GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

Approved in XXV IIIth Academic Council
Dated: 25th Jun 2024

B. Total Credits for the completion of B.Tech. in Electronics & Telecommunication Engineering:

The total number of credits proposed for the four-year B.Tech Electronics and Telecommunication Engineering (E&TC) with 1 Multidisciplinary minor (Compulsory) degree is 170 as per the structure given below**:**

Structure of B. Tech. in Electronics and Telecommunication Engineering (E&TC) with minor:

Semester		**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total Credits**
Basic Science Course	BSC	08	08		--	--	--	--	--	16
Engineering Science Course	ESC	07	07		--	--	--	--	--	14
Programme Core Course (PCC)	Program Courses	--	02	12	10	15	11	--		50
Programme Elective Course (PEC)	Program Elective	--	--	--	--	04	08	08	-	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		-	04	03	04	03			14
Open Elective (OE) Other than a particular program	OE	--	--	03	03	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)		02	--	02	--	--	--	--	04
Entrepreneurship/Economics/ Management Courses		--		02	02	--	--	--	--	04
Indian Knowledge System (IKS)		02			--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--	--	02	02
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	02	--	--	--	--	--	02
Project		--	--	--	--	--	--	02	04	06
Internship/ OJT		--	--	--	--	--	--	--	12	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02	--	--	--	--	--	-	04
Total Credits (Major)		**21**	**23**	**25**	**24**	**25**	**24**	**10**	**18**	**170**

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

1. **B. Tech with one Minor = Total 170 Credits**
2. **B. Tech with one Minor and Honor in A.I.M.L. = Total 188 Credits**
3. **B. Tech with one Minor and Honor by Research = Total 188 Credits**
4. **B. Tech with two Minors = Total 184 Credits**

Total Credits for the completion of B.Tech. Course with Minor for Direct Second Year admitted students:

The total number of credits proposed for the B.Tech with 1 Multidisciplinary minor (Compulsory) degree is **128** as per the structure given below**:**

Semester		**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total Credits**
Programme Core Course (PCC)	Program Courses	**12+ 02***	10	15	11	--	-	50
Programme Elective Course (PEC)	Program Elective	--	--	04	08	08	-	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses	04	03	04	03			14
Open Elective(OE)Other than a particular program	OE	03	03	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	--	02	--	02	--	--	04
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	--	02	--	--	--	--	02
Entrepreneurship/Economics/ Management Courses		02	02	--	--	--	--	04
Indian Knowledge System (IKS)			--	--	--	--	--	-
Value Education Course (VEC)		02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	02	02
Comm. Engg. Project (CEP)/Field Project(FP)		02	--	--	--	--	--	02
Project		--	--	--	--	02	04	06
Internship/OJT		--	--	--	--	--	12	12
Co-curricular Courses(CC)	Liberal Learning Courses	--	--	--	--	--	-	-
Total Credits(Major)		**27**	**24**	**25**	**24**	**10**	**18**	**128**

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

1. **B. Tech with one Minor = Total 128 Credits**
2. **B. Tech with one Minor and Honor in A.I.M.L. = Total 146 Credits**
3. **B. Tech with one Minor and Honor by Research = Total 146Credits**
4. **B. Tech with two Minors = Total 142 Credits**

Government College of Engineering, Aurangabad

(An Autonomous Institute)

Teaching and Evaluation Scheme from year 2024-2025

B. Tech. Program in Electronics & Telecommunication Engineering with Minor

Semester – III

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
Sr No	**Category**	**Course Code**	**Course Name**	**TH**	**T**	**PR**	**Credits**	**ISE I**	**ISEII**	**ISEIII**	**ESE**	**Total (100)**
1	PCC	ETPCC2001	Digital Electronics	3	-	-	3	15	15	10	60	100
2	PCC	ETPCC2002	Lab Digital Electronics	-	-	2	1	-	-	25	25	50
3	PCC	ETPCC2003	Signals & Systems	3	-	-	3	15	15	10	60	100
4	PCC	ETPCC2004	Lab Signals & Systems	-	-	2	1	-	-	25	25	50
5	PCC	ETPCC2005	Network Theory	3	-	-	3	15	15	10	60	100
6	PCC	ETPCC2006	Lab Network Theory	-	-	2	1	-	-	25	25	50
7	*PCC	ETPCC1001	Sensors andInstruments	2	-	-	2	10	10	-	30	50
8	MDM I / II		MDM-01	3	-	-	3	15	15	10	60	100
9	MDM I / II		Lab- MDM-01	-	-	2	1	-	-	25	-	25
10	OE		OE-01	3	-	-	3	15	15	10	60	100
11	HSSM		Any one from the group	2	-	-	2	10	10	-	30	50
12	VEC	INVEC0010	Universal Human Values – II Understanding Harmony	2	-	-	2	10	10	-	30	50
13	Exp. Learning	ETCEP2001	Community Engineering Project	-	-	4	2	-	25	25	-	50
	Total for B. Tech with one minor			21	-	12	**27**	**105**	**130**	**175**	**465**	**875**

Semester IV

Sr No	**Category**	**Course Code**	**Course Name**	**TH**	**T**	**PR**	**Credits**	**ISE I**	**ISEII**	**ISEIII**	**ESE**	**Total**
1	PCC	ETPCC2007	Mathematics for AIML	3	-	-	3	15	15	10	60	100
2	PCC	ETPCC2008	Analog & Digital Communication	3	-	-	3	15	15	10	60	100
3	PCC	ETPCC2009	Lab-Analog & Digital Communication	-	-	2	1	-	-	25	25	50
4	PCC	ETPCC2010	Linear Integrated Circuits	3	-	-	3	15	15	10	60	100
5	MDM I / II		MDM-02	3	-	-	3	15	15	10	60	100
6	OE		OE-II	3	-	-	3	15	15	10	60	100
7	VSEC-03	ETVSE2001	Electronics Workshop – II	-	-	2	1	-	25	25	-	50
8	VSEC-04	ETVSE2002	Lab-Linear Integrated Circuits	-	-	2	1	-	25	25	-	50
9	AEC-02	ETAEC1020	Sanskrit	2	-	-	2	10	10	-	30	50
10	HSSM		Entrepreneurship/Economics/ Management Courses	2	-	-	2	10	10	-	30	50
11	VEC	INVEC1020	Environmental Science	2	-	-	2	10	10	-	30	50
	Total for B. Tech with one minor			**21**		**06**	**24**	**105**	**155**	**125**	**415**	**800**

BSC	**(16)**	**IKS**	**02**	**PCC**	**22 (24)**	**OE**	**06**	**MDM-1**	**07**
ESC	**(14)**	**VEC**	**04 (04)**	**PEC**	**--**				
CC	**(04)**	**AEC**	**02 (04)**	**E.L.**	**02(02)**	**Honors**	**--**	**MDM-II**	**07**
VSEC	**2 (6)**	**HSSM**	**04 (04)**						

*This course is a 02 credit Program core course offered to be Bridge course for DSY Students Only.

