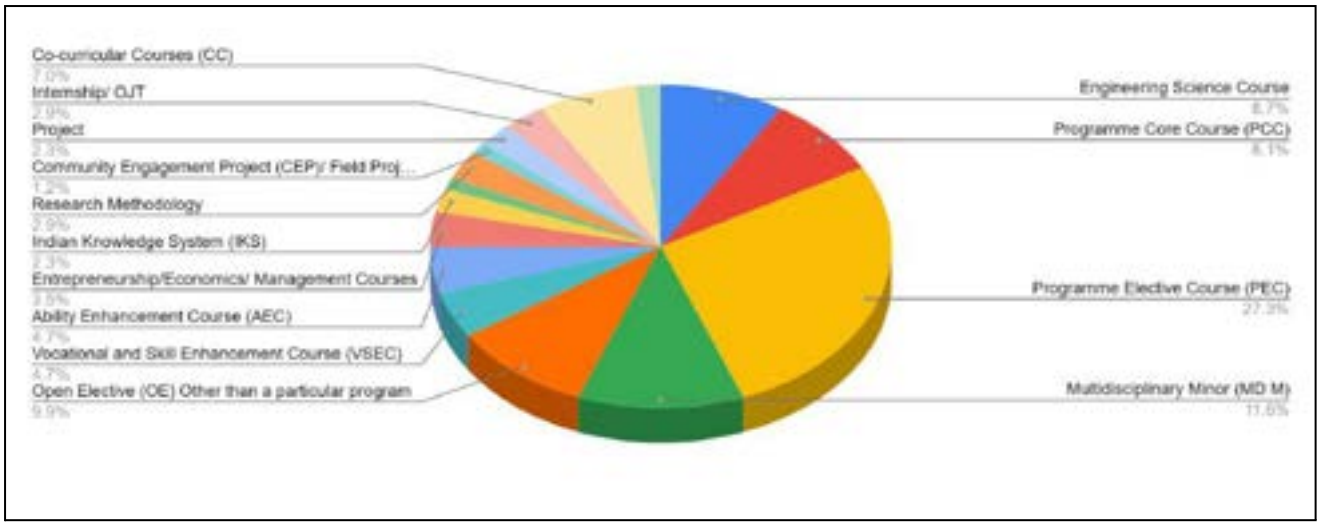
Table 3: Range of Credits

Course Category		Credits As PER NEP Guidelines	Proposed Credits
Basic Science Course	BSC/ESC	14-18	15
Engineering Science Course		16-12	14
Programme Core Course (PCC)	Program Courses	44-56	47
Programme Elective Course (PEC)		20	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses	14	17
Open Elective (OE) Other than a particular program		8	8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	8	8
Ability Enhancement Course (AEC)	Humanities Social Science and Management (HSSM)	4	6
Entrepreneurship/Economics/ Management Courses		2	4
Indian Knowledge System (IKS)		2	2
Value Education Course (VEC)		4	5
Research Methodology(RM)	Experiential Learning Courses	4	4
Community Engagement Project (CEP)/ Field Project (FP)		2	2
Project		4	5
Internship/ OJT		12	12
Co-curricular Courses (CC)	Liberal Learning Courses	4	3
Total Credits		**160-176**	**172**

C. Semester wise Credit Distribution Structure for Four Year B. Tech in Computer Engineering with Multidisciplinary Minor:

Table 4: Semester-wise Credit Distribution Structure

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	8	7	-	-	-	-	-	-	15
Engineering Science Course		7	7	-	-	-	-	-	-	14
Programme Core Course (PCC)	Program Courses	-	3	11	8	9	4	9	3	47
Programme Elective Course (PEC)		-	-	-	-	6	5	6	3	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses	-	-	3	3	3	2	3	3	17
Open Elective (OE) Other than a particular program		-	-	-	3	2	3	-	-	8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	2	2	-	2	-	2	-	-	8
Ability Enhancement Course (AEC)	Humanities Social Science and Management (HSSM)	1	-	1	2	2	-	-	-	6
Entrepreneurship/Economics/ Management Courses		-	-	2	2	-	-	-	-	4
Indian Knowledge System (IKS)		2	-	-	-	-	-	-	-	2
Value Education Course (VEC)		-	-	3	2	-	-	-	-	5
Research Methodology	Experiential Learning Courses	-	-	-	-	-	4	-	-	4
Community Engagement Project (CEP)/ Field Project (FP)		-	-	2	-	-	-	-	-	2
Project		-	-	-	-	-	2	3	-	5
Internship / OJT		-	-	-	-	-	-	-	12	12
Co-curricular Courses (CC)	Liberal Learning Courses	1	2	-	-	-	-	-	-	3
Total Credits (Major)		**21**	**21**	**22**	**22**	**22**	**22**	**21**	**21**	**172**



Students can opt for any of the following as per the rules and regulations given by the institute:

1. B. Tech with Multidisciplinary Minor = Total 172 Credits
2. B. Tech with Multidisciplinary Minor and Honor = Total 190 Credits
3. B. Tech with Multidisciplinary Minor and Honor by Research = Total 190 Credits
4. B. Tech with Multidisciplinary Minors (Double Minor) = Total 190 Credits

Students will have the flexibility to enter a program in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs. **Students exiting will be awarded provided they secure additional EIGHT credits in skill-based vocational courses.**

The credit structure for different levels under the Four-year Bachelor's Multidisciplinary B. Tech Programme with multiple entries and multiple exit options are as given below**:**

Table 5: Credit Requirements

Level	Qualification Title	Credit Requirements	Semester	Year
4.5	One Year UG Certificate in Tech.	42	2	1
5.0	Two Years UG Diploma in Tech.	86	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B. Sc. (Tech.)	130	6	3
6.0	4-Years Bachelor's degree (B.Tech. or Equivalent) in Tech. with Multidisciplinary Minor	172	8	4

D. Category-wise Courses

1. MULTIDISCIPLINARY MINOR (MD M)

- List of Multidisciplinary Minor Courses from other departments: Total 17 Credits
- The Minor courses may be from the different disciplines of the Engineering faculty, or they can be from different faculty altogether.
- Students have to choose the MD M in the Second Year and once opted then students can not change it throughout the semesters.

Table 6: Multidisciplinary Minors

Multidisciplinary Minor Baskets (UG)					
MDM Offered by Department	**To be Opted By Department**	**Sr No**	**Course Code**	**Course Name**	**Semester**
Civil Engineering	**Students other than Civil department**	1	24-MDM-CE-2-01	Fundamentals of Green Technology	III
			24-MDM-CE-2-02	Fundamentals of Green Technology Lab	
		2	24-MDM-CE-2-03	Green Building Rating System	IV
		3	24-MDM-CE-3-01	Water and Land Management	V
			24-MDM-CE-3-02	Water and Land Management Lab	
		4	24-MDM-CE-3-03	Socio-economic Management	VI
		5	24-MDM-CE-4-01	Urban Policy Framework	VII
			24-MDM-CE-4-02	Urban Policy Framework Lab	
		6	24-MDM-CE-4-03	Life Cycle Assessment	VIII
Computer Engineering & Artificial Intelligence and Data Science	**Students other than the Computer and AIDS department**	1	24-MDM-CS-2-01	Data Structure	III
			24-MDM-CS-2-02	Data Structure Lab	
		2	24-MDM-CS-2-03	Database Management System	IV
		3	24-MDM-CS-3-01	Object Oriented Programming in Java	V
			24-MDM-CS-3-02	Java Programming Lab	
		4	24-MDM-CS-3-03	Cloud Computing	VI
		5	24-MDM-CS-4-01	Data Science and Machine Learning	VII
			24-MDM-CS-4-02	Data Science and Machine Learning Lab	
		6	24-MDM-CS-4-03	Blockchain Technologies	VIII
Electronics & Telecommunication	**Students other than E&TC department**	1	24-MDM-ET-2-01A	Internet of Things	III
			24-MDM-ET-2-02A	Internet of Things Laboratory	
		2	24-MDM-ET-2-03A	Digital Electronics and Microprocessor	IV

Engineering		3	24-MDM-ET-3-01A	Drone Technology	V
			24-MDM-ET-3-02A	Drone Technology Laboratory	
		4	24-MDM-ET-3-03A	Robotics	VI
		5	24-MDM-ET-4-01A	Mobile Computing	VII
			24-MDM-ET-4-02A	Mobile Computing Laboratory	
		6	24-MDM-ET-4-03A	Wireless Sensor Networks	VIII
Electronics & Telecommunication Engineering	**Students other than E&TC department**	1	24-MDM-ET-2-01B	Lean Systems Fundamentals	III
		2	24-MDM-ET-2-02B	Industry 4.0 Concepts and Technologies	IV
		3	24-MDM-ET-3-01B	Advanced Lean Practices	V
			24-MDM-ET-3-02B	Lean Simulation and Automation Lab	
		4	24-MDM-ET-3-03B	Smart Manufacturing Systems and Digital Transformation	VI
		5	24-MDM-ET-4-01B	Robotics and Automation for Smart Manufacturing	VII
			24-MDM-ET-4-02B	Robotics and AI Implementation Lab	
		6	24-MDM-ET-4-03B	Lean Industry 4.0	VIII
Mechanical Engineering	**Students other than Mechanical department**	1	24-MDM-ME-2-01	Engineering Materials and Safety	III
			24-MDM-ME-2-02	Engineering Materials and Safety Lab	
		2	24-MDM-ME-2-03	Sustainable Energy Technology	IV
		3	24-MDM-ME-3-01	Remote Sensing and GIS	V
			24-MDM-ME-3-02	Remote Sensing and GIS Lab	
		4	24-MDM-ME-3-03	Project Planning & Management	VI
		5	24-MDM-ME-4-01	Estimation and Costing	VII
			24-MDM-ME-4-02	Estimation and Costing Lab	
		6	24-MDM-ME-4-03	System Approach in Engineering	VIII

#Note: You can refer syllabus of all SEM III and SEM IV MDM Courses from
https://snjb.org/engineering/uploads/media/2025/03/SY2025-26-MDM-2024-28.pdf

2. OPEN ELECTIVES

- A Student can opt for any one course out of available institute-wide courses defined in the following list as Open Elective – provided he/she has not taken that particular course in his/her Programme core, Programme elective, Multidisciplinary Minor, other Open elective, and Vocational and Skill Enhancement courses, etc. throughout his/her four years of B. Tech Programme.
- The student must opt for a course that is compulsory from another discipline/branch, not from the same Major discipline/branch, and also the course must be not related to his/her major degree/branch courses.
- For Open Electives 8 credits are offered from semester IV to semester VI.
- Two courses of 3 credits and one course of 2 credits.

Table 7: Open Electives

Sr. No	Course Code	Course Name
Open Elective I (SEM-IV)		
1	24-OEC-2-4-01	Precision Agriculture
2	24-OEC-2-4-02	Soil and Water Conservation for Agriculture
3	24-OEC-2-4-03	Business Development, Marketing and Finance
4	24-OEC-2-4-04	Financial Accounting and Management
5	24-OEC-2-4-05	Information Technology Laws and Policies
Open Elective II (SEM-V)		
1	24-OEC-3-5-01	Agronics
2	24-OEC-3-5-02	Digital Marketing
3	24-OEC-3-5-03	Estimation and Costing
4	24-OEC-3-5-04	Sustainable Energy Engineering
5	24-OEC-3-5-05	Occupational Health and Safety
Open Elective III (SEM-VI)		
1	24-OEC-3-6-01	E-Governance in Agriculture
2	24-OEC-3-6-02	Agro Entrepreneurship
3	24-OEC-3-6-03	Startup and New Venture Management
4	24-OEC-3-6-04	Rural Finance Management and Budgeting
5	24-OEC-3-6-05	Green Energy

#Note: You can refer syllabus of sem IV Open Elective Courses from
https://snjb.org/engineering/uploads/media/2025/03/SY2025-26-Open-Electives-2024-28.pdf

3. DOUBLE MINORS

- In addition to 172 credits of B. Tech Programmes (Bachelor of Technology) i.e. Major in which the student has taken admission, a student may opt for Specialization Minor in another discipline/branch/emerging areas, not in Major discipline/branch.
- A student is required to earn an additional 18 credits in another discipline/ branch/ emerging areas for Specialization Minor distributed over semesters III to VIII.
- The total number of credits required to complete the Specialization Minor in another discipline/ emerging area is 18 credits, in addition to 172 credits in the Major.
- Minor Courses can be completed through an online platform.

