Society for Computer Technology & Research's (SCTR's)

Pune Institute of Computer Technology (PICT), Pune

An Autonomous Institute affiliated to the Savitribai Phule Pune University (SPPU)
Approved by AICTE & Government of Maharashtra,
Accredited by NAAC (A+) & NBA [All eligible UG Programs]

Syllabus for

S.Y B. Tech Electronics and Telecommunication Engineering (E&TCE)

(2025-26 Course) *

With effect from (June 25)
National Education Policy (NEP) 2020 Compliant
*Approved by the Board of Studies (BoS) and Academic Council

Abbreviations used (Refer [1-3] for more details)

Sr. No.	Broad Category of the course	Sub- Category of course	Category Code
I.	Basic Science/ Engineering Science Course (BSC/ ESC)	Basic Science Course (BSC)	01
		Engineering Science Course (ESC)	02
II.	Program Courses (PC)	Program Core Course (PCC)	03
		Program Elective Course (PEC)	04
III.	Multidisciplinary Courses (MC)	Multidisciplinary Minor (MDM)	05
		Open Elective (OE) Other than particular program	06
IV.	Skill Courses (SC)	Vocational and Skill Enhancement Course (VSEC)	07
V.	Humanities Social Science and Management (HSSM)	Ability Enhancement Course (AEC-01, AEC-02)	08
		Entrepreneurship/Economics/ Management Courses (EEM)	09
		Indian Knowledge System (IKS)	10
		Value Education Course (VEC)	11
VI.	Experiential Learning Courses (ELC)	Research Methodology (RM)	12
		Community Engagement Project (CEP) / Field Project (FP)	13
		Project (PRJ)	14
		Internship/ On Job Training (IP/OJT)	15
VII.	Liberal Learning Courses (LLC)	Co-curricular Activities (CCA)	16

Detailed guidelines for General Instructions:

Link: General Instructions

Detailed guidelines for Evaluation and Assessment:

Link: Guidelines for Evaluation and Assessment

Detailed guidelines for examination:

Link: Guidelines for examination

Index

Contents

S.Y B. Tech Syllabus Structure
Semester – III

Semester -3			Teaching Scheme (Hours/Week)				Credit scheme				Examination/ Evaluation Scheme and Marks						
Category of Course	Course code	Name of the Course	L	P	T	Total	L	P	T	Total	Theory			Practical			Total
											ISE	CIE	ESE	CIE	ESE		
											[20]	[20]	[60]	TW	P	OR	
PCC	**2303101**	Signals and Systems (S&S)	3	-	1	**4**	3	-	1	**4**	20	20	60	25	-	25	**150**
PCC	**2303102**	Analog Circuit Design (ACD)	3	-	-	**3**	3	-	-	**3**	20	20	60	-	-	-	**100**
PCC	**2303203**	Analog Circuit Design Lab (ACDL)	-	2	-	**2**	-	1	-	**1**	-	-	-	25	25	-	**50**
PCC	**2303104**	Network Analysis and Synthesis (NAS)	2	-	1	**3**	2	-	1	**3**	20	20	60	25	-	-	**125**
VSEC	**2307201**	Electronics Skill Development Lab (ESDL)	-	4	-	**4**	-	2	-	**2**	-	-	-	50	-	25	75
MDM	**03051X1**	MDM-1	2	-	-	**2**	2	-	-	**2**	20	20	60	-	-	-	100
MDM	**03052X1**	MDM-1 #	-	2	-	**2**	-	1	-	**1**	-	-	-	-	25	-	25
OE	**0306301**	OE-I: Foreign Language Studies (FLS)	-	-	2	**2**	-	-	2	**2**	-	-	-	50	-	-	50
VEC	**0311101**	Universal Human Values (UHV)	2	-	-	**2**	2	-	-	**2**	-	-	-	25	-	-	**25**
AEC	**0308202**	Professional Development and Career Readiness (PDCR)	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
CEP	**03132XX**	Community Engagement project (CEP) /Field project (FP) /CCA$	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
		Total	**12**	**12**	**4**	**28**	**12**	**6**	**4**	**22**	**80**	**80**	**240**	**250**	**50**	**50**	**750**

L: Lecture, P: Practical, T: Tutorial,
CIE: Continuous Internal Evaluation, ISE: In-Semester Examination, ESE: End-Semester Examination,
TW: Term work, OR: Oral, P: Practical examination

S.Y. B. Tech, Semester - IV

Semester-4			Teaching Scheme (Hours/Week)				Credit scheme				Examination/ Evaluation Scheme and Marks						
											Theory			Practical			
Category of Course	Course code	Name of the Course	L	P	T	Total	L	P	T	Total	ISE [20]	CIE [20]	ESE [60]	CIE TW	ESE P	ESE OR	Total
PCC	**2403105**	Principles of Communication Engineering (PCE)	3	-	-	**3**	3	-	-	**3**	20	20	60	-	-	-	**100**
PCC	**2403206**	Principles of Communication Engineering Lab (PCEL)	-	2	-	**2**	-	1	-	**1**	-	-	-	-	25	-	**25**
PCC	**2403107**	Digital Circuit Design (DCD)	3	-	-	**3**	3	-	-	**3**	20	20	60	-	-	-	**100**
PCC	**2403208**	Digital Circuit Design Lab (DCDL)	-	2	-	**2**	-	1	-	**1**	-	-	-	-	25	-	**25**
PCC	**2403109**	Control Systems (CS)	2	-	1	**3**	2	-	1	**3**	20	20	60	25	-	-	**125**
VSEC	**2407202**	Project Based Learning (PBL)	-	4	-	**4**	-	2	-	**2**	-	-	-	25	-	25	**50**
EEM	**2409101**	Project Management and Finance Essentials (PMFE)	2	-	-	**2**	-	1	-	**1**	-	-	50	-	25	-	**75**
MDM	**04051X2**	MDM-2	2	-	-	**2**	2	-	-	**2**	20	20	60	-	-	-	**100**
MDM	**04052X2**	MDM-2 #	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	25	**50**
OE	**04063XX**	Open Elective-II (OE-II) *	-	-	2	2	-	-	2	2	-	-	50	-	-	-	50
AEC	**0408203**	Collaborative Skills, Digital Ethics, and Cyber Security (CDC)	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
VEC	**0411102**	Indian Constitution and Social Responsibility (ICSR)	1	-	-	**1**	1	-	-	**1**	-	-	-	25	-	-	**25**
		Total	**13**	**12**	**3**	**28**	**11**	**7**	**3**	**21**	**80**	**80**	**340**	**125**	**75**	**50**	**750**

#: Tutorial or laboratory as applicable. Choose one course from the MDM baskets. MDM: X is basket number, **Refer** **Annexure-I** for MDM details.

*: Open elective (OE) offered by online platform such as SWAYAM/NPTEL, **Refer** **Annexure-II** for details.

$: Student should choose any one course from Community Engagement project (CEP) /Field project (FP) /CCA prescribed in the syllabus at the start of semester.

X: Serial number of the courses under that particular category.

Second Year B-Tech
(S. Y B. Tech)
Semester-3

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2303101]: Signals and Systems (S&S)

Semester	Credits	Teaching Scheme	Examination Scheme
3	3	L: 3 Hrs./ Week	ISE: 20 Marks CIE: 20 Marks ESE: 60 Marks
	1	Tut: 1 Hr./ Week	ESE (OR): 25 Marks CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Fundamentals of linear algebra, complex numbers, calculus, linear equations, partial differential equations.

Course Objectives: The objective of this course is to provide students with

- A fundamental understanding of signals and systems concepts and essential groundwork for advanced courses such as signal processing, control systems, and communication.
- Analysis of systems using impulse and step responses, convolution integrals, and convolution sums.
- Frequency-domain analysis for periodic and non-periodic signals through Fourier series and Fourier transforms.
- A foundational understanding of LTI system analysis using the Laplace transform.

Course Outcomes: After completing this course, students will be able to

CO1: Identify and classify basic signals based on their mathematical descriptions and **perform** operations on dependent and independent variables of deterministic signals. **Apply** the properties of systems to characterize and **classify** them using input-output relations and impulse responses.

CO2: Analyze linear time-invariant systems to **determine** the output signal for a given system impulse response and arbitrary input using convolution integral and sum.

CO3: Analyze and **resolve** the signals in the frequency domain using Fourier analysis. **Determine** and **sketch** the amplitude and phase spectrum.

CO4: Given a time domain signal, **determine** the Laplace transform and **draw** its ROC. Given an impulse response of the LTI system, **analyze** the stability and causality using the Laplace transform and its properties.

COURSE CONTENTS

Module-I	Introduction to Signals and Systems	09 Hrs.

Signals: Introduction, Elementary signals: Unit impulse, Unit step, Unit ramp, Exponential, Sinusoidal, Rectangular pulse, Signum, and Sinc function. Operations on signals: time shifting, time reversal, time scaling, amplitude scaling, signal addition, and subtraction. Classification of signals: deterministic and random, periodic and non-periodic, energy and power, causal and non-causal, and even and odd signals. Systems: Introduction, Classification of systems: static and dynamic, causal and non-causal, linear and non-linear, time-variant and time-invariant, stable and unstable, and invertible and non-invertible systems. Analysis of the input voltage (unit step) and current signal in an RL/ RC circuit.

Module-II	Time domain representation of LTI System	09 Hrs.
Definition of the impulse response, Convolution integral: Computation of convolution integral using the graphical method for unit step to unit step, unit step to exponential, unit step to rectangular, and rectangular to rectangular signals. Convolution sum and its computation, Properties of convolution. System interconnection, System properties in terms of impulse response, Step response in terms of impulse response. Computing the impulse response of an RL/ RC circuit and using convolution to find its output for a rectangular voltage input.		
Module-III	**Fourier Analysis of Signals**	**09 Hrs.**
Exponential Fourier Series, Symmetries in exponential Fourier series, Properties of Fourier series, Gibb's phenomenon. Fourier Transform (FT) of aperiodic continuous time (CT) signals, Dirichlet conditions for the existence of Fourier transform, FT of standard CT signals, Properties, and their significance, Interplay between time and frequency domain using Sinc and Rectangular signals, FT for periodic signals. Frequency analysis of an RL/ RC circuit using Fourier methods.		
Module-IV	**Laplace Transform**	**09 Hrs.**
Definition of Laplace Transform (LT), Region of Conversion, Laplace transform of standard signals, Properties of ROC, Properties of Laplace transform and their significance, Inverse Laplace transform based on partial fraction expansion, Stability considerations in S domain, Application of Laplace transforms to the LTI system analysis. Application of Laplace transform to model and analyze a series RL/ RC circuit with a step input voltage.		
Text Books:		
T1.	S. Haykin and B. Van Veen, *Signals and Systems*, 2nd ed. New Delhi, India: Wiley India, 2007.	
T2.	C. Phillips, *Signals, Systems and Transforms*, 3rd ed. New Delhi, India: Pearson Education, 2003.	
Reference Books:		
R1.	M. J. Roberts, *Signals and Systems*. New Delhi, India: Tata McGraw-Hill, 2007.	
R2.	N. Kanni, *Signals and Systems*, 2nd ed. New Delhi, India: McGraw-Hill, 2013.	
Relevant MOOCs Course (Course name and Weblink)		
NPTEL Course: Principles of Signals and Systems, by Prof. Aditya K. Jagannatham, IIT Kanpur, Link: https://nptel.ac.in/courses/108104100.		
Relevant Topics for Self-study:		
Gaussian function, Signal multiplication, Convolution of exponential-to-exponential signal, Continuous-Time Fourier Series, Discrete-Time Fourier Series, Continuous-Time Fourier Transform, Discrete-Time Fourier Transform, Discrete Fourier Transform, Laplace Transform, Z-Transform, and their interrelations.		

List of Tutorials:

Sr. No.	Problem Statement	Hrs.	COs
1.	A. Sketch and write mathematical expressions for the following elementary signals in continuous time and discrete time: a) Unit Impulse b) Unit Step c) Unit Ramp d) Rectangular e) Sinusoidal f) Exponential g) Signum h) Sinc i) Triangular B. Classify and find the respective value for the above signals. a) Periodic / non-periodic b) Energy / Power/ Neither	2	CO1
2.	Consider any two continuous and discrete time signals and perform operations like amplitude scaling, addition, multiplication, differentiation, integration (accumulator for discrete time), time scaling, time shifting, and folding.	2	CO1
3.	Express the mathematical expressions of continuous time systems in input-output relation form and determine whether each is memoryless, causal, linear, stable, time-invariant, and invertible.	2	CO1
4.	Perform convolution two continuous-time signals using convolution integral and discrete-time signals using convolution sum. Prove the properties of convolution.	2	CO2
5.	Express the mathematical expressions of discrete time systems in impulse response form and determine whether each is memoryless, causal, linear, stable, and time-invariant.	2	CO2
6.	Compute the output of an RL/ RC circuit for a given rectangular voltage input using convolution.	2	CO2
7.	Compute Fourier Series components for the signals and plot their magnitude and phase response.	2	CO3
8.	State and prove the various properties of the Continuous Time Fourier Transform. Find the Fourier Transform of signals and plot amplitude and phase spectrum.	2	CO3
9.	Analyze the frequency response of an RL/RC circuit using the Fourier Transform and interpret the results.	2	CO3
10.	Compute the Laplace Transform of standard signals and determine the Region of Convergence (ROC).	2	CO4
11.	State and prove the properties of Continuous Time Laplace Transform. Find the Laplace Transform of given signals.	2	CO4
12.	Model and analyze a series RL/RC circuit with a step input voltage using the Laplace Transform and determine the output response.	2	CO4

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2303102]: Analog Circuit Design (ACD)

Semester	Credits	Teaching Scheme	Examination Scheme
3	3	L: 3 Hrs./ Week	ISE: 20 Marks CIE: 20 Marks ESE: 60 Marks

Prerequisite: Students should have prior knowledge of

- Basic electronic circuit components such as resistors, capacitors, and diodes.
- Fundamentals of semiconductor physics.
- Basic principles of transistor operation.
- Network analysis techniques.

Course Objectives: The objective of this course is to provide students with

- An understanding of the construction, characteristics, and operation of MOSFETs, along with their applications in amplifier and switching circuits.
- The ability to analyze the functionality of MOSFET-based circuits, feedback amplifiers, and oscillators used in analog electronics.
- The skills to design and evaluate operational amplifier-based analog circuits for real-world applications, including signal conditioning, waveform generation, and analog-to-digital conversion.