Approved in XXV IIIth Academic Council
Dated: 25th Jun 2024

ETPCC2001 : Digital Electronics		
Teaching Scheme	**Examination Scheme**	
Lectures:03hrs /week	**ISEI**	**15Marks**
	ISEII	**15Marks**
Credits:03	**ISEIII**	**10Marks**
	End Semester Examination	**60Marks**

Course description: After completing this course, students will have a clear and fundamental understanding of Digital systems. Topics range from an overview of Basics of Digital Electronics, Types of digital logics, different logic families and Finite State Machine

Course Objectives:

- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions.
- To introduce the methods for simplifying Boolean expressions.
- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To learn the procedures for the analysis and design of combinational circuits.
- To outline the formal procedures for the analysis and design of sequential circuits.
- To introduce the concept of memories and programmable logic devices.
- To introduce the concept of synchronous and asynchronous sequential circuits and to design Combinational and Sequential circuits to solve real world problem

Course Outcomes:

Students will be able to:

CO1	Understand Boolean algebraic theorems and different minimization techniques
CO2	Apply the knowledge of digital circuit concepts to optimize a digital circuit.
CO3	Develop a digital logic and apply it to solve real life problems.
CO4	Design and implement Combinational circuits that solve binary logical tasks
CO5	Design and implement synchronous and asynchronous sequential circuits.
CO6	Summarize different logic devices and logic families

Detailed Syllabus

UNIT 1	**Minimization Techniques and Logic Gates** Boolean postulates and laws, De-Morgan's Theorem, Principle of Duality, Boolean expression, Minimization of Boolean expressions, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method of minimization. Conversion of basic logics gates to universal logic gates, Implementations of Logic Functions using gates, NAND–NOR implementations, Multi-level gate implementations, Multi output gate implementations. Introduction to CAD tools and VHDL

UNIT 2	**Combinational Circuits** Design procedure, Half adder, Full Adder, Half Subtractor, Full Subtractor, Parallel binary adder, parallel binary Subtractor, Fast Adder, Carry Look Ahead adder, Serial Adder/Subtractor, BCD adder, Binary Multiplier, Binary Divider, Multiplexer/ Demultiplexer, decoder, encoder, parity checker, parity generators, code converters, Magnitude Comparator.
UNIT 3	**Sequential Circuits** Latches, Flip-flops, SR, JK, D, T, and Master-Slave, Characteristic table and equation, Application table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops, serial adder/subtractor, Counters, Asynchronous and Synchronous counters, Ring Counter, Johnson counter, Registers, shift registers, VHDL code for Flip-flop and counter.
UNIT 4	**Memory Devices and Digital Integrated Circuits** Basic memory structure: ROM, PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM, Programmable Logic Devices, PLA, PAL, FPGA, combinational logic circuits using PLA, PAL. logic families and their characteristics-RTL, TTL, ECL, CMOS, Tristate gates, Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin,
UNIT 5	**Sequential Circuits Design** Synchronous Sequential Circuits**:** Basic design steps. Mealy and Moore state models, state minimization. Design of counter using sequential circuit approach. Algorithmic State Machine (ASM) charts. Asynchronous Sequential Circuits**:** Behavior, Analysis, Synthesis, State reduction, state assignments, Examples. Hazards

TEXT AND REFERENCE BOOKS

1. M. Morris Mano, *Digital Design*, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008
2. W.H. Gothman, *Digital Electronics-An introduction to theory and practice*, PHI, 2016
3. A.P.Malvino, D.P.Leach, *Digital Principles and Applications*, 4th Edition,MGH, 2018
4. R.P.Jain, *Modern Digital Electronics*, 4th Edition, Tata McGraw Hill, 2009
5. Charles H Roth, *Digital Systems Design using VHDL*, Thomson Learning, 1998
6. H.Taub, D. Schilling, *Digital Integrated Electronics*, McGraw Hill, 2017
7. D.A. Hodges, H.G. Jackson, *Analysis and Design of Digital Integrated Circuits*, 3rd Edition, International Student Edition, McGraw Hill, 2005

Mapping of Course Outcome with PO and PSO

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	1	1	1	1	1	1		1	2		1	2	1	
CO2	2	1	1	1	1	1	1		1	2		1	2	1	
CO3	2	2	2	1	1	1	1		1	2		1	2	1	
CO4	2	2	2	2	1	1	1		1	2		1	2	2	1
CO5	3	1	1	1	1	1	1		1	2		1	2	1	1
CO6	3	3	1	1	1	1	1		1	2		1	2	1	1

3 – High 2 – Medium 1 – Low

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE 1**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	05	-	12
K2	Understand	05	05	05	30
K3	Apply	05	05	05	18
K4	Analyze	-	-	-	-
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
		15	15	10	60

Assessment table

Assessment Tool	K1,K2,K3	K1,K2,K3	K1,K2	K1,K2	K1,K2,K3	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	04	05	06	-	-	-
ISE II (15 Marks)	-	-	-	05	05	05
ISE III (10 Marks)	-	-	-	05	05	-
ESE Assessment (60 Marks)	12	10	10	08	15	05

ETPCC2002: Lab Digital Electronics		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs./Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Implement logical operations using basic and universal logic gates
CO2	Perform and realize arithmetic, logic circuits using ICs
CO3	Execute and realize the combinational logic circuits using gates and ICs
CO4	Perform and realize sequential logic, circuits using ICs.