Table 8: Double Minors

Double Minor Basket (UG) (2024-28)						
Double Minor Offered by	**To be Opted By Department**	**Double Minor Basket Name**	**Sr No**	**Course Code**	**Course Name**	**Semester**
Artificial Intelligence & Data Science Engineering	**Students other than the Computer and AIDS department**	**High Performance Computing**	1	24-DMC-AD-2-01	Computer Networks	**III**
			2	24-DMC-AD-2-02	Cloud Computing	**IV**
			3	24-DMC-AD-3-03	Distributed Computing	**V**
			4	24-DMC-AD-3-04	Blockchain Technology	**VI**
			5	24-DMC-AD-4-05	High Performance Computing	**VII**
			6	24-DMC-AD-4-06	Mastering in Cloud Architecture	**VIII**
Civil Engineering	**Students other than Civil department**	**Infrastructure Engineering**	1	24-DMC-CE-2-01	Infrastructure Planning and Management	**III**
			2	24-DMC-CE-2-02	Infrastructure Economics	**IV**
			3	24-DMC-CE-3-03	Project Formulation and Appraisal	**V**
			4	24-DMC-CE-3-04	Advanced and Sustainable Materials in Infrastructure	**VI**
			5	24-DMC-CE-4-05	Management Information Systems	**VII**
			6	24-DMC-CE-4-06	Computational Methods in Infrastructure Engineering	**VIII**
Computer Engineering	**Students other than Computer and AIDS department**	**Data Science**	1	24-DMC-CS-2-01	Foundation of Data Science	**III**
			2	24-DMC-CS-2-02	Principles of Artificial Intelligence and Machine Learning	**IV**
			3	24-DMC-CS-3-03	Data analytics with Python	**V**
			4	24-DMC-CS-3-04	Business Intelligence & Analytics	**VI**

			5	24-DMC-CS-4-05	Natural Language Processing	**VII**
			6	24-DMC-CS-4-06	Large Language Models	**VIII**
Electronics & Telecommunication Engineering	**Students other than E&TC department**	**Embedded System**	1	24-DMC-ET-2-01	Digital Electronics	**III**
			2	24-DMC-ET-2-02	Microprocessor & Microcontroller	**IV**
			3	24-DMC-ET-3-03	Analog Circuits	**V**
			4	24-DMC-ET-3-04	Mechatronics	**VI**
			5	24-DMC-ET-4-05	Embedded System	**VII**
			6	24-DMC-ET-4-06	Internet of Things	**VIII**
Mechanical Engineering	**Students other than Mechanical department**	**Sustainable Energy Engineering**	1	24-DMC-ME-2-01	Introduction to Sustainable Energy Systems	**III**
			2	24-DMC-ME-2-02	Solar PV Design Optimization & Manufacturing	**IV**
			3	24-DMC-ME-3-03	Future Solar Energy Harnessing Technologies	**V**
			4	24-DMC-ME-3-04	Grid Integration and Smart Grid Technologies	**VI**
			5	24-DMC-ME-4-05	Sustainable Engineering Solutions	**VII**
			6	24-DMC-ME-4-06	Sustainability Assessment and Analysis	**VIII**

#Note for NPTEL/SYAYAM: Approved courses and platforms will be enlisted timely by authorities along with rules and regulations

#Note: You can refer syllabus of all SEM III and IV Double Minor Courses from
https://snjb.org/engineering/uploads/media/2025/03/SY2025-26-Double-Minors-2024-28.pdf

4. HONORS

- In addition to 172 credits of B. Tech Programmes (Bachelor of Technology) i.e. Major in which the student has taken admission, a student may opt for Honors in the same Tech. discipline/branch / Emerging Areas.
- A student is required to earn an additional 18 credits in the same Tech. discipline/ branch / Emerging Areas for Honors distributed over semesters III to VIII.
- The total number of credits required to complete the Honors in the same Tech. discipline/ Emerging Areas is 18 credits, in addition to 172 credits in Major.
- Students will have to compulsorily choose Honors from the same Tech. discipline/branch.
- Honors Degree in the Bachelor of Engineering programme shall be awarded to students earning additional total credits of all six semesters from the second year to final year, i.e., 18 Credits, in addition to 172 credits or 130 credits respectively. The student admitted in the first year must earn 172 credits and 130 credits admitted in lateral entry (admitted after Diploma or B.Sc.) in the second year.
- Minor Courses can be completed through an online platform.

The student has to choose One Honor out of the Two Honor groups provided below

Honors offered by Computer Engineering are as follows:

Table 9: Honors

Sr No	Name of Honors Offered by Department
A.	Blockchain Technologies
B.	Cyber Security

The detailed syllabus structure for the same is as follows:

Table 10A: Specialization Honors in Blockchain Technologies

Sr. No	Category	SEM	Course Code	Course Name	Teaching Scheme				
					Hours				Credits
					L	T	P	Total Hours	
01	HOC	III	24-HOC-CS-2-01A	Foundation of Blockchain Technology	3	-	-	3	3
02	HOC	IV	24-HOC-CS-2-02A	Decentralize and Blockchain Technologies	3	-	-	3	3
03	HOC	V	24-HOC-CS-3-03A	Blockchain Architecture Design	3	-	-	3	3
04	HOC	VI	24-HOC-CS-3-04A	Smart Contract and Cryptocurrency	3	-	-	3	3
05	HOC	VII	24-HOC-CS-4-05A	Blockchain Security	3	-	-	3	3
06	HOC	VIII	24-HOC-CS-4-06A	Blockchain Applications	3	-	-	3	3
Total					**18**	-	-	**18**	**18**

Table 10B: Specialization Honors in Cyber Security

Sr. No	Category	SEM	Course Code	Course Name	Teaching Scheme				
					Hours				Credits
					L	T	P	Total Hours	
01	HOC	III	24-HOC-CS-2-01B	Cryptography and Network Security	3	-	-	3	3
02	HOC	IV	24-HOC-CS-2-02B	Information Security	3	-	-	3	3
03	HOC	V	24-HOC-CS-3-03B	Ethical Hacking	3	-	-	3	3
04	HOC	VI	24-HOC-CS-3-04B	Digital Forensic	3	-	-	3	3
05	HOC	VII	24-HOC-CS-4-05B	Network Forensics and Cyber Threat Analysis	3	-	-	3	3
06	HOC	VIII	24-HOC-CS-4-06B	Cyber Physical Systems	3	-	-	3	3
Total					**18**	-	-	**18**	**18**

#Note for NPTEL/SYAYAM: Approved courses and platforms will be enlisted timely by authorities along with rules and regulations

#Note: You can refer syllabus of all SEM III and SEM IV Honors Courses from
https://snjb.org/engineering/uploads/media/2025/03/SY_Btech_Comp_honors_2025-26.pdf

5. HONORS WITH RESEARCH AND MULTIDISCIPLINARY MINOR

- The Student will work on a Research Project or Dissertation for 18 Credits in the Fourth Year in the respective discipline.
- The distribution of 18 Credits for Research projects in Sem-VII and Sem-VIII is given below.
- To get a B. Tech in Computer Engineering-Honors with Research and Multidisciplinary Minor degree Students need to earn a total of 190 Credits which consist of 172 credits of regular Multidisciplinary Minor courses, 18 Credits of Honor courses, 18 credits of Research courses.

Table 11: Honors with Research and Multidisciplinary Minor (Sem-VII)

Final Year B. Tech Semester-VII													
Course Code	Course Name	Teaching Scheme				Evaluation Scheme							
		Hours			Credit	Theory Course				Lab Course			Total Marks
		L	T	P	Total	CIE	MSE	SEE	TH Marks	TW	PR	OR	
24-HRC-4-01	Intellectual Property Right (IPR)	2	-	-	2	-	50	50	100	-	-	-	100
24-HRC-4-02	Research Project (Synopsis) Phase-I	-	-	4	2	-	-	-	-	50	-	50	100
24-HRC-4-03	Research Specific Core Course-I (Online NPTEL Course#)	3	-	-	3	-	50	50	100	-	-	-	100
Total		**5**	**-**	**4**	**7**	**-**	**100**	**100**	**200**	**50**	**-**	**50**	**300**

#Note for NPTEL/SYAYAM: Approved courses and platforms will be enlisted timely by authorities along with rules and regulations

Table 12: Honors with Research and Multidisciplinary Minor (Sem-VIII)

Final Year B. Tech Semester-VIII													
Course Code	Course Name	Teaching Scheme				Evaluation Scheme							
		Hours			Credit	Theory Course				Lab Course			Total Marks
		L	T	P	Total	CIE	MSE	SEE	TH Marks	TW	PR	OR	
24-HRC-4-04	Research Project Phase-II	-	-	22	11	-	-	-	-	50	-	50	100
Total		**-**	**-**	**22**	**11**	**-**	**-**	**-**	**-**	**50**	**-**	**50**	**100**

TEACHING AND EVALUATION SCHEME FOR FIRST YEAR B-TECH

Semester – I

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	24-BSC-1-01	Engineering Physics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	24-BSC-1-03	Linear Algebra And Differential Calculus	3	1	-	4	4	20	20	60	100	-	-	-	100
3	ESC	24-ESC-1-01	Basic Electrical and Electronics Engineering	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	24-ESC-1-02	Programming and Problem Solving	2	-	-	2	2	20	20	60	100	-	-	-	100
5	BSC	24-BSC-1-05	Engineering Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
6	ESC	24-ESC-1-05	Basic Electrical and Electronics Engineering Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	24-ESC-1-07	Programming and Problem Solving Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	VSEC	24-VSC-1-01	TechSkill	-	-	4	4	2	-	-	-	-	50	-	-	50
9	CCC		Co-curricular Course -I	-	-	2	2	1	-	-	-	-	50	-	-	50
10	IKS	24-IKS-1-01	Indian Knowledge System	-	2	-	2	2	-	-	-	-	50	-	-	50
11	AEC	24-AEC-1-01	Professional Communication Skills	-	1	-	1	1	-	-	-	-	25	-	-	25
Total				**11**	**4**	**12**	**27**	**21**	**80**	**80**	**240**	**400**	**250**	**-**	**-**	**650**

Course Code	Basket of Co-curricular Course
24-CCC-1-A	Yoga
24-CCC-1-B	Sports
24-CCC-1-C	NSS (National Service Scheme)
24-CCC-1-D	Cultural

Note: Students have to select any one course from the above basket.

Induction Program (Mandatory)	3 Weeks Duration
The induction program (as per AICTE guidelines) is to be completed at the start of the first year.	• SIP Module 1: UHV 1 • SIP Module 2: Physical Health and Related Activities • SIP Module 3: Familiarization of Department/ Branch and Innovation • SIP Module 4: Visit to a Local Area • SIP Module 5: Lectures by Eminent People • SIP Module 6: Proficiency Modules • SIP Module 7: Literature / Literary Activities • SIP Module 8: Creative Practices • SIP Module 9: Extra Curricular Activities

Semester – II

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	24-BSC-1-02	Engineering Chemistry	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	24-BSC-1-04	Statistics and Integral Calculus	3	-	-	3	3	20	20	60	100	-	-	-	100
3	ESC	24-ESC-1-03	Engineering Graphics	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	24-ESC-1-04	Smart Building and Materials	2	-	-	2	2	20	20	60	100	-	-	-	100
5	PCC	24-PCC-CS-1-01	Object Oriented Programming using Java	2	-	-	2	2	20	-	30	50	-	-	-	50
6	BSC	24-BSC-1-06	Engineering Chemistry Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	24-ESC-1-08	Engineering Graphics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	ESC	24-ESC-1-09	Smart Building and Materials Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
9	PCC	24-PCC-CS-1-02	Java Programming Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
10	VSEC	24-VSC-1-02	TechShop	-	-	4	4	2	-	-	-	-	50	-	-	50
11	CCC	24-CCC-1-05	Co-curricular Course -II	-	-	4	4	2	-	-	-	-	25	-	-	25
Total				**13**	**-**	**16**	**29**	**21**	**100**	**80**	**270**	**450**	**175**	**25**	**-**	**650**

Level 4.5 Exit Criteria: Mandatory Courses to be completed after the first year to obtain One Year UG Certificate in Computer Engineering

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	EXT	24-EXT-1-01	Internship / Fieldwork/OJT	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	24-EXT-1-02	Mini Project	-	-	8	8	4	-	-	-	-	50	-	50	100
Total				**-**	**-**	**16**	**16**	**8**	**-**	**-**	**-**	**-**	**150**	**-**	**50**	**200**

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TEACHING AND EVALUATION SCHEME FOR SECOND YEAR B-TECH

Semester – III

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	PCC	24-PCC-CS-2-01	Discrete Mathematics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-CS-2-02	Data Structures & Algorithms	3	-	-	3	3	20	20	60	100	-	-	-	100
3	PCC	24-PCC-CS-2-03	Computer Organization and Architecture	3	-	-	3	3	20	20	60	100	-	-	-	100
4	MD M		Multi-Disciplinary Minor-I	2	-	-	2	2	20	-	30	50	-	-	-	50
5	PCC	24-PCC-CS-2-04	Data Structures Lab	-	-	4	4	2	-	-	-	-	50	50	-	100
6	MD M		MultiDisciplinary Minor-I Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
7	EEM	24-EEM-2-01	Engineering Economics	1	-	2	3	2	-	-	-	-	25	-	-	25
8	AEC	24-AEC-2-01	Business Communication Skill	-	-	2	2	1	-	-	-	-	25	-	-	25
9	VEC	24-VEC-2-01	Universal Human Values-II	3	-	-	3	3	-	-	-	-	50	-	-	50
10	ELC (CEP/FP)	24-ELC-CS-2-01	Community Engagement Project / Field Project	-	-	4	4	2	-	-	-	-	25	-	25	50
Total				**15**	**-**	**14**	**29**	**22**	**80**	**60**	**210**	**350**	**200**	**75**	**25**	**650**

Semester – IV

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	PCC	24-PCC-CS-2-05	Database Management System	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-CS-2-06	Design and Analysis of Algorithm	3	-	-	3	3	20	20	60	100	-	-	-	100
3	MD M		Multi Disciplinary Minor -II	3	-	-	3	3	20	20	60	100	-	-	-	100
4	OE		Open Elective-I	3			3	3	20	20	60	100	-	-	-	100
5	PCC	24-PCC-CS-2-07	Database Management System Lab	-	-	4	4	2	-	-	-	-	50	50	-	100
6	AEC		Modern Language	1	-	2	3	2	-	-	-	-	-	-	25	25
7	EEM	24-EEM-2-02	Entrepreneurship Development	1	-	2	3	2	-	-	-	-	50	-	-	50
8	VSEC	24-VSEC-CS-2-01	Application Development Programming I	-	-	4	4	2	-	-	-	-	25	25	-	50
9	VEC	24-VEC-2-02	Digital and Technological Solutions	1	-	2	3	2	-	-	-	-	25	-	-	25
Total				**15**	**-**	**14**	**29**	**22**	**80**	**80**	**240**	**400**	**150**	**75**	**25**	**650**

AEC- Modern Language Basket		
Course Code	**Course Name**	**Who can Opt**
Indian Languages		
24-AEC-2-02-A	Modern Language- Basic Marathi	Students who have not studied this course from Grade I to Grade X can opt this course in the curriculum
24-AEC-2-02-B	Modern Language- Advance Marathi	Students who have studied this course from Grade I to Grade XIcan opt this course in the curriculum
24-AEC-2-02-C	Modern Language- Basic Hindi	Students who have not studied this course from Grade I to Grade X can opt this course in the curriculum
24-AEC-2-02-D	Modern Language- Advance Hindi	Students who have studied this course from Grade I to Grade X can opt this course in the curriculum
24-AEC-2-02-E	Modern Language- Sanskrit	Students who have not studied this course from Grade I to Grade X can opt this course in the curriculum
Foreign Languages		
24-AEC-2-02-F	Modern Language- Japanese	Students who have not studied this course from Grade I to Grade X can opt this course in the curriculum
24-AEC-2-02-G	Modern Language- German	Students who have not studied this course from Grade I to Grade X can opt this course in the curriculum
24-AEC-2-02-H	Modern Language- French	Students who have not studied this course from Grade I to Grade X can opt this course in the curriculum

#Note: Students have to select any one course from the above basket.

