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

Curriculum and Evaluation Scheme for Second Year B. Tech. in Electronics & Telecommunication Engineering with Multidisciplinary Minor

To be implemented for 2024-28 Batch
(With Effect from Academic Year 2025-26)

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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 faculties and students for the welfare of society.

Vision of the Electronics & Telecommunication Engineering Department

To prepare Electronics & Telecommunication Engineers for the benefit of the society.

Mission of the Electronics & Telecommunication Engineering Department

1. To provide quality education to students
2. To enrich the skill in collaboration with industry for better career opportunity
3. To inculcate ethics, values and environment awareness

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 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

PSO1: Apply their skills in designing, implementing and testing electronic systems.

PSO2: Demonstrate proficiency in use of modern electronic design automation (EDA) tools.

PSO3: Communicate and work effectively as individuals and as team members.

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 **Electronics & Telecommunication Engineering** with Multidisciplinary minor degree is kept as **172.**

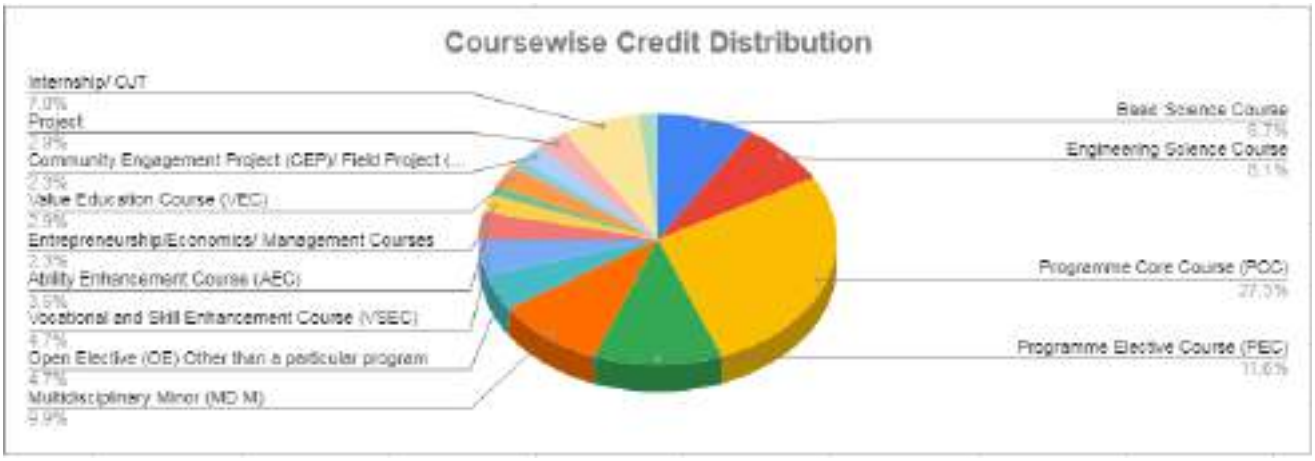
Table 3: Range of Credits

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 Electronics & Telecommunication 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 Electronics & Telecommunication Engineering are as follows:

Table 9: Honors

Sr No	Name of Honors Offered by Department
A.	VLSI Design
B.	Robotics

The detailed syllabus structure for the same is as follows:

Table 10A: Specialization Honors in VLSI Design

Sr. No	Category	SEM	Course Code	Course Name	Teaching Scheme				
					Hours				Credits
					L	T	P	Total Hours	
01	HOC	III	24-HOC-ET-2-01A	VLSI Technology	3	-	-	3	3
02	HOC	IV	24-HOC-ET-2-02A	VLSI Design Flow	3	-	-	3	3
03	HOC	V	24-HOC-ET-3-03A	VLSI Testing & Testability	3	-	-	3	3
04	HOC	VI	24-HOC-ET-3-04A	VLSI Interconnect	3	-	-	3	3
05	HOC	VII	24-HOC-ET-4-05A	Digital CMOS Design	3	-	-	3	3
06	HOC	VIII	24-HOC-ET-4-06A	Analog CMOS Design	3	-	-	3	3
Total					**18**	-	-	**18**	**18**

Table 10B: Specialization Honors in Robotics

Sr. No	Category	SEM	Course Code	Course Name	Teaching Scheme				
					Hours				Credits
					L	T	P	Total Hours	
01	HOC	III	24-HOC-ET-2-01B	Introduction to Robotics	3	-	-	3	3
02	HOC	IV	24-HOC-ET-2-02B	Fundamental of Power Electronics	3	-	-	3	3
03	HOC	V	24-HOC-ET-3-03B	Robotics: Basics and Selected Advanced Concepts	3	-	-	3	3
04	HOC	VI	24-HOC-ET-3-04B	Wheeled Mobile Robots	3	-	-	3	3
05	HOC	VII	24-HOC-ET-4-05B	Mechanism And Robot Kinematics	3	-	-	3	3
06	HOC	VIII	24-HOC-ET-4-06B	Advanced Robotics	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_E&tc_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 Electronics & Telecommunication 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**

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Curriculum and Evaluation Scheme for Second Year B. Tech. in Electronics & Telecommunication Engineering with Multidisciplinary Minor

To be implemented for 2024-28 Batch

(With Effect from Academic Year 2025-26)

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-1-02	Engineering Chemistry	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-1-03	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	BSC	24-BSC-1-06	Engineering Chemistry Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
6	ESC	24-ESC-1-08	Engineering Graphics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	24-ESC-1-09	Smart Building and Materials Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	VSEC	24-VSC-1-02	TechShop	-	-	4	4	2	-	-	-	-	50	-	-	50
9	CCC		Co-curricularCourse -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-1-01	Engineering Physics	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-1-01	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	PCC	24-PCC-ET-1-01	Digital Design	2	-	-	2	2	20	-	30	50	-	-	-	50
6	BSC	24-BSC-1-05	Engineering Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	24-ESC-1-05	Basic Electrical and Electronics Engineering Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	ESC	24-ESC-1-07	Programming and Problem Solving Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
9	PCC	24-PCC-ET-1-02	Digital Design Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
10	VSEC	24-VSC-1-01	TechSkill	-	-	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 Electronics & Telecommunication 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-ET-2-03	Electromagnetics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-ET-2-04	Analog Circuits	3	-	-	3	3	20	20	60	100	-	-	-	100
3	PCC	24-PCC-ET-2-05	Analog & Digital Communications	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-ET-2-06	Analog Circuits lab	-	-	2	2	1	-	-	-	-	25	25	-	50
6	MD M		MultiDisciplinary Minor-I Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
7	PCC	24-PCC-ET-2-07	Communications Lab	-	-	2	2	1	-	-	-	-	25	25		50
8	EEM	24-EEM-2-01	Engineering Economics	1		2	3	2	-	-	-	-	25	-	-	25
9	AEC	24-AEC-2-01	Business Communication Skill	-	-	2	2	1	-	-	-	-	25	-	-	25
10	VEC	24-VEC-2-01	Universal Human Values-II	3	-	-	3	3	-	-	-	-	50	-	-	50
11	ELC(CEP/FP)	24-ELC-ET-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**