List of Experiments (Note: At least 10 Practical should be performed)

Sr. No.	Details
1	To verify of logic gates such as AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR
2	To realize logic operations using NAND /NOR
3	To reduce Karnaugh Map (SOP/POS) • Realize a code converter binary to gray • Realize a circuit to detect prime numbers in a 4-bit binary numbers • Realize a circuit to detect the numbers divisible by 03 in 4-bit binary numbers
4	To develop Adder/ Subtractor Study of 4-bit adder using IC7483
5	Multiplexer- Demultiplexer Study of 4-bit Adder using 4:1 MUX
6	To study Encoder 8:3, 16:4, Decoder 3:8, 4:16
7	To study comparators IC 7485
8	To study Flip-flops D, R-S, J-K Realize conversion of JK to T, JK to D flip flop
9	To design Asynchronous counter using J-K Flip-flops
10	To study Shift Register and their application using ICs 7476,7495
11	To study Decade counter/Ring counter
12	To design Synchronous Counter using J-K Flip –flops
13	Realization of 3 bit counter as sequential circuit and Mod-N counter design (7476,7490,74192,74193)
14	Introduction to Hardware Description Language

Mapping of Course outcome with Program Outcomes and Program Specif

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
CO1	3	3	2	2	2	1	2		2	2	1	1	2	2	2
CO2	3	3	2	2	2	1	1		2	2	1	1	2	2	2
CO3	2	2	2	2	2	1	1		2	2	1	1	2	2	2
CO4	2	2	2	2	2	1	1		2	2	1	1	2	2	2

3 – High 2 – Medium 1 – Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE III**	**ESE**
S1	Imitation	05	05
S2	Manipulation	15	15
S3	Precision	05	05
S4	Articulation	00	00
S5	Naturalization	00	00
		25	25

Assessment table

Assessment Tool	S1	S2	S3	S2
	CO1	CO2	CO3	CO4
ISE III (25 Marks)	05	05	10	05
ESE (25 Marks)	05	05	10	05

ETPCC2003: Signals & Systems		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description:

The course will provide a strong foundation on signals and systems which will be useful for creating the foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Students will understand the application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore power and energy signals and spectrum.

Course Outcomes

After completing the course, students will be able to:

CO1	Recognize different signals, systems and transforms
CO2	Understand the characteristics of signals and systems and study basic operations of signals
CO3	Evaluate time domain response of LTI systems
CO4	Infer steps of finding the transforms
CO5	Interpret properties of transform
CO6	Apply transform to analyze the system variables

Detailed Syllabus:

UNIT 1	Basic definitions, Classification of signals and systems. Signal operations and properties, Basic continuous time signals, signal sampling and reconstruction, Basic system properties
UNIT 2	Continuous and discrete time: Impulse response characterization and convolution integral for LTI system, signal responses to LTI system, properties of convolution, LTI system response properties
UNIT 3	Fourier Analysis of Continuous Time Signals and Systems, Fourier Series, Fourier Transform and properties and applications, Fourier Analysis of Discrete Time Signals and Systems, Discrete Time Fourier series, Discrete Fourier Transform and properties.
UNIT 4	Laplace Transform and its properties, Inverse Laplace Transform Application of Laplace transforms
UNIT 5	The Z-Transform, Convergence of Z-Transform, Basic Z-Transform, Properties of Z- Transform, Inverse Z-Transform and Solving difference equation using Z-Transform

TEXT AND REFERENCE BOOKS

1. Alan V. Oppenheim, Alan S. Wilsky, S.H. Nawab, *Signals and Systems*, 2nd ed., Prentice Hall, 2018
2. K. Gopalan, *Signals and Systems*, 1st ed., Cengage Learning (India Edition), 2010
3. Michal J. Roberts, Govind Sharma, *Fundamentals of Signals and Systems*, 2nd ed., Tata Mc-Graw Hill Publications, 2012
4. Simon Haykin, Bary Van Veen, *Signals and Systems* 2nd ed., by Wiley- India Publications, 2007
5. B.P.Lathi, *Linear Systems and Signals* 3rd ed., Oxford University Press
6. Charles L. Philips, J. M. Parr and E. A. Riskin, 4th ed., *Signal, Systems and Transforms* by Pearson Education, 2008
7. Li Tan, *Digital Signal Processing: Fundamentals and Applications*, Elsevier, Academic Press, 2008

Signal and Systems By Anand Kumar, 3rd Edition, PHI

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	2	2	-	1	2	2	3
CO2	2	2	1	-	-	-	-	-	2	2	-	1	2	3	3
CO3	2	2	1	1	-	-	-	-	2	2	-	1	-	3	3
CO4	2	2	1	-	-	-	-	-	2	2	-	1	2	3	3
CO5	2	1	1	1	1	-	-	-	2	2	-	1	-	2	3
CO6	3	2	1	1	1	-	-	-	2	2	-	1	-	2	-

3 – High 2 – Medium 1 – Low

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	-	-	05
K2	Understand	10	10	05	50
K3	Apply	-	05	05	05
K4	Analyze	-	-	-	-
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I(15 Marks)	05	05	05	-	-	-
ISE II (15 Marks)	-	-	-	05	05	05
ISE-III (10 Marks)	-	-	05	-	-	05
ESE Assessment (60 Marks)	05	15	05	15	15	05

ETPCC2004: Lab - Signals & Systems		
Teaching Scheme	**Examination Scheme**	
Practical: 02 hrs/Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course using MATLAB/CCS/IDE, students will able to:

CO1	Write the programs for signal generation, operations, transformation.
CO2	Use simulation tools for signal generation, operations, and transformation.
CO3	Understand the time and frequency domain representation of discrete time signals through simulation.
CO4	Prove properties of transforms.