#Note: You can refer syllabus all AEC- Modern Language Basket from

https://snjb.org/engineering/uploads/media/2025/03/SY2025-26-Modern-Languages-2024-28.pdf

Level 5.0 Exit Criteria

Mandatory Courses to be completed after Second Year for obtaining Two Years UG Diploma in Computer Engineering

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	EXT	24-EXT-CS-2-01	Internship / Fieldwork/OJT	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	24-EXT-CS-2-02	Mini Project	-	-	8	8	4	-	-	-	-	50	-	50	100
Total				**-**	**-**	**16**	**16**	**8**	**-**	**-**	**-**	**-**	**150**	**-**	**50**	**200**

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TEACHING AND EVALUATION SCHEME FOR THIRD YEAR B-TECH

Semester – V

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	PCC	24-PCC-CS-3-01	Data Science and Machine Learning	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-CS-3-02	Computer Network	3	-	-	3	3	20	20	60	100	-	-	-	100
3	PEC		Program Elective Course- I	4	-	-	4	4	20	20	60	100	-	-	-	100
4	MD M		MultiDisciplinary Minor-III	2	-	-	2	2	20	-	30	50	-	-	-	50
5	OE		Open Elective - II	2	-	-	2	2	20	-	30	50	-	-	-	50
6	PCC	24-PCC-CS-3-03	Data Science and Machine Learning Lab	-	-	4	4	2	-	-	-	-	25	25	-	50
7	PCC	24-PCC-CS-3-04	Computer Network Lab	-	-	2	2	1	-	-	-	-	25	-	25	50
8	PEC		Program Elective Course- I Lab	-	-	4	4	2	-	-	-	-	25	25	-	50
9	MD M		MultiDisciplinary Minor-III Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
10	AEC	24-AEC-3-01	Environmental Science	-	-	4	4	2	-	-	-	-	50	-	-	50
Total				**14**	**-**	**16**	**30**	**22**	**100**	**60**	**240**	**400**	**150**	**75**	**25**	**650**

Program Elective Course – I				
	Course Code-TH	Name of the Course- TH	Course Code-PR	Name of the Course(PR/OR)
A	24-PEC-CS-3-01A	Computer Graphics	24-PEC-CS-3-02A	Computer Graphics Lab
B	24-PEC-CS-3-01B	Information and Network Security	24-PEC-CS-3-02B	Information and Network Security Lab
C	24-PEC-CS-3-01C	Artificial Neural Network	24-PEC-CS-3-02C	Artificial Neural Network Lab
D	24-PEC-CS-3-01D	Pervasive Computing	24-PEC-CS-3-02D	Pervasive Computing Lab
E	24-PEC-CS-3-01E	Web Technology	24-PEC-CS-3-02E	Web Technology Lab

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(With Effect from Academic Year 2025-26)

Semester – VI

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	PCC	24-PCC-CS-3-05	Automata Theory	3	1	-	4	4	20	20	60	100	-	-	-	100
2	PEC		Program Elective Course- II	3	-	-	3	3	20	20	60	100	-	-	-	100
3	MD M		Multi Disciplinary Minor-IV	2	-	-	2	2	20	-	30	50	-	-	-	50
4	OE		Open Elective -III	3	-	-	3	3	20	20	60	100	-	-	-	100
5	PEC		Program Elective Course- II Lab	-	-	4	4	2	-	-	-	-	25	-	25	50
6	VSEC	24-VSEC-CS-3-01	Application Development Programming II	-	-	4	4	2	-	-	-	-	25	50	-	75
7	ELC (RM)	24-ELC-CS-3-01	Research Methodology and Software Engineering	4	-	-	4	4	20	20	60	100	-	-	-	100
8	ELC (PR)	24-ELC-CS-3-02	Project Stage-I	-	-	4	4	2	-	-	-	-	25	-	50	75
Total				**15**	**1**	**12**	**28**	**22**	**100**	**80**	**270**	**450**	**75**	**50**	**75**	**650**

Program Elective Courses For SEM VI				
	Course Code-TH	Name of the Course- TH	Course Code-PR	Name of the Course (PR/OR)
A	24-PEC-CS-3-03A	Game Development & Animation	24-PEC-CS-3-04A	Game Development & Animation Lab
B	24-PEC-CS-3-03B	Cyber Security & Digital Forensic	24-PEC-CS-3-04B	Cyber Security & Digital Forensic Lab
C	24-PEC-CS-3-03C	Deep Learning	24-PEC-CS-3-04C	Deep Learning Lab
D	24-PEC-CS-3-03D	High-Performance Computing	24-PEC-CS-3-04D	High-Performance Computing Lab
E	24-PEC-CS-3-03E	Advanced Web Technology	24-PEC-CS-3-04E	Advanced Web Technology Lab

Level 5.5 Exit Criteria
Mandatory Courses to be completed after Third Year for obtaining Three Year Bachelor's Degree in Vocation (B. Voc.) in Computer Engineering

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	EXT	24-EXT-CS-3-01	Internship / Fieldwork/OJT	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	24-EXT-CS-3-02	Mini Project	-	-	8	8	4	-	-	-	-	50	-	50	100
Total				**-**	**-**	**16**	**16**	**8**	**-**	**-**	**-**	**-**	**150**	**-**	**50**	**200**

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TEACHING AND EVALUATION SCHEME FOR FINAL YEAR B-TECH

Semester – VII

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	PCC	24-PCC-CS-4-01	Cloud Computing	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-CS-4-02	System Programming and Operating System	3	-	-	3	3	20	20	60	100	-	-	-	100
3	PEC		Program Elective -III	4	-	-	4	4	20	20	60	100	-	-	-	100
4	MD M		MultiDisciplinary Minor-V	2	-	-	2	2	20	-	30	50	-	-	-	50
5	PCC	24-PCC-CS-4-03	Cloud Computing Lab	-	-	4	4	2	-	-	-	-	25	-	25	50
6	PCC	24-PCC-CS-4-04	System Programming and Operating System Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
7	PEC		Program Elective -III Lab	-	-	4	4	2	-	-	-	-	25	25	-	50
8	MD M		MultiDisciplinary Minor-V Lab	-	-	2	2	1	-	-	-	-	25	-	25	50
9	ELC (PR)	24-ELC-CS-4-01	Project Stage-II	-	-	6	6	3	-	-	-	-	50	-	50	100
Total				**12**	**-**	**18**	**30**	**21**	**80**	**60**	**210**	**350**	**150**	**50**	**100**	**650**

Program Elective Course For SEM VII				
	Course Code-TH	Name of the Course- TH	Course Code-PR	Name of the Course(PR/OR)
A	24-PEC-CS-4-05A	Virtual Reality & Augmented Reality	24-PEC-CS-4-06A	Virtual Reality & Augmented Reality Lab
B	24-PEC-CS-4-05B	Cloud Security	24-PEC-CS-4-06B	Cloud Security Lab
C	24-PEC-CS-4-05C	Natural Language Processing	24-PEC-CS-4-06C	Natural Language Processing Lab
D	24-PEC-CS-4-05D	Fog and Edge Computing	24-PEC-CS-4-06D	Fog and Edge Computing Lab
E	24-PEC-CS-4-05E	Software Testing and Quality Assurance	24-PEC-CS-4-06E	Software Testing and Quality Assurance Lab

Semester – VIII

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	PCC	24-PCC-CS-4-05	DevOps	3	-	-	3	3	40	-	60	100	-	-	-	100
2	PEC		Program Elective Course-IV	3	-	-	3	3	40	-	60	100	-	-	-	100
3	MD M		Multi-Disciplinary Minor VI	3	-	-	3	3	40	-	60	100	-	-	-	100
4	ELC	24-ELC-CS-4-02	Internship	-	-	24	24	12	-	-	-	-	200	-	150	350
Total				**9**	**-**	**24**	**33**	**21**	**120**	**-**	**180**	**300**	**200**	**-**	**150**	**650**

Note: Above Courses form Sr. No. 1 to 3 of SEM-VIII will be conducted in online mode or may be mapped with suitable NPTEL/SWAYAM Courses.

Program Elective Course For SEM VIII		
	Course Code-TH	**Name of the Course- TH**
A	24-PEC-CS-4-07A	UI & UX Design
B	24-PEC-CS-4-07B	Blockchain
C	24-PEC-CS-4-07C	Generative AI
D	24-PEC-CS-4-07D	Quantum Computing
E	24-PEC-CS-4-07E	Compiler

Note: The above Courses from Sr. No. 1 to 3 of SEM-VIII will be conducted in online mode or may be mapped with suitable NPTEL/SWAYAM Courses.

SEM III

24-PCC-CS-2-01 : Discrete Mathematics

Teaching Scheme:	**Credit:** 03	**Examination Scheme:**
Theory: 3 Hours/Week		**CIE** : 20 Marks **MSE :** 20 Marks **SEE** : 60 Marks

Prerequisite Courses: NA

Companion Course: NA

Course Objective:

- Develop student's logical thinking skills and a strong foundation in discrete mathematics, enabling them to analyze and solve mathematical and real-world problems .

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	Utilize fundamental concepts of discrete mathematics, including sets and logic, to address problems.	3
CO2	Use equivalence relations and construct functions for effective problem-solving.	3
CO3	Employ permutations, combinations and the binomial theorem to tackle various problems	3
CO4	Apply concepts and algorithms from graph theory and trees to analyze, evaluate, and solve real-world and practical problems.	3
CO5	Apply coding theory to design and assess error-detecting and error-correcting codes for data transmission.	3

Course Contents

Unit I	**Mathematical Logic and Set Theory**	**8 Hours**

Propositional Logic: Introduction, Proposition, Logical Connectives, Applications of Propositional Logic:-Translating English Sentences, Normal Forms, Proof by Mathematical Induction.
Set Theory: Introduction, Types of Sets, Venn Diagram, Principal of Inclusion Exclusion, Multisets.

#Exemplar/Case Studies: Venn diagram representation of weather analysis of three countries.

***Mapping of Course Outcomes**	**CO1**

Unit II	**Relations and Functions**	**7 Hours**

Relations: Relations and their Properties, n-ary Relations, Representing Relations, Closures of Relations, Warshall's Algorithm, Equivalence Relations, Partial Orderings, Lattice, Hasse Diagram, Chain and Antichain.
Functions: Types of Functions: Surjective, Injective and Bijective functions, Partial function, Identity function, Invertible function,

Constant function, Inverse functions and Compositions of functions, The Pigeonhole Principle.		
#Exemplar/Case Studies: Know about the great philosophers-Dirichlet.		
***Mapping of Course Outcomes**	**CO2,CO1**	
Unit III	**Graph Theory**	**8 Hours**
Introduction to Graph, Types of Graphs, Isomorphism of Graphs, Euler and Hamilton Paths and Circuits, Dijkstra's shortest path Algorithm, Planar Graphs, Graph Coloring.		
#Exemplar/Case Studies: Web Graph, Google Maps.		
***Mapping of Course Outcomes**	**CO4,CO1**	
Unit IV	**Trees**	**8 Hours**
Introduction and properties of trees, M-ary tree, Binary Tree, Binary search tree, Tree Traversal Techniques, Huffman Coding and Prefix codes, cut sets, Spanning Trees and Minimum Spanning Tree, Prim's and Kruskal's algorithms, The Max flow- Min Cut Theorem (Transport network).		
#Exemplar/Case Studies: Expression Tree, Tic-Tac-Toe Game Using Tree concepts.		
***Mapping of Course Outcomes**	**CO4,CO1**	
Unit V	**Combinatorics**	**7 Hours**
The Basics of Counting, Rule of Sum and Product, Permutations and Combinations, Binomial Coefficients and Identities.		
#Exemplar/Case Studies: Enhancing Cybersecurity through Password Creation Using Permutation and Combination		
***Mapping of Course Outcomes**	**CO3,CO1**	
Unit VI	**Algebraic System and Coding Theory**	**7 Hours**
The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, Rings, Integral Domains and Fields, Coding theory, Hamming code.		
#Exemplar/Case Studies: Galois Theory –Field Theory and Group Theory.		
***Mapping of Course Outcomes**	**CO1,CO5**	
Learning Resources		
Text Books		
T1. Chung Laung Liu, "Elements of Discrete Mathematics" McGraw-Hill, 1977, Edition 2, ISBN 0070381313, 9780070381315. **T2.** Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw-Hill, 2019, Edition 8, ISBN 1260091996, 9781260091991.		
Reference Books:		
R1. Norman Biggs, Discrete Mathematics, OUP Oxford, 2002, ISBN 0198507178, 9780198507178. **R2.** Deo Narsingh., "Graph theory with applications to Engineering & Computer Science", PHI, 2000.		