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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-ET-2-08	Networks, Signals and Systems	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-ET-2-09	Control Systems	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/OEC		Open Elective-I	3	-	-	3	3	20	20	60	100	-	-	-	100
5	PCC	24-PCC-ET-2-10	NSAS Lab	-	-	2	2	1	-	-	-	-	25	25		50
6	PCC	24-PCC-ET-2-11	Control Systems Lab	-	-	2	2	1	-	-	-	-	25		25	50
7	AEC	24-AEC-2-02	Modern Language	1	-	2	3	2	-	-	-	-	-	-	25	25
8	EEM	24-EEM-2-02	Entrepreneurship Development	1	-	2	3	2	-	-	-	-	50	-	-	50
9	VSEC	24-VSEC-ET-2-01	PCB Design Laboratory	-	-	4	4	2	-	-	-	-	25	25	-	50
10	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**	**50**	**50**	**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 Electronics & Telecommunication 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-AD-2-01	Internship / Fieldwork/OJT	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	24-EXT-AD-2-02	Mini Project	-	-	8	8	4	-	-	-	-	50	-	50	100
Total				**-**	**-**	**16**	**16**	**8**	**-**	**-**	**-**	**-**	**150**	**-**	**50**	**200**

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-ET-3-12	Digital Signal Processing	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-ET-3-13	Microcontroller	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		Multi Disciplinary Minor-III	2	-	-	2	2	20	-	30	50	-	-	-	50
5	OE/OEC		Open Elective-II	2	-	-	2	2	20	-	30	50	-	-	-	50
6	PCC	24-PCC-ET-3-14	DSP Lab	-	-	4	4	2	-	-	-	-	25	25	-	50
7	PCC	24-PCC-ET-3-15	Microcontroller lab	-	-	2	2	1	-	-	-	-	25	25	-	50
8	MD M		Multi Disciplinary Minor-III Lab	-	-	2	2	1	-	-	-	-	25	25		50
9	PEC		Program Elective Lab-I	-	-	4	4	2	-	-	-	-	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-ET-3-01A	Sensors in Automation	24-PEC-ET-3-02A	Sensors in Automation Lab
B	24-PEC-ET-3-01B	Sensors in Automation	24-PEC-ET-3-02B	Sensors in Automation Lab
C	24-PEC-ET-3-01C	Computer Networks	24-PEC-ET-3-02C	Computer Networks Lab
D	24-PEC-ET-3-01D	Digital CMOS Design	24-PEC-ET-3-02D	Digital CMOS Design Lab

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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-ET-3-16	Wireless Communication	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PEC		Program Elective Course–II	4	-	-	4	4	20	20	60	100	-	-	-	100
3	MD M		Multi Disciplinary Minor-IV	2	-	-	2	2	20	-	30	50	-	-	-	50
4	OE/OEC		Open Elective-III	3	-	-	3	3	20	20	60	100	-	-	-	100
5	PCC	24-PCC-ET-3-17	Wireless Communication Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
6	PEC		Program Elective Lab-II	-	-	2	2	1	-	-	-	-	25	-	25	50
7	VSEC	24-VSEC-ET-3-02	Electronics Design Skill	-	-	4	4	2	-	-	-	-	25	25	-	50
8	ELC	24-ELC-ET-3-02	Research Methodology	4	-	-	4	4	20	20	60	100	-	-	-	100
9	ELC	24-ELC-ET-3-03	Project-stage-I	-	-	4	4	2	-	-	-	-	25		25	50
Total				**16**	**-**	**12**	**28**	**22**	**100**	**80**	**270**	**450**	**100**	**50**	**50**	**650**

Program Elective Courses For SEM VI				
	Course Code-TH	Name of the Course- TH	Course Code-PR	Name of the Course(PR/OR)
	Course Code-TH	**Name of the Course- TH**	**Course Code-PR**	**Name of the Course(PR/OR)**
A	24-PEC-ET-3-03A	Embedded Processors	24-PEC-ET-3-04A	Embedded Processors Lab
B	24-PEC-ET-3-03B	Mechatronics	24-PEC-ET-3-04B	Mechatronics Lab
C	24-PEC-ET-3-03C	Microwave Engineering	24-PEC-ET-3-04C	Microwave Engineering Lab
D	24-PEC-ET-3-03D	Analog CMOS Design	24-PEC-ET-3-04D	Analog CMOS Design 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 Electronics & telecommunication 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-AD-3-01	Internship / Fieldwork/OJT	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	24-EXT-AD-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-ET-4-18	Optical Fiber Communication	3	-	-	3	3	20	20	60	100	-	-	-	100
2	PCC	24-PCC-ET-4-19	Programmable Logic Controller	3	-	-	3	3	20	20	60	100	-	-	-	100
3	PEC		Program Elective Course –III	4	-	-	4	4	20	20	60	100	-	-	-	100
4	MD M		Multi Disciplinary Minor-V	2	-	-	2	2	20		30	50	-	-	-	50
5	PCC	24-PCC-ET-4-20	OFC Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
6	PCC	24-PCC-ET-4-21	PLC Lab	-	-	4	4	2	-	-	-	-	25	-	25	50
7	PEC		Program Elective Lab-III	-	-	4	4	2	-	-	-	-	25	25	-	50
8	MD M		Multi Disciplinary Minor-V Lab	-	-	2	2	1	-	-	-	-	25	-	25	50
9	ELC	24-ELC-ET-4-04	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)
	Course Code-TH	**Name of the Course- TH**	**Course Code-PR**	**Name of the Course(PR/OR)**
A	24-PEC-ET-4-05A	Embedded C and RTOS	24-PEC-ET-4-06A	Embedded C and RTOS Lab
B	24-PEC-ET-4-05B	Automation in Agriculture	24-PEC-ET-4-06B	Automation in Agriculture Lab
C	24-PEC-ET-4-05C	Network Security	24-PEC-ET-4-06C	Network Security Lab
D	24-PEC-ET-4-05D	System on Chip	24-PEC-ET-4-06D	System on Chip 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-ET-4-22	VLSI Design	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-ET-4-05	Internship	-	-	24	24	12	-	-	-	-	200		150	350
Total				**9**	**-**	**24**	**33**	**21**	**120**	**-**	**180**	**300**	**200**	**-**	**150**	**650**

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.