Course Outcomes: After completing this course, students will be able to:

CO1: Explain the working principles of MOSFETs, their non-ideal characteristics, and their role in amplifier and switching circuits.

CO2: Apply MOSFETs and operational amplifiers to design and simulate basic analog electronic circuits.

CO3: Analyze the performance of different types of feedback amplifiers and oscillators based on circuit parameters and design specifications.

CO4: Evaluate and **design** operational amplifier-based applications such as comparators, rectifiers, and waveform generators for industrial and academic purposes.

COURSE CONTENTS

Module-I	MOSFET Basic	09 Hrs.

Enhancement MOSFET: Construction, Characteristics, DC Load line, AC equivalent circuit, Parameters, Parasitic. Non ideal characteristics: Finite output resistance, Body effect, Sub-threshold conduction, breakdown effects, temperature effect, effect of W/L ratio, Common source amplifier & analysis, Source follower: circuit diagram, comparison with common source, Frequency response for amplifier.

Module-II	MOSFET Applications	09 Hrs.

Introduction to MOSFET as a basic element in VLSI, MOSFET as switch, CMOS inverter, resistor & diode. Current sink & source, Current mirror. Four types of feedback amplifiers, Effects of feedback, Voltage series & current series feedback amplifiers and analysis, Barkhausen criterion, Wein bridge & phase shift oscillator.

Module-III	OP-AMP Basics	09 Hrs.

Block diagram, Differential amplifier analysis for Dual input Balanced output mode - AC analysis (using r parameters) & DC analysis, Level shifter, Op amp parameters, Current mirror, Op-amp characteristics (AC & DC). Voltage series & voltage shunt feedback amplifiers, Effect on Ri, Ro, gain & bandwidth.

Module-IV	**OP-AMP Applications**	**09 Hrs.**

Inverting amplifier, non-inverting amplifier, Voltage follower, Summing amplifier, Differential amplifier, Practical integrator, Instrumentation amplifier, Precision rectifier, Comparator, Schmitt trigger, Wave form generator (Square & triangular wave generator), DAC, ADC.

Text Books:

T1. D. Neamen, *Electronic Circuits: Analysis and Design*, 3rd ed. New York, NY, USA: McGraw-Hill, 2002.

T2. R. A. Gaikwad, *Op-Amps and Linear Integrated Circuits*. New Delhi, India: Pearson Education, 2005.

T3. K. R. Botkar, *Integrated Circuits*. Mumbai, India: Technical Publications, 2010.

Reference Books:

R1. J. Millman and C. Halkias, *Integrated Electronics: Analog and Digital Circuits and Systems*. New Delhi, India: McGraw-Hill, 1991.

R2. D. A. Bell, *Electronic Devices and Circuits*, 5th ed. Oxford, U.K.: Oxford University Press, 2009.

R3. A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, 5th ed. New York, NY, USA: Oxford University Press, 1999.

Relevant MOOCs Course (Course name and Weblink)

1. NPTEL Course: Analog Electronic Circuits, IIT Kharagpur, by Prof. Pradip Mandal
   Link: https://nptel.ac.in/courses/108105158
2. NPTEL Course: **Analog Circuits, IIT Bombay, by Prof.** Jayanta Mukherjee
   Link: https://nptel.ac.in/courses/108101094

Virtual Laboratory Links:

1. Integrated Circuits:
   Link: http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/electronerds/index.html
2. Basic Electronics Virtual Lab
   Link: http://vlabs.iitkgp.ernet.in/be/

Relevant Topics for Self-study:

Study Various types of BJT, JFET, D-MOSFET with their construction, Working and Q-point calculations.

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2303203]: Analog Circuit Design Lab (ACDL)

Semester	Credits	Teaching Scheme	Examination Scheme
3	1	P: 2 Hrs./ Week	ESE (P): 25 Marks CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basic electronic components and circuit theory.
- Fundamentals of MOSFET and Op-Amp operations.
- Circuit simulation tools such as Micro-Wind and SPICE.
- Basics of analog and digital electronics.

Course Objectives: The objective of this course is to provide students with

- The ability to apply fundamental concepts of MOSFETs and operational amplifiers to design and implement basic analog circuits.
- The skills to analyze the performance characteristics of MOSFET-based and Op-Amp-based circuits through simulation and experimental testing.
- The expertise to design and evaluate practical analog circuits, including amplifiers, Schmitt triggers, and digital-to-analog converters (DACs), for real-world applications.

Course Outcomes: After completing this course, students will be able to

CO1: Construct and **test** various analog circuits such as amplifiers, Schmitt triggers, and DACs using MOSFETs and operational amplifiers.

CO2: Analyze the frequency response, gain, and impedance characteristics of single-stage amplifiers and differential amplifiers through simulations and experimental verification.

CO3: Evaluate the performance of Op-Amps by measuring parameters like input bias current, slew rate, and CMRR, and compare them with datasheet specifications.

COURSE CONTENTS

Expt. No.	Problem Statement	Hrs.	CO
1.	Design, build single stage CS amplifier & verify dc operating point.	2	CO1
2.	Simulate single stage CS amplifier, plot frequency response. Calculate A_v, R_i, R_o & bandwidth.	2	CO2
3.	Simulate CMOS inverter and transaction switch using Micro wind	2	CO2
4.	Measure following Op- amp parameters & compare with specifications given in data sheet. a) Input bias current b) Input offset current c) Input offset voltage d) Slew rate e) CMRR	2	CO3
5.	Simulation of differential amplifier up to second stage using MOSFET	2	CO2
6.	Design, build & test integrator using Op-amp for given frequency f_a.	2	CO1
7.	Design, build & test Schmitt trigger using Op-Amp (LF356, TI071)	2	CO1

8.	Design, build & test 2 or 3-bit R-2R ladder DAC.	2	CO1
9.	Design PCB for any suitable circuit	2	CO1

Text Books:

T1. D. Neamen, Electronic Circuits: Analysis and Design, 3rd ed. New York, NY, USA: McGraw-Hill, 2002.

T2. R. A. Gaikwad, Op-Amps and Linear Integrated Circuits. New Delhi, India: Pearson Education, 2005.

T3. K. R. Botkar, Integrated Circuits. Mumbai, India: Technical Publications, 2010.

Reference Books:

R1. J. Millman and C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems. New Delhi, India: McGraw-Hill, 1991.

R2. D. A. Bell, Electronic Devices and Circuits, 5th ed. Oxford, U.K.: Oxford University Press, 2009.

R3. A. S. Sedra and K. C. Smith, Microelectronic Circuits, 5th ed. New York, NY, USA: Oxford University Press, 1999.

Relevant Topics for Self-study:

Transistor as a switch in CE configuration, Application of Schmitt trigger (Temperature controller), PID controller.

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)
[2303104]: Network Analysis and Synthesis (NAS)

Semester	Credits	Teaching Scheme	Examination Scheme
3	2	L: 2 Hrs./ Week	ISE: 20 Marks CIE: 20 Marks ESE: 60 Marks
	1	Tut: 1 Hr./ Week	CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basics of Circuit Analysis: Voltage and current sources, Current Division, Voltage Division. Star-Delta transformation.

Course Objectives: The objective of this course is to provide students with

- A fundamental understanding of circuit analysis and network design.
- Knowledge of different types of circuit analysis, simplification techniques, and network theorems essential for analyzing electrical networks.
- Proficiency in transient analysis techniques for R-L and R-C circuits.
- An introduction to two-port networks and their applications.
- The skills to design and implement filters for various signal processing applications.

Course Outcomes: After completing this course, students will be able to

CO1: Select and **apply** the techniques & tools such as nodal analysis, mesh analysis, Thevenin's, Norton's, Superpositions, Maximum Power transfer theorems, and transformations to **solve** the electrical circuits.

CO2: Formulate and **analyze** the driven and source free RL and RC circuits. **Solve** for RL & RC circuits to **find** the transient responses in mathematical form.

CO3: Formulate the network equations and find the parameters for given network.

CO4: Design & **analyze** the filters for the given specifications.

COURSE CONTENTS

Module-I	Circuit Analysis and Network Theorems	08 Hrs.

Kirchoff's Laws, DC Circuit Analysis using Mesh and Node. Network Theorems: Thevenin's, Norton's, Maximum Power Transfer & Superposition. Circuit Simplification Techniques: Source Transformation & Source Shifting.

Module-II	Transient Analysis of Circuits	07 Hrs.

Time Constant, Initial & Final conditions for circuit elements, Transient analysis of R-L and R-C circuits, Analysis of first ordered equations.

Module-III	Two Port Parameters	06 Hrs.

Relationship of Two port variables, Short Circuit Admittance Parameters, Open Circuit Impedance Parameters, Transmission Parameters, Hybrid Parameters, Reciprocity and Symmetry condition.

Module-IV	Filters	05 Hrs.

Introduction to filters, Filter classification, filter parameters. Introduction to fundamental T & π filter sections, Design of Butterworth Low Pass Filters, Transformation of Low Pass Filters to High Pass Filter, Band Pass Filter, Band Stop Filter.
Text Books:
T1. Network Analysis by M.E.Van Valkenburg, Prentice-Hall India
T2. Ravish R Singh, "Network Analysis & Synthesis", McGraw-Hill Education.
T3. William H. Hayt, Jack E. Kimmerly and Steven M. Durbin, "Electrical Circuit Analysis", Tata McGraw Hill publication
Reference Books:
R1. M. E. Van Valkenburg, *Network Analysis*. New Delhi, India: Prentice-Hall of India, 2006.
R2. R. R. Singh, *Network Analysis and Synthesis*. New Delhi, India: McGraw-Hill Education, 2018.
R3. W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, *Electrical Circuit Analysis*. New Delhi, India: Tata McGraw-Hill, 2012.
Relevant MOOCs Course (Course name and Weblink)
1. NPTEL Course: Basic Electrical Circuits, IIT Madras, by Prof. Gajendranath Chowdary Link: https://nptel.ac.in/courses/117/106/117106108/ 2. SWAYAM Course: Network Analysis, by Prof. Tapas Kumar Bhattacharya, IIT Kharagpur Link: https://onlinecourses.nptel.ac.in/noc20_ee46/preview
Relevant Topics for Self-study:
S-parameter analysis of active and passive filters.

List of tutorials:

Sr. No.	Problem Statement	Hrs.	CO
1.	Determine the network parameters using KVL, KCL, node analysis, mesh analysis and circuit simplification techniques.	2	CO1
2.	Determine the network parameters using Network Theorems	2	CO1
3.	Formulate differential equation for R-L circuit and solve for current and voltages by determining initial conditions for driven and source free conditions and verify the same using simulation.	2	CO2
4.	Formulate differential equation for R-C circuit and solve for current and voltages by determining initial conditions for driven and source free conditions and verify the same using simulation.	2	CO2
5.	Determine the Short Circuit Admittance Parameters, Open Circuit Impedance Parameters for a given network.	2	CO3
6.	Determine the Transmission Parameters, Hybrid Parameters for a given network.	2	CO3
7.	For the given Butterworth Low Pass Filter specifications, find the order of the filter and show the structure.	2	CO4
8.	Convert the above Butterworth Low Pass Filter into High Pass Filter, Band Pass Filter, Band Stop Filter using appropriate transformations.	2	CO4
9.	Simulation of RC, LC. RLC circuits using MATALB/SCILAB	2	CO3

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2307201]: Electronics Skill Development Lab (ESDL)

Semester	Credits	Teaching Scheme	Examination Scheme
3	2	P: 2 Hrs. / Week	CIE (TW): 25 Marks ESE (OR): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basics of electronics devices, circuits sensors.

Course Objectives: The objective of this course is to provide students with

- A fundamental understanding of Arduino microcontroller architecture and its programming environment.
- Hands-on experience in interfacing sensors, actuators, and communication modules for embedded applications.
- The ability to design and implement basic embedded system prototypes using Arduino.

Course Outcomes: After completing this course, students will be able to

CO1: Demonstrate the ability to interface various sensors, actuators, and communication modules with the Arduino microcontroller.

CO2: Implement digital and analog input/output operations, PWM control, and serial communication to develop embedded system applications.

CO3: Design basic embedded system prototypes using Arduino for automation, measurement, and wireless communication applications.

COURSE CONTENTS

Expt. No.	Problem Statement	Hrs.	CO
1	Introduction to Arduino and LED Blinking	2	CO1
2	Switch/ Button-Controlled circuit (Digital Input and Output)	2	CO1
3	Analog and Digital Sensor Interfacing	2	CO1
4	DC Motor Speed Control	2	CO2
5	Servo Motor Control	2	CO2
6	LCD/GLCD/OLED Display Interfacing using I2C	2	CO2
7	Distance Measurement	2	CO2
8	Wireless Communication using Bluetooth Module	2	CO3

Text Books:

T1. Banzi, M., and Shiloh, M. *Getting Started with Arduino* 3rd ed. O'Reilly Media, 2014.

T2. Monk, S. *Programming Arduino: Getting Started with Sketches*, 2nd ed. McGraw Hill, 2013.

T3. Norris, T. *Arduino for Beginners: Essential Skills Every Maker Needs*. Que Publishing, 2016.

Reference Books:

R1. Purdum, J. *Beginning C for Arduino: Learn C Programming for the Arduino*, 2nd ed. Apress, 2020.

R2. McRoberts, M. *Beginning Arduino*, 2nd ed. Apress, 2013.

	R3. Margolis, M. *Arduino Cookbook*, 3rd ed. O'Reilly Media, 2020.
	R4. Cicci, J. *Arduino Project Handbook: 25 Practical Projects to Get You Started*. No Starch Press, 2017.
Relevant MOOCs Course (Course name and Weblink)	
1. NPTEL Course: Arduino, by Prof Kannan Moudgalya - Principal Investigator of Spoken Tutorial Project, Indian Institute of Technology, Mumbai: Link: https://onlinecourses.swayam2.ac.in/aic20_sp04/preview?utm_source=chatgpt.com. 2. NPTEL Course: Microprocessors and Microcontrollers, by Prof. Santanu Chattopadhyay, IIT Kharagpur: Link: https://onlinecourses.nptel.ac.in/noc25_ee49/preview?utm_source=chatgpt.com.	
Relevant Topics for Self-study:	
Study of various Arduino Boards, ports, timers etc.	