Additional Resources: (Books, e-Resources)

e-Resources:

Unit 1 Exemplar/Case Studies: https://boardmix.com/examples/example-of-a-venn-diagram/
Unit 2 Exemplar/Case Studies: https://mathshistory.st-andrews.ac.uk/Strick/dirichlet.pdf
Unit 3 Exemplar/Case Studies: https://snap.stanford.edu/class/cs224w-readings/broder00bowtie.pdf
Unit 4 Exemplar/Case Studies: https://virtual-labs.github.io/exp-expression-trees-iiith/
Unit 5 Exemplar/Case Studies: https://effectiva.hr/en/blog/how-to-use-permutation-for-a-password-generation
Unit 6 Exemplar/Case Studies: https://www.math3ma.com/blog/what-is-galois-theory-anyway

Books:

https://www.ebookphp.com/discrete-mathematical-structures-6th-edition-epub-pdf/
http://discrete.openmathbooks.org/pdfs/dmoi-tablet.pdf
http://home.iitk.ac.in/~arlal/book/mth202.pdf
https://web.stanford.edu/class/cs103x/cs103x-notes.pdf
http://home.iitk.ac.in/~arlal/book/mth202.pdf
https://www.ams.org/books/gsm/210/gsm210-endmatter.pdf

MOOC Courses links :

- https://onlinecourses.nptel.ac.in/noc20_cs82/preview
- https://archive.nptel.ac.in/courses/111/106/111106086/
- https://archive.nptel.ac.in/courses/106/108/106108227/

24-PCC-CS-2-02: Data Structures & Algorithms

Teaching Scheme: Theory: 3 Hours/Week	**Credit:** 03	**Examination Scheme:** **CIE** : 20 Marks **MSE**: 20 Marks **SEE** : 60 Marks

Prerequisites Courses: (24-ESC-1-02) Programming and Problem Solving, (24-PCC-CS-1-01) Object Oriented Programming in JAVA, (24-PCC-CS-2-01) Discrete Mathematics

Companion Course: (24-PCC-CS-2-04) Data Structures Laboratory

Course Objectives:

- Comprehend data structures and analyze their trade-offs in algorithm efficiency for effective problem-solving.
- Implement linear data structures in real-world applications.
- Develop and optimize sorting, searching, and hashing algorithms.
- Investigate and manipulate advanced tree structures for complex operations.

Course Outcomes:

After completion of the course, learners should be able to

CONo	Course Outcome (CO)	BL
CO1	**Demonstrate** the use of Sequential Data Structures to store and process the data.	3
CO2	**Apply** the concepts of stacks and queues to solve real-world problems.	3
CO3	**Analyze** the various sorting, and searching algorithms and choose the most efficient one for the specific application.	4
CO4	**Apply** tree data structures to solve real-world problems in areas such as data organization, indexing, and efficient searching	3
CO5	**Perform** various operations on the Graph to solve real world problems.	3

Course Contents

Unit I	Introduction to Data Structures & Algorithms	7 Hours

Basics Concepts: Data structure, Primitive and non-primitive, Linear and nonlinear, Static and Dynamic, Persistent and Transient, **Algorithms**: Characteristics, Analysis of algorithms - Space complexity, Time complexity, **Applications of an Array**: **Polynomial** (Addition, Multiplication), **Sparse Matrix:** Representation, Addition, Transpose

#Exemplar/Case Studies: Managing **Student Database System** that allows users to **add, update, delete, and**

search student records efficiently. The database should store student details, including **Student ID, Name, Age, Course, and Marks**.		
***Mapping of Course Outcomes**		**CO1**
Unit II	**Stack and Queues**	**8 Hours**
Stacks: Concept, Representation, Operations, **Applications:** Polish Notation, Expression Conversion, Function Calls, Recursion, **Queues**: Concept, Representation, Operations, **Types of Queue**: Circular, Priority, Deque, **Applications of Queue:** Scheduling, Print Spooling		
#Exemplar/Case Studies: Browser History Management (Stack) / Call Center Customer Service (Queue)		
***Mapping of Course Outcomes**		**CO1, CO2**
Unit III	**Linked Lists**	**6 Hours**
Linked List: Concepts, Operations, **Types of Linked List:** Singly, Doubly, Circular, Generalized, **Applications:** Representation of Polynomial using Generalized Linked List.		
#Exemplar/Case Studies: Dynamic Memory Management in OS Using Linked Lists		
***Mapping of Course Outcomes**		**CO1, CO3**
Unit IV	**Searching and Sorting Techniques**	**6 Hours**
Searching: Linear, Binary, Fibonacci, **Sorting:** Bubble, Selection, Insertion, Heap, Quick, Merge, **Hashing:** Introduction, Collision Resolution Technique (Linear Probing with and without replacement), **Application:** Securing User Authentication.		
#Exemplar/Case Studies: Managing an E-Commerce Product Catalog: Product Search by Price, Hash Maps.		
***Mapping of Course Outcomes**		**CO1, CO3**
Unit V	**Trees**	**8 Hours**
Trees: Concept, Applications, **Binary Trees**: Properties, Representations (Array-Based and Linked Structure), Traversal (In-Order, Pre-Order, Post-Order), Applications, Binary Search Tree, **AVL Tree**: Properties, Rotations, Insertion, Deletion, **Advanced Tree:** B-Tree.		
#Exemplar/Case Studies: Decision Tree: Uber Mobile Build-Up System		
***Mapping of Course Outcomes**		**CO1, CO4**
Unit VI	**Graphs**	**7 Hours**
Graphs: Properties, Representations (Adjacency Matrix, Adjacency List), Traversals (Depth First and Breadth First Search), **Applications**: **Minimum Spanning Tree (**Kruskal's, Prim's Algorithm), **Shortest Path**: Single Source using Dijkstra's Algorithm, **Applications**: Directed Graph, Floyd-Warshall's Transitive Closure.		
#Exemplar/Case Studies: Study of Google Maps Navigation Using Graph Algorithms		

***Mapping of Course Outcomes**	**CO1, CO5**

Learning Resources

Text Books

T1. Horowitz, Sahani, Dinesh Mehata, "Fundamentals of Data Structures in C++", Edition 2, Galgotia Publication Pvt Ltd, 2012 ISBN: 8175152788, 9788175152786.
T2. Sartaj Sahni, "Data Structure and Algorithms and Applications in C++", Edition 2, University Press, 2008, ISBN:9780929306322, 0929306325.

Reference Books :

R1. Preiss Bruno R. "Data Structure and Algorithms with Object Oriented Design Pattern", Edition 1, John Wiley & Sons, 2005, ISBN:9780471346135
R2. Drozdevk Adam, "Data Structure and Algorithms in C++ ", Edition3, Cengage Learning India Pvt Ltd, 2013, ISBN: 9780471202080

Additional Resources: (Books, e-Resources)

- https://ia801404.us.archive.org/2/items/cprogbooks/k%26r.pdf
- https://www.ebooks.com/en-us/book/95777110/Python-data-structures-and-algorithms/benjamin-baka/
- https://www.ebookphp.com/advanced-data-structures-epub-pdf/
- https://www.ebookphp.com/data-structures-and-algorithms-professional-edition-beginners-guide-epubpdf/

MOOC Courses links :

- https://onlinecourses.nptel.ac.in/noc21_cs38/preview
- https://onlinecourses.nptel.ac.in/noc22_cs40/preview
- https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

24-PCC-CS-2-03 : Computer Organization and Architecture

Teaching Scheme:	**Credit:** 03	**Examination Scheme:**
Theory: 3 Hours/Week		**CIE** : 20 Marks **MSE :** 20 Marks **SEE** : 60 Marks

Prerequisites Courses: (24-ESC-1-01) Basic Electrical & Electronics Engineering, (24-ESC-1-02)Programming and Problem Solving Lab

Companion Course: _____

Course Objectives:

- Develop a foundational understanding of computer architecture, including CPU components, instruction sets, and system evolution.
- Analyze data representation techniques and computer arithmetic algorithms used in modern computing.
- Explore CPU control unit design, covering hardwired and microprogrammed control and optimization techniques.
- Examine I/O subsystems, device interfaces, and interrupt handling mechanisms for efficient process execution.
- Investigate memory organization strategies, including cache, virtual memory, and secondary storage, to improve system efficiency.
- Analyze parallel processing architectures, focusing on multithreading, concurrency, and performance evaluation.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	Identify the fundamental concepts of computer architecture, instruction sets, and CPU components.	2
CO2	Analyze and compare data representation techniques and computer arithmetic algorithms.	4
CO3	Examine different CPU control unit designs and their impact on execution performance.	3
CO4	Compare and assess various I/O device interfaces, interrupt mechanisms, and their role in system performance.	4
CO5	Apply memory organization principles to enhance memory hierarchy efficiency and system performance.	3
CO6	Analyze the performance of parallel and multiprocessor architectures using standard evaluation metrics.	4

Course Contents

Unit I	Introduction to Computer Architecture	6 Hours

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

#Case Studies: Evolution and Architecture of Computer Systems.		
***Mapping of Course Outcomes**	**CO1**	
Unit II	**Data representation & Computer arithmetic**	**6 Hours**
Data representation:Signed number representation, fixed and floating-point representations, character representation. Computer arithmetic:Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.		
#Case Studies: Floating-Point Arithmetic in Computer Systems.		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**CPU control unit design**	**6 Hours**
Introduction to Control Unit and CPU Architecture, Instruction Set Architecture (ISA) and Micro-operations, Control Unit Design: Hardwired Control, Control Unit Design: Microprogrammed Control, Control Unit Implementation and Timing Diagrams, Control Unit Optimization and Advanced Concepts, Practical Applications.		
#Case Studies: Study of Intel Core i9 Architecture		
***Mapping of Course Outcomes**	**CO3**	
Unit IV	**Peripheral devices and their characteristics**	**6 Hours**
Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB.		
#Case Studies: Study of excessive CPU involvement in I/O operations leading to performance bottlenecks and inefficient multitasking.		
***Mapping of Course Outcomes**	**CO4**	
Unit V	**Memory organization**	**6 Hours**
Introduction to Memory and Basic Concepts, Main Memory (RAM) and Memory Addressing, Cache Memory, Virtual Memory, Secondary Storage and Memory Hierarchy, Memory Performance and Recent Trends		
#Case Studies: Study of efficient cache management minimizing memory access latency and improving system performance.		
***Mapping of Course Outcomes**	**CO5**	
Unit VI	**Parallel and Multiprocessing Systems**	**6 Hours**
Introduction to Parallelism (Fundamentals), Multiprocessor Architectures, Multithreading and Concurrency, Performance and Challenges: Performance Metrics: Speedup, Efficiency, Amdahl's Law, Challenges: Load Balancing, Communication Overhead, Synchronization.		
#Case Studies: Performance analysis of RISC-V vs. ARM		

***Mapping of Course Outcomes**	**CO6**
Learning Resources	
Text Books	
T1: William Stallings – Computer Organization and Architecture, Pearson Education. **T2:** David A. Patterson, John L. Hennessy – Computer Organization and Design: The Hardware/Software Interface,Elsevier.	
Reference Books :	
R1: Carl Hamacher, Zvonko Vranesic, Safwat Zaky – Computer Organization (5th Edition), McGraw-Hill **R2**: Kai Hwang – Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill	
Additional Resources: (Books, e-Resources) MIT OpenCourseWare – *https://ocw.mit.edu/courses/6-004-computation-structures-spring-2017/* NPTEL Course – *https://nptel.ac.in/courses/106106134* IEEE Xplore Digital Library – Synergistic Processing in Cell's Multicore Architecture by Michael Gschwind, H. Peter Hofstee, Brian Flachs, Martin Hopkins, and Yukio Watanabe.	
MOOC Courses links : ● Coursera: Computer Architecture by Princeton University	

24-PCC-CS-2-04: Data Structures Laboratory

Teaching Scheme: Practical: 4 Hours/Week	**Credit:** 2	**Examination Scheme:** Termwork **(TW)**: 50 Marks **Oral/Practical (PR)**: 50 Marks

Prerequisites Courses: (24-ESC1-07) Programming and Problem Solving Lab, (24-PCC-CS-1-02) Java Programming Lab

Companion Course: (24-PCC-CS-2-02) Data Structures & Algorithms

Course Objectives:

- Implement linear data structures like arrays, stacks, queues, and linked lists, and perform operations such as insertion, deletion, and traversal.
- Implement and analyze sorting, searching, and hashing algorithms, and understand their trade-offs in terms of algorithm efficiency.
- Implement and build non-linear data structures such as Tree and Graph.

Course Outcomes:

After completion of the course, learners should be able to

CONo	Course Outcome (CO)	BL
CO 1	**Implement** linear data structures such as arrays, stacks, queues, and linked lists by performing key operations like insertion, deletion, and traversal.	3
CO 2	**Implement and evaluate** sorting, searching, and hashing algorithms, analyzing their efficiency and trade-offs in terms of time and space complexity.	4
CO 3	**Design and implement** non-linear data structures such as trees and graphs, and apply operations like traversal, insertion, and deletion to solve complex problems.	3
CO4	**Design & Implement** efficient solutions using appropriate data structures.	3

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, pseudocode, flowchart, conclusion/analysis. Program codes with sample output of all performed assignments will be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environmental awareness, attaching printed papers as part of write-ups and program listing to journals must be avoided. Softcopy containing student programs maintained by the Laboratory in charge is highly encouraged.