Lists of Experiments

No.	Aim	CO
1	Understand basic Matlab functions and its IDE and learn and understand Simulink toolbox.	2
2	Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv)periodic sinusoidal sequences. Plot all the sequences. Using Function generators and CRO observe these signals in a continuous time domain. Also vary and measure their amplitude and frequency. Generate these signals using the Simulink toolbox.	1-3
3	Generate a discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.	1-3
4	Perform basic operations like addition, subtraction, folding, shifting on signals.	1-3
5	Extraction of odd and even parts of 5 different signals and compare with the theoretical results.	1-3
6	Write a program to convolve any two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation. Convolve the two x1(n), x2(n) signals. Convolve x1(n) with x3(n), x4(n) and compare the results of each convolution. Try the same for x2(n) also.	1,2
7	Find the Fourier transform of a square pulse, sinusoidal signal, exponential signal Plot their amplitude and phase spectrum. Compare the results with mathematical solutions. Also find the inverse Fourier transform.	1-3
8	Find the Laplace and inverse Laplace transform of the given functions. Verify the result by analytical calculation. Plot the characteristics. Find the Z transform and inverse Z transform of the given functions. Verify the result by analytical calculation.	1
9	Write a program to prove the time shifting property of Laplace, Z and Fourier transform.	1-4
10	Implement signal transforms using Simulink.	1-4

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

CO No.	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
01	1	-	-	1	2	-	-	-	-	1	-	-	1	2	2
02	1	1	1	1	2	-	-	-	-	1	-	3	2	2	2
03	1	1	1	1	2	-	-	-	-	1	-	3	2	2	2
04	1	-	-	1	2	-	-	-	-	1	-	3	2	2	2

3- High 2-Medium 1-Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool	**S2**	**S2**	**S2**	**S2**
	CO1	**CO2**	**CO3**	**CO4**
ISE III (25 Marks)	10	05	05	05
ESE (25 Marks)	10	05	05	05

Assessment Pattern

Level	**Skill**	**ISE III**	**Practical Examination & Viva voce**
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	-	-
S4	Articulation	-	-
S5	Naturalization	-	-
Total		**25**	**25**

ETPCC2005 : Network Theory		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Course description: On completion of this course, students will have a basic and comprehensive understanding of network analysis and synthesis methods. It includes the network analysis methods, resonance, transient analysis, properties of symmetric and asymmetric network, passive filter design, attenuator, network functions and two port parameters.

Course Objectives:

1. To offer basic understanding for solving circuits using network theorems.
2. To explain resonance circuits, properties of symmetric and asymmetric passive network, passive filters and attenuators.
3. To give knowledge about two port parameters, network functions, stability and transient analysis of basic circuits.

Course Outcomes

After completing the course, students will able to:

CO1	Define basic terms in concern with different networks.
CO2	Simplify network using different network analysis methods
CO3	Estimate transient analysis of networks.
CO4	Perform AC analysis of networks.
CO5	Determine two port network parameters, driving point functions and transfer functions
CO6	Apply the knowledge of network analysis to solve given problem.

Detailed Syllabus:

UNIT 1	**Network Analysis:** Mesh, Super mesh, Node and Super Node analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Milaman's Theorem. Electromagnetic induction, **Graph Theory:** Network graph, tree, co-tree, and loops. Incidence matrix, tie-set, cut-set matrix. Formulation of equilibrium equations in matrix form
UNIT 2	**Transient Analysis of Basic RC, RL and RLC Circuits** Initial conditions, source free RL and RC circuits, properties of exponential response, Driven RL and RC circuits, Natural and Forced response of RL and RC circuits. Introduction to Source free and driven series RLC circuit. Over damped and Under damped series RLC circuit.
UNIT 3	**Resonance** **AC Circuits: R, L, C, RL, RC, RLC (series and parallel AC circuits)** **Series Resonance:** Impedance, Phase angle variations with frequency, Voltage and current variation with frequency, Bandwidth, Selectivity. **Parallel resonance:** Resonant frequency and admittance variation with frequency Bandwidth and selectivity. General case: Resistance present in both branches. Comparison and applications of series and parallel resonant circuits.

UNIT 4	**Filters and Attenuators** **Classifications:** Symmetrical networks, asymmetrical networks, properties of symmetrical and asymmetrical networks. **Filters:** Filter fundamentals, Constant K-LPF, HPF, BPF and BSF, introduction to concept of m derived LPF and HPF, Terminating half sections, and composite filters. **Attenuators:** Introduction to Neper and Decibel. Symmetrical T and type attenuators.
UNIT 5	**Two Port Network Parameters and Functions** Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Application of Laplace Transforms to circuit analysis. Network functions for one port and two port networks, Pole-zeros of network functions and network stability.

TEXT AND REFERENCE BOOKS

1. Franklin F. Kuo, *Network Analysis and Synthesis*, 2nd ed., Wiley Publications, 2006.
2. M.E. Van Valkanburg, *Network Analysis*, 3rd ed., PHI Publications, 2010.
3. M.E. Van Valkanburg, *Introduction to Modern Network Synthesis*, Wiley Publications, 1960.
4. L. Wadhawa, *Network Analysis and Synthesis*, 3rd ed., New Age International Publications, 2006.
5. Roy Chaudhary, *Networks and Systems*, 2nd ed., New Age International Publications, 2013.
6. John D Ryder, Network Lines and Fields, 2nd ed., PHI, New Delhi, 2015.
7. A. K. Chakarvorty, *Network Filters and Transmission Lines*, 2nd ed., Dhanpat Rai and Co. Publication, 2013.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	2	2	3				1	1		1	1	2	3
CO2	3	2	2	1	3				1	1		1	2	2	2
CO3	3	2	2	2	3				1	1		1	2	2	2
CO4	3	2	2	2	3				1	1		1	2	2	2
CO5	3	2	2	1	3				1	1		1	2	2	2
CO6	3	2	1	1	3				1	1		1	2	2	2

3- High 2-Medium 1-Low

Assessment: **ISE I**: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	03	03	00	04
K2	Understand	12	12	00	50
K3	Apply	00	00	10	06
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE-I (15 Marks)	03	06	00	06	00	00
ISE-II (15 Marks)	03	00	06	00	06	00
ISE-III (10 Marks)	00	00	00	00	00	10
ESE Assessment (60 Marks)	04	10	12	16	12	06

ETPCC2006: Lab Network Theory		
Teaching Scheme	**Examination Scheme**	
Practical:0 2 hrs/Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Experiment for verification of network theorems.
CO2	Plot transient response of RL and RC circuits.
CO3	Measurement of two port parameters for a given circuit.
CO4	Plot frequency response of passive networks.