Second Year B. Tech (S. Y B. Tech) AY (2025-26) Electronics and Telecommunication Engineering (E&TCE) [03051X1]: Multidisciplinary Minor (MDM-1)			
Semester	**Credits**	**Teaching Scheme**	**Examination Scheme**
3	**2**	**L: 2 Hrs./ Week**	**ISE: 20 Marks** **CIE: 20 Marks** **ESE: 60 Marks**
Refer Annexure-I			

Second Year B. Tech (S. Y B. Tech) AY (2025-26) Electronics and Telecommunication Engineering (E&TCE) [03052X1]: Multidisciplinary Minor Lab (MDM-1)			
Semester	**Credits**	**Teaching Scheme**	**Examination Scheme**
3	**1**	**P: 2 Hrs./ Week**	**ESE (P): 25 Marks**
Refer Annexure-I			

Second Year B. Tech (S. Y B. Tech) AY (2025-26) Electronics and Telecommunication Engineering (E&TCE) [0306301]: OE-I Foreign Language Studies (FLS)			
Semester	**Credits**	**Teaching Scheme**	**Examination Scheme**
3	**2**	**Tut.: 2Hrs./ Week**	**CIE (TW): 50 Marks**
Refer Annexure-II			
Select one course listed in Annexure and			

Second Year
B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0311101]: Universal Human Values (UHV)

Semester	Credits	Teaching Scheme	Examination Scheme
3	2	L: 2 Hrs. / Week	CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- UHV-I: Universal Human Values-Introduction (SIP)

Course Objectives: The objective of this course is to provide students with

- An appreciation for the essential complementarity between 'values' and 'skills' as a foundation for sustained happiness and prosperity — the core aspirations of every human being.
- A holistic perspective on life and profession, grounded in a correct understanding of human reality and the rest of existence. This perspective supports the development of universal human values and encourages value-based living in a natural and integrated manner.
- Insights into the practical implications of a holistic understanding — fostering ethical human conduct, trustful and fulfilling relationships, and mutually enriching interactions with nature. This serves as an essential orientation in value education for young and curious minds.

Course Outcomes: After completion of this course, students will be able to

CO1: Distinguish between values and skills; differentiate happiness from the accumulation of physical facilities; compare the Self and the Body, and **evaluate** the role of intention and competence in human behavior.

CO2: **Analyze** the importance of harmonious relationships based on trust and respect, and **apply** these principles in personal and professional life.

CO3: **Examine** the role of human beings in establishing harmony with society and nature; **develop** strategies for ethical living and professional conduct.

COURSE CONTENT

Module-I	Basic aspiration of Human being & Harmony in Human being	12 Hrs.

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations. 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, Program to ensure self-regulation and Health.

Module-II	Harmony in the Family, society & Nature / Existence	12 Hrs.

Harmony in the Family – the Basic Unit of Human Interaction, Values in Human–to–Human Relationship, Nine universal values in relationships viz. Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude, Love. Understanding Harmony in Society, Vision for the Universal Human Order, Human Order Five Dimension. Understanding Harmony in the Nature, self–regulation

& mutual fulfillment among the Four orders of Nature, Realizing Existence as co-existence at all levels holistic perception of harmony in existence.

Textbooks:

T1. Gaur, R. R., Sangal, R., and Bagaria, G. P. *Human Values and Professional Ethics* 3rd revised ed., PHI, Excel Books Pvt. Ltd., New Delhi, 2010.

Reference Books:

R1. Nagaraj, A. *Jeevan Vidya: Ek Parichaya*. Jeevan Vidya Prakashan, Amarkantak, 1999.

R2. Tripathi, A. N. *Human Values*. New Age International Publishers, New Delhi, 2004.

R3. Krishnamurthy, J. *The Story of My Experiments with Truth* – by Mohandas Karamchand Gandhi on Education.

R4. Dharampal. *Rediscovering India*. Hind Swaraj or *Indian Home Rule* – by Mohandas K. Gandhi.

R5. Gandhi, M. K. *Hind Swaraj or Indian Home Rule*.

Websites and Online Resources:

W1. Universal Human Values

- Link: Universal Human Values - YouTube
- The focus of Universal Human Values is to guide learners in discovering what they find truly valuable in all aspects of life—individual, family, society, and nature/existence—while strengthening their resolve to uphold and live by these values.

W2. English eSIP Module 1 Universal Human Values I (UHV I) Session 1& 2

- Link: https://www.youtube.com/live/OgdNx0X923I?feature=shared
- This video module introduces Universal Human Values (UHV), explores life without clarity of basic aspirations, and highlights the importance of right understanding, relationships, and physical facilities.

Relevant MOOCs Course (Course name and Weblink)

1. NPTEL Course: Visions of Happiness and Perfect Society, by Prof. A. K. Sharma, Humanities and Social Sciences, IIT Kanpur.
   Link: NPTEL :: Humanities and Social Sciences - Exploring Human Values: Visions of Happiness and Perfect Society.

Relevant Topics for Self-study:

Making the Right Choices: Staying True to Your Values Despite Outside Pressure
How Kindness and Understanding Help Build Strong Relationships

List of tutorials:

Sr. No.	Problem Statement	Hrs.	CO
1.	Analyze inherent relationships and harmony through self-exploration, and evaluate the shift toward universal human consciousness and a holistic world vision.	2	CO1, CO3
2.	Reflect on personal experiences to identify patterns in human consciousness, and assess the influence of natural acceptance on decision-making.	2	CO1
3.	Differentiate between the needs of the Self and the Body; evaluate the sources of imagination within the Self; relate mental well-being to physical health.	2	CO1
4.	Analyze the role of trust and respect in human interactions, and evaluate their impact on personal and societal relationships.	2	CO2
5.	Reflect on personal family experiences to identify value systems and evaluate their contribution to societal harmony.	2	CO2, CO3
6.	Document and discuss real-life examples of universal human values like trust, respect, and gratitude in human relationships.	2	CO2
7.	Analyze the interconnectedness of self, family, and society, and assess how personal well-being contributes to societal harmony.	2	CO2, CO3
8.	Investigate natural ecosystems for balance and self-regulation, and propose ways humans can align their behavior with ecological harmony.	2	CO3

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0308202]: Professional Development and Career Readiness (PDCR)

Semester	Credits	Teaching Scheme	Examination Scheme
3	1	P: 2 Hrs./ Week	CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Soft Skills (SS)

Course Objectives: The objective of this course is to provide students with

- The skills to prepare a good resume, as well as prepare for interviews and group discussions.
- The ability to explore desired career opportunities in the employment market while considering their personal strengths, weaknesses, opportunities, and threats (SWOT).
- The necessary career skills to partake in and fully pursue a successful career path.

Course Outcomes: After completing this course, students will be able to

CO1: Prepare the resume on an appropriate template without any grammatical and syntax errors, and Present and Discuss with students.

CO2: Participate in a simulated interview and evaluate own performance for betterment.

CO3: Demonstrate effective communication skills through Group Discussion, self-management attributes.

CO4: Define personal and career goals (short-term and long-term) using introspective skills and Perform SWOT assessment.

CO5: Identify career opportunities in consideration of potential and aspirations.

COURSE CONTENTS

Expt. No.	Task to carry out	Hrs.	CO
1.	**Resume Skills** • Introduction of resume and its importance • Difference between a CV, resume and biodata • Essential components of a good resume. • Common errors while preparing a resume	4	CO1
2.	Prepare a good resume considering all essential components and present the resume	2	CO 1
3.	**Interview Skills: Preparation and Presentation** • Meaning and types of interviews (F2F, telephonic, video, etc.) • Dress code, background research, dos and don'ts. • Situation, task, action, and response (STAR concept) for facing an interview. • Interview procedure (opening, listening skills, and closure). • Important questions generally asked at a job interview (open- and close-ended questions)	2	CO 2
4.	**Interview Skills: Common Errors** • Discuss the common errors that candidates generally make at an interview • Demonstrate an ideal interview	2	CO 3
5.	**Group Discussion Skills**	2	CO 3

	• Meaning and Methods of Group Discussion • Procedure of Group Discussion • Group Discussion — Simulation Group Discussion — Common Errors		
6.	**Strengths, Weaknesses, Opportunities and Threats Analysis (SWOT):** • To carryout introspection and become aware of one's Strengths, Weakness, • Opportunities and Threats. • Document SWOT analysis in a matrix format.	2	CO 3
7.	**Exploring Career Opportunities** • Knowledge about the world of work, requirements of jobs, including self-employment. • Sources of career information. • Preparing for a career based on potential and availability of opportunities.	2	CO 4

Text Books:

T1. Bhattacharya, I. *An Approach to Communication Skills*. Dhanpat Rai.

T2. Chauhan, R. G. S., and Sharma, S. *Soft Skills: An Integrated Approach to Maximize Personality*. Wiley, First Edition, 2016.

Reference Books:

R1. Sweeney, S. *English for Business Communication*. Cambridge University Press.

R2. Kumar, S., and Lata, P. *Communication Skills*. Oxford University Press.

R3. Kalam, A. P. J. *Ignited Minds: Unleashing the Power Within India*. Penguin Books India, New Delhi, 2003.

Relevant Topics for Self-study:

- Foundation Skills in IT (FSIT) — Refer to the websites like https://www.sscnasscom. com/ssc-projects/capacity-building-and-development/training/fsit/ and
- Global Business Foundation Skills (GBFS) – Refer websites like https://www. sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0313201]:Community Engagement Project (CEP)

Semester	Credits	Teaching Scheme	Examination Scheme
3	1	P: 2 Hrs./ Week	CIE (TW): 50 Marks

Prerequisite: Students should have prior knowledge of

- Basic understanding of social and ethical responsibilities.
- Teamwork and communication skills acquired in prior coursework or group activities.
- Familiarity with problem-solving methodologies and project planning.

Course Objectives: The objective of this course is to provide students with

- Opportunities to engage with their local community, fostering empathy, teamwork, and problem-solving skills while contributing positively to their surroundings.
- An understanding of the challenges faced by the local community and the role of engineering in addressing those challenges.
- The ability to apply technical knowledge and skills to design solutions or interventions that create a positive impact on the community.
- The skills to evaluate and critically analyze the outcomes of their engagement activities, deriving actionable insights for sustainable impact.

Course Outcomes: After completing this course, students will be able to

CO1: Identify and Analyze community needs and challenges by engaging with stakeholders and evaluating real-world problems. *(Remembering & analyzing)*

CO2: Design and Implement practical, creative, and context-specific solutions using engineering principles to address community issues. *(Creating & applying)*

CO3: Reflect and Evaluate the effectiveness of their interventions and articulate lessons learned through reports and presentations. *(Evaluating & Understanding)*

COURSE GUIDELINES

A. Group Formation:

- Form a group of 3-4 students that share a similar interest in each batch, Duration: 24 hours (divided into manageable sessions or shifts).
- The group should be cohesive, sharing and caring, contribute to the task assigned.
- The task carried out need to be maintained in LOG book by each group.

B. Project Scope:

The CEP should focus on addressing a specific community or societal issue. Projects may fall under the following themes:

1. **Education and Awareness:**
   - Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability, mental health, or career planning for local stakeholders.
2. **Technology for Social Good:**
   - Develop a simple prototype or solution that addresses a real-world problem (e.g., a water-saving device, simple mobile apps, or tools for community use).
3. **Environmental Sustainability:**

- Organize clean-up drives, tree plantations, recycling campaigns, or energy conservation initiatives.

4. **Health and Wellness:**

- Promote health through awareness programs on hygiene, nutrition, and exercise.

5. **Skill Development:**

- Teach basic computer or technical skills to students, staff, or the community.

C. Step-by-Step Execution Plan:

1. Planning Phase:

- **Team Formation:**

Form teams of 3-4 students with a balance of skills and interests.

- **Project Selection:**

Choose a project theme and define a clear objective that aligns with community needs.

- **Proposal Submission:**
  - Submit a one-page project proposal outlining:
  - Title of the project.
  - Objective and expected outcome.
  - Plan of execution (timeline and activities).
  - Required resources (if any).
  - Get approval from the designated faculty mentor.

2. Execution Phase:

- **Phase 1 Activities**
  - Conduct initial outreach and engage with the community or target participants.
  - Implement planned activities with close teamwork and documentation.
- **Phase Activities**
  - Continue engagement and collect feedback from the participants.
  - Begin summarizing the outcomes of the project.
- **Best Practices:**
  - Maintain a positive attitude and open communication with the community.
  - Respect cultural norms and values of the participants.
  - Adapt your plan based on real-time needs or challenges.

3. Reporting Phase:

- **Documentation:**
  - Create a detailed report containing
  - Title, objective, and scope of the project.
  - Activities conducted and timeline.
  - Outcomes and community feedback.
  - Photos/videos of the activities (if permitted).
  - Challenges faced and how they were addressed.
- **Presentation:**
  - Each team will present their project to a panel of faculty members or peers, showcasing their efforts and outcomes.
  - Duration of presentation: 5-7 minutes per team.

D. Evaluation Criteria:

Projects will be evaluated based on:

1. **Relevance:** How well the project aligns with community needs.
2. **Impact:** The tangible and intangible benefits delivered to the community.
3. **Innovation:** Creativity in the approach or solution provided.
4. **Teamwork:** Collaboration and effective delegation within the group.
5. **Documentation & Presentation:** Clarity, depth, and overall delivery of the report and presentation.

E. Guidelines for Conduct:

1. **Behavior:** Students should display professionalism, punctuality, and respect.
2. **Safety:** Follow all safety protocols during on-campus or fieldwork activities.
3. **Feedback:** Collect feedback from participants to measure the success and identify areas for improvement.

F. Support and Supervision:

1. Faculty mentors will be assigned to each group to guide them throughout the project.
2. A resource or helpdesk will be available for logistical or technical support.

Reference Books:

R1. Dostilio, L. D., et al. *The Community Engagement Professional's Guidebook: A Companion to The Community Engagement Professional in Higher Education*. Stylus Publishing, 2017. A practical guide for community engagement projects, including tools and strategies for effective implementation and assessment.

R2. Waterman, A. *Service-Learning: A Guide to Planning, Implementing, and Assessing Student Projects*. Routledge, 1997. Insights into service-learning methodology, planning, and assessment techniques for impactful projects.