For reference one or two journals may be maintained with program prints in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Practical Examination

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

Guidelines for Laboratory Conduction

The laboratory is structured into three groups: A, B, and C. Each group contains 6 assignments, for a total of 18 assignments. Students must complete 10 assignments, selecting 3 from group A , C and 4 assignments from group B).

Hardware Requirement: Any open Source operating System

Software Requirement:

Vi-editor, Eclipse for cpp/Java

Virtual Laboratory: (If Any):

- https://cse01-iiith.vlabs.ac.in/List%20of%20experiments.html

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Write a program to consolidate temperature data recorded on Monday, Wednesday, Friday, and Sunday from two weather monitoring stations. Convert the data matrices into sparse matrix representations using triplets (row, column, value). Perform addition of the two sparse matrices to generate a consolidated data matrix	CO 1, CO4
2.	Write a program to create a recursive function (like calculating factorial of Fibonacci sequence) and track how each function call is pushed onto the stack and subsequently popped off. Use logging or a visual representation to show each function entering and exiting the stack.	CO 1
3.	Write a program with functions a) To print the original string followed by a reversed string using stack b) To check whether the given string is palindrome or not. For example, "madam" is a palindrome.	CO 1
4.	Implement a program for expression conversion as infix to postfix and its evaluation using stack based on given conditions: 1. Operands and operators, both must be single characters. 2. Input Postfix expression must be in a desired format. 3. Only '+', '-', '*' and '/ ' operators are expected.	CO 1

5.	Simulate a printer queue where multiple print jobs are sent to a printer. Each print job is enqueued as it arrives, and jobs are dequeued for printing in the order they were received. Write functions to add jobs and delete jobs from the queue.	CO 1, CO4
6.	Pizza parlor accepting maximum M orders. Orders are served on a first come first served basis. Order once placed cannot be canceled. Write a program to simulate the system using a circular queue using an array.	CO 1
Group B: Assignments		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Develop a library management system using linked lists, where each node represents a book, storing details like title, author, ISBN, and availability status. Implement functionalities to add or remove books, check book availability, issue a book to a borrower, and return a book. The system should also display the current list of available and borrowed books.	CO 1, CO4
2.	Create a program that allows efficient representation, storage, and manipulation of polynomials using a generalized linked list. Each node of the generalized linked list will either represent a coefficient and exponent (for a single term) or point to another sublist (for nested or more complex polynomial terms).	CO1
3.	Build a module for an e-commerce platform to sort products by price using Bubble Sort and Selection Sort.	CO2, CO4
4.	Design a search system for a university that stores student records with unique IDs. Implement both linear and binary search to find students based on ID.	CO2, CO4
5.	Create a program to manage and sort student CGPA for a university using Quick or Merge Sort.	CO2
6.	Build a system for an organization to manage employee records by employee ID. Implement hash tables with collision handling techniques such as linear probing, with and without replacement	CO2, CO4
Group C: Assignments		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	In a computer file system, directories and files are often structured hierarchically. This structure can be represented as a binary tree where: ● Each node represents a file or directory. ● The left child represents the primary file/subdirectory. ● The right child represents the secondary file/subdirectory. Develop a program to implement binary tree traversal techniques (Preorder, Inorder, and Postorder)	CO3,CO1, CO4

2	Given a valid mathematical expression in infix notation, your task is to: 1. Construct an expression tree for the given infix expression. 2. Traverse the expression tree using any of the tree traversal methods.	CO3
3	In a disaster-prone city, emergency response teams need to efficiently navigate between critical locations (such as hospitals, shelters, fire stations, and affected zones). The city can be represented as a graph, where Nodes (vertices) represent important locations and edges represent roads connecting these locations, with weights representing travel times or distances. Develop a system using Prim's algorithm to assist emergency teams in: 1. Finding the fastest route to reach a specific location during an emergency. 2. Identifying reachable zones to assess the city's connectivity and ensure aid can be delivered everywhere. 3. Evaluating alternative routes in case of road blockages.	CO3, CO4
4	Develop an inventory management system for a warehouse where product IDs are stored and need to be accessed frequently. Use AVL Tree to maintain dynamic data into it. The system should efficiently handle: ● Adding new product IDs. ● Removing discontinued product IDs.. ● Searching for specific product IDs.	CO3, CO4
5	Implement Kruskal's algorithm to design a minimum cost communication network (e.g., laying fiber-optic cables between cities).	CO3
6	Implement Dijkstra's algorithm to find the shortest path between a source location and all other locations in a graph representing a city's public transport network.	CO3

Learning Resources (If applicable)

Text Books

T1. Horowitz, Sahani, Dinesh Mehata, "Fundamentals of Data Structures in C++", Galgotia Publisher, ISBN: 8175152788, 9788175152786.
T2. Goodrich, Michael T, "Data Structures & Algorithms in Java", Wiley Publisher.

Reference Books :

R1. J. Tremblay, P. Soresan, "An Introduction to Data Structures with Applications", TMH Publication, 2nd Edition, 1984. ISBN:0-07-462471-7
R2. G A V Pai, "Data Structures and Algorithms", McGraw-Hill Companies, ISBN:9780070667266

Additional Resources: (Books, e-Resources)

MOOC Courses links :

- https://www.coursera.org/learn/algorithms-part1

24-EEM-2-01: Engineering Economics

Teaching Scheme: Theory: 1 Hours/Week Practical: 2 Hours/Week	**Credit:** 02	**Examination Scheme:** Term work (TW): 25 Marks

Prerequisites Courses: - –

Companion Course:- –

Course Objectives:

- To introduce the fundamentals of Economics and its application in engineering.
- To learn to apply the time value of money in project evaluation.
- To understand cost behavior and classification for decision-making.
- To analyze and apply depreciation policies in calculating asset depreciation.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Explain** the key concepts of microeconomics and macroeconomics and their relevance in engineering decision-making.	2
CO2	**Understand** the present value and future value of the business.	2
CO3	**Calculate** break-even for different production levels.	3
CO4	**Understanding** different depreciation methods and their impact on asset valuation.	2

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement,Assessment grade/marks and assessor's sign, Theory- Concept in brief, test cases, conclusion/analysis.All performed assignments will be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environmental awareness, attaching printed papers as part of write-ups to journals must be avoided. For reference one or two journals may be maintained in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Laboratory Conduction

Students are expected to perform one assignment each week, do a thorough case study and prepare a presentation on it. He/She has to present it during lab hours within 6-10 minutes. The instructor is expected to assign Assignments and conduct presentations in two separate practical sessions.

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Determination of equilibrium price under perfect competition for a Company	CO1
2.	Determining elasticity of demand for a company	CO1
3.	Determining elasticity of Supply for a company.	CO1
4.	Evaluation of engineering projects using Present worth method and Future worth method for a Company	CO2
5.	Determining the Break-even analysis for a product of a company.	CO3
6.	Preparation of cost sheet of a company.	CO3
7.	Calculating Depreciation of Assets using Straight line method.	CO4
8.	Calculating Depreciation of Assets using declining balance method.	CO4

Note:-Companies will be assigned to the students before the practical.

Learning Resources (If applicable)

Text Books

T1. Fundamentals of Engineering Economics by Pravin Kumar, John Wiley Publishing INC
T2. Engineering Economics R. Panneerselvam Ed.2nd © 2001 by PHI Learning Private Limited, New Delhi.

Reference Books :

R1.Economics for engineering students,.Seema Singh,2009,IK International Publication House.
R2. Engineering Economics,James L. Riggs, David D. Bedworth, and Sabah U. Randhawa,, Ed.4th Tata McGraw Hill Education Private Limited.

Additional Resources: (Books, e-Resources)

- https://www.hzu.edu.in/engineering/engineering%20economy.pdf
- https://www.uoanbar.edu.iq/eStoreImages/Bank/6298.pdf
- https://brijbhooshan.in/Brij%20Data/Industrial%20Management/Book/Engineering%20Economics%20By%20R.%20Paneerselvam.pd

MOOC Courses links :

- Link to NPTEL course contents: Engineering Economics Analysis
  https://archive.nptel.ac.in/courses/112/107/112107209/#
- Udemy Course - Fundamental of Engineering Economics
  https://www.udemy.com/course/fundamentals-of-engineering-economics/?couponCode=NVDIN35

24-AEC-2-01 : Business Communication Skill

Teaching Scheme: Practical: 2 Hours/Week	**Credit:** 01	**Examination Scheme:** Termwork **(TW)** : 25 Marks

Prerequisites Courses: 24-AEC-1-01 Professional Communication Skill

Companion Course: NA

Course Objectives:

- **Professional Writing Skill:** To understand the concepts of professional writing skills.
- **Business drafting skills**: Develop proficiency in professional business correspondence, including writing formal Memorandum, Drafting notices and preparing agendas
- **Team Based Learning**: To enhance learning through collaborative teamwork and active problem-solving.
- **Business ethics and conduct:** To promote ethical decision-making and integrity in professional business practices.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Apply writing** techniques to craft clear and professional job application letters, resumes, and emails using advanced tools and strategies.	3
CO2	**Apply** business drafting concepts to create clear, professional and impactful business documents	3
CO3	**Perform** tasks utilizing knowledge to enhance critical thinking, problem-solving, and communication skills in a team setting.	3
CO4	**Understand** the concepts of business ethics and conduct	2

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate,

table of contents, and handwritten write-up /print of each assignment (Title, Date of Completion, Objectives, Problem Statement, Assessment grade/marks and assessor's sign, Theory- Concept in brief).

Guidelines for Laboratory /Term Work Assessment

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

Virtual Laboratory:

- https://ve-iitg.vlabs.ac.in/Business%20Communication.html

Suggested List of Laboratory Experiments/Assignments

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	**Draft a job application letter** for a fresher applying to your dream company, along with a professional email to accompany the application.	CO1
2	**Create a resume** as a fresher applying to your dream company	CO1
3	**Compose a professional email** to accompany the job application, following proper email etiquette.	CO1
4	**Write a memorandum** announcing the guest lecture, providing details about the speaker, the date, time, venue, and any preparation students should do before attending	CO2
5	**Draft a notice** to inform students about the Annual Gathering Symposium, including key event details such as the date, time, venue, and registration procedure, along with any specific instructions for participants or attendees.	CO2
6	**Prepare a meeting agenda** for the upcoming project review meeting. Include topics such as progress updates on the prototype, technical challenges, resource requirements, timelines, and the next steps for each department. Ensure time is allocated for discussions and question-	CO2
7	**Develop a unique advertisement** poster for a product, keeping in mind the characteristics and preferences of their target market	CO3

	(Group of 4-5 Students)	
8	**Conduct case studies on business ethics** by analyzing any corporate organizations (e.g., Enron, Volkswagen, TATA).	CO4

Learning Resources (If applicable)

Text Books :

T1.The Ace of Soft Skills - Attitude Communication and Etiquette for Success by Ramesh Gopal Swamy Ramesh Mahadevan

T2. Personality Development & Communication Skills by Gupta Sachin

References Books :

R1. Global Business Foundation Skills by : Accenture Convergys

R2. Business Ethics by: Awasthappab K

Additional Resources: (Books, e-Resources)

- https://nptel.ac.in/courses/109104031
- https://archive.nptel.ac.in/courses/109/106/109106129/

MOOC Courses links :

- https://www.coursera.org/courses?query=communication%20skills
- https://www.britishcouncil.in/english/online/resources-websites/moocs

24-VEC-2-01: Universal Human Values-II

Teaching Scheme: Theory: 3 Hours/Week	**Credit:** 03	**Examination Scheme:** **Termwork(TW): 50 Marks**

Prerequisites Courses: 24-IKS-1-01: IKS, SIP Module 1- UHV-I

Companion Course: NA

Course Objectives:

- To appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- To facilitate the development of a holistic perspective among students to lead their personal and professional lives in an ethical way
- To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior, and mutually enriching interaction with nature.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Demonstrate** the relevance of 'Universal Human Values'.	3
CO2	**Develop** an understanding about human being as coexistence of 'Self' & 'Body'	2
CO3	**Apply** the learnings to ensure harmony in family and society.	3
CO4	**Model** coexistence with nature by integrating Universal Human Values for ethical personal and professional lives.	3

Course Contents

Unit 1	**Introduction to Value Education**	**6 Hours**

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

#Exemplar/Case Studies : PS1 Sharing about Oneself, PS2 Exploring Human Consciousness, PS3 Exploring Natural Acceptance

***Mapping of Course Outcomes**	**CO1,CO2**

Unit 2	**Harmony in the Human Being**	**6 Hours**

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		
#Exemplar/Case Studies: PS4 Exploring the difference of Needs of Self and Body, PS5 Exploring Sources of Imagination in the Self PS6 Exploring Harmony of Self with the Body		
***Mapping of Course Outcomes**	**CO1,CO2**	
Unit 3	**Harmony in the Family and Society**	**6 Hours**
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, Understanding Harmony in the Society, Vision for the Universal Human Order		
#Exemplar/Case Studies : PS7 Exploring the Feeling of Trust, PS8 Exploring the Feeling of Respect PS9 Exploring Systems to fulfil Human Goal		
***Mapping of Course Outcomes**	**CO1,CO3**	
Unit 4	**Harmony in the Nature (Existence)**	**6 Hours**
Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Coexistence at All Levels, The Holistic Perception of Harmony in Existence		
#Exemplar/Case Studies : PS10 Exploring the Four Orders of Nature, PS11 Exploring Co-existence in Existence		
***Mapping of Course Outcomes**	**CO1,CO4**	
Unit 5	**Implications of the Holistic Understanding - a Look at Professional Ethics**	**6 Hours**
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		
#Exemplar/Case Studies: PS12 Exploring Ethical Human Conduct, PS13 Exploring Humanistic Models in Education, PS14 Exploring Steps of Transition towards Universal Human Order		
***Mapping of Course Outcomes**	**CO1,CO2,CO3,CO4**	
Learning Resources		
Text Books		
T1. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.		
Reference Books :		
R1. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers. **R2.** A N Tripathy, 2003, Human Values, New Age International Publishers. **R3.** E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.		
Additional Resources: (Books, e-Resources) • https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2026-28%20Ethics%20v1.pdf • https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree%20in%20UHV.pdf		

- https://www.youtube.com/c/UniversalHumanValues
- https://atmiyauni.ac.in/public/file/HVPE%20Text%20Book.pdf
- https://drive.google.com/file/d/1C8qp78Uesoptk5lLR2PQNJOOm43ni7da/view?usp=sharing
- https://drive.google.com/file/d/1q_uwhIGqNJuYLgIAu9hOjciZ6q2RsNIc/view?usp=sharing
- https://fdp-si.aicte-india.org/UHVII.php

MOOC Courses links :

- 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/

24-ELC-CS-2-01: Community Engagement Project / Field Project

Teaching Scheme: **Practical:** 4 Hours/Week	**Credit:** 02	**Examination Scheme:** **TW**: 25 Marks **OR:** 25 Marks

Prerequisites Courses: (24-CCC-1-05) Co-curricular Course -II, (24-VSC-1-01) Techskill, (24-AEC-1-01) Professional Communication Skills

Companion Course: (24-AEC-2-01) Basic Communication Skills.