List of Experiments

Sr. No.	List of Experiments
1	To verify i. Thevenin's theorem. ii. Maximum power transfer theorem iii. Superposition theorem. iv. Norton's Theorem
2	To find transient response of RL and RC circuits
3	To measure the 'Z' and 'Y' parameters of two port network.
4	To measure the 'h' and ABCD parameters of two port network.
5	To simulate R, L, C, RL, RC and RLC series AC circuits.
6	i. To find resonance frequency and bandwidth of series and parallel RLC circuit. ii. To Simulate parallel resonance circuit in which resistance present in both branches
7	To plot frequency response of low pass and high pass filter. Also find out cutoff frequency.
8	To plot frequency response of band pass and band stops filter.
9	To plot frequency response of m derived low pass and high pass filter.
10	Write MATLAB program to draw pole-zero plot of a transfer function. Comment on stability.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	1	-	-	-	1	1	-	1	2	2	1
CO2	3	2	2	2	2	-	-	-	1	1	-	1	2	2	1
CO3	3	2	2	2	1	-	-	-	1	1	-	1	2	2	1
CO4	3	2	2	2	2	-	-	-	1	1	-	1	2	2	1

3- High 2-Medium 1-Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool				
	CO1	**CO2**	**CO3**	**CO4**
Term Work (25 Marks)	05	05	05	10
Practical Examination & Viva Voce (25 Marks)	05	05	05	10

Assessment Pattern

Assessment Pattern Level No.	**Skill Level**	**ISE III**	**Practical Examination & viva voce**
S1	Imitation	00	00
S2	Manipulation	25	25
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		**25**	**25**

ETPCC1001 SENSORS AND INSTRUMENTS		
Teaching Scheme	**Examination Scheme**	
Lectures: 02hrs/ week	**ISE I**	**10 Marks**
Credits: 02	**ISE II**	**10 Marks**
	End Semester Examination	**30 Marks**

Course description:

This course is electronics - based course dealing with Sensors and Instruments designed for students in Electronics Engineering. It is a theory course based on the use of electrical and electronics instruments for measurements. The course deals with topics such as Principle of measurements, Errors, Accuracy, Units of measurements and electrical standards, Q-meters, Digital Multimeters, recorders, principles of operation of transducers used for measurement.

Course Objectives:

- To understand the operation of different instruments
- To familiarize with various measurement methods & electronic measurement equipment's
- To analyze the signals using different analyzers
- To introduce transduction methods

Course Outcomes:

After completing the course, students will be able to:

CO1	Identify elements of setup for measurement of physical quantities and parameter.
CO2	Understand the various techniques for parameter measurement & study of signals.
CO3	Apply the complete knowledge of various electronics instruments / transducers to measure the Physical quantities in the field of science, Engineering and technology.

Detailed Syllabus:

Unit 1	**Basics Instruments and bridge measurement**
	Introduction to measurements, Units and standards of measurement and their classification, Sensing and Transduction, Block diagram of Instrumentation system, Errors in measurements, Probability of errors, Static and Dynamic performance characteristics of Measuring Transducers Bridge measurement: Measurement of Voltage, Current, AC/DC Bridges such as Wheatstone, Kelvin, Maxwell, Hay, Schering, Wein bridge and their application.
Unit 2	**Transducer** Definition, classification, selection criterion, Resistive, Capacitive, Transducers, Hall Effect Transducer, piezoelectric, Thermocouple, strain gauge, Transducers for Measurement of Humidity, Pressure. Concept of smart sensor.
Unit 3	**Basic Parameter Measurement and analysis by Electronic Instrumentation** Block diagram of Digital Multimeter, Function generator, LCR Q-meter, Sound level meter, Recorders, CRO, DSO.

Text and Reference Books:

1. W.D.Cooper,AD.Helfrick,ModernElectronicInstrumentationandMeasurements,
2. Edition,Prentice-Halloflndia,1985
3. H.S.Kalsi, Electronic Instrumentation and Measurements,4thEdition, TMH,2019 B.Oliver,I.Cage, Electronic Measurements andInstrumentation,McGrawHill,2017
4. J.J.Carr,Elements of Electronics Instrumentation and Measurement Handbook, 3rdEdition, Pearson Education,2002
5. B.C. Nakra, K.K. Chaudhary, Instrumentation Measurement and Analysis, 2nd Edition, Tata McGraw Hill

Assessment:

ISEI:	Shall be based on Class Tests/ Assignments/Quizzes/Field visits/Presentations/ Course Projects
ISEII:	Shall be based on class test.

Mapping of Course outcome With Program Outcomes:

Course Outcome	PO I	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	POI 0	POI I	POI 2	PSO I	PSO 2	PSO 3
COI	2	2	-	-		-	-	-	-	-	-	-	I	-	I
CO2	2	2	-	-	2	-	-	-	-	-	-	-	2	-	1
CO3	3	2	-	-		1	1	-	-	-	-	-	2	-	I

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE1	ISEII	ESE
Kl	Remember	05	05	08
K2	Understand	05	05	12
K3	Apply	-	-	10
K4	Analyze	-	-	-
KS	Evaluate	-	-	-
K6	Create	-	-	-
Total Marks 50		**10**	**10**	**30**

Assessment table:

Assessment Tool	Kl	K2	K3
	COl	CO2	CO3
ISEI(10Marks)	05	05	-
ISEII(10Marks)	05	05	-
ESE(30Marks)	08	12	10

INVEC0010 : Universal Human Values -II Understanding Harmony		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I Online Examination**	**10 Marks**
	ISE II Online Examination	**10Marks**
Credits: 02	**ISE III**	
No. of Teaching Hours 25-28	**End Semester Examination Online Examination**	**30 Marks**

Course description:

The objective of the course is fourfold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:

After completing the course, students will able to:

Course Outcomes
By the end of the course, students are expected to become more aware of themselves, and their surroundings(family,society,nature);theywouldbecomemoreresponsibleinlife,andinhandling problemswithsustainablesolutions,whilekeepinghumanrelationshipsandhumannatureinmind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction. This is only an introductory foundational input. It would be desirable to follow it up by a) faculty-student or mentor-mentee programs throughout their time with the institution b) Higher level courses on human values in every aspect of living. E. g. as a professional

Detailed Syllabus:

Unit 1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. **Home Work :** Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co- existence) rather than as arbitrariness in choice based on liking-disliking
Unit 2	**Understanding Harmony in the Human Being - Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body :Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health. **Home Work :** Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease
Unit 3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** 1Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. **Home Work :** Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.
Unit 4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment amongthefourordersofnaturerecyclabilityandselfregulationinnature.Understanding ExistenceasCo-existenceofmutuallyinteractingunitsinallpervasivespace.Holistic perception of harmony at all levels of existence.