R3. Beckman, M., and Long, J. F. *Community-Based Research: Teaching for Community Impact*. Stylus Publishing, 2016. Approaches for conducting research and engagement projects collaboratively with communities.

R4. IDEO.org. *Design Thinking for Social Innovation*. IDEO Press, 2015. Explains how to apply design thinking to solve social problems, ideal for projects focusing on community engagement.

R5. Sherrod, L. R., Torney-Purta, J., and Flanagan, C. A. (Eds.). *Handbook of Research on Civic Engagement in Youth*. Wiley, 2010. A detailed guide on youth involvement in civic and community projects, with case studies and strategies for engagement.

Websites and Online Resources:

For Planning and Conducting Projects:

W1. UNESCO: Education for Sustainable Development

- Website: https://www.unesco.org
- Focus: Resources and case studies related to sustainability and community engagement.

W2. EPICS (Engineering Projects in Community Service)

- Website: https://engineering.purdue.edu/EPICS
- Focus: Offers methodologies and tools for engineering students to work on real-world projects benefiting communities.

W3. Ashoka: Innovators for the Public

- Website: https://www.ashoka.org

- Focus: Information on social entrepreneurship and community innovation projects.

W4. Design for Change

- Website: https://www.dfcworld.com
- Focus: Templates, toolkits, and project ideas for implementing impactful community-based projects.

For Evaluation and Impact Assessment:

W5. Community Tool Box (University of Kansas)

- Website: https://ctb.ku.edu
- Focus: Comprehensive resources for community engagement, project evaluation, and measuring outcomes.

W6. UN SDG (Sustainable Development Goals) Knowledge Platform

- Website: https://sdgs.un.org/
- Focus: Guidance on aligning community engagement projects with UN Sustainable Development Goals (SDGs).

W7. Campus Compact

- **Website: https://www.compact.org/**
- **Focus: Resources on civic and community engagement for students and educators, with a focus on project assessment.**

W8. BetterEvaluation

- Website: https://www.betterevaluation.org
- Focus: Tools and frameworks to evaluate the impact of community projects effectively.

W9. lan-Do-Check-Act Cycle (PDCA) – Deming Institute

- Website: https://deming.org/explore/pdsa
- Focus: Step-by-step guides for planning, implementing, and refining community projects.

Relevant MOOCs Course (Course name and Weblink)

1. NPTEL course: Ecology and Society, by Prof. Ngamjahao Kipgen, IIT Guwahati
   This course delves into the dynamic relationships between human cultures and their ecological environments, focusing on human-environment interactions and sustainable development.
   Link: https://onlinecourses.nptel.ac.in/noc20_hs77/preview.
2. NPTEL course: Basics of Health Promotion and Education Intervention, by Dr. Arista Lahiri, Dr. Sweety Suman Jha (IIT Kharagpur), Dr. Madhumita Dobe, Dr. Chandrashekhar Taklikar (AIIH&PH, Kolkata)
   This course provides a comprehensive understanding of health promotion and education interventions, covering planning, implementation, and evaluation strategies.
   Link: https://onlinecourses.nptel.ac.in/noc22_ge18/preview
3. NPTEL course: A Hybrid Course on Water Quality – An Approach to People's Water Data, by IIT Madras
   This hybrid course emphasizes practical fieldwork, including water sample collection and analysis, engaging with communities to assess water quality.
   Link: https://elearn.nptel.ac.in/shop/iit-workshops/completed/a-hybrid-course-on-water-quality-an-approach-to-peoples-water-data/?v=c86ee0d9d7ed

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0313202]: Field Project (FP)

Semester	Credits	Teaching Scheme	Examination Scheme
3	1	P: 2 Hrs./ Week	CIE (TW): 50 Marks

Prerequisite: Students should have prior knowledge of

- Basic understanding of core engineering concepts relevant to the chosen field of work.
- Knowledge of teamwork, communication, and project planning.
- Awareness of safety protocols and ethical considerations for fieldwork.

Course Objectives: The objective of this course is to provide students with

- Hands-on, real-world experience in applying engineering concepts through practical problem-solving and teamwork.
- The ability to analyze real-world field situations by identifying key challenges and requirements.
- The skills to apply engineering knowledge, tools, and techniques to develop effective solutions.
- The capability to critically evaluate their fieldwork outcomes in terms of impact, feasibility, and sustainability.

Course Outcomes: After completing this course, students will be able to

CO1: Assess field conditions and identify problems through observation and interaction with stakeholders.
CO2: Develop and **execute** a practical, field-based solution or prototype aligned with the identified needs.
CO3: Reflect on and evaluate the project outcomes in terms of their technical, social, and ethical impact.

COURSE GUIDELINES

A. Group Formation:

- Form a group of 3-4 students that share a similar interest in each batch, Duration: 24 hours (divided into manageable sessions or shifts).
- The group should be cohesive, sharing and caring, contribute to the task assigned.
- The task carried out need to be maintained in LOG book by each group.

B. Field Project Execution Guidelines

1. **Team Formation and Topic Selection:**
   - Students form groups of 3-4.
   - Select a project aligned with an engineering problem or theme, such as:
     - Environmental monitoring and solutions.
     - Designing small-scale engineering systems.
     - Infrastructure or community development.
     - Renewable energy solutions.
2. **Proposal Submission:**
   - Prepare a proposal that includes:
     - Project title and objectives.
     - Problem statement and proposed solution.
     - Field location and timeline.
     - Required resources.
   - Obtain faculty mentor approval.
3. **Fieldwork:**
   - Conduct site visits, data collection, and stakeholder interactions.
   - Design or develop the solution based on field observations.

- Ensure proper documentation of all activities.

4. **Reporting and Presentation:**
   - Prepare a detailed report with:
     - Objectives, methodology, and field observations.
     - Design, implementation, and results.
     - Challenges faced and lessons learned.
   - Present the report and findings to faculty and peers.

Reference Books:

R1. Walesh, S. G. *Engineering Your Future: The Professional Practice of Engineering*. Cengage Learning, 2012. Real-world applications of engineering principles, teamwork, and ethical practices.

R2. Phillips, R., and Johns, J. *Fieldwork for Human Geography*. Sage Publications, 2012. Field research methodologies, data collection techniques, and stakeholder engagement.

R3. Oberlender, G. D. *Project Management for Engineering and Construction*. McGraw-Hill Education, 2014. Planning and managing projects with practical tools for engineers.

R4. Williams, D. E. *Sustainable Design: Ecology, Architecture, and Planning*. Wiley, 2007. Field-based solutions emphasizing sustainability and environmental impact.

R5. Martin, M. W., and Schinzinger, R. *Introduction to Engineering Ethics*. McGraw-Hill, 2005. Ethical considerations in fieldwork and engineering projects.

Websites and Online Resources:

For Planning and Conducting Projects:

W1. Engineering Projects in Community Service (EPICS)
- Website: https://engineering.purdue.edu/EPICS
- Focus: Resources for field-based projects benefiting communities.

W2. Community Tool Box
- Website: https://ctb.ku.edu
- Focus: Guidelines for project planning, stakeholder engagement, and evaluation.

W3. National Geographic Education – Fieldwork Resources
- Website: https://education.nationalgeographic.org/
- Focus: Tips for conducting fieldwork, documenting findings, and analyzing data.

W4. BetterEvaluation
- Website: https://www.betterevaluation.org
- Focus: Frameworks and tools for project evaluation and impact assessment.

W5. Design for Change (DFC)
- Website: https://www.dfcworld.com
- Focus: Step-by-step guidance for impactful, design-based field projects.

W6. PDCA (Plan-Do-Check-Act) Methodology
- Website: https://deming.org/explore/pdsa
- Focus: Tools for iterative project planning and improvement during field execution.

Relevant MOOCs Course (Course name and Weblink)

1. Project Management, by Prof. Ramesh Anbanandam, IIT Roorkee,
   Link: https://onlinecourses.nptel.ac.in/noc24_mg01/preview.
2. Project Planning & Control, by Prof. Koshy Varghese, IIT Madras,
   Link: https://onlinecourses.nptel.ac.in/noc19_ce30/preview.
3. Project Management: Planning, Execution, Evaluation and Control, by Prof. Sanjib Chowdhury, IIT Kharagpur.
4. Link: https://onlinecourses.nptel.ac.in/noc24_mg78/preview.

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0313203]: Co-Curricular Activity (CCA)

Semester	Credits	Teaching Scheme	Examination Scheme
3	1	P: 2 Hrs./ Week	CIE (TW): 50 Marks

Prerequisite: Students should have prior knowledge of

- Basic understanding of core engineering concepts relevant to the chosen field of work.
- Knowledge of teamwork, communication, and project planning.
- Awareness of safety protocols and ethical considerations for fieldwork.

Course Objectives: The objective of this course is to provide students with

- An opportunity to acquire skills and competencies beyond the core curriculum.
- A foundation for holistic personality development.
- Preparation for future academic, professional, and personal growth.

Course Outcomes: After completing this course, students will be able to

CO1: Demonstrate the ability to lead and participate in teams.

CO2: Develop several important life skills such as leadership, organization, confidence time management, and socialization.

CO3: Improve self-confidence and decision-making abilities.

CO4: Experience the importance of community involvement.

COURSE GUIDELINES

As part of the implementation of autonomy with effective from Academic Year 2025-26 for the UG Co-curricular activities are included as credit courses in the curriculum. Accordingly, the number of credits is incorporated in curriculum structure.

BACKGROUND

SCTR's Pune Institute of Computer Technology believes in wholistic development of student catering to the requirements of engineering attributes (program outcomes) prescribed by Washington Accord and NBA through the implementation of Outcome Based Education. There is a limited scope of attaining all the program outcomes through classroom and laboratory teaching learning process. To expand the scope of learning to acquire all the attributes, PICT proposes to institutionalize and formalize the ongoing extra and co-curricular activities which are being carried out by students by awarding due credits and a certificate at the time of their graduation in addition to the University degree certificate. The purpose of Co and extracurricular activities is primarily the acquisition of skills and competencies in areas that are not directly part of the curriculum.

SCOPE

Co-curricular activity (CCA) is an activity, performed by students, that falls outside the realm of the regular academics of college or university education. Such activities are generally social, philanthropic, and often involve others of the same age. However, as part of autonomy and NEP 2020 guidelines some of the credits are included in the curriculum as mandatory for CCA. CCA includes but are not limited to Community Service Organizations (NCC, NSS), Cultural / Ethnic Organizations, Engineering Academic Honor Societies, Engineering Clubs/ Organizations, Orientation Programs, Health Related Organizations, Professional Engineering Societies – Student Chapters, Research(Voluntary Basis), Sports, educational

activities that include, seminars, workshops, project competitions, hackathons, debate competitions, and mathematics, robotics, and engineering teams and contests.

A student can earn one/two credits per year.

The activity hours accumulated throughout the year shall be calculated by the Co-Curricular Activity Committee (CCAC) to fix the number of credits to be granted to students at the end of the year. (Note: 30 hours =1credit)

MODE OF IMPLEMENTATION

1. A committee called Co-Curricular Activity Committee (CCAC) consisting of Dean Student Affairs and all the functional in charges of various activities shall facilitate the activities.
2. Identification and inclusion of Co-Curricular Activities to be considered for Credit System.
3. Mapping each activity to the program outcomes, design the assessment methodology.
4. Define the scope, methodology, number of hours required of each activity
5. Announcement of activity calendar
6. Registration and enrollment of interested students.
7. Allocation of faculty mentors to interested students based on the activity and expertise/interest.
8. Carry out the activities, submission of weekly report in the form of logbook.
9. Submission of detailed report in prescribed format mentioning all the activities carried out along with certificates, mementoes, photographs etc.
10. End-semester assessment and certificate of appropriate credits with the grade Outstanding, Excellent, Very Good, Good, Satisfactory etc.
11. Award of consolidated certificate at the time of graduation.

LIST OF VARIOUS CO-CURRICULAR ACTIVITIES

1. ADDICTION- Annual Social Gathering
2. Alumni Association
3. Art Circle
4. Astro Club
5. Automobile Club
6. AWS Cloud Club
7. Career Guidance Cell
8. Code Chef
9. CSI
10. Cyber Security Club
11. Debate Society DEBSOC
12. Defense Aspirant Club
13. Entrepreneurship Development Cell
14. Ethicraft Club
15. Finance club (PFISOC)
16. FOSS Club
17. Game Development Club (Game Utopia)
18. IEEE (PISB)
19. IEEE APS
20. Impetus & Concepts (INC)
21. Model United Nations (MUN)
22. National Service Scheme (NSS)
23. PICTOREAL
24. ROBOCON
25. Smart India Hackathon (SIH)
26. Social media Cell
27. Sports
28. Startup and Innovation Cell
29. Student Welfare & Discipline
30. TechFiesta (PICT International Hackathon)
31. ACM (PASC)
32. TEDx PICT
33. Training and Placement
34. Universal Human Values (UHV)

Second Year B. Tech (S.Y B. Tech)

Semester-4

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2403105]: Principles of Communication Engineering (PCE)

Semester	Credits	Teaching Scheme	Examination Scheme
4	3	L: 3 Hrs./ Week	ISE: 20 Marks CIE: 20 Marks ESE: 60 Marks

Prerequisite: Students should have prior knowledge of

- Basics of Fourier analysis, Signals and Systems

Course Objectives: The objective of this course is to provide students with

- A fundamental understanding of communication systems essential for analyzing modern analog and digital communication technologies.
- Knowledge of various analog modulation schemes (AM, FM), the need for sampling and quantization in PCM, and different waveform coding techniques such as DM and ADM.
- An understanding of various line coding schemes and their appropriate applications.
- Insights into different digital modulation schemes and spread spectrum techniques.

Course Outcomes: After completing this course, students will be able to

CO1: Define AM and FM techniques, analyze them in time and frequency domains, and explain their generation and detection methods. Compare power requirements, bandwidth, and hardware complexity.

CO2: Explain the sampling process and theorem for low-pass signals. Sketch the frequency spectrum for ideal, natural, and flat-top sampling. Draw and describe PCM, DM, and ADM modulators and demodulators.

CO3: Compare Polar, Unipolar, and Manchester line codes based on PSD, transparency, and error detection. Draw the transmitter and receiver block diagrams for BASK, BPSK, BFSK, QPSK, and MPSK, highlighting each block's function.