Program Elective Course For SEM VIII		
	Course Code-TH	Name of the Course- TH
	Course Code-TH	**Name of the Course- TH**
A	24-PEC-ET-4-07A	Industrial Internet of Things
B	24-PEC-ET-4-07B	Industrial Automation & Control
C	24-PEC-ET-4-07C	Wireless sensor networks
D	24-PEC-ET-4-07D	Low Power VLSI Design

SEM III

24-PCC-ET-2-03: Electromagnetics

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

Prerequisites Courses: - 24-BSC-1-04: Statistics and Integral Calculus

Companion Course: -

Course Objectives:

- Fundamental concepts of electromagnetism
- Use of Maxwell's equations, wave propagation, transmission lines analysis
- Behavior of electromagnetic waves in different media
- Applications of EM in E&TC engineering

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

CO No	CO	BL
CO1	**Investigate** the fundamental laws & principles of electromagnetic fields	**3**
CO2	**Understand** the applications of electromagnetic fields	**2**
CO3	**Analyze** the behavior of electromagnetic fields in materials	**3**
CO4	**Analyze** electromagnetic wave propagation in unbounded and bounded medium	**3**

Course Contents

Unit I	**Electrostatics**	**7 Hours**

Review of 3 D coordinate systems, Physical significance of Divergence, Curl, & Gradient, Electric field intensity & flux density due to different charge distributions, Gauss's law, Electrical potential & potential gradient, Energy density.

Case Studies/Simulation: Case study on the application of Electrostatics**,** Gauss's law, Simulate the electric field generated by one or more point charges in space.

Mapping of Course Outcomes	**CO1, CO2**

Unit II	**Electric Fields in Materials**	**7 Hours**

Electric fields in conductor, dielectrics, Continuity equation, Electrostatic Boundary conditions, Poissons & Laplace equations,

Capacitors.		
Case Studies/Simulation: Case study on materials with high dielectric constant useful to semiconductor industry, Capacitive sensors, Supercapacitor.		
Mapping of Course Outcomes	**CO3, CO2**	
Unit III	**Magnetostatics**	**7 Hours**
Magnetic field intensity & flux density. Biot Saravat's law, Stoke's Theorem, Ampere's law. Magnetic Potential, Magnetic force, Magnetic boundary conditions, Inductors & inductances. Maxwell equation for statics field.		
Case Studies/Simulation: Case study on the application of magnetic fields: Maglev, Hall effect, LVDT. Simulate force between two current carrying conductors, or magnetic field generated by different current magnitudes.		
Mapping of Course Outcomes	**CO1, CO2**	
Unit IV	**Time Varying Fields**	**7 Hours**
Laws of Electromagnetic induction, EMF, Displacement current, Time varying Maxwell's equations: integral, differential forms & for different mediums. Power flow and Poynting vector.		
Case Studies/Simulation: Case study on the application of EM fields, Maxwell's equation & Health Risks of EM Fields.		
Mapping of Course Outcomes	**CO3, CO2**	
Unit V	**EM Wave Propagation**	**7 Hours**
Wave propagation in unbounded mediums, dielectric, loss tangent, conductor & Skin effect, Wave polarization, Reflection at normal incidence.		
Case Studies/Simulation: Virtual lab: Case study on the application of skin effect, Simulate Transverse Nature of Fields, polarization of waves.		
Mapping of Course Outcomes	**CO4, CO2**	
Unit VI	**Transmission Lines**	**7 Hours**
Introduction, Concept of distributed elements, Primary & Secondary parameters, Line equation, Input impedance, Lossless and Lossy Transmission Lines, Distortions, SWR, Reflection coefficient, Smith chart, Impedance matching.		
Case Studies/Simulation: Case study on Coaxial Cable/Twisted Pair/ Microwave Waveguides Simulate the behavior of transmission lines with different terminations.		
Mapping of Course Outcomes	**CO4, CO2**	

Learning Resources
Text Books
T1. Matthew N O Sadiku, S V Kulkarni, Principles of Electromagnetics, 6th edition, Oxford university press, **T2.** B Somanathan Nair, S R Deepa, Applied Electromagnetic Theory- Analyses, Problems & Applications, PHI
Reference Books :
R1. Shevgaonkar, R. K., "Electromagnetic waves", Tata McGraw-Hill Education **R2.** Fawwaz Ulaby, Umberto Ravaioli, Fundamentals of Applied Electromagnetics, Pearson **R3.** William H. Hayt and John A. Buck, Engineering Electromagnetic, 8 edition, TMH
Additional Resources: (Books, e-Resources) ● https://em8e.eecs.umich.edu/
MOOC Courses links : ● Transmission Line & EM Waves, Prof. R K Shevgaonkar, IIT Mumbai, https://nptel.ac.in/courses/117101056 ● Electromagnetic Theory by Prof. Pradeep Kumar, IIT Kanpur, https://nptel.ac.in/courses/108104087 ● Virtual Electromagnetics Laboratory, https://www.ee.iitb.ac.in/course/~vel/

24-PCC-ET-2-04: Analog Circuits

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

Prerequisites Courses: 24-ESC-1-01: Basic Electrical & Electronics Engineering.