	Home Work : Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
Unit 5	**ImplicationsoftheaboveHolisticUnderstandingofHarmonyonProfessionalEthics** Naturalacceptanceofhumanvalues.DefinitivenessofEthicalHumanConduct.Basisfor Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professionalethics: a.Abilitytoutilizetheprofessionalcompetenceforaugmentinguniversalhumanorderb. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. **Some Case Studies can be given as home work** Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations Sum up. **Home Work:** Include practice Exercises and Case Studies will be taken up in Practice Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text and Reference Books

1. HumanValuesandProfessionalEthicsbyRRGaur,RSangal,GPBagaria,ExcelBooks,New Delhi,2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
3. HumanValues,A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004.3.TheStoryofStuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi 5. Small is Beautiful - E. FSchumacher.
5. Slow is Beautiful - CecileAndrews
6. Economy of Permanence - J CKumarappa
7. Bharat Mein Angreji Raj – PanditSunderlal
8. Rediscovering India - byDharampal
9. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
10. India Wins Freedom - Maulana Abdul KalamAzad
11. Vivekananda - Romain Rolland(English)
12. Gandhi - Romain Rolland(English)

MODE OF CONDUCT

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them..While analyzing and discussing the topic ,the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. Such observations and their analyses are shared and discussed with other students and facultymentor,inagroupsitting.Tutorials(experimentsorpractical)areimportantforthecourse. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of

commitment,namelybehavingandworkingbasedonbasichumanvalues.Itisrecommendedthat this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty.

Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

ETCEP2001 : Community Engineering Project		
Teaching Scheme	**Examination Scheme**	
Practical: 04 hrs/week	**ISE II**	**25 Marks**
Credits : 02	**ISE III**	**25 Marks**

Course description: The aim of this course is to aware students about the social responsibility. This course will lead to exposure to society and their life practices. Students will be nurtured to identify the societal problems and designing the solutions to it. Finally they will be exploring the analysis means.

Course Objectives:

- Develop sympathetic view towards the society among the students
- Expose students to societal problems
- Make the students to think, design the solutions
- Groom the students to analyze the solutions

Course Outcomes

After completing the course, students will be able to:

CO1	Identification of real world problems
CO2	Suggest methods to solve the identified problems & design
CO3	Analyze and validate the solution with sustainability
CO4	Understand the role of engineer in society,

Detailed Syllabus:

A group two to three student shall select a focus area from the society. Learn the practices in the focus area. Identify the issues and accordingly propose some solutions through the technical abilities. Students have to build a system / project (hardware/software) and test it.

Term Work: It will consist of a report based on the study and actual work done on the selected topic, which will cover theoretical and analytical study of the system, specifications, applications, results etc. Project report should include abstract in 100 words (max), key words, introduction, design, simulation, implementation, results/ results comparison, conclusion and references.

Students will carry out the following activities

Week	Activity for students
01 to 04	Overview of the course and group formation
	Identification of focus areas (Village/ Hospitals/ NGOs/ Public places / Schools / Orphanage / Old age homes etc.) & Visit
	Design the questionnaire / survey to identify the problems
	Survey Analysis and group discussions
05	Proposing problem solutions
06 to 09	Implementing the solutions
10+	Validate the solution, presentation & report submission

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	**3**	**2**	**1**			**2**	**1**		**1**	**3**	**1**	**1**			
CO2	**3**	**3**	**1**	**1**	**2**			**1**	**1**	**3**	**1**	**1**	**2**	**1**	**2**
CO3	**3**	**3**	**3**	**1**	**2**		**1**	**1**	**1**	**3**	**1**	**1**	**2**	**1**	**2**
CO4	**2**	**2**				**2**			**1**	**3**	**1**	**1**			

3 – High 2 – Medium 1 – Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE II**	**ISE III**
S1	Imitation	05	00
S2	Manipulation	20	20
S3	Precision	05	05
S4	Articulation	-	-
S5	Naturalization	-	-
		25	25

Assessment table

Assessment Tool	S1	S2	S2	S3
	CO1	CO2	CO3	CO4
ISE II (25 Marks)	05	10	10	00
ISE III (25 Marks)	00	10	10	05

ETPCC2007: Mathematics for AIML		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description:

MABS 2004: Engineering Mathematics-III is a compulsory course to Second Year engineering students of E&TC and CSE of the institute in the Semester –III and is a continuation of previous year courses viz. MABS1001: Engineering Mathematics-I and MABS1002: Engineering Mathematics-II. The course aims to equip the students with statistical tools and concepts that help in decision-making. This course is intended to provide Engineering students a coherent and balanced account of probability and statistics that form the basis of many engineering analytical tools.

Course objectives:

1. To create interest in students in statistical thinking.
2. To understand, analyze, and solve problems on random variables statistics, significance testing and goodness of fit tests for probability distributions.

Course Outcomes:

After completing the course, students will be able to

CO1	Define the basic concepts of probability distributions, random variable and sampling
CO2	Explain the concepts of random variable, probability distributions and population parameters of large or small size sample
CO3	Apply the regression techniques (least square method) and correlation techniques to the sample data, testing hypothesis for small and large samples
CO4	Compute and interpret the results of Bi-variate regression and correlation analysis, for forecasting
CO5	To apply non-parametric tests for significance testing and goodness of fit of the probability distribution

Detailed Syllabus:

UNIT-1	**Basic Statistics:** Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves.
UNIT-2	**Random Variables:** Random variable, discrete random variables, continuous random variables, definition of distribution and types of distribution: p.d.f, p.m.f, c.d.f. of random variables, characteristic function of random variables, univariate and bivariate distribution and its marginal distribution.
UNIT-3	**Mathematical Expectations:** Mathematical expectation: definition and properties, mean, variance, standard deviation in terms of expectations, moment generating function, characteristics function.
UNIT-4	**Probability distribution:** Binomial distribution, Poisson distribution, Normal distribution, Chi-square distribution and Student's t distribution.
UNIT-5	**Sampling and Tests of Significance**: Basic concepts sampling and its type (simple random, stratified and cluster), its needs; types of hypothesis, types of error, critical region; level of significance. procedure of testing hypothesis, test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text and Reference Books :

1.S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 10th edition, New Delhi, S. Chand & Sons Publications, 2002.