CO4: Draw the transmitter and receiver block diagrams for QASK, MSK, OFDM, DSSS, and FHSS. Analyze and compare bandpass modulation techniques based on BER, hardware complexity, and applications.

COURSE CONTENTS

Module-I	Analog transmission & reception	09 Hrs.

Amplitude modulation (DSB-FC), Double sideband Suppressed carrier (DSB-SC) modulation Spectrum and Bandwidth of AM, DSB-SC, Calculation of Modulation Index for AM wave, Power and power efficiency, Block diagram of AM receiver. Frequency Modulation (FM), Modulation Index, Spectrum of FM (single tone): Feature of Bessel Coefficient, Power of FM signal, Bandwidth of FM signal, FM Modulator, FM generation by Armstrong's Indirect method, FM demodulator.

Module-II	Pulse Modulation	09 Hrs.

Sampling theorem for low pass signal in time domain and Fourier domain and Nyquist criteria, Types of sampling- natural and flat top. Pulse amplitude modulation & concept of TDM: Channel bandwidth for PAM, Quantization of Signals, Quantization error, Companding: A-law & μ-law. Generation &

Reconstruction of Pulse code modulation (PCM), Differential Pulse code modulation, Delta Modulation, Adaptive Delta Modulation.		
Module-III	**Digital Modulation I**	**09 Hrs.**
Line codes: Properties and spectrum, Baseband Signal Receiver, Digital Modulation: Generation, Reception, Signal Space Representation and Probability of Error Calculation for Binary Phase Shift Keying (BPSK), Binary Frequency Shift Keying (BFSK), Quadrature Phase Shift Keying (QPSK), M-ary Phase Shift Keying (MPSK).		
Module-IV	**Digital Modulation II**	**09 Hrs.**
Generation, Reception, Signal Space Representation and Probability of Error Calculation for Quadrature Amplitude Shift Keying (QASK), Minimum Shift Keying (MSK), Orthogonal Frequency Division Multiplexing (OFDM), Comparison of digital modulation systems. Basics od Spread spectrum, Block diagram of Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread spectrum (FHSS).		
Text Books:		
T1.	B.P. Lathi, Zhi Ding, *Modern Analog and Digital Communication Systems*, 4th Edition, Oxford University Press, **2010**.	
T2.	Taub, Schilling, Saha, *Principles of Communication Systems*, 4th Edition, McGraw-Hill Education, **2013**.	
Reference Books:		
R1.	Bernard Sklar, Prabitra Kumar Ray, Digital Communications: Fundamentals and Applications, 2nd Edition, Pearson Education, 2009.	
R2.	Simon Haykin, Communication Systems, 4th Edition, John Wiley & Sons, 2001.	
R3.	A.B. Carlson, P.B. Crilly, J.C. Rutledge, Communication Systems, 5th Edition, Tata McGraw-Hill, 2010.	
Relevant MOOCs Course (Course name and Weblink)		
1. NPTEL Course: Principles of Communication Systems-I, by Prof. Aditya K. Jagannatham, IIT Kanpur, Link: https://nptel.ac.in/courses/108/104/108104091 2. NPTEL Course: Principles of Communication, by Prof. V. Venkat Rao, IIT Madras. Link: https://nptel.ac.in/courses/117/106/117106090/		
Relevant Topics for Self-study:		
AM receivers, Optimum Receiver, Mary-FSK		

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2403206]: Principles of Communication Engineering Lab (PCEL)

Semester	Credits	Teaching Scheme	Examination Scheme
4	1	P: 2 Hrs./ Week	CIE (TW): 25 Marks ESE(P): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basics of Fourier analysis, Signals and Systems

Course Objectives: The objective of this course is to provide students with

- A foundational understanding of analog modulation techniques such as Amplitude Modulation (AM) and Frequency Modulation (FM), including their generation, transmission, and reception through practical implementations.
- The knowledge and skills to analyze and implement digital pulse modulation techniques such as PCM and PAM, and various line coding schemes, along with the ability to evaluate their signal characteristics and bandwidth requirements.
- Practical exposure to digital modulation techniques including BFSK and DSSS, and to assess their performance under real-world conditions, including noise and interference, using simulation tools or hardware setups.

Course Outcomes: After completing this course, students will be able to

CO1: Analyze and **demonstrate** the generation and reception of analog modulation schemes such as AM and FM, and evaluate their characteristics using waveform and spectrum observations.

CO2: Construct, **illustrate**, and **evaluate** digital pulse modulation and line coding schemes including PCM, PAM, and various line codes; analyze their bandwidth and signal characteristics.

CO3: Demonstrate and **assess** the performance of baseband and bandpass digital modulation techniques like BFSK and DSSS in the presence of noise using simulation or hardware tools.

COURSE CONTENTS

Expt. No.	Problem Statement	Hrs.	CO
1.	Analyze AM transmitter and receiver using block diagrams; generate DSB-FC AM signals, compute modulation index and power, and evaluate waveform and spectral changes across various modulation indices.	2	CO1
2.	Analyze frequency modulator and demodulator systems using block diagrams; generate FM signals, compute modulation index and bandwidth, and interpret waveform and spectral characteristics.	2	CO1
3.	Apply the Sampling Theorem to generate PAM (natural and flat-top) signals, reconstruct the original waveform, and evaluate aliasing effects in the frequency domain.	2	CO2
4.	Construct and analyze a PCM system, sketch PCM waveforms, and compute signaling rate and bandwidth.	2	CO2

5.	Generate and compare line codes (NRZ, RZ, AMI, Manchester), sketch corresponding waveforms, and analyze bandwidth requirements.	2	CO2
6	Generate baseband input bit sequences and evaluate receiver performance in noisy environments using appropriate hardware setup.	2	CO3
7.	Analyze BFSK modulation using block diagrams; generate ASK1, ASK2, BFSK waveforms, sketch input and carrier signals, and evaluate bandwidth using practical methods.	2	CO3
8.	Demonstrate DSSS modulation; generate PN codes and DSSS signals using hardware setup and sketch the associated waveforms.	2	CO3

Text Books:

T1. B.P. Lathi, Zhi Ding, Modern Analog and Digital Communication Systems, 4th Edition, Oxford University Press, 2010.

T2. Taub, Schilling, Saha, Principles of Communication Systems, 4th Edition, McGraw-Hill Education, 2013.

Reference Books:

R1. Bernard Sklar, Prabitra Kumar Ray, Digital Communications: Fundamentals and Applications, 2nd Edition, Pearson Education, 2009.

R2. Simon Haykin, Communication Systems, 4th Edition, John Wiley & Sons, 2001.

R3. A.B. Carlson, P.B. Crilly, J.C. Rutledge, Communication Systems, 5th Edition, Tata McGraw-Hill, 2010.

Relevant Topics for Self-study:

Simulation of OFDM can be explored using Octave/ LabView

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2403107]: Digital Circuit Design (DCD)

Semester	Credits	Teaching Scheme	Examination Scheme
3	3	L: 3 Hrs./ Week	ISE: 20 Marks CIE: 20 Marks ESE: 60 Marks

Prerequisite: Students should have prior knowledge of

- Knowledge about basic logic gates and its truth table, Implementation of simple combinational digital circuit using logic gate, Knowledge of different Number system and its conversion.
- Knowledge about basic Boolean laws and De morgans law for designing combinational and sequential circuits.

Course Objectives: The objective of this course is to provide students with

- A foundational understanding of two-valued logic and logical circuits.
- Knowledge of Boolean algebra, Karnaugh maps, and their applications in designing and analyzing digital circuits.
- The ability to design, implement, and verify logical operations using combinational and sequential logic circuits.
- An introduction to the basics of Hardware Description Language (HDL) and programmable logic devices.

Course Outcomes: After completing this course, students will be able to

CO1: Explain and **compare** the characteristics of the logic families and **draw** the interfacing circuits (TTL to CMOS and vice-versa).

CO2: Design, Analyze and **Implement** the various combinational and sequential logic circuits to verify their function table.

CO3: Define and **compare** the state machine and **develop** the FSM using Mealy Moore machine representations.

CO4: Design of combinational circuits using various types of PLDs. **Design** the combinational logic circuits using HDL and PLDS.

COURSE CONTENTS

Module-I	Combinational Logic Design	10 Hrs.

Standard representation of logic functions, Realization of SOP and POS forms, Canonical form, Minimization of logic functions using K-map up to 4 variables. Design of Adders, Sub tractors, Code converters, Digital Comparators, Multiplexers, Demultiplexers, Decoders, Parity generator, Arithmetic Logic Unit

Module-II	Sequential Logic Design	08 Hrs.

Flip Flops, Clocked SR, JK, T, D and MS-JK flip-flop, Excitation table for flip-flops, Conversion of flip-flops, Applications of flip-flops: Counters: Synchronous and Asynchronous counters, shift registers, sequence generators. Mealy and Moore machines representation.

Module-III	ASM Design and Introduction to HDL	10 Hrs.

State diagram, State table, Design of State Machines using State assignment and State reduction, Design of sequence detector using Finite State Machine (FSM), Applications of FSM

Introduction to HDL, Modelling Styles, Modelling Combinational Logic using HDL, Modelling Sequential Logic using HDL.

Module-IV	**Digital Logic Families and PLD**	**08 Hrs.**

Classification of logic families, Characteristics of digital logic families: Speed of operation, Power Dissipation, Figure of merit, Fan in, Fan out, Current and Voltage parameters, Noise immunity, Operating temperatures and Power supply, Two Input TTL NAND Gate, CMOS Invertor, NAND and NOR, Interfacing

Introduction to PLDs and their types: ROM, PAL, PAL, CPLD and FPGA.

Text Books:

T1. R.P. Jain, Modern Digital Electronics, 4th Edition, 12th Reprint, TMH Publication, 2007.

T2. Thomas Floyd, Digital Electronics, 11th Edition, Pearson Publication, Year not specified, 2017.

T3. M. Morris Mano, Digital Logic and Computer Design, 4th Edition, Prentice Hall of India, 2018.

T4. Taub and Schilling, Digital Principles and Applications, 7th Edition, Tata McGraw-Hill Education, 2010.

T5. S. Palnitkar, Verilog HDL – A Guide to Digital Design and Synthesis, 3rd Edition, Pearson Publication, 2010.

Reference Books:

R1. A. Anand Kumar, "Fundamentals of digital circuits" 4th edition, PHI publication, 2014.

R2. John F. Wakerly, "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004.

R3. M. M. Mano, "Digital Design," 6th Edition. Pearson Education, 2018.

Relevant MOOCs Course (Course name and Weblink)

1. NPTEL Course: Digital Circuits and Systems, by Prof. Shankar Balchandran, IIT, Bombay.
Link: https://nptel.ac.in/courses /117/106/117106086/
2. NPTEL Course: Hardware modeling using verilog, by Prof. Indranil Sengupta, IIT Kharagpur,
Link: https://nptel.ac.in/courses/106/105/106105165/.

Relevant Topics for Self-study:

Quine-McCluskey Method 5-6 variables K-map, Ring / Twisted Ring counter using Shift Register.

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2403208]: Digital Circuit Design Lab (DCDL)

Semester	Credits	Teaching Scheme	Examination Scheme
4	1	P: 2 Hrs./ Week	ESE (P): 25 Marks CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basic Boolean laws, De Morgan's law.
- Implementation of simple combinational digital circuit using logic gate.

Course Objectives: The objective of this course is to provide students with

- The ability to design, implement, and verify logical operations using combinational and sequential logic circuits.
- Skills to analyze digital circuits for functionality and performance, as well as to troubleshoot and resolve issues in digital designs.

Course Outcomes: After completing this course, students will be able to

CO1: Design & implement various combinational and sequential logic circuits on digital trainer kit to verify their function table.

CO2: Design & implement various combinational and sequential logic circuits using HDL.

COURSE CONTENTS

Expt. No.	Problem Statement	Hrs.	CO
1.	**i). Study of IC-74LS153 as a Multiplexer.** a) Design and Implement 8:1 MUX using IC-74LS153 & Verify its Truth Table. b) Design & implement the given 4 variable functions using IC74LS153. Verify its Truth- Table. **ii). Study of IC-74LS138 as a Demultiplexer / Decoder**. a) Design and implement full adder and subtractor function using IC- 74LS138. b) Design & Implement 3-bit code converter using IC-74LS138. (Gray to Binary/Binary to Gray)	4	CO1
2.	**Study of IC-74LS83 as a BCD adder: (Refer Data-Sheet).** a) Design and Implement 1-digit BCD adder usingIC-74LS83. b) Design and Implement 4-bit Binary sub tractor using IC-74LS83.	4	CO1
3.	**Study of IC-74LS85 as a magnitude comparator, (Refer Data-Sheet).** Design and Implement 4-bit / 8-bit Comparator circuits.	2	CO1
4.	**Study of Counters:** Design and Implement 4-bit counter using JK- Flip flop.	2	CO1
5.	**Study of Counter ICs (74LS90/74HC191): (Refer Data-Sheet)**	4	CO1

	a) Design and Implement MOD-N and MOD-NN using IC-74LS90 and IC-74LS93. b) Design & Implement MOD-N Up/down Counter using IC74HC191 / IC74HC193. .		
6.	Study of shift register: (IC75HC 194/IC74LS194) a) Design and implement 4-bit register using D FF b) Ring counter and twisted ring counter	2	CO1
7.	Design and Implement Combinational Logic Circuit Using HDL.	2	CO2
8.	Design and Implement Sequential Logic Circuit Using HDL.	2	CO2
9.	Design PCB for any suitable digital circuit	2	CO1

Text Books:

T1. R.P. Jain, Modern Digital Electronics, 4th Edition, 12th Reprint, TMH Publication, 2007.

T2. Stephen Brown, *Fundamentals of Digital Logic Design with VHDL*, 1st Edition, TMH Publication, **2002**.

Reference Books:

R1. A. Anand Kumar, "Fundamentals of digital circuits" 4th edition, PHI publication, 2014.

R2. M. M. Mano, "Digital Design," 6th Edition. Pearson Education, 2018.

Relevant Topics for Self-study:

Verify & compare four voltage and current parameters for TTL and CMOS (IC 74LSXX, 74HCXX), (Refer Data-Sheet).