Companion Course: 24-PCC-ET-2-06 : Analog Circuits lab

Course Objectives:

- Understand Power Semiconductor devices.
- Study MOSFET Small signal model, concepts of feedback in amplifiers & oscillators.
- Explain the fundamental concepts of operational amplifiers by identifying key parameters.
- Demonstrate significance of operational amplifiers in various applications by designing and implementing op-amp-based circuits.
- Study converters, characteristics & applications of PLL.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Identify** suitability of the power device for electronic applications.	2
CO2	**Perform** small signal analysis to amplifier circuits & Design MOSFET CS amplifier and oscillator circuits.	3
CO3	**Understand** internal schematic of Op-Amp and its performance parameters.	2
CO4	**Design** various applications of Operational Amplifier.	3
CO5	**Illustrate** A-D and D-A conversion techniques.	2

Course Contents

Unit I	**Power Semiconductor Devices**	**8 Hours**

Construction, Basic operation, VI Characteristics & Applications of Power Diode, SCR, DIAC, TRIAC, UJT ,MOSFET & IGBT. Analysis of Half Converter, Semi converter and Full converter, Diode Circuits: Clipper & clamper.

#Exemplar/Case Studies: Advantages of Gallium Nitride Technology over other semiconductor materials.

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

Unit II	**MOSFET Amplifiers**	**8 Hours**

MOSFET: MOSFET Biasing. Small signal model– Analysis of CS amplifiers. Frequency response, Feedback Amplifiers: - Feedback Concept, Classification of amplifiers based on feedback topology, Effect of negative feedback on various performance parameters of an amplifier, Comparison of feedback topologies.		
#Exemplar/Case Studies: Design of a Common-Source MOSFET Amplifier		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Oscillators & Multivibrators**	**6 Hours**
Oscillator introduction, Barkhausen Criterion, Condition for oscillations, Classification of Oscillators, RC Oscillator: RC Phase shift & wein bridge oscillator, LC Oscillators: Hartley & Colpitts Oscillator, IC 555 Multivibrator: Mon stable & Astable Multivibrator..		
#Exemplar/Case Studies: Design of RC Oscillator for given frequency.		
***Mapping of Course Outcomes**	**CO2**	
Unit IV	**Operational Amplifier**	**6 Hours**
Block diagram, Differential amplifier analysis for Dual input Balanced output mode, Level shifter, Op-Amp parameters, Comparison of ideal and 741 Op-Amp Parameters, concept of virtual short and virtual ground, op amp circuit analysis, Inverting amplifier, non-inverting amplifier, voltage follower.		
#Exemplar/Case Studies: Real Life applications of OP-Amp, GATE questions.		
***Mapping of Course Outcomes**	**CO3**	
Unit V	**Op-Amp Applications**	**8 Hours**
Summing amplifier, Differential amplifier, integrator, differentiator, Instrumentation amplifier, Comparator, Schmitt trigger, Square & triangular wave generator.		
#Exemplar/Case Studies: Temperature Measurement System Using Op-Amp.		
***Mapping of Course Outcomes**	**CO4**	
Unit VI	**Converters & PLL**	**6 Hours**
Voltage to Current, Current to Voltage converters, Digital to Analog Converters: Weighted Resistor, R-2R Ladder DAC, Analog to Digital Converters: Successive Approximation ADC, Flash type ADC, Phase Locked Loop.		
#Exemplar/Case Studies: Applications of ADC/DAC.		
***Mapping of Course Outcomes**	**CO5**	
Learning Resources		

Text Books

T1. M. D. Singh and K. B. Khanchandani, "Power Electronics", TMH.
T2. MillmanHalkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGraw-Hill.
T3. Donald Neaman, "Electronic Circuit Analysis and Design", 3rd Edition, Tata McGraw Hill.
T4. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition**.**

Reference Books :

R1. David A.Bell,"ElectronicDevicesandCircuits",5thEdition, Oxford press.
R2. R. L. Boylestad, L. Nashlesky, "Electronic Devices and Circuits Theory", 9thEdition, Prentice Hall of India.
R3. D.Roy Choudhary, Shail Jain "Linear Integrated Circuits", New Age International.
R4. Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill.

MOOC Courses links :

- NPTEL Course "Analog Electronic Circuits" https://nptel.ac.in/courses/108/105/108105158/
- NPTEL Course on "Analog Circuits" https://nptel.ac.in/courses/108/101/108101094/

24-PCC-ET-2-05: Analog & Digital Communications

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

Prerequisites Courses: 24-BSC-1-04: Statistics and Integral Calculus
24-ESC-1-01 : Basic Electrical & Electronics Engineering

Companion Course: - 24-PCC-ET-2-07: Communications Lab

Course Objectives:

- Introduce basic components of analog and digital communication systems
- Understand analog to digital conversion process
- Study different coding schemes to improve the performance of digital communication system

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

CO No	CO	BL
CO1	**Recognize** the performance parameters of analog communication systems.	**1**
CO2	**Demonstrate** amplitude and phase modulation schemes.	**3**
CO3	**Analyze** the impact of sampling, quantization and bit rate on quality of the signal.	**4**
CO4	**Understand** issues involved in digital baseband signal transmission.	**2**
CO5	**Understand** various components of digital communication systems.	**2**
CO6	**Implement** the error control codes for a given application.	**3**

Course Contents

Unit I	Basics of Communication System	7 Hours

Block diagram, electromagnetic spectrum, signal bandwidth and power, types of communication channels, Introduction to time and frequency domain. Fourier transform of some useful functions, Types of noise, signal to noise ratio, noise figure and noise temperature.