Course Objectives:

- To develop an appreciation of rural culture, lifestyle, and wisdom amongst students.
- To learn about the status of various agricultural and development programmes.
- To understand the causes for distress and poverty faced by vulnerable households and explore solutions for the same.
- To apply classroom knowledge of courses to field realities and thereby improve the quality of learning.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
1	Gain an understanding of rural life, Indian culture & ethos, and social realities	2
2	Develop a sense of empathy and bonds of mutuality with the local community	3
3	Appreciate the significant contributions of local communities to Indian society and economy	2
4	Learn to value the local knowledge and wisdom of the community	2
5	Identify opportunities for contributing to the community's socio-economic improvements	2

Course Contents

Preamble

The Community Engagement Project/Field Project subject involves activities that will expose students to socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems.

Assessment

The course requires students to participate in any **TWO** field-based learning/projects as listed below under the supervision of faculty. This will help educate local communities about new technological innovations as well as make students aware of ways to harness local technology and knowledge. In this approach, students apply their knowledge and skills in a chosen community to improve the lives of people in that community. The activities may also be conducted other of working hours.

Recommended field-based activities (Tentative):

1. Interaction with Self Help Groups (SHGs) women members, and study of their functions and challenges; planning for their skill building and livelihood activities

2. Visit the Mahatma Gandhi National Rural Employment Guarantee Act 2005 (MGNREGS) project sites, interact with beneficiaries, and interview functionaries at the work site
3. Field visit to Swachh Bharat project sites, conduct analysis, and initiate problem-solving measures
4. Conduct Mission Antyodaya surveys to support under Gram Panchayat Development Plan (GPDP)
5. Interactive community exercise with local leaders, panchayat functionaries, grass-root officials, and local institutions regarding village development plan preparation and resource mobilization
6. Visit Rural Schools / mid-day meal centres, study academic and infrastructural resources and gaps
7. Participate in Gram Sabha meetings, and study community participation
8. Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries
9. Visit to local Nagarpalika office and review schemes for urban informal workers and migrants
10. Attend Parent Teacher Association meetings, and interview school dropouts
11. Visit the local Anganwadi Centre and observe the services being provided
12. Visit local NGOs, civil society organisations, and interact with their staff and beneficiaries,
13. Organize awareness programmes, health camps, Disability camps, and cleanliness camps
14. Aware / conduct soil health tests, drinking water analysis, energy use and fuel efficiency surveys and guide solar powered village
15. Raise understanding of people's impacts of climate change, building up community's disaster preparedness
16. Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers and promotion of traditional species of crops and plants
17. Formation of committees for common property resource management, village pond maintenance and fishing
18. Identifying small business ideas for rural areas to make the people self-reliant.
19. Undertaking research projects in partnership with the local community through community-based research methods
20. Social innovation projects with a social impact
21. Financial Literacy Awareness Programme
22. Digital Literacy Awareness Programme
23. Education Loan Awareness Programme
24. Entrepreneurship Awareness Programme
25. Awareness Programmes on Government Schemes
26. Products Market Awareness
27. Services Market Awareness
28. Consumer Awareness Programme
29. Accounting Awareness Programme for Farmers
30. Accounting Awareness Programme for Street Vendors etc.
31. Nutrition survey for mothers and children, and educate them about hygiene and nutrition.

Students must conduct comprehensive studies on various challenges that they face in their chosen field. Every work relevant to the subject matter should be compiled and documented.

Students should keep a separate fieldwork diary or maintain a journal to record their fieldwork experiences, i.e. reading, e-contents, tasks, planning, and work hours have to be recorded in the diary. Detailed work records report on students' fieldwork experiences and activities to be submitted and should be presented.

Every student shall submit a report in the form of a journal that may include, but not be limited to, the following.

1. A map (physical, visual, or digital) of the village you visited, and write an essay about inter-family relations in that village/community.
2. Videos and/or Geo-tagged photographs of events/activities conducted
3. Describe your analysis of the rural household economy, its challenges, and possible pathways to address them

4. How effectively are institutions functioning? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual).
5. Describe the benefits received and challenges faced in the delivery of one of these programmes in the local community; give suggestions about improving the implementation of the programme for the community.

Guidelines for Students

Students must submit an assignment in the form of a journal. Faculty in charge will monitor and assess continuously, with grade or mark each project on the completion date declared for each of them. Assessments of students shall include a review of their involvement and contributions to community engagement. It shall also include the presentation of project findings as documented in the journal.

SEM IV

24-PCC-CS-2-05: Database Management System

Teaching Scheme: Theory: 3 Hours/Week	**Credit:** 03	**Examination Scheme:** **CIE**: 20 Marks **MSE:** 20 Marks **SEE**: 60 Marks

Prerequisites Courses: (24-PCC-CS-2-01) Discrete Mathematics, (24-PCC-CS-2-02) Data Structures & Algorithms

Companion Course: (24-PCC-CS-2-07) Database Management System Lab

Course Objectives:

- To understand the fundamental concepts of Database Management Systems
- To acquire knowledge of database query languages and query processing
- To acquire the knowledge of transaction processing
- To understand systematic database design approaches
- To be familiar with NoSQL database concepts

Course Outcomes:

After completion of the course, learners should be able to

CONo	Course Outcomes (CO)	BL
CO1	**Design** a comprehensive Entity-Relationship (ER) diagram for real-life application	3
CO2	**Normalize** the database design using normal forms	3
CO3	**Implement** various database queries using MySQL	3
CO4	**Apply** transaction management concepts in real-time situations	3
CO5	**Use** NoSQL databases for processing unstructured data	3

Course Contents

Unit I	Introduction to Database Management Systems	7 Hours

Introduction, Applications, Need, Views of data, Data Independence, Instances and Schema, Database Language, Database System Structure, Data Models, **Entity Relationship (ER) Model:** Entity, Attributes, Relationships, Cardinalities, Keys, Extended E-R (EER) Features, Converting ER and EER Diagrams into Tables.

#Exemplar/Case Studies: Design a database using the ER Model for suitable application and convert it into tables.

*Mapping of Course Outcomes	CO1

Unit II	Relational Database Design	8 Hours

Relational Model: Basic Concepts, Attributes and Domains. **Integrity Constraints:** Entity, Domain, Referential, Enterprise. **Database Design:** Anomalies, **Normalization:** Functional Dependencies (FD), FD Closure, Attribute Closure, **Decomposition**:

Lossy, Lossless Join, and dependency preservation, **Normal Forms:** 1NF, 2NF, 3NF, BCNF.		
#Exemplar/Case Studies	Normalize the relational database designed in Unit I.	
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Structured Query Language (SQL)**	
Relational Algebra: Overview, Basic Operators, Extended Operators, **SQL:** Characteristics, Advantages, Data Types, and Literals, SQL Languages: **DDL: Tables:** Create, Delete, Alter, truncate, drop, **DML:** Insert, Delete, Update, Select Query and Clauses (Where, Group By, Having and Order By), Null Values, SQL Operators, Index, and Sequence. **Views:** Create, Drop, Update, **DCL:** Grant and Revoke, **TCL:** Commit, Rollback, and Savepoint.		
#Exemplar/Case Studies Implementation of Unit 2 Case Study using SQL Statements (DDL, DML)		
***Mapping of Course Outcomes**	**CO3**	
Unit IV	**Procedural Language SQL (PLSQL)**	
Introduction, Flow Control Statements: LOOP, While, Conditional Statements: IF, IF-ELSE-THEN, SWITCH CASE, Stored Procedures, Functions, Cursors, Triggers, Assertions, Embedded SQL, Dynamic SQL, Query Processing		
#Exemplar/Case Studies Demonstrate Embedded SQL using known Host Languages or Applications.		
***Mapping of Course Outcomes**	**CO3**	
Unit V	**Transaction Management**	**8 Hours**
Introduction, States, ACID properties, **Schedule**: Concept, Serial and Concurrent, **Serializability:** Conflict and View, **Concurrency Control:** Lock-based, Time-stamp-based, **Deadlock:** Detection, Prevention and recovery, Transaction, **Recovery methods:** Shadow-Paging, Log-Based Recovery, Checkpoints.		
#Exemplar/Case Studies: Role of transaction management in financial transaction apps to maintain data consistency, atomicity, and concurrency control (e.g. leading apps: Phonepe, Gpay but not limited to)		
***Mapping of Course Outcomes**	**CO4**	
Unit VI	**NoSQL Databases**	**7 Hours**
Types of Data: Structured, Unstructured, and Semi-Structured, **NoSQL Database:** Introduction, Need, Types (Key-value store, document store, graph, column stores), CAP Theorem, BASE Properties, **MongoDB (with syntax and usage):** CRUD Operations, Indexing, Aggregation, Introduction to Big Data, **Hadoop:** Basics, Components (HDFS, Map-Reduce), Introduction to Vector Databases.		
#Exemplar/Case Studies: Use of NoSQL databases for processing unstructured data from social media.		
***Mapping of Course Outcomes**	**CO5**	
Learning Resources		
Text Books		

T1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
T2. Acharya Seema, "Demystifying NoSQL", First Edition, New Delhi Wiley India 2020, ISBN: 978-81-265-7996-9.

Reference Books :

R1. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719
R2: Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill International Editions, ISBN 978-0072465631.
R3. MAHESHWARI SHARAD, "INTRODUCTION TO SQL AND PL/SQL", Firewall Media; 2009

Additional Resources: (Books, e-Resources)

1. SQL and Relational Theory (How to Write Accurate SQL code), C.J. Date, O'Reilly Publication
2. SQL A Beginner's Guide, Andy Oppel, Robert Sheldon, McGraw Hill Publication
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.mongodb.com/resources/basics/databases/nosql-explained

MOOC Courses links :

- https://onlinecourses.nptel.ac.in/noc24_cs21/preview
- https://onlinecourses.nptel.ac.in/noc25_cs40/preview

24-PCC-CS-2-06: Design and Analysis of Algorithm

Teaching Scheme: Theory: 3 Hours/Week	**Credit:** 3	**Examination Scheme:** **CIE** : 20 Marks **MSE :** 20 Marks **SEE** : 60 Marks

Prerequisites Courses: (24-PCC-CS-2-01) Discrete Mathematics, (24-PCC-CS-2-02) Data Structures & Algorithms.

Companion Course: --

Course Objectives:

- To understand the fundamentals of algorithm design and analysis
- To provide insights into complexity theory
- To analyze performance of different algorithmic strategies in terms of time and space.
- To Explore modern trends in advanced topics in algorithm design
- To Apply algorithmic techniques to real-world problems

Course Outcomes:

After completion of the course, learners should be able to

CO No	**CO**	**BL**
CO1	**Apply** algorithmic strategies to solve given problem	3
CO2	**Analyze** the asymptotic performance of algorithms	4
CO3	**Analyze** various methods to determine optimal solutions	4
CO4	**Apply** scheduling, sorting, and optimization algorithms	3
CO5	**Explore** advanced algorithmic concepts	2

Course Contents

Unit I	**Algorithm design and analysis**	**8 Hours**

Introduction of Algorithm, Characteristics of Algorithm and Types of Algorithms, Classification of Time Complexities (Linear, Logarithmic, etc.), Asymptotic Notations: Big O, Big Θ, Big Ω. Lower Bound and Upper Bound Analysis: Best Case, Worst Case, Average Case. Performance Analysis: Basic Programming Constructs- Time and Space Complexity. Amortized Analysis