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2403109]: Control Systems (CS)

Semester	Credits	Teaching Scheme	Examination Scheme
4	2	L: 2 Hrs./ Week	ISE: 20 Marks CIE: 20 Marks ESE: 60 Marks
	1	Tut: 2 Hrs./ Week	CIE(TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Concept of open loop and closed loop transfer function,
- Steady state and transient state, Pole- zero plot of a system.

Course Objectives: The objective of this course is to provide students with

- A comprehensive understanding of control system fundamentals, including various modeling techniques and analysis methods.
- The ability to evaluate system stability and performance through time and frequency response analysis.
- Knowledge of advanced control concepts such as root locus, Bode plots, state variable analysis, and PID controllers.

Course Outcomes: After completing this course, students will be able to

CO1: Classify the control systems. **Obtain** the transfer function of a control system using block diagram reduction technique. **Define** stability and comment on the stability of the given system using Routh-Hurwitz Criterion.

CO2: Analyze the time domain response of a control system to obtain performance parameters like steady state error, static error coefficients, rise time, peak time, peak overshoot, settling time & delay time.

CO3: Sketch and **analyze** the root locus and comment on closed loop stability of a control system. **Determine** frequency domain parameters such as resonant frequency, resonant peak and bandwidth. **Draw** Bode plot and **analyze** the closed loop stability of a system by calculating gain margin and phase margin.

CO4: Obtain state equations, state diagram, state transition matrix and canonical forms for a control system using state space method. **Analyze** the characteristics of PID controller in P, I, D, PI, PD & PID modes. **State** the applications of PID controller.

COURSE CONTENTS

Module-I	Title: Introduction, Transfer Function and Stability of Control Systems	08 Hrs.

Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and Transfer function, Block diagram reduction Techniques.

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 of system from pole locations, Routh Hurwitz stability criterion.

Module-II	Title- Time Domain Analysis	05 Hrs.
Time domain analysis: transient response and steady state response, 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.		
Module-III	**Title- Frequency Response and Stability Analysis Techniques**	**08 Hrs.**
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. Frequency response and frequency domain specifications, stability analysis using Bode plot, Calculation of gain margin and phase margin from Bode plot.		
Module-IV	**Title- State Space Analysis and Controllers**	**05 Hrs.**
State space analysis, advantages and representation, transfer function from State space, canonical forms, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only. Concept of Controller, Basic ON-OFF Controller, Concept of Dead Zone, Introduction to P, I, D, PI, PD and PID controller, OFFSET of Controller, Integral Reset, PID Characteristics.		

Text Books:

T1. N. J. Nagrath & M. Gopal, *Control System Engineering*, 5th Edition, New Age International Publishers, 2017.

T2. K. Ogata, *Modern Control Engineering*, 5th Edition, Prentice Hall India Learning Private Limited, 2010.

Reference Books:

R1. Benjamin C. Kuo, Automatic Control Systems, 7th Edition, Prentice Hall of India, 2003.

R2. M. Gopal, Control System – Principles and Design, 4th Edition, Tata McGraw-Hill, 2012.

R3. Schaum's Outline Series, Feedback and Control Systems, Tata McGraw-Hill, 2010

Relevant MOOCs Course (Course name and Weblink)

1. NPTEL Course: Control systems, by Prof. C.S.Shankar Ram IIT Madras,
   Link: https://nptel.ac.in/courses/107/106/107106081/ .
2. NPTEL Course: Control System Design, by Prof. G R Jayanth, IISc Bangalore
   Link: https://nptel.ac.in/courses/115/108/115108104/

Relevant Topics for Self-study

Transfer function of RLC network, Mathematical Modeling of mechanical systems

List of Tutorials:

Expt. No.	Problem Statement	Hrs.	CO
1.	Derive the transfer function of electrical and mechanical systems by applying mathematical modeling techniques using Force-Voltage and Force-Current analogies.	2	CO1
2.	Evaluate the steady state error and calculate static error coefficients for the given control system.	2	CO2
3.	Determine the time domain performance specifications including rise time, peak time, peak overshoot, settling time, and delay time for a given system.	2	CO2
4.	Calculate and interpret the frequency domain specifications such as resonant frequency, resonant peak, and bandwidth for the given control system.	2	CO3
5.	Sketch the Bode plot for a given open-loop transfer function G(s)H(s), and determine gain margin, phase margin, and assess the stability of the system.	2	CO3
6.	Formulate the state equations, draw the state diagram, and compute the state transition matrix for a control system using the state-space representation.	2	CO4
7.	Simulate a control system using software tools and analyze its performance parameters based on time and frequency domain responses.	2	CO2, CO3
8.	Develop and execute a simulation program for a given control system using an object-oriented programming language to evaluate system behavior.	2	CO4

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2407202]: Project Based Learning (PBL)

(Circuit Minds: Learn by Doing)

Semester	Credits	Teaching Scheme	Examination Scheme
4	1	P: 2 Hrs./ Week	CIE (TW): 25 Marks ESE (OR): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basics of electronics components, circuits, electrical and electronics circuit analysis.
- C/ C++/ object-oriented programming and other programming knowledge.

Course Objectives: The objective of this course is to provide students with

- The ability to solve real-world problems individually or in groups using available resources.
- Skills to develop applications by applying electronics and communication engineering concepts, integrating prior knowledge when necessary.
- Hands-on experience in all stages of electrical and electronic system development, including specification, design, implementation, and testing.

Course Outcomes: After studying this course students will be able to

CO1: Formulate and **present** a project idea based on interest, literature survey, recent trends and real-life problems**. Plan** project work in team.

CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing, and troubleshooting etc. **Identify** appropriate solution and implement it using electronic hardware/software principles. **Demonstrate** the use of modern tools for simulation and implementation of the system.

CO3: Prepare a technical report based on the mini project work. **Comprehend** and **write** a project report and **draw** conclusions at a technical level.

COURSE GUIDELINES

A. Group Formation:

- Form a group of 3-4 students that share a similar interest in each batch.
- The group should be cohesive, sharing and caring, contribute to the task assigned.
- The task allocation for each week should be maintained in LOG book by each group.
- Hardware projects should be encouraged (80%) and some software projects may be allowed (20%).

B. Problem statement selections:

- Each course teacher will provide a list of problems statement in particular course studying in current year. These statements will be displayed prior to the commencement of semester.
- Students are instructed to choose one out of the provided statements. The statement will approve by course teachers on first come first serve basis.

OR

- A group of students will find THREE problem statements in any domain. Course teachers will approve one out of that depending on resources availability, and need of time. You may use following list to search appropriate project title.
  - Professional society (IEEE, IET, ACM etc.) Journal, Conference/transaction papers.
  - Electronics project or design magazine (E4U, ED, ESD etc.)
  - Component manufactures web sites (on semi, national semiconductors)
  - Data sheets/ application notes/ data manuals by electronics component manufacturers.
  - Design tutorials by electronics manufacturer.
  - Appendix, exercise section of reference books listed in the syllabus.
  - Recent trends in electronics.
  - Manufacturer challenges/ competition.
  - Carry out survey to solve problem by electronic means.
  - Robotics/ Robocon and other professional society requirements.
  - Extension to the old projects.
  - Social, live, sponsored, consultancy projects, inter-disciplinary may be encouraged.

C. Evaluation Method:

- The project Seminar-I (Introductory seminar) and Seminar-II (Completion seminar) are compulsory.
- Course teacher will prepare rubrics for the assessment and share the same with students at the commencement of semester.
- Week wise assessment is considered under the head continuous internal evaluation (CIE).

D. Week wise Assessment schedule:

Week Scheduled	Task to be performed
Week-1	a. Formation of Group and b. Literature Survey, Finalizing the Specifications
Week-2	a. Finalization of project titles b. Seminar-I (Project Idea) Presentation
Week-3	a. Selection of Components/devices/ algorithms, Paper Design b. Block schematic and Circuit diagram/ flow charts
Week-4	a. Simulation of Different modules/ functions b. Component Purchasing, Breadboard testing/ PCB layout design. c. Algorithm, Flow Chart testing
Week-5	Programming, Assembling, Soldering and testing.
Week-6	a. Integrating modules in HW/SW b. Designing enclosures
Week-7	a. Testing and Troubleshooting of HW/SW b. Seminar –II (Project Work) Presentation
Week-8	a. Testing and Troubleshooting of HW/SW b. Seminar –II (Project Work) Presentation
Week-9	a. Project Demonstration b. Project report preparation
Week-10	a. Project Exhibition b. Final report submission

Note: Students are instructed to adhere to the schedule strictly to smooth conduction of course.

Reference Books:	
R1.	Larmer, J., Mergendoller, J. R., & Boss, S., *Setting the Standard for Project Based Learning*, ASCD, 2015.
R2.	Larmer, J., & Boss, S., *Project Based Teaching: How to Create Rigorous and Engaging Learning Experiences*, ASCD, 2018.
R3.	Murphy, E. M., & Cooper, R., *Hacking Project Based Learning: 10 Easy Steps to PBL and Inquiry*, Times 10 Publications, 2017.
R4.	Krašna, M., *Project Based Learning (PBL) in the Teachers' Education*, 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), IEEE, pp. 852–856, 2016.
R5.	Macias-Guarasa, J., Montero, J. M., San-Segundo, R., Araujo, A., & Nieto-Taladriz, O., *A Project-Based Learning Approach to Design Electronic Systems Curricula*, IEEE Transactions on Education, Vol. 49, No. 3, pp. 389–397, 2006.
Relevant MOOCs Course (Course name and Weblink)	
SWYAM: Problem Based learning, by Dr. Indrajit Saha, National Institute of Technical Teachers Training and Research, Kolkata Link: https://onlinecourses.swayam2.ac.in/ntr20_ed12/preview.	

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[2409101]: Project Management and Finance Essentials (PMFE)

Semester	Credits	Teaching Scheme	Examination Scheme
4	2	L: 2 Hrs./ Week	CIE (TW): 25 Marks
	1	Tut.: 1 Hr. / Week	ESE (OR): 25 Marks

Prerequisite: Students should have prior knowledge of

- Principles of Management Course

Course Objectives: The objective of this course is to provide students with

- Fundamental concepts of project management and financial planning.
- An understanding of management evolution, principles, and strategic planning.
- Key aspects of forecasting, project estimation, and risk assessment.
- Enhanced decision-making abilities and organizational effectiveness.

Course Outcomes: After completing this course, students will be able to

CO1: Describe fundamental management principles and project management concepts, and **analyze** their applications in real-world scenarios.

CO2: Explain financial planning, risk assessment, and decision-making processes, and **evaluate** their effectiveness in project execution.

CO3: Apply basic management and project planning techniques to solve engineering and business-related problems, and **create** structured project plans for practical implementation.

COURSE CONTENTS

Module-I	Management and Project Fundamentals	5 Hrs.

- **Management Principles**: Definition, Nature, Scope, Characteristics, Functions, Roles, and Skills of an Effective Manager.
- **Evolution of Management**: Classical Theory, Scientific Management, Bureaucracy, Behavioral Science Approach, Systems Approach.
- **Project Management**: Introduction to Project Management, Project Life Cycle, Organization Strategy, and Project Selection.
- **Organizational Structure**: Project Management Organization Structure, Work Breakdown Structure (WBS).

Module-II	Planning, Forecasting, and Risk Management	5 Hrs.

- **Planning**: Types of Plans, Planning Process, Strategic Management, Environmental Appraisal, Industry Analysis.
- **Forecasting**: Components of Business Forecasting, Benefits, Techniques, and Limitations.
- **Project Estimation**: Time & Cost Estimation, Network Analysis using PERT/CPM, Resource Levelling, Scheduling.
- **Project Risk Management**: Risk Identification, Quantification, Mitigation, and Capital Project Risk Assessment.

Module-III	Financial and Objective Management	5 Hrs.

- **Decision-Making**: Decision-making Process, Group Decision-making, Problem-solving.
- **Management by Objectives (MBO)**: Concepts, Characteristics, Goal Setting, Action Plan.

- **Financial Management**: Profit Maximization, Wealth Maximization, Investment, Financing, and Dividend Decisions.
- **Investment Decisions**: Cost of Capital, Payback Period, Net Present Value, Internal Rate of Return, Profitability Index.

Module-IV	**Communication and Project Appraisal**	**5 Hrs.**

- **Communication**: Importance, Process, Barriers, Tone, Language, Role of Perception and Culture in Communication.
- **Project Appraisal**: Market, Technical, and Financial Feasibility.
- **Project Financing**: Capital Structure, Sources of Finance, Term Loans, Debentures, Public Issues.

Text Books:

T1:	Robbins, S. P., & Decenzo, D. A., *Fundamentals of Management*, 9th Edition, Pearson Education, 2016.
T2:	Koontz, H., O'Donnell, & Weihrich, H., *Essentials of Management*, 9th Edition, Tata McGraw Hill, 2012.
T3:	Chandra, P., *Projects: Planning, Analysis, Selection, Implementation & Review*, Tata McGraw Hill Publishing Co, 2014.
T4:	Gray, C. F., Larson, E. W., & Joshi, R., *Project Management – The Managerial Process*, 8th Edition, McGraw Hill Education, 2020.
T5:	Gido, J., & Clements, J. P., *Successful Project Management*, 6th Edition, Cengage Learning, 2014.
T6:	Chandra, P., *Financial Management*, Tata McGraw Hill Publishers, 2014.

Reference Books:

R1:	Nicholas, J. M., *Project Management for Business and Technology – Principles and Practice*, Prentice-Hall of India Ltd.
R2:	Pinto, J. K., *Project Management – Achieving Competitive Advantage*, 5th Edition, Pearson Publishing Ltd.
R3:	Khan, M. Y., & Jain, P. K., *Financial Management*, Tata McGraw Hill Publishers.
R4:	Daft, R. L., *Principles of Management*, Cengage Learning, 2009.
R5:	Tripathy, P. C., & Reddy, P. N., *Principles of Management*, Tata McGraw Hill, 1999.
R6:	Kreitner, R., & Mohapatra, M., *Management*, Biztantra, 2008.
R7:	*Management Fundamentals: Concepts, Applications, & Skill Development*, 6th Edition, Sage Publications, 2014.

Relevant MOOCs Course (Course name and Weblink)

1. Project Management: Planning, Execution, Evaluation and Control, By Prof. Sanjib Chowdhury, IIT Kharagpur
   Link: https://onlinecourses.nptel.ac.in/noc23_mg124/preview.
2. Introduction to Project Management: Principles & Practices, By Dr. Nimisha Singh, Quality Council of India
   Link: https://onlinecourses.swayam2.ac.in/imb25_mg80/preview.