#Exemplar/Case Studies:

- Analysis of Signal spectrum, bandwidth calculation of given signal/s
- Noise calculation in a given situation

*Mapping of Course Outcomes	CO1

Unit II	**Analog Transmission & Reception**	**7 Hours**
Generation of AM, DSBSC, SSB & VSB, and its spectrum, Power relations applied to sinusoidal signals, Envelope detection, Super heterodyne Receiver and characteristics. Mathematical analysis of FM, Frequency spectrum analysis of FM, pre and de-emphasis in FM, any one FM generation and detection Technique. AM/FM Comparison.		
#Exemplar/Case Studies: Real Time applications of AM/FM or Specifications of local FM Radio station		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Waveform and Source Coding**	**7 Hours**
Block diagram of digital communication system, Waveform Coding: Sampling, Nyquist Theorem, aliasing, quantization, encoding, pulse code modulation, bandwidth of PCM, DM, Differential PCM, Information, entropy, Information capacity theorem, Source coding ; Shannon-Fano coding, Huffman coding.		
#Exemplar/Case Studies: Comparison of Shannon Fano and Huffman codes in typical application		
***Mapping of Course Outcomes**	**CO3**	
Unit IV	**Digital Baseband Transmission**	**7 Hours**
Introduction, Line codes for Binary Signals, Baseband reception and Probability of Error, ISI, EYE diagram, Nyquist criteria for zero ISI, pulse shaping, M-ary signaling, equalization, Scrambling and descrambling.		
#Exemplar/Case Studies ● Applications of different line codes ● Mathematical modeling of pulse shaping network		
***Mapping of Course Outcomes**	**CO4**	
Unit V	**Digital Carrier Modulation Techniques**	**7 Hours**
Introduction to Digital Carrier Modulation-Demodulation Techniques: Modulation techniques for Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Binary Phase Shift Keying (BPSK), Quadrature Phase shift Keying (QPSK)		
#Exemplar/Case Studies: ● Signal space representation of all digital carrier modulated signals ● Real time applications of all digital carrier modulation techniques		
***Mapping of Course Outcomes**	**CO5**	
Unit VI	**Error-Control Coding**	**7 Hours**
Linear Block Codes: Coding, Syndrome and error detection, Error detection and correction capability, Standard array and syndrome decoding. **Cyclic Codes:** Coding & Decoding		
#Exemplar/Case Studies: Justify: Convolutional Codes to enhance error correction in communication systems		

***Mapping of Course Outcomes**	**CO6**
Learning Resources	
Text Books	
T1. B P Lathi, Zhi Ding, Modern Analog and Digital Communication System, Oxford University Press, 4 th Edition **T2.** K. Sam Shanmugam, Digital and Analog Communication Systems, John Wiley and Sons (Asia), Student Edition	
Reference Books	
R1. Bernard Sklar and Pabitra kumar Ray, Digital Communications Fundamentals and Applications, Pearson Education 3rd Edition **R2.** P. Ramakrishna Rao, Digital Communication, Tata Mc Graw Hill Education **R3**. Taub, Schilling and Saha, Principles of Communication Systems, McGraw-Hill (India), 4 th Edition **R4**: Wayne TomasiElectronic Communication Systems, Pearson,Second Edition	
Additional Resources: (Books, e-Resources)	
MOOC Courses links • https://nptel.ac.in/courses/108/104/108104091/ • https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-ee69/ • https://www.youtube.com/watch?v=OyWdYkx0PmI&list=PLq-Gm0yRYwTjdesS06WhESHJCVcJz6ibO	

24-PCC-ET-2-06: Analog Circuits lab

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

Prerequisites Courses: 24-ESC-1-05: Basic Electrical and Electronics Engineering Lab

Companion Course: 24-PCC-ET-2-04: Analog Circuits

Course Objectives:

- To study characteristics of Power Devices.
- To provide practical demonstration of semiconductor devices and their applications.
- To provide practical demonstration of Op-Amp applications.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Understand** Power device characteristics and calculate Parameters.	**2**
CO2	**Design** and test MOSFET based circuits such as CS amplifier, Feedback amplifier and oscillator.	**3**
CO3	**Measure** Op-Amp parameters and Compare with ideal values.	**2**
CO4	**Design** and test linear and nonlinear applications of Op-Amp.	**3**

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include rubric for the assessment and practical conduction plan. The Instructor's Manual should contain the following related to every experiment – Aim , objectives, Brief theory related to the experiment, Apparatus with their detailed specifications, Connection diagram /circuit diagram, Observation table/ simulation waveforms, Result table, Graph and Conclusions. Few questions related to the experiment, Relevance of practicality in real life /industry.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten/printed write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, test cases, Test Data Set (if applicable), mathematical model (if applicable), conclusion/analysis. 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 grade/marks based on parameters, such as timely completion, performance, punctuality and neatness etc. or as per the defined rubrics.

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 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.

Guidelines for Laboratory Conduction

All the experiments mentioned in the syllabus are compulsory. Use of open source software and recent versions is to be encouraged.

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of CO
1	V-I Characteristics of Power MOSFET i) Plot output characteristics and calculate output resistance ii) Plot transfer characteristics and measure threshold voltage.	CO1
2.	Design and test single stage CS amplifiers and verify the DC operating point.	CO2
3.	Design and test single stage CS amplifiers using MOSFET. Verify Av, Ri & Ro.	CO2
4.	Simulate frequency response of single stage CS amplifiers (use the same circuit).	CO2
5.	Simulate RC/LC oscillator.	CO2

Group B: Assignments (Out of List perform any 3)

Sr No	Assignment Title	*Mapping of CO
1.	V-I Characteristics of Power SCR: Plot V-I characteristics to measure IH and IL.	CO1
2.	Measure op-amp parameters and compare with the specifications. (a) Slew rate (b) CMRR	CO3
3.	Design, Build and test Integrator for given frequency.	CO4
4.	Build and test square & triangular wave generators.	CO4
5.	Design and test an Astable Multivibrator using IC555.	CO4
6.	Simulate R-2R Ladder DAC.	CO4

24-PCC-ET-2-07: Communications Lab

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

Prerequisites Courses: -

Companion Course: 24-PCC-ET-2-05: Analog & Digital Communications

Course Objectives:

- Study of analog and digital communication techniques
- Study of ADC, bit rate
- Understand error control codes

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Demonstrate** different modulation and demodulation techniques	**3**
CO2	**Demonstrate** the analog to digital conversion process and encoding techniques	**3**
CO3	**Identify** the significance of ISI and relevance of Nyquist rate.	**1**
CO4	**Use** different virtual laboratories to simulate different analog and digital communication, error control codes	**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 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

Experiment Journal Format: Experiment No., Title, Objective, Clearly state the aim of the experiment, Theory & Concepts, List all hardware components and equipment, Circuit Diagram / Block Diagram, Procedure, Observations and Readings, Results, Conclusion, Key takeaways from the experiment, Viva Questions.