#Exemplar/Case Studies: Analysis of iterative and recursive algorithm

***Mapping of Course Outcomes**	CO1

Unit II	**Complexity Theory and Divide & Conquer Strategies**	**8 Hours**

Complexity Classes: Tractable and Intractable problems , Polynomial and non-polynomial problems, deterministic and

non-deterministic algorithms, P-class problems, NP-class of problems,NP Complete Problems, NP- Hard Problems. **Divide and Conquer :** General method for Divide and Conquer, Applications of Divide and Conquer: Merge Sort, Binary Search, Analysis of Divide and Conquer algorithms		
#Exemplar/Case Studies: Implementing Merge Sort for sorting large datasets of historical stock prices, and using Binary Search to quickly locate specific data points. This helps with both efficient data handling and decision-making.		
***Mapping of Course Outcomes**	CO1, CO2, CO3, CO4	
Unit III	**Greedy algorithms**	**7 Hours**
Greedy strategy: Principle, control abstraction, time analysis of control abstraction, knapsack problem, scheduling algorithms-Job scheduling and single source shortest path		
#Exemplar/Case Studies: Use the Job Scheduling problem, a greedy algorithm technique, to assign time slots to workshops, ensuring maximum utilization of available time without conflicts. The system also minimizes the total idle time.		
***Mapping of Course Outcomes**	CO1, CO3, CO4	
Unit IV	**Dynamic Programming**	**7 Hours**
Dynamic Programming: Principle, control abstraction, time analysis of control abstraction, OBST, 0/1 knapsack, Chain Matrix multiplication, Traveling Salesperson Problem.		
#Exemplar/Case Studies: Apply Dynamic Programming to solve the Matrix Chain Multiplication problem, optimizing the transportation route between warehouses. Additionally, the Knapsack problem can be used for inventory management in logistics, maximizing profit within limited resources.		
***Mapping of Course Outcomes**	CO1, CO3, CO4	
Unit V	**Backtracking and Branch-n-Bound algorithm**	**8 Hours**
Backtracking: Principle, control abstraction, time analysis of control abstraction, n-queen problem, graph coloring problem, sum of subsets problem, Analysis of Backtracking algorithms, **Branch-and-Bound:** Principle, control abstraction, time analysis of control abstraction, strategies- FIFO, LIFO and LC approaches, knapsack problem.		
#Exemplar/Case Studies: Solving Sudoku Puzzles Using Backtracking Algorithms		
***Mapping of Course Outcomes**	CO1, CO3	
Unit VI	**Advanced Algorithms**	**7 Hours**
Concepts and Use Cases:Approximation Algorithms, Randomized Algorithms, Parallel Algorithms, Distributed Algorithms.		
#Exemplar/Case Studies: (Any one) **1. Parallel Algorithms:** Use (OpenMP directives Preferably) to parallelize the loops and optimize memory access patterns. **2. Distributed Algorithms:** Use (C++/Java/Python) sockets to establish connections between peers and transfer files.		
***Mapping of Course Outcomes**	**CO6**	
Learning Resources		

Text Books

T1. Parag Himanshu Dave, Himanshu Bhalchandra Dave, " Design And Analysis of Algorithms",Pearson Education, ISBN 81-7758-595-9.
T2. Gilles Brassard, Paul Bratley, "Fundamentals of Algorithmics", PHI, ISBN 978-81-203-1131-2.

Reference Books :

R1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, " Introduction to Algorithms", MIT Press; ISBN 978-0-262-03384-8.
R2. Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978817371 6126, 81 7371 61262.
R3. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms" Cambridge University Press, ISBN: 978-0-521-61390-3.
R4. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press,ISBN:0-521-67035-7.

Additional Resources: (Books, e-Resources)

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf
2. https://www.ebooks.com/en-in/book/1679384/algorithms-design-techniques-and-analysis/m-h-alsuwaiyel

MOOC Courses links :

- Design and Analysis of Algorithms: https://onlinecourses.nptel.ac.in/noc19_cs47/preview

24-PCC-CS-2-07: Database Management Systems Laboratory

Teaching Scheme: Practical: 4 Hours/Week	**Credit:** 2	**Examination Scheme:** **Termwork (TW)**: 50 Marks **Practical (PR)**: 50 Marks

Prerequisites Courses: (24-PCC-CS-2-01) Discrete Mathematics, (24-PCC-CS-2-02) Data Structures & Algorithms.

Companion Course: (24-PCC-CS-2-05) Database Management System.

Course Objectives:

- To develop Database programming skills
- To create basic Database administration skills
- To develop skills to handle NoSQL database
- To learn, understand, and execute the process of software application development

Course Outcomes:

After completion of the course, learners should be able to

CO No	Course Outcome (CO)	BL
CO1	**Design** database schemas in an appropriate normal form, considering the functional and non-functional requirements.	3
CO2	**Construct** complex SQL queries to retrieve, manipulate, and analyze data from relational databases.	3
CO3	**Develop** PL/SQL code blocks for a specific application.	3
CO4	**Implement** NoSQL queries using MongoDB.	3
CO5	**Develop** an application by selecting an appropriate front-end technology and integrating it with MySQL/MongoDB for data management and storage.	3

Guidelines for Instructor's Manual

The instructor's manual will be developed as a reference and hands-on resource. It should include a prologue (about the University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.
Note: The instructor will formulate the problem statements for Assignments 5, 6, 7, and 8 of Group A, ensuring they align with the respective assignment titles.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate, table of contents, and write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, conclusion/analysis. Program codes with sample output of all performed assignments will be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environmental awareness, attaching printed papers as part of write-ups and program listing to journals must be avoided. For reference one or two journals may be maintained with program prints in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Practical Examination

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

Note:

• Practical examination will be on assignments given above in Group A and Group B only.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility, and recent trends related to the topic. The assignment framing policy needs to address the average students and be inclusive of an element to attract and promote intelligent students. The use of open-source software is encouraged. Based on the concepts learned. The instructor may also set one assignment or mini-project.

Programming tools recommended: - MYSQL, MongoDB.

Virtual Laboratory: (If Any):

- http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/labs/index.php

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	**SQL Queries: To perform DDL commands** Design and Develop SQL DDL(Data Definition Language) statements like Create, Alter, truncate, and drop that demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym, and different constraints.	CO2
2.	**SQL Queries: To perform DML commands** a. Design and Develop SQL DML(Data Manipulation Language) queries on a suitable database application that demonstrate the use of SQL concepts like Insert, Select, Update, and Delete with operators, functions, set operators, Aggregate function, and Group by- Having clauses on the database. b. Perform different SQL Select operations on suitable datasets available on the server.	CO2
3.	**SQL Queries: To perform DCL, TCL commands** a. Design and Develop SQL DCL(Data Control Language) queries on the suitable database application that demonstrate the use of SQL concepts: Grant, Revoke, Roles b. Design and Develop SQL TCL(Transaction Control Language) queries on the suitable database	CO2

	application that demonstrate the use of SQL concepts: Commit, Rollback, Savepoint	
4.	**SQL Queries: To perform SQL Joins** To perform different SQL Join operations on databases such as natural, inner, and outer joins.	CO2
5.	**Named PL/SQL Block:** Write PL/SQL block which will use **Stored Procedure**	CO3
6.	**Named PL/SQL Block:** Write PL/SQL block which will use **Stored Function**	CO3
7.	**Cursors:** Write a PL SQL Block which should use a Cursor.	CO3
8.	**Database Trigger:** Write a PL SQL Block for Triggers.	CO3
9.	**Database Connectivity:** Write a program to implement MySQL/Oracle database connectivity with any front-end language to implement Database navigation operations (add, delete, edit, etc.)	CO1, CO2, CO5
Group B: Assignments		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	**MongoDB Queries:** Write MongoDB Queries using CRUD operations.	CO4
2.	**Database Connectivity:** Write a program to implement MongoDB database connectivity with suitable front-end language to implement Database navigation operations (add, delete, edit, etc.)	CO1,CO4, CO5
Group C: Assignments		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	**Using the database concepts covered in Group A and Group B, develop an application with the following details:** Develop application considering: • Front End: Java/PHP/Python any other language • Backend: MongoDB/ MySQL The student should develop an application in groups of 3-4 students and submit the Project Report which will consist of • Title of the Project, Abstract, Introduction • Software Requirement Specification • Conceptual Design using ER features, Relational Model in appropriate Normalize form • Graphical User Interface, Source Code • Testing document • Conclusion.	CO1, CO2,CO4, CO5

Learning Resources (If applicable)
Text Books
T1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition**.**
Reference Books :
R1. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719 **R2.** Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill International Editions, ISBN 978-0072465631
Additional Resources: (Books, e-Resources) ● e-Books: 1. SQL and Relational Theory a. (How to Write Accurate SQL code), C.J. Date, O'Reilly Publication ● SQL A Beginner's Guide, Andy Oppel, Robert Sheldon, McGraw Hill Publication
MOOC Courses links : ● https://onlinecourses.nptel.ac.in/noc24_cs21/preview ● https://onlinecourses.nptel.ac.in/noc25_cs40/preview

24-EEM-2-02: Entrepreneurship Development

Teaching Scheme: Theory: 1 Hours/Week Practical: 2 Hours/Week	**Credit:** 02	**Examination Scheme:** **Term work (TW):** 50 Marks

Prerequisite Course: 24-EEM-2-01-Engineering Economics

Companion Courses: 24-OEC-1-4-03: Financial Accounting & Management, 24-OEC-2-4-03 Business Development, Marketing and Finance

Course Objectives:

- To equip students with the foundational knowledge of entrepreneurship
- To develop skills for identifying potential market opportunities and generating innovative ideas
- To equip students with the knowledge needed to create a viable business plan.
- To enable students to translate a business model to a startup by understanding market research, marketing, and navigating the legal aspects of entrepreneurship.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
1	Understand foundational concepts of entrepreneurship and traits of successful entrepreneurs.	2
2	Identify market gaps and assess feasibility of business ideas.	4
3	Apply Business Model Canvas framework.	3
4	Apply business models to actionable startup plans by leveraging market intelligence and navigating the relevant legal frameworks for their ventures.	3

Guidelines for Student's Termwork

The termwork assignments will be submitted as presentations/PDFs by students via Google Classroom.

Guidelines for Term Work Assessment

Continuous assessment ofterm work should be based on the overall performance of assignments by a student. Each assignment assessment will assign grades/marks based on parameters, such as timely completion, performance, innovation, presentation skills, and punctuality.

Guidelines for Laboratory Conduction

Students are expected to select one assignment each week, do a thorough case study and prepare a presentation on it. He/She has to present it during lab hours within 6-10 minutes. The instructor is expected to assign Assignment 'a' to half batch and 'b' to the remaining half batch and conduct presentations in two separate practical sessions. The instructor is expected to create as much variety he/she can so that students get equipped with a vast entrepreneurial environment in a short span.

Suggested List of Laboratory Experiments/Assignments		
Group A: Assignments (Mandatory Assignment)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	a. Journey of Entrepreneurship through E-Cell/ Incubation Centre Support b. Disruptive Technological Innovation (Amazon, RedBus, etc..)	CO1
2.	a. Successful businesses that solved market gaps (e.g., Uber, Airbnb, Oyo, etc...) b. Feasibility of an outlet (cafe, retail store, etc.. in institute campus) justifying whether or not it should be launched	CO2
3.	a. Market Analysis of a Product b. Social Media Commercial (present in the form of a self-made video)	CO4
4.	a. Develop a Business Plan for an existing Company b. Develop a Business Plan for an innovative idea*	CO3
5.	a. Startups Raising Investor Funds b. Govt. Schemes	CO4
Group B: Assignments (Out of List; perform any 1)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	An advertisement pamphlet using tools like Canva, etc.. for any new idea with a novel logo, company name, etc...	CO4
2.	Build a website using Google Sites or any other no-code tool for any new idea and integrate forms to collect email/name/phone of potential customers	CO4
Group C: Assignments		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	a. Registering your first startup and generating Udyog Aadhar or b. Case Study Report on Shark Tank Pitches	CO4
Learning Resources (If applicable)		
Text Books		
T1. Paul Swamidass, Engineering Entrepreneurship from Idea to Business Plan, Cambridge		

Reference Books :

R1. Charantimath Poornima, Entrepreneurship Development and Small Business Enterprises, Pearson Education, 2014
R2. Vangundy Arthur, Getting To Innovation - How Asking The Right Questions Generates The Great Ideas Your Company Needs, Prentice - Hall Of India Private Limited, 2008
R3. Dorf Richard, Technology Ventures - From Idea To Enterprise, Mcgraw - Hill, 2005
R4. Nandan H, Fundamentals of Entrepreneurship, PHI Learning Pvt Ltd, 2018

Additional Resources: (Books, e-Resources)

- "Jugaad Innovation: A Frugal and Flexible Approach to Innovation for the 21st Century" by Navi Radjou, Jaideep Prabhu, and Simone Ahuja
- Shirk Martha, How To Become Your Own Boss - Eleven Women Who Escaped Poverty By Their Entrepreneurship, Viva Books Private Ltd, 2007
- National Innovation & Startup Policy (2019)

MOOC Courses links :

- Link to AICTE Evaluated Entrepreneurship Awareness Program: 16-Days Professional Certification by Turnip Innovations https://www.turnip.co.in/entrepreneurship-course/index.html
- Link to NPTEL course contents: Entrepreneurship https://nptel.ac.in/courses/110106141
- Link to NPTEL course contents: Entrepreneurship Development https://onlinecourses.swayam2.ac.in/cec20_mg19/preview

24-VSEC-CS-2-01: Application Development Programming I

Teaching Scheme:	**Credit:** 02	**Examination Scheme:**
Practical: 04 Hours/Week		TW: 25 Marks PR: 50 Marks

Prerequisites Courses: 24-ESC-1-02: Programming and Problem Solving

Companion Course: NA

Course Objectives:

- Develop the ability to analyze and evaluate different websites based on their purpose, usability, and design elements
- learn to create structured multi-page websites using HTML, incorporating various elements such as text, images, audio, video, and links.
- Gain proficiency in designing login and registration forms with multiple input types using HTML.
- Explore and implement different types of CSS (internal, external, and inline) to enhance the appearance and usability of web pages.
- Design interactive and dynamic web content using Canvas and SVG for graphical elements.
- Learn to incorporate HTML plugins for Flash movies, maps, virus scanning, bank ID verification, and design responsive layouts using Bootstrap and GUI prototyping with Figma.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO 1	Analyze and evaluate websites based on usability, design, and functionality.	3
CO 2	Create multi-page, fully functional websites using HyperText Markup Language (HTML) with various multimedia elements.	3
CO 3	Design and implement login and registration forms with appropriate input types for user authentication.	3
CO 4	Apply Cascaded Style Sheets (CSS) to enhance web design aesthetics and usability.	3
CO 5	Create interactive graphics and animations using Canvas and Scalable Vector Graphics (SVG) in HTML5.	3
CO 6	Design responsive web pages with Bootstrap and integrate essential plugins for enhanced functionality.	3

Guidelines for Instructor's Manual

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

Guidelines for Students' Laboratory Journal

The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, Test Data Set(if applicable), mathematical model (if applicable), conclusion/analysis. Program codes with sample output of all performed assignments will be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environmental awareness, attaching printed papers as part of write-ups and program listings to journals must be avoided. Google Drive / Google

Classroom containing student programs maintained by the laboratory in charge are highly encouraged. For reference, one or two students lab manuals may be kept with program prints in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on the student's overall laboratory assignment performance. Each Laboratory assignment assessment will assign grades/marks based on parameters, such as timely completion, performance, innovation, efficient codes, and punctuality.