Relevant Topics for Self-study:

Arbitration, Conflict Resolution and Project Management Tools

Second Year B. Tech (S. Y B. Tech) AY (2025-26) Electronics and Telecommunication Engineering (E&TCE) [04051X2]: Multidisciplinary Minor (MDM-2)			
Semester	**Credits**	**Teaching Scheme**	**Examination Scheme**
4	**2**	**L: 2 Hrs./ Week**	**ISE: 20 Marks** **CIE: 20 Marks** **ESE: 60 Marks**
Refer Annexure-I			

Second Year B. Tech (S. Y B. Tech) AY (2025-26) Electronics and Telecommunication Engineering (E&TCE) [04051X2]: Multidisciplinary Minor Lab (MDM-2)			
Semester	**Credits**	**Teaching Scheme**	**Examination Scheme**
4	**1**	**P: 2 Hrs./ Week**	**ESE (P): 25 Marks**
Refer Annexure-I			

Second Year B. Tech (S. Y B. Tech) AY (2025-26) Electronics and Telecommunication Engineering (E&TCE) [04063XX]: Open Elective-II (OE-II)			
Semester	**Credits**	**Teaching Scheme**	**Examination Scheme**
4	**2**	**Tut.: 2 Hrs./ Week**	**ESE: 50 Marks**
Refer Annexure-II			

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0408203]: Collaborative Skills, Digital Ethics, and Cyber Security (CDC)

Semester	Credits	Teaching Scheme	Examination Scheme
4	1	P: 2 Hrs./ Week	CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Course on Soft Skills (SS)

Course Objectives: The objective of this course is to provide students with

- Recognize the importance of team skills and develop strategies to acquire them.
- Effectively design, develop, and adapt to various situations both individually and as part of a team.

Course Outcomes: After completing this course, students will be able to

CO1: Empathize with and trust colleagues for improving interpersonal relations.

CO2: Demonstrate effective communication by respecting diversity and embracing good listening skills.

CO3: Distinguish the guiding principles for communication in a diverse, smaller, internal world.

CO4: Practice interpersonal skills for better social and professional relations with seniors, juniors, peers, and stakeholders.

COURSE CONTENTS

Expt. No.	Task to carry out	Hrs.	CO
1.	**Trust and Collaboration** Explain the Importance of Trust in Creating a Collaborative Team Agree to Disagree and Disagree to Agree – Spirit of Teamwork Understanding Fear of Being Judged and Strategies to Overcome Fear.	4	1
2.	**Listening as a Team Skill** Advantages of Effective Listening Listening as a Team Member and Team Leader. Use of active listening strategies to encourage sharing of ideas (full and undivided attention, no interruptions, no pre-think, use empathy, listen to tone and voice modulation, recapitulate points.).	2	2
3.	**Brainstorming** Brainstorming as a Technique to Promote Idea Generation a. Brainstorming: Meaning and the Process b. Procedure for Conducting Brainstorming c. Importance of Using Brainstorming Technique d. Types of Brainstorming	2	3
4.	Learning and Showcasing the Principles of Documentation of Team Session Outcomes.	2	3
5.	**Social and Cultural Etiquette** Need for Etiquette (impression, image, earn respect, appreciation) • Aspects of Social and Cultural/Corporate Etiquette in Promoting Teamwork • Importance of Time, Place, Propriety and Adaptability to Diverse Cultures	2	4
6.	**Digital Ethics**	2	4

	Digital Ethics i. Digital Literacy Skills, ii. Digital Etiquette, iii. Digital Life Skills		
7.	**Cyber Security** The Art of Protecting Secrets a. Understanding Encryption and Decryption and Its Different Types b. Art of Data Masking c. Firewall and Its Proper Use in Cyber Protection	2	4

Text Books:	
T1.	Ratliff, J., *Leadership Through Trust & Collaboration: Practical Tools for Today's Results-Driven Leader*, Morgan James Publishing, 2020.
T2.	Dauda, J., *Cybersecurity and Digital Ethics: Principles of Cybersecurity (Cybersecurity Practices, Technologies, and Processes), 2023*.
Reference Books:	
R1.	Kelly, T., & Kelly, D., *Creative Confidence: Unleashing the Creative Potential Within Us All*, Harper Collins Publishers India, New Delhi, 2014.
R2.	Sweeney, S., *English for Business Communication*, Cambridge University Press, 2003.
R3.	Kumar, S., & Lata, P., *Communication Skills*, Oxford University Press, 2015.

Students can avail additional resources to enhance soft skills further

1. SWAYAM Course: Leadership, by Prof. Kalyan Chakravarti and Prof. Tuheena Mukherjee, IIT Kharagpur Link: https://onlinecourses.nptel.ac.in/noc19_mg34/preview.
2. SWYAM course: Towards an Ethical Digital Society: From Theory to Practice, by Prof. Bidisha Chaudhuri, IIIT Bangalore
   Link: https://nptel.ac.in/course s/109106184
3. Global Business Foundation Skills (GBFS) – Refer websites like https://www. sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Electronics and Telecommunication Engineering (E&TCE)

[0411102]: Indian Constitution and Social Responsibility (ICSR)

Semester	Credits	Teaching Scheme	Examination Scheme
4	1	L: 1 Hrs./ Week	CIE (TW): 25 Marks

Prerequisite: Students should have prior knowledge of

- Basic Knowledge of Civics and Governance.
- Ethical Reasoning and Social Awareness, Communication and Critical Thinking Skills.

Course Objectives: The objective of this course is to provide students with

- An understanding of the principles of social responsibility, ethical citizenship, and the Indian Constitution.
- The ability to analyze the role of individuals and institutions in fostering responsible citizenship, democracy, and social change.
- Skills to evaluate ethical dilemmas and legal frameworks for making informed civic decisions.
- Opportunities to design initiatives that promote social responsibility and active community participation.

Course Outcomes: After completing this course, students will be able to

CO1: Explain fundamental concepts of social responsibility, civic engagement, and constitutional law.

CO2: Apply ethical and legal principles to address community and global issues.

CO3: Analyze the relationship between fundamental rights, duties, and governance in India.

CO4: Develop community-driven projects that contribute to sustainable development and civic well-being.

COURSE CONTENTS

Module-I	Introduction to Indian Constitution	4 Hrs.

- Historical Background and Evolution of the Indian Constitution
- Preamble and its significance
- Fundamental Rights and Duties
- Directive Principles of State Policy

Activities:

- **Debate:** Relevance of Fundamental Rights in Contemporary India
- **Case Study:** Landmark Supreme Court Judgments

Module-II	Government Structure & Electoral System	4 Hrs.

- Separation of Powers: Legislature, Executive, and Judiciary
- Parliamentary vs. Presidential System
- Supreme Court and High Court
- Federalism: Centre-State Relations
- Election Commission and Electoral Reforms (Antidefection law)

Activities:

- **Mock Parliament Session**
- **Discussion:** Impact of Electoral Reforms on Indian Democracy. Role of executives.

Module-III	Social Responsibility & Citizenship	4 Hrs.

- Definitions of Social Responsibility and Citizenship
- Ethics and Moral Duties in Society
- Individual vs. Collective Responsibility
- Case Studies: Impactful Citizens and Social Movements

Activities:

- **Group Discussion:** What does responsible citizenship mean to you?
- **Reflection Assignment:** Personal Social Responsibility

Module-IV	Civic Engagement & Sustainable Development	4 Hrs.

- Forms of Civic Engagement (Volunteering, Advocacy, Social Activism)
- Role of NGOs, Government, and Private Sectors
- Sustainable Development Goals (SDGs)
- Corporate Social Responsibility (CSR)

Activities:

- **Role-Playing Exercise:** Simulating a Town Hall Meeting
- **Local Community Service Initiative**

Reference Books:

R1:	Sen, Amartya. *The Idea of Justice*, Discusses fairness and ethics in society, 2009.
R2:	D.D. Basu, *Introduction to the Constitution of India*, LexisNexis, Latest Edition.
R3:	Granville Austin, *The Indian Constitution: Cornerstone of a Nation*, Oxford University Press.
R4:	Rawls, John. *A Theory of Justice*– Covers principles of justice and democracy, 1971.
R5:	United Nations Sustainable Development Goals (SDGs) – Official UN resources on social responsibility.
R6:	Sachs, Jeffrey. *The Age of Sustainable Development*– Insights into global responsibility, 2015.

Relevant Online Courses (Course name and Weblink)

1. **Harvard University (edX): "Justice" by Michael Sandel** – Ethics & civic responsibility.
2. **Coursera (University of London): "Global Diplomacy – The United Nations in the World"** – Understanding international citizenship.
3. **Future Learn: "Social Responsibility and Sustainable Development"** – Corporate & personal social responsibility.
4. **Khan Academy: "Civics & Government"** – Basic concepts of democracy and civic engagement.

Relevant Topics for Self-study:

1. NPTEL course: Corporate Social Responsibility, by Prof. Aradhna Malik, IIT Kharagpur
   This course introduces participants to the field of Corporate Social Responsibility (CSR), covering its history, planning, implementation, evaluation, and future directions.
   Link: Corporate Social Responsibility
2. NPTEL course: Community Engagement and Social Responsibility, by Prof. Akshay Kumar Satsangi, Dayalbagh Educational Institute, Agra
   This course emphasizes the importance of community development through self-help groups, health and well-being, literacy, employment, and the role of social networking in bridging government schemes and the people of India.
   Link: Community Engagement and Social Responsibility.
3. NPTEL course: Constitutional Government & Democracy in India, by Prof. Amitabha Ray, St. Xavier's College (Autonomous), Kolkata

This course acquaints students with the constitutional design of state structures and institutions, and their actual working overtime. It traces the embodiment of conflicting impulses within the constitution and encourages a study of state institutions in their mutual interaction and with the larger extra-constitutional environment.
Link: SWAYAM: Constitutional Government & Democracy in India

4. NPTEL course: Constitution Law and Public Administration in India, By Prof. Sairam Bhat, National Law School of India University
This course explores the intricacies of constitutional law and public administration in India, providing insights into the legal frameworks and administrative structures that govern the country.
Link: NPTEL: Constitution Law and Public Administration in India

Any special topics of interest:
Constitutional Bodies, Competitive examinations: UPSC, MPSC, IES.

Annexures

Annexure-I

Structure of Multi-Disciplinary Minor Courses

The structure for the multidisciplinary Minor courses is as follows.

			Teaching Scheme (Hours/Week)				Credits				Examination Scheme and Marks						
Sem	**Course code**	**Name of Course**	**L**	**P**	**T**	**Total**	**L**	**P**	**T**	**Total credits**	**Theory**			**Practical**			**Semester**
											CIE	**ISE**	**ESE**	**CIE**	**ESE**		**Total**
											[20]	**[20]**	**[60]**	**TW**	**P**	**OR**	**550**
3	**03051X1**	MDM-1	2	-	-	**2**	2	-	-	**2**	20	20	60	-	-	-	**100**
3	**03052X1**	MDM-1 #	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
4	**04051X2**	MDM-2	2	-	-	**2**	2	-	-	**2**	20	20	60	-	-	-	**100**
4	**04052X2**	MDM-2 #	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
5	**05051X3**	MDM-3	2	-	-	**2**	2	-	-	**2**	20	20	60	-	-	-	**100**
5	**05052X3**	MDM-3 #	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
6	**06051X4**	MDM-4	2	-	-	**2**	2	-	-	**2**	20	20	60	-	-	-	**100**
6	**06052X4**	MDM-4 #	-	2	-	**2**	-	1	-	**1**	-	-	-	25	-	-	**25**
8	**08053X5**	MDM-5	-	-	2	**2**	-	-	2	**2**	-	-	-	50	-	-	**50**
		Total	**8**	**8**	**2**	**18**	**8**	**4**	**2**	**14**	**80**	**80**	**240**	**150**	**0**	**0**	**550**

Note: In course code X is basket number. #: is laboratory or tutorial as per course requirements.

1. Students are expected to choose one of the eligible domains of MDM at the beginning of the Semester III.
2. Students will complete the chosen set of all multidisciplinary minor courses mentioned under the chosen MDM domain.
3. Students are not permitted to change from one domain to another.
4. Refer to the last column of following table for eligibility to choose a particular MDM domain.

Lis of Multi-Disciplinary Minor Domains

Label	Multi-Disciplinary Minor Domains	SY		TY		B-Tech	Offered to students of B Tech Program
		MD1-1	MD2-2	MD3-3	MD4-4	MD5-5	
		Sem-III	Sem-IV	Sem-V	Sem-VI	Sem-VII/VIII	
MD1	**Smart and Sustainable Systems (SSS)**	Fundamentals of Smart and Sustainable Systems (FSSS) & Tut	IoT for Smart and Sustainable Systems (ISSS) & Lab	Data Analytics for Smart and Sustainable Systems (DASSS) & Lab	Security for Smart and Sustainable Systems (SSS&S) Smart and Sustainable System Development (SSD) Lab	Smart and Sustainable System Development (SSD)	**ALL**
MD2	**Finance and Management (F&M)**	Fundamentals of Financial Engineering (FFE) & Tut	Banking, Financial Services and Insurance (BFSI) &Tut	Fundamentals of Stock Market (FSM) &Tut	Fintech: Foundations & Applications (FFA) &Tut	Financial Derivatives & Risk Management (FDRM)	**ALL**
MD3	**3D- Printing (3DP)**	3D modeling and Design (3MD) & Lab	Fundamentals of Additive Manufacturing (FAM)& Lab	3D Printing Materials and Processes (3DPMP)	Industry 4.0 and Digital Manufacturing (IDM)	Applied 3D Printing and Prototyping Lab (A3DPPL)	**ALL**
MD4	**Electric Vehicles (EV)**	EV foundation – Principles and Concepts (EVPC) & Lab	Advanced Motor Technologies and Power Electronics for EV(AMT) & Lab	EV Powertrain Dynamics and Control System (PDC) Tut/Lab	Intelligent EV Systems: AI IoT and Automation (IEV)	Capstone Project in Electric Mobility	**ALL**
MD5	**Applied Mathematics for Engineering (AME)**	Linear Algebra with Python & Lab	Statistical Techniques and Numerical Methods with R & Lab	Fuzzy Logic and Graph Theory with Matlab/Python & Lab	Optimization Techniques & Lab	Field Study/Case Study	**ALL**
MD6	**Software Development (SD)**	Data Structures and Algorithms (DSA) & Lab	Object Oriented Programming (OOP) &Lab	Database and Management Systems (DBMS) & Lab	Web Development (WD) & Lab	System Programming and Operating System (SPOS)	**Only E&TCE**
MD7	**Autonomous and Intelligent Systems (AIS)**	Digital Systems and Organization (DSO) & Lab	Smart System Engineering (SSE) & Lab	Embedded IoT Systems (EIS) & Lab	Autonomous Systems (AS) & Lab	Cyber Physical Systems: Screen Mode (CPS) / Capstone Project	**All except E&TCE**
MD8	**Embedded Systems (ES)**	Fundamental of Microcontroller (FM) & Lab	Embedded Processors –I (EP -I) & Lab	Microcontrollers and IoT (MI) & Lab	Embedded Systems and RTOS (ES-RTOS) & Lab	Capstone Project using Microcontrollers lab (CPML)	**All Except E&TCE**
MD9	**AI & Machine Learning (AI-ML)**	Statistical Data Analysis & Lab	Machine Learning (ML) & Lab	Natural Language Processing (NLP) & Lab	Artificial Intelligence (AI) & Lab	Deep Learning (DL)	**Only E&CE**

Link: **Detailed Syllabus**

Annexure -II

Guidelines for Open elective Courses

1. Open Elective – I will be offered in third semester as foreign language as prescribed in the structure.
2. Open Electives – II, III, IV will be offered through SWAYAM/NPTEL MOOCs of Equivalent Credits.
3. Departments shall prepare the baskets of open elective courses from discipline/faculty other than respective major programs. Students may choose any course from the basket without adhering to any one stream.
4. Credits & Grade will be awarded based on the Marks Obtained through the certification including assignments and proctored examination as per the MOOCs Policy.