2.S.C. Gupta ,*Fundamentals of Statistics*, 7th edition, New Delhi, Himalaya Publishing House, 2021.

3.E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi,
John Willey Eastern Ltd. 2006.

4.B.S. Grewal, *Higher Engineering Mathematics* 44th edition, New Delhi,
Khanna publication, 2017.

5.N.P. Bali and M. Goyal, *A textbook of Engineering Mathematics*, 9th edition, New Delhi, Laxmi Publications pvt.ltd, 2014.

6.Ross, S.M., *Introduction to Probability and Statistics for Engineers and Scientists*, 5th edition, New Delhi, Elsevier Publication, 2004

Mapping of Course outcome with Program Outcomes
(Electronics and Telecommunication Engineering & Computer Science Engineering)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		2								1
CO2	3	2		2								1
CO3	3	2		2	2							1
CO4	3	3		3								1
CO5	3	3		3								1

3 – High, 2 – Medium, 1 – Low

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE-I, ISE-II, ISE-III (Class Test-1, Class Test-2, TA) & ESE

TA: Students will perform one or more of the following activities

1.Surprise Test
2.Assignment using Mathematical tools like Mathematical / MatLab or similar.
3.Quiz
4.Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**	**Total**
K1	Remember	03	03			06
K2	Understand	08	12	10	40	70
K3	Apply	04			20	24
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K3	K2	K3	Total
	CO1	CO2	CO3	CO4	CO5	
ISE I (15 Marks)	03	04	04	04		15
ISE II (15 Marks)	03	12				15
ISE III (10 Marks)		04		06		10
ESE Assessment (60 Marks)	14	04	16	10	16	60
Total Marks 100	20	24	20	20	16	**100**

ETPCC2008: Analog & Digital Communication		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Course description: After completing this course, students will have a clear and fundamental understanding of Communication theory. Topics range from an overview of types of modulation. Effect of noise in communication is also covered. Subject develops the understanding of students to treat the modulation in time and frequency domain.

Course Objectives:

- To provide students with basics of Analog Communication principles
- To emphasize Analog modulation and demodulation techniques.
- To emphasize Performance of communication circuits in presence of noise
- To emphasize Modern trends in communication systems and transmitter/receiver circuits.

Course Outcomes

After completing the course, students will be able to:

CO1	Summarize basic concepts involved in electronic communication	K2
CO2	Explain various types of modulation and demodulation techniques	K2
CO3	Formulate mathematically the modulations and demodulations principles	K3
CO4	Comprehend modulations in time and frequency domain	K2
CO5	Interpret the performance of modulation techniques.	K3
CO6	Compare different techniques of modulation and demodulation	K2

Detailed Syllabus:

UNIT 1	**Amplitude Modulation** Introduction to communication system, Need for modulation, Noise in Electronics Communication, types of noise, Frequency Division Multiplexing, Time division multiplexing, Amplitude Modulation, single tone modulation, power relations in AM waves, Generation of AM waves, Demodulators, DSB, SSB and VSB, AM receivers
UNIT 2	**Angle Modulations** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, FM, Detection of FM Waves, Comparison of FM and AM, FM Receivers, Noise in analog communication
UNIT 3	**Pulse modulation** PAM, PWM, PPM, Sampling, Quantization, Pulse code modulation, line coding, DPCM, DM, ADM, Voice coder (Vocoders)

UNIT 4	**Digital Modulation Techniques** Phase shift keying, Quadrature Amplitude shift keying,Frequency shift keying, Pulse shaping, reduction of inter channel and inter symbol interference, regenerative repeaters.
UNIT 5	**Optimal Reception of Digital Signal** Baseband signal receiver, probability of error, optimum receiver for both baseband and pass band, optimal coherent reception: PSK,FSK, QPSK. Signal space representation and Comparison of modulation system.

Text and Reference Books

1. B.P.Lathi, Zhi Ding, *Modern Digital & Analog Communication, Oxford*, 4th Edition 2011
2. Simon Haykin,*Introduction to Analog and Digital Communications*, 2nd ed., John Wiley, 2012
3. Proakis J. G. and Salehi M., *Communication Systems Engineering*, Pearson Education, 2002
4. Taub H. and Schilling D.L., *Principles of Communication Systems*,Tata McGraw Hill, 2001
5. Proakis J.G., *Digital Communications*', 4th Edition, McGraw Hill, 2000
6. R. Anand, *Communication Systems*, Khanna Book Publishing Company, 2011
7. George F. Kennedy, Davis,*Electronic Communication System*, 4th ed., Tata McGraw Hill
8. K. Sam Shanmugam , *Digital & Analog and Digital Communication Systems*, Wiley India ed., Wiley,2006
9. Roy Blake, *Electronic Communication Systems*, Cengage Learning India

Mapping of Course outcome with Program Outcomes

C O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1							2				3	
CO2	2	2	1	1						2				3	2
CO3	3	2	2		1					2	1	2		3	2
CO4	2	1	1	1						2				3	1
CO5	3	2	2		1					2	1	2		3	2
CO6	2	1	1							2				3	

3 – High **2 – Medium** **1 - Low**

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III
K1	Remember	05	05	10
K2	Understand	10	05	30
K3	Apply	-	-	20
K4	Analyze	-	-	-
K5	Evaluate	-	-	-
K6	Create	-	-	-
Total Marks 60		15	15	60

Assessment table

Assessment Tool	K2	K2	K3	K3	K3	K2
	C01	C02	C03	CO4	CO5	CO6
ISE I (15 Marks)	05	05	--	05	--	--
ISE II (15 Marks)	--	05	--	05	--	05
ISE-III (10 Marks)	--	--	05	--	05	--
ESE (60 Marks)	10	20	05	10	05	10

ETPCC2009: Lab Analog &Digital Communication		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs/Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will be able to:

CO1	Implement and realize circuits for different modulation techniques
CO2	Implement and realize circuits for different demodulation techniques
CO3	Use modern tools for simulation for modulation
CO4	Write programs for generation and detection of different modulations and demodulation