Guidelines for Practical Examination

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

Guidelines for Laboratory Conduction

Tools and Technologies (commonly used in labs)

- **Development Tools:** VS Code, Browser Developer Tools.
- **Languages and Frameworks:** HTML5, CSS3.

The practicals can be adapted based on the specific syllabus and focus areas of the course, and you may find that some programs will have a particular emphasis on certain programming paradigms, frameworks, or platforms.

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Case study: Before coding the website, planning is important, students should visit different websites (Min. 5) and note down the evaluation results for these websites, either good or bad, by considering the following parameters. a. Purpose of Website b. Things liked on the website c. Things disliked on the website d. Overall evaluation of the website (Good/Bad)	CO1
2.	Create a multi-page website using Hyper Text Markup Language (HTML). Include headings, paragraphs, lists, tables, images, audio, video, and hyperlinks.	CO2
3	Create a Login Form using Hyper Text Markup Language (HTML).	CO3
3.	Design a user registration form with input fields like text, radio, checkbox, dropdown, and submit button.	CO3
4.	Use internal, external, and inline Cascaded Style Sheet (CSS) in the Registration form designed in assignment No. 2.	CO4

5.	Design a Web site using Canvas and Scalable Vector Graphics (SVG) features of HyperText Markup Language (HTML5).	CO5
6.	Use different Hyper Text Markup Language (HTML) plugins - 1. To display Flash movies 2. To display maps 3. To scan for viruses 4. To verify a bank ID	CO5
7.	Design a responsive web page using Bootstrap	CO6
8.	Design a webpage GUI using Figma	CO6
Group B: Mini Project>>		
Sr No	**Assignment Title**	
1	Create / Develop any website using the above techniques.	CO6
Learning Resources (If applicable)		
Text Books		
T1. "HTML & CSS: Design and Build Websites" by Jon Duckett **T2. "JavaScript and JQuery: Interactive Front-End Web Development" by Jon Duckett** **T3. "PHP & MySQL: Server-side Web Development" by Jon Duckett**		
Reference Books :		
R1. "Web Development with HTML, CSS, JavaScript and jQuery" by Robin Nixon **R2. "Bootstrap 5 by Example" by Silvio Moreto**		
Additional Resources: (Books, e-Resources) ● **www.W3Schools.com:** This website offers tutorials and references for various web technologies.		

24-VEC-2-02: Digital and Technological Solutions

Teaching Scheme: Lecture: 1 Hour/Week Practical: 2 Hours/Week	**Credit:** 2	**Examination Scheme:** Termwork **(TW)**: 25 Marks

Prerequisite Courses: -

Course Description:

Digital Technological Solutions is a comprehensive course designed to equip students with essential skills and knowledge for navigating and contributing to the digital landscape. This course covers a broad spectrum of contemporary topics, and application software by examining critical tools and platforms used in modern workplaces, including productivity software, project management tools, and cloud-based applications.

A significant portion is dedicated to Digital India and e-Governance, where students explore India's initiatives to leverage digital technology for inclusive growth and improved governance. Through case studies and practical examples, they learn how digital transformation impacts citizens, businesses, and government functions.

The course also delves into Cybersecurity, a critical area as digital threats increase in frequency and complexity.

With a blend of theoretical knowledge and hands-on projects, students gain the ability to develop and implement digital solutions that align with current technological and economic trends, preparing them for roles in various tech-driven sectors

Course Objectives:

The objective of the **Digital Technological Solutions** course is to provide students with a foundational understanding and practical skills to thrive in a digital-first world. By the end of this course, students will be able to:

1. **Proficiency in Application Software**: Gain hands-on experience with key application software tools essential for productivity, collaboration, and management in digital workplaces.
2. **Understand Digital Transformation**: Grasp the significance of Digital India and e-Governance initiatives, recognizing how digitalization can enhance governance, inclusivity, and socio-economic growth in India and beyond.
3. **Enhance Cybersecurity Awareness**: Develop a solid understanding of cybersecurity principles, enabling students to identify potential threats, implement security measures, and contribute to safer digital ecosystems.
4. **Develop Digital Solutions**: Equip students with the knowledge and skills to design, implement, and manage digital solutions that address real-world challenges across sectors.

The course aims to empower students with a versatile skill set, preparing them for dynamic roles in the digital and technological domains.

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

CONo	**CO**	**BL**
CO1	Utilize workspace tools (Forms, Docs, Slides, and Sheets) to plan, organize, analyze data, and present information professionally while demonstrating critical thinking and problem-solving skills.	3

CO2	Develop impactful digital content, effectively use e-governance platforms, and perform secure financial transactions.	3
CO3	Apply cybersecurity principles to protect information and digital systems from threats and vulnerabilities.	3
CO4	Design and implement digital solutions for real-world challenges, demonstrating the ability to leverage technology for process optimization and improved outcomes.	3

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include a prologue (about the University/Program/ Institute/ Department/ Foreword/ Preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/guidelines, and references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software / Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm (if applicable), flowchart, test cases (if applicable), Test Data Set(if applicable), mathematical model (if applicable), conclusion/analysis). Attaching printed papers as part of writeups must be avoided. For reference, one or two journals may be maintained with program prints in the laboratory.

Guidelines for Laboratory/Term Work Assessment

Continuous assessment of laboratory work should be based on the overall performance of laboratory assignments by a student. Evaluate assignments based on timeliness, creativity, technical accuracy, and professionalism, maintaining transparency and fairness.

Guidelines for Laboratory Conduction

Familiarize yourself with the syllabus, lab guidelines, and necessary tools. Prepare the lab environment with the required software and hardware. Communicate the objectives, deliverables, and timeline for each practical. Ensure students understand the mapping between assignments and course outcomes. Encourage hands-on practice, collaboration, and innovative problem-solving.

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Scenario: You are a project manager for a school event. Your task is to plan and organize the event using Workspace tools.

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Create a **Form (Google/ Microsoft Form/Zoho Forms/ JotForm etc.)** to survey students' preferences for the event theme, date, and activities. Include various question types (multiple-choice, short-answer, etc.) to gather diverse information. Customize the form's appearance with a relevant theme and clear instructions. Share the form with students through email or a class website.	CO1
2.	Create a **spreadsheet** (**Google Sheets/Excel/Zoho Sheet)** to analyze the survey responses. Use five functions like COUNT, SUM, AVERAGE, and SORT to summarize the data. Visualize the data using charts and graphs to identify trends and	CO1

	preferences.	
3.	Create a **Document (Google Docs/ Microsoft Docs Online/Zoho Docs)**to outline the event schedule, including timings, activities, and responsibilities. Share the document with team members and collaborate on the schedule. Use formatting tools (headings, bullet points, etc.) to organize the information.	CO1
4.	Design a presentation (**Google Slides/ Canva/Prezi/Figma)** to showcase the event plan to the school community. Use slides to highlight key information, such as the event theme, date, time, activities, and expected outcomes. Incorporate images, videos, and animations to enhance the presentation's visual appeal. Practice the presentation to ensure smooth delivery.	CO1
Group B: Assignments (Out of List perform any 2)		
Sr No	**Assignment Title**	**Mapping of Course Outcomes**
1.	**Digital India and E-Governance Initiatives and Infrastructure** Create a Report on any five major Digital India Initiatives (Aple Sarkar, Digital Locker/APAAR, National Academic Depository (NAD), NPTEL/SkillIndia/National Career Service) * , etc. and register on any learning and assessment portal mentioned above and earn certification ***Note: Digital India Initiative names will be declared as per availability of the initiatives available in that particular year for the semester**	CO2, CO4
2.	**Basics of E-Commerce and Digital Marketing** Create one LinkedIn-specific post promoting an aspect of your institute (e.g., academic excellence, alumni success stories, or collaborations). Write compelling ad captions for the post. Research and suggest 10 relevant and trending hashtags to maximize reach.	CO4
3.	**Digital Financial Tools and Applications** Create a tutorial video / a comparison table, or an infographic explaining any 5 digital tools and applications. Simulate or demonstrate a simple transaction using a dummy banking app using any of the studied tools and applications	CO2,CO4,CO5
Group C: Assignments (Out of List perform any 2)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Analyze Your Digital Footprint for online privacy and security by performing the audit of privacy settings on Facebook, Instagram, or LinkedIn: profile visibility, post/story visibility, location sharing, and linked accounts.	CO3,CO4
2.	Use online tools such as WHOis Lookup, GoPhish, or similar platforms to verify the authenticity of any website.	CO3
3.	Prepare a report or presentation on the concept of Cybercrime, its classification, and provide a detailed analysis of any one type of cybercrime, including its working, real-world examples, and preventive measures.	CO3

Learning Resources (If applicable)
Text Books
T1 Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer forensics and legal Perspectives", Wiley
Reference Books:
R1 Joel Elad, "LinkedIn For Dummies", OReilly, 5th Edition **R2** Dr. Nilakshi Jain, Dr Dhananjay R. Kalbande, "Digital Forensic", Wiley
Additional Resources: (Books, e-Resources) ● **GDrive:** https://support.google.com/a/users/answer/9389764?hl=en ● **Digital India Initiatives:** https://www.digitalindia.gov.in/about-us/ ● **Skill India :** https://www.skillindiadigital.gov.in/home ● **NPTEL:** https://onlinecourses.nptel.ac.in/ ● **National Career Service:** https://www.ncs.gov.in/Pages/default.aspx#main ● **WHOis Lookup:** https://who.is/ ● **GoPhish:** https://getgophish.com
MOOC Courses links: ● Digital Skilling: https://elearn.nptel.ac.in/shop/nptel/digital-skilling

Mid Semester Examination (MSE: March 2025)

Programme: AIDS/Civil/Computer/E&TC/Mechanical/MBA-I	
Class	**Pattern:**
Course Name:	**Course Code:**
AY:	**Semester:**
Time:	**Maximum Marks:** 20

Instructions to the candidates:

1. *Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6*
2. *Bold-faced figures to the right indicate full marks.*
3. *Assume the suitable data if necessary*
4. *Any other instruction required for particular course may be added by subject/course chairman*

QN	Question	Mark
1a)	Q 1 can be bifurcated to maximum two sub questions	07
1b)		
	OR	
2	Q 2 can be bifurcated to maximum two sub questions	07
3	Q 3 can be bifurcated to maximum two sub questions	07
	OR	
4	Q 4 can be bifurcated to maximum two sub questions	07
5	Q 5 can be bifurcated to maximum two sub questions	06
	OR	
6	Q 6 can be bifurcated to maximum two sub questions	06

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Semester End Examination (Regular) <<Month Year>>

Programme: Class:

Course and Code: Semester

Academic Year: Pattern:

Time: 2Hr 30 Min Examination: SEE (Month Year) Max. Marks: 60

Instructions to the candidates:

1. *Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8*
2. *Bold-faced figures to the right indicate full marks.*
3. *Assume the suitable data if necessary, but Justify it.*
4. *Draw the neat labelled diagrams, wherever necessary.*

QN	Question	Marks
1 a)	Unit I	6
1 b)	Unit II	7
1 c)	Unit III	7
	OR	
2 a)	Unit I	6
2 b)	Unit II	7
2 c)	Unit III	7
3 a)	Unit IV	7
3 b)	Unit IV	7
	OR	
4 a)	Unit IV	7
4 b)	Unit IV	7
5 a)	Unit V	7
5 b)	Unit V	6
	OR	
6 a)	Unit V	7
6 b)	Unit V	6
7 a)	Unit VI	7
7 b)	Unit VI	6
	OR	
8 a)	Unit VI	7
8 b)	Unit VI	6

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Supporting Document

Sr. No.	Syllabus Contains	Short Answer	Yes / No	Page No. (In Syllabus)
1	अभ्यासक्रम	Enclosed in Syllabus	Yes	1
2	पात्रता	(As per the Rules and Regulations mentioned in MoM)	Yes	78
3	अभ्यासक्रमाची उद्दिष्टे	Enclosed in Syllabus	Yes	30
4	विषयाचे नाव	Enclosed in Syllabus	Yes	20
5	घटकांचा तपशील	Enclosed in Syllabus	Yes	20
6	तासिका	Enclosed in Syllabus	Yes	20
7	श्रेयांक पद्धत	Enclosed in Syllabus	Yes	20
8	संदर्भ साहित्य	Enclosed in Syllabus	Yes	31
9	संदर्भ ग्रंथ	Enclosed in Syllabus	Yes	31
10	प्रश्नपत्रिकेचे स्वरूप	Enclosed in Syllabus	Yes	76
11	अंतर्गत मूल्यमापनाचे स्वरूप	Enclosed in Syllabus	Yes	20
12	सत्र परीक्षेचे स्वरूप	Enclosed in Syllabus	Yes	77
13	गुणांकन	Enclosed in Syllabus	Yes	20