			Teaching Scheme (Hours/Week)				Credits				Examination Scheme and Marks						
Sem	Course code	Name of the Course	L	P	T	Total	L	P	T	Total	Theory			Practical			Total
											CIE	ISE	ESE	CIE	ESE		
											[20]	[20]	[60]	TW	P	OR	
3	OE-I	Foreign Language Studies (FLS)	-	-	2	2	-	-	2	2	-	-	-	50	-	-	50
4	OE-II	MOOCs	-	-	2	2	-	-	2	2			50	-	-	-	50
5	OE-III	MOOCs	-	-	2	2	-	-	2	2	-	-	50	-	-	-	50
6	OE-IV	MOOCs	-	-	2	2	-	-	2	2	-	-	50	-	-	-	50

Guidelines for MOOCs

1. The department shall release a list of approved SWAYAM-NPTEL courses before the commencement of every semester.
2. Students shall register for the approved Courses as per the schedule announced by SWAYAM-NPTEL.
3. A student shall undergo the courses only from the list notified by the department through SWAYAM/NPTEL platform and complete all the assignments and examination requirements as specified by SWAYAM/NPTEL.
4. SWAYAM-NPTEL Courses are considered for transfer of credits only if the student concerned has successfully completed and obtained the SWAYAM-NPTEL Certificate.
5. The credit equivalence for SWAYAM-NPTEL Courses: 12 weeks – 3credits; 8 weeks – 2 credits; 4 weeks – 1 credit.
6. Equivalent marks will be considered for awarding the grades as specified in examination rules and regulations. The weightage for assignments is 40%, while the weightage for the proctored examination will be 60% for award calculating SGPA/CGPA. Students must score a minimum of 40% of the total marks by combining both assignments and proctored examinations

7. A student must submit the original SWAYAM-NPTEL Course Certificates to the Head of the Department concerned, with a written request for the transfer of the equivalent credits. On verification of the SWAYAM-NPTEL Course Certificates and approval by the head of the department, credits will be awarded.
8. The Institute shall not reimburse any fees/expenses a student may incur for the SWAYAM-NPTEL Courses.
9. If the SWAYAM/NPTEL course calendar does not align with the institute's calendar, the department shall facilitate and conduct examination of the relevant course of equivalent credits in physical/virtual mode and award the credits accordingly.

Detailed Syllabus for Foreign Language Studies

Choose any one course from the following courses and report that to department

Second Year B. Tech (S. Y B. Tech) AY (2025-26)
Common to all

[0306301]: Foreign Language Studies - German (FLSG)

Semester	Credits	Teaching Scheme	Examination Scheme
3	2	T: 2 Hrs./ Week	CIE: 50 Marks

Prerequisite: Nil

Course Objectives: The objective of this course is to provide students with

- Ccommunicate about everyday topics in German.
- Learn basic German grammar rules.
- Build a practical German vocabulary.
- Gain awareness of German culture.

Course Outcomes: After completing this course, students will be able to

CO1: Introduce themselves and others in German.
CO2: Describe daily life and their surroundings
CO3: Discuss time, jobs, and health in German.
CO4: Plan leisure activities and travel in German

COURSE CONTENTS

Module-I	Introduction, Personal Information, and Basic Grammar	6 Hrs.

Themes:

- Introducing oneself and others
- Hobbies
- Days of the week, months, seasons

Grammar:

- W questions
- Personal pronouns
- Simple sentences
- Verb conjugation
- Articles (definite and indefinite)
- Plurals
- Verbs "to have" and "to be"

Module Content:

- Introduction to German greetings and how to introduce oneself.
- Practicing conjugation of common verbs.
- Learning W-questions and using personal pronouns in conversation.
- Discussing hobbies and daily routines.
- Days of the week, months, and seasons in German.
- Building simple sentences using the conjugated verb forms and personal pronouns.

- Grammar practice: Definite and indefinite articles, plural forms.
- Introducing the verbs “haben” (to have) and “sein” (to be) with conjugation practice.

Activities:

- **Role-play:** Students practice introducing themselves, asking and answering W-questions.
- **Group discussion:** Students talk about their hobbies, days of the week, and favorite months/seasons using the vocabulary they learned.
- **Grammar Quiz:** Personal pronouns, articles, and verb conjugations.

Module-II	City Life, Directions, and Food	6 Hrs.

Themes:

- In the city (naming places, buildings, means of transport, basic directions)
- Food, drink, family, groceries, meals

Grammar:

- Articles and plural forms
- Negation (kein, nicht)
- Imperative forms

Module Content:

- Vocabulary related to city life: buildings, streets, means of transport.
- Giving and asking for directions.
- Learning the imperative mood for giving directions and requests.
- Vocabulary related to food, meals, and drinks.
- Talking about family and daily meal routines.
- Grammar: Using “kein” and “nicht” to form negations.
- Practice with the accusative case.

Activities:

- **City tour role-play:** Students practice asking for and giving directions.
- **Group activity:** Create a menu with German food items, then role-play ordering food.
- **Grammar exercise:** Negation using "kein" and "nicht."

Module-III	Everyday Life, Time, Professions, and Health	6 Hrs.

Themes:

- Everyday life, telling time, making appointments
- Professions
- Health and the body

Grammar:

- Prepositions: “am,” “um,” “von…bis”
- Modal verbs
- Possessive articles
- Perfect tense

Module Content:

- Telling time and scheduling appointments.
- Using prepositions (am, um, von…bis) in sentences.
- Practice with modal verbs for expressing necessity or ability.
- Talking about professions and workplace vocabulary.
- Discussing health, body parts, and feelings.

- Practice using the perfect tense for past actions.

Activities:

- **Time-based role-play:** Scheduling appointments and practicing telling time.
- **Profession Bingo:** Students match professions with corresponding vocabulary.
- **Health questionnaire:** Ask classmates about their health using body-related vocabulary and modal verbs.

Module-IV	Leisure, Travel	6 Hrs.

Themes:

- Leisure activities and celebrations
- Travel, holiday plans, weather

Grammar:

- Separable verbs
- Accusative case (continued)
- Imperative and modal verbs (review)

Module Content:

- Discussing hobbies, leisure activities, and holiday celebrations.
- Using separable verbs in the context of free time.
- Grammar review: Imperative mood, modal verbs.
- Talking about holiday plans, travel vocabulary, and discussing weather.
- Review of key grammar concepts throughout the course.

Activities:

- **Group activity:** Plan a holiday trip in German, using travel-related vocabulary and separable verbs.
- **Weather forecast role-play:** Students practice talking about the weather and making holiday plans.
- **Final review quiz:** Comprehensive review of grammar topics such as accusative, modal verbs, perfect tense, and imperative.

Reference Books:

R1: Goyal, M. *Netzwerk: Deutsch als Fremdsprache A1*. Goyal Publishers, 2015.

R2: Schulz-Griesbach: Deutsch als Fremdsprache. Grundstufe in einem Band (for Grammar)

Relevant Online Courses (Course name and Weblink)

1. NPTEL Course: German - I By Prof. Milind Brahme, IIT Madras, NPTEL
   Link: https://onlinecourses.nptel.ac.in/noc21_hs30/preview
2. PICT - Powerlingo Foreign Languages Institute
   Link: https://pict.edu/pict/
3. **FACTS ABOUT GERMANY:**
   Link: https://www.tatsachen-ueber-deutschland.de/en
4. **ONLINE GERMAN-ENGLISH DICTIONARY:**
   Link: http://www.leo.org/

Second Year B. Tech (S. Y B. Tech) AY (2025-26)

Common to all

[0306302]: Foreign Language Studies - Japanese (FLSJ)

Semester	Credits	Teaching Scheme	Examination Scheme
3	2	T: 2 Hrs./ Week	ISE: NA Marks CIE: 50 Marks ESE: NA Marks

Prerequisite: Nil

Course Objectives: The objective of this course is to provide students with

- Enable students to communicate in basic Japanese about themselves and everyday topics.
- Develop an understanding of fundamental Japanese grammar, including particles and basic verb forms.
- Build a vocabulary related to daily life, city environments, food, leisure, and travel.
- Introduce students to aspects of Japanese culture and customs.

Course Outcomes: After completing this course, students will be able to

CO1: Introduce themselves and others, and talk about their hobbies in Japanese.

CO2: Describe places in the city, give directions, and order food in Japanese.

CO3: Discuss daily routines, professions, and basic health in Japanese.

CO4: Talk about their leisure activities and travel plans in Japanese.

COURSE CONTENTS

Module-I	Introduction, Personal Information, and Basic Grammar	6 Hrs.

Themes:

- Introduction to Japanese scripts (Hiragana, Katakana)
- Introducing oneself and others (name, nationality, etc.)
- Hobbies

Grammar:

- Basic sentence structure (Subject-Object-Verb)
- Particles: wa (は), ga (が), mo (も)
- Pronouns: watashi (私), anata (あなた)
- Counters (basic introduction)

Module Content:

- Introduction to Hiragana and Katakana, basic stroke order and pronunciation.
- Greetings and introductions: Hajimemashite, Yoroshiku onegaishimasu.
- Using particles to indicate the topic and subject of a sentence.
- Talking about hobbies using simple sentence structures.
- Counting simple objects (using basic counters).

Activities:

- **Writing practice:** Hiragana and Katakana characters.
- **Role-play:** Introducing oneself to a classmate and asking about hobbies.

- Counting objects in the classroom (e.g., pencils, books).

Module-II	City Life, Directions, and Food	6 Hrs.

Themes:

- Places in the city (train station, school, supermarket, etc.)
- Asking for and giving directions
- Food and drinks

Grammar:

- Locational particles: ni (に), e (へ)
- Directional words: migi (右), hidari (左), mae (前), ushiro (後ろ)
- Verb arimasu/imasu (あります/います)

Module Content:

- Vocabulary for common places in a city.
- Giving and understanding basic directions using landmarks.
- Talking about food and drinks, ordering in a restaurant.
- Using arimasu/imasu to indicate the existence of things/people.

Activities:

- **City map activity:** Pointing out places and giving directions.
- **Restaurant role-play:** Ordering food and drinks.
- Describing the contents of a room using arimasu/imasu.

Module-III	Everyday Life, Time, Professions, and Health	6 Hrs.

Themes:

- Daily routines
- Telling time and making appointments
- Professions
- Basic health vocabulary

Grammar:

- Time expressions: ji (時), fun (分), gozen (午前), gogo (午後)
- Verb conjugation (present and past tense)
- Particles kara (から) and made (まで) to indicate time duration

Module Content:

- Describing daily routines using time expressions and verbs.
- Asking about and stating professions.
- Basic vocabulary related to health and common ailments.
- Making simple appointments.

Activities:

- **Daily routine presentation:** Describing one's daily schedule.
- **Role-play:** Making an appointment with a doctor.
- **Profession guessing game.**

Module-IV	Leisure, Travel	6 Hrs.

Themes:

- Hobbies and leisure activities
- Travel and holiday plans

- Weather

Grammar:

- ~tai desu (～たいです) to express desires
- Adjectives (review and expansion)
- Conditional form ~tara (～たら) for hypothetical situations

Module Content:

- Talking about hobbies and things you want to do.
- Describing travel plans and destinations.
- Talking about the weather.
- Using conditional sentences to express hypothetical travel scenarios.

Activities:

- **Holiday plan presentation:** Describing a dream vacation.
- **Role Play:** Weather forecast.
- **Sentence construction:** Expressing desires and hypothetical situations using ~tai desu and ~tara.

Reference Books:

R1: Yamamoto, N. *Shin Nihongo no Kiso I (Romanized Edition)*. Association for Overseas Technical Scholars (AOTS), 3A Corporation, June 1990.

R2: *Minna no Nihongo*. 3A Network, Goyal Publishers.

R3: Mizutani, Osamu, and Nobuko Mizutani. *Introduction to Modern Japanese*. Japan Times, November 1992.

R4: Nichimo, A. *250 Essential Kanji for Everyday Use*. 2nd rev. ed., Tuttle Publishing, January 2004.

R5: *Japanese for Busy People*. 3rd ed., Association for Japanese Language Teaching, Kodansha Tokyo, Kodansha International, November 2011.

Relevant Online Courses (Course name and Weblink)

1. NPTEL Course: Introduction to Japanese Language and Culture by Prof. Vatsala Misra, IIT Kanpur
   Link: https://onlinecourses.nptel.ac.in/noc19_hs52/preview
2. PICT - Powerlingo Foreign Languages Institute
   Link: https://pict.edu/pict/