Simulation Experiment Journal Format: For software-based experiments using MATLAB, Python, Scilab, LabVIEW, etc., format shall consist of Experiment No. & Title, , Objective, brief theory & concepts being simulated, Equations involved, Software/Tools Used, Mention the programming language and tools (MATLAB, GNU Radio, Python with NumPy, etc.), Algorithm / Flowchart, Code Implementation, Simulation Results, Analysis and Discussion, Compare results with theoretical expectations, Conclusion.

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 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.

Suggested List of Laboratory Experiments/Assignments

Group A: Laboratory Experiments (Out of List perform any 5)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Demonstration of Amplitude Modulation	CO1
2.	Implement pre-emphasis and de-emphasis circuit in Frequency Modulation	CO1
3.	Study of Sampling and Reconstruction in PCM	CO2
4.	Study of ASK	CO1
5.	Generation and Detection of BPSK	CO1
6.	Generation and Detection of QPSK	CO1
7	Observing Eye Diagram	CO3

Group B: Assignments/Simulation (Out of List perform any 3)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Study of AM system	CO4
2.	Study of Sampling Theorem, understand Nyquist criteria	CO2
3.	Study of Quantization process	CO2
4.	Study of Digital carrier modulation system	CO4
5.	Study of Linear Block Code	CO4
6.	Study of Cyclic Code	CO4

Group C: Self Learning Assignments/Mini Project (Any 1)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Power requirements in Communication Systems	CO1
2.	Quality Circle in Communication Systems	All

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-ET-2-01: Community Engagement Project / Field Project

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

Prerequisites Courses:24-BSC-1-01 : Engineering Physics, 24-ESC-1-01: Basic Electrical & Electronics Engineering, 24-PCC-ET-1-01: Digital Design, 24-CCC-1-05: Co-curricular Course -II.

Companion Course: 24_PCC-ET-2-06 Analog Circuit

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 than 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-ET-2-08: Networks, Signals & Systems

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

Prerequisites Courses: 24-BSC1-03: Linear Algebra & Differential Calculus, 24-BSC-1- 04: Statistics Probability and Integral Calculus, 24-ESC-1- 01: Basic Electrical and Electronics Engineering

Companion Course: 24-PCC-ET -2-10: Networks, Signals & Systems Lab

Course Objectives:

- To understand and apply fundamental network theorems for circuit analysis.
- To analyze the transient and steady-state response of RLC circuits.
- To study two-port networks and their parameters for network characterization.
- To explore continuous-time (CT) signals and systems, their classification, and mathematical operations.
- To analyze signals in the frequency domain using Fourier series & Fourier transform.
- To apply Laplace Transform for system analysis and stability evaluation in the S-domain.

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

CONo	**CO**	**BL**
CO1	**Apply** network theorems to analyze electrical circuits	**3**
CO2	**Analyze** the transient and steady-state response of RLC circuits and two port network parameters.	**4**
CO3	**Perform** mathematical operations on continuous-time signals and analyze their frequency domain representation.	**4**
CO4	**Apply** Laplace Transform for circuit analysis and assess the stability of continuous-time systems.	**3**

Course Contents

Unit I	**Network Theorems**	**7 Hours**

Network Analysis: Mesh, Super mesh, Node and Supernode analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Miller's Theorem and its dual.

#Exemplar/Case Studies: Case study of Sound systems for maximum power transfer theorem.

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

Unit II	**Analysis of RLC circuits**	**7 Hours**

Steady state and transient response, unit step forcing function, Response of R-L, R-C and R-L-C circuit, Introduction to state equations for networks.		
#Exemplar/Case Studies: Simulation of any circuit in Pspice		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Two port Network**	**7 Hours**
Terminal characteristics of the network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters, Network functions for one port and two port networks, Pole-zeros of network functions and network stability.		
#Exemplar/Case Studies: Solve GATE questions on Two port networks.		
***Mapping of Course Outcomes**	**CO2**	
Unit IV	**Continuous Time Signals and systems.**	**7 Hours**
Standard continuous time signals, classification of CT signals, Mathematical operations on CT signals, Impulse signal, Classification of CT systems, impulse response, stability.		
#Exemplar/Case Studies: Matlab program to find even and odd parts of any given signal.		
***Mapping of Course Outcomes**	**CO3**	
Unit V	**Frequency domain analysis of CT Signals**	**7 Hours**
Introduction to Fourier series, Trigonometric and exponential Fourier series, Properties of FS, Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier transform, Properties of FT, FT of some important signals.		
#Exemplar/Case Studies: FT in Speech Recognition.		
***Mapping of Course Outcomes**	**CO3**	
Unit VI	**Frequency domain analysis of CT System**	**7 Hours**
Introduction to Laplace Transform, RoC & Properties of Laplace Transform, Inverse Laplace Transform, Analysis of LTI CT system using Laplace Transform, Stability in S domain. Applications of LT for circuit analysis.		
#Exemplar/Case Studies: Compare FT and LT of given signal [e^-at*u(t)] and comment on it.		
***Mapping of Course Outcomes**	**CO4**	
Learning Resources		
Text Books		

T1. Sudhakar,Shyammohan S Palli, Circuits & Networks Analysis & Synthesis, Tata Mcgraw-Hill.
T2. A. Nagoor Kani, Signals and Systems, 2nd 2nd Edition, McGraw Hill India, 2018.
T3. Hwei Hsu, Signals and Systems, Schaum's outlines, 2nd Edition, 2010.

Reference Books

R1. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley and Sons, Second Edition, 2004.
R2. Alan S. Willsky, Alan V. Oppenheim, and Ian T. Young, "Signals and Systems," Prentice Hall Signal Processing Series, 2nd Edition, 1996.
R3. B. P. Lathi, "Signals Processing and Linear Systems," Berkeley Cambridge Press, 1998.
R4. K.S Suresh Kumar, Electric Circuit Analysis, Pearson Publication

Additional Resources: (Books, e-Resources)

- https://mrcet.com/downloads/digital_notes/EEE/Network%20Theory.pdf

MOOC Courses links:

- https://www.mooc-list.com/course/signals-and-systems-part-1-edx
- https://archive.nptel.ac.in/courses/108/105/108105159/
- https://onlinecourses.nptel.ac.in/noc22_ee07/preview
- https://onlinecourses.nptel.ac.in/noc21_ee28/preview

24-PCC-ET-2-09: Control System

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

Prerequisite Courses: 24-BSC-1-03:Linear Algebra And Differential Calculus

Companion Course: 24-PCC-ET-2-08: Networks, Signals and Systems, 24-PCC-ET-2-11: Control Systems Lab

Course Objectives:

- To Introduce elements of the control system and their modeling using various techniques.
- To make aware of the methods for analyzing the time and frequency domain response of system
- To Introduce State Variable Analysis method.
- To get acquainted with Concepts of PID controllers

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

CONo	CO	BL
CO1	**Determine** and use models of physical systems and Find transfer function	**3**
CO2	**Analyze** the response of a closed-loop control system.	**3**
CO3	**Perform** time domain analysis of control systems required for stability analysis.	**3**
CO4	**Perform** frequency domain analysis of control systems required for stability analysis.	**3**
CO5	**Express** and solve system equations in state variable form	**3**
CO6	**Differentiate** between various digital controllers	**2**

Course Contents

Unit I	**Introduction to Control Systems & its Modeling**	**7 Hours**

Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and Transfer function, Characteristics, advantages and limitations of Transfer function, Limitations of transfer function approach, Modeling of Electric systems, Translational and rotational mechanical systems, analogy Force-Voltage, Force-Current, Torque-Voltage and Torque-Current, Block diagram reduction Techniques, Signal flow graph

#Exemplar/Case Studies: Electrical Circuit TF and SFG, Mechanical system , TF, SFG

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

Unit II	**Time Domain Analysis**	**7 Hours**
Time domain analysis: transient response and steady state response, Importance of time constant, standard test inputs for time domain analysis, order and type of a system, transient analysis of first and second order systems, time domain specifications of second order under damped system from its step response, Steady state error and static error constants		
#Exemplar/Case Studies: Time Domain Analysis of given System		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Stability Analysis in Time Domain**	**7 Hours**
Characteristic equation of a system, concept of pole and zero, response of various pole locations in s-plane, concept of stability absolute stability, relative stability, stability of system from pole locations, Routh-Hurwitz stability criterion with special cases, Root locus: definition, magnitude and angle conditions, construction of root locus, concept of dominant poles, effect of addition of pole and zero on root locus. Application of root locus for stability analysis		
#Exemplar/Case Studies: Stability analysis of given system		
***Mapping of Course Outcomes**	**CO3**	
Unit IV	**Frequency Domain Analysis**	**7 Hours**
Frequency response and frequency domain specifications, correlation between time domain and frequency domain specifications, polar plot, Nyquist stability criterion and construction of Nyquist plot, Bode plot, determination of frequency domain specifications and stability analysis using Nyquist plot and Bode plot		
#Exemplar/Case Studies: Frequency Domain Analysis of given System		
***Mapping of Course Outcomes**	**CO4**	
Unit V	**State space representation**	**7 Hours**
Concept of state, state space, Advantages of State space approach over classical approach, state space representation, Transfer function from State space, physical variable form, phase variable forms: controllable canonical form, observable canonical form, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only		
#Exemplar/Case Studies: State-Space Modeling of a Mass-Spring-Damper System, State-Space Modeling of a electrical System		
***Mapping of Course Outcomes**	**CO5**	
Unit VI	**Controllers and Digital Control Systems**	**7 Hours**
Basic block diagram of Digital Control System, Digital Controller Introduction, Basic ON-OFF Controller, Concept of Dead Zone, Introduction to P, I, D, PI, PD and PID controller, OFFSET of Controller, Integral Reset, and PID Characteristics. Tuning of PID		

Controllers, Concept of Zeigler - Nicholas method for PID tuning	
#Exemplar/Case Studies: Temperature Control Using Various Controllers.	
***Mapping of Course Outcomes**	**CO6**
Learning Resources	
Text Books	
T1. N. J. Nagrath and M. Gopal, "Control System Engineering", New Age International Publishers, 5th Edition **T2.** K. Ogata, "Modern Control Engineering", Prentice Hall India Learning Private Limited; 5th Edition	
Reference Books	
R1. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition. **R2.**M. Gopal, "Control System – Principles and Design", Tata McGraw Hill, 4th Edition. **R3.** Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley	

24-PCC-ET-2-10: Networks, Signals & Systems Lab

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

Prerequisites Courses: -

Companion Course: 24-PCC-ET -2-08: Networks, Signals & Systems

Course Objectives:

- To develop proficiency in using open-source platforms.
- To verify fundamental circuit theorems.
- To perform basic operations on signals.
- To analyze different signals using Fourier transform and Laplace transform.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Understand** the basics operation of any open source software like Pspice, Spyder etc	**2**
Co2	**Analysis** of Circuits using different theorems	**4**
CO3	**Understand** signal processing operations using open source software.	**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 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. DVD 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 or defined rubrics.

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 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.

Guidelines for Laboratory Conduction

- Practicals will be conducted on an open source platform.After each practical conduction continuous assessment of the previously conducted practical will be done.

Virtual Laboratory: (If Any):

- https://www.iitg.ac.in/cseweb/vlab/Signal-Systemlab/signalsystem/Signals%20and%20their%20properties(simulator).html.
- https://asnm-iitkgp.vlabs.ac.in/List%20of%20experiments.html

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Verification of Thevenin's Theorem	CO2
2.	Verification of Superposition Theorem	CO2
3.	Verification of Maximum Power Transfer Theorem	CO2
4	Using an open source platform, perform the following a. Define and use variables and functions. b. Define and use Vectors and Matrices c. Study various arithmetic operators and mathematical functions.	CO1
5.	Generate and plot the following signals in time domain and also sketch its amplitude and phase spectrum. Verify the result: Impulse, Unit Step, Exponential, and Unit ramp, Sinc, Rectangular.	CO1, CO3
6.	Perform arithmetic operations on different types of signals Using an open source platform.(Addition, scaling, shifting & folding)	CO1,CO3

Group B: Assignments (Out of List perform any 2)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	To measure the 'Z' and 'Y' parameters of two port networks.	CO2
2.	To find transient response of RL circuits.	CO2

3.	Find Thevenin Voltage and Resistance of a circuit using PSPICE Software.	CO2
4	To find transient response of RC circuits.	CO2
Group C: Assignments (Any 1)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1	To locate the zeros and poles and plot the pole zero maps in s plane for the given transfer function & comment on it.	CO1, CO3
2.	Finding the Fourier transform of a given Signal and plotting its magnitude and phase spectrum & comment on it.	CO1, CO3

24-PCC-ET-2-11: Control Systems Lab

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

Prerequisite Courses: 24-BSC-1-03 Linear Algebra And Differential Calculus.

Companion Course: 24-PCC-ET-2-08 Networks, Signals and Systems, 24-PCC-ET-2-09 Control Systems.

Course Objectives:

- Analyze Control System Representations and Model and Analyze Physical Systems.
- Analyze Time Response of Systems and Perform Stability Analysis.
- Establish Correlation between Time and Frequency Domains.
- Apply State-Space Representation.
- Evaluate Frequency Response of System.
- Observe and compare the effects of P, PI, PD, and PID controllers on the step response of a system.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Determine** Transfer function using Modeling, Block diagram reduction, SFG and State Model techniques	**3**
CO2	**Compute** the correlation of time and frequency domain	**3**
CO3	**Analyze** the system response and Find the stability	**4**
CO4	**Analyze** the system using Root locus, Bode Plot and Nyquist Plot	**4**
CO5	**Observe** the effect of P, PI, PD and PID controller	**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 of each assignment .

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 answers, problem solving/ coding efficiency, viva and timely completion.

Guidelines for Laboratory Conduction

1. All questions in Group A Assignment are to be solved by students.
2. Use MATLAB software for Group B Assignment
3. Write answers of the questions provided at the end of experiment
4. Attach printout of program for assignment in Group B
5. Attach printout of results for assignment in Group B
6. Write conclusion of every experiment

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

SN	Assignment Title	*Mapping of CO
1.	Numerical on Black diagram reduction technique, Signal Flow Graphs (at least 3 numericals each)	CO1
2.	Computation of transfer function of Electric Circuits, Mechanical Circuits for the concept understanding with Force-Voltage and Force Current analogies (at least 3 numericals each	CO1
3.	Compute correlation between time domain and frequency domain with examples (at least 4 numericals)	CO2
4.	Computation of State Model from Transfer function and Compute Transfer Function from state model solve (at least 4/5 numericals)	CO1

Group B: Assignments

SN	Assignment Title	*Mapping of CO
1.	Standard input signals and time response analysis of First Order and Second order Systems for step input. Underdamped, Critically damped and Overdamped case	CO3
2.	Check the stability analysis of given characteristics equation in time domain	CO3
3.	Study and Implement the root locus of given G(s)H(s) and Compute and Comment on time domain specifications and stability of the system	CO4
4.	Study and Implement the frequency response analysis using Bode Plot for given G(s) H(s). Compute and Comment on Gain Margin, Phase Margin and Stability of the system	CO4
5.	Study and Implement the frequency response analysis using Nyquist Plot for given G(s) H(s). Compute and Comment on Gain Margin, Phase Margin and Stability of the system	CO4
6.	Observe the effect of P, PI, PD and PID controllers on the step response of a feedback control system. Comment on Time domain specifications of response	CO5

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-ET-2-01: PCB Design Laboratory

Teaching Scheme:	**Credit:** 2	**Examination Scheme:**
Practical: 4 Hours/Week		**Term work (TW)** : 25 Marks **Practical (PR)** : 25 Marks

Prerequisites Courses: 24-PCC-ET-2-04: Analog Circuits, 24-PCC-ET-1-01: Digital Design.

Companion Course: -

Course Objectives:

- To study the basics of PCB and standards.
- To study PCB layout.
- To study PCB Design techniques.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Understand** the basics of PCB technology	**2**
CO2	**Study** the PCB layout rules.	**2**
CO3	**Prepare** the layout using the CAD tool.	**3**
CO4	**Develop** layout on copper clad.	**3**

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a reference and hands-on resource. It should include rubric for the assessment and practical conduction plan. The Instructor’s Manual should contain the following related to every experiment – Aim , objectives, Brief theory related to the experiment, Apparatus with their detailed specifications, Connection diagram /circuit diagram, Observation table/ simulation waveforms, Result table, Graph and Conclusions. Few questions related to the experiment, Relevance of practicality in real life /industry.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten/printed write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, test cases, Test Data Set (if applicable), mathematical model (if applicable), conclusion/analysis. 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 grade/marks based on parameters, such as timely completion, performance, punctuality and neatness etc. or as per the defined rubrics.

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 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.

Guidelines for Laboratory Conduction

Use of open source software and recent versions is to be encouraged.

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Study of basics of PCB, Introduction to PCB: Need for PCB, Types. Technology: plated through holes, surface mount PCB Material.	CO1
2.	Study IPC standards for PCB and environment	CO1
3.	Study of component lead configuration and packages along with component symbols and Identification (through hole and surface mount components).	CO1
4.	Study PCB Design Considerations: Conductor thickness, spacing, Supply and Ground conductors, and layout design checklist.	CO2
5.	Study EMI and EMC considerations.	CO2

Group B: Assignments (Out of List perform any 3)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Draw the layout of a given electronic circuit using CAD tool.	CO3
2.	Develop the layout on copper clad.	CO4
3.	Drill, Solder the components and test Circuit.	CO4
4.	Prepare BOM of the components.	–

Group C: Assignments (if Any) <<Mini Project/Field Visit Etc>>

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Industrial visit to PCB Assembly Unit.	All
Learning Resources (If applicable)		
Text Books		
T1. Printed Circuit Boards: Design and Technology, Walter C Bosshart,,McGraw-Hill **T2**. Printed Circuit Boards Design Fabrication and Assembly, R S Khandpur,McGraw-Hill.		
MOOC Courses links : ● https://onlinecourses.swayam2.ac.in/aic20_sp59/preview ● https://onlinecourses.nptel.ac.in/noc23_ee74/preview		
Additional Resources: (Books, e-Resources) ● Open source EDA Tool KiCad Tutorial: http://kicad-pcb.org/help/tutorials/		
MOOC Courses links : ● https://onlinecourses.swayam2.ac.in/aic20_sp59/preview ● https://onlinecourses.nptel.ac.in/noc23_ee74/preview		

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

Shree Neminath Jain Brahmacharyashram's
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An Autonomous Institute, Affiliated to Savitribai Phule Pune University, Pune

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

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	29
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