List of Experiments

No	Aim	CO
1	Implement the circuit for Amplitude Modulation and Demodulation. Perform this using simulation software (Proteus or similar). Determine modulation index with trapezoidal method and the observed results with the theoretical values	1 - 4
2	Perform the experiment for Frequency Modulation and Demodulation	1 - 4
3	Perform the experiment for PAM , PWM and PPM generation and Reconstruction	1 - 4
4	Perform Pulse Code Modulation and Demodulation and recover original signal	1 - 4
5	Perform Delta and Adaptive Modulation and Demodulation. Observe change of step size in ADM, Sigma Delta	1 - 4
6	Experiment on Line coding technique	3 - 4
7	Perform Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying transmission and reception. Find out bandwidth of modulated signal	1,3,4
8	Experiment on Frequency Division Multiplexing	3,4
9	Experiment on Time Division Multiplexing	3,4
10	Compare performance of digital modulation techniques by EYE diagram	1-4

Mapping of Course outcome with Program Outcomes

C O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1				1	1	-	-	1	1	-
CO2	2	1	1	3	2				1	1	1	-	1	1	-
CO3	1	1	1	2	1				1	1	-	-	-	1	-
CO4	1	1	1	2	1				1	1	1	-	-	1	-

3 – High 2 – Medium 1- Low

Assessment:

ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool				
	CO1	**CO2**	**CO3**	**CO4**
ISE III (25 Marks)	06	05	04	10
ESE (25 Marks)	06	05	04	10

Assessment Pattern

Assessment Pattern Level No.	**Skill Level**	**ISE III**	**ESE (Practical Examination & viva voce)**
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

ETPCC2010 : Linear Integrated Circuits		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Course description: This course covers fundamentals of Linear Integrated Circuits. It deals with characteristics of Operational amplifiers. It covers applications such as summing, precision rectifying, filtering as well as timer, PLL *etc.*

Course Objectives:

- To impart knowledge of working principles of Op-Amp & its applications
- To emphasize the features and advantages of integrated circuits
- To introduce the theoretical concepts and applications of analog multipliers & PLL
- To design simple filter circuits for particular application

Course Outcomes: After completing the course, students will able to:

CO1	Define the basic terminology related to Op-Amp.
CO2	Describe the working of op-amp based circuits.
CO3	Illustrate the use of linear ICs.
CO4	Understand op-amp based specific circuits like data converters, active filters, multivibrators.
CO5	Implement the linear/non-linear circuits for signal processing and communications.
CO6	Apply linear circuits for real life situations.

Detailed Syllabus:

UNIT 1	**Op-Amp Fundamentals** Block diagram of Op-Amp. An overview of different types of OPAMP, their peculiarities and application areas. Op-Amp parameters, Frequency response, inverting, and non-inverting configurations.
UNIT 2	**Op-Amp Applications** Summing amplifier, Difference amplifier, Instrumentation amplifier and applications, Integrator, Differentiator and applications. V to I and I to V converter, Comparators, Limitations of Op-amp as Comparator, Schmitt trigger, Comparator IC LM339, Precision rectifiers, Peak detector.
UNIT 3	**Signal Generators** Square wave generators, Triangular wave generators, Saw tooth generators, V to F and F to V converters, function generator IC 8038 , Multi vibrators using IC 555, D-A and A-D converters.
UNIT 4	**Active Filter Design** All types of filter responses, First and second order active filters LP and HP, BPF, band reject and bi quad filters, sensitivity analysis.

UNIT 5	**Non-linear Applications and Phase Locked Loops** Log and Antilog amplifiers, Analog multipliers, Block diagram of PLL, free running frequency, lock range, capture range, Transfer characteristics of PLL, Block diagram of PLL IC 565, Applications of PLL - Frequency synthesizer, FM demodulator, AM demodulator, FSK demodulator

Text and Reference Books

1. D. Roy Choudhary, Shail Jain, *Linear Integrated Circuits*, 4th Edition, New Age International Pvt. Ltd, 2017.
2. Jacob Miliman, ChristosHalkias, *Integrated Circuits*, 2nd Edition New York , Tata McGraw-Hill 2017.
3. Ramakant A. Gaikwad, *Op-Amps and Linear Integrated Circuits*,4th Edition, Prentice Hall / Pearson Education, 2015.
4. Robert F.Coughlin, Frederick F.Driscoll, *Operational Amplifiers and Linear Integrated Circuits*,Sixth Edition, PHI, 2001.
5. B.S.Sonde, *System design using Integrated Circuits* , 2nd Edition, New Age Publication, 2001.
6. Gray and Meyer, *Analysis and Design of Analog Integrated Circuits*,5th Edition, Wiley International, 2009.
7. S.Salivahanan& V.S. KanchanaBhaskaran, *Linear Integrated Circuits*, 2nd Edition ,TMH, 4 th Reprint, 2016.
8. William D.Stanley, *Operational Amplifiers with Linear Integrated Circuits*, 4th Edition Pearson Education, 2001.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	1	1	-	1	1	2	
CO2	2	2	1	-	-	-	-	-	1	1	-	1	1	3	
CO3	2	2	1	1	-	-	-	-	1	1	-	1	1	3	
CO4	2	2	1	1	-	-	-	-	1	1	-	1	1	3	
CO5	2	1	1	1	1	-	-	-	1	1	-	1	1	2	
CO6	3	2	1	1	1	-	-	-	1	1	-	1	1	2	

3 – High 2 – Medium 1-Low

Assessment: ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Assignments / Quizzes / Field visits / Presentations / Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	06
K2	Understand	10	15	10	48
K3	Apply	00	00	00	06
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	05	05	05	00	00	00
ISE II (15 Marks)	00	00	05	05	05	00
ISE III (10 Marks)	00	05	05	00	00	00
ESE Assessment (60 Marks)	06	12	12	12	12	06

ETVSE2001 : Electronics Workshop-II		
Teaching Scheme	**Examination Scheme**	
Practical: 02 hrs/week	**ISE II**	**25 Marks**
Credits : 01	**ISE III**	**25 Marks**

Course description: The aim of this course is to enable the student to comprehend the principles of modern manufacturing processes and to acquire competency in the design, construction and documentation of electronic equipment.

Course Objectives:

- Elaborate the design processes and production methods
- Explain the use of software techniques and thermal analysis techniques
- Explain the use and application of surface mount technology
- Build capacity amongst students to design a PCB, assemble and test an electronic circuit

Course Outcomes

After completing the course, students will be able to:

CO1	Identify task and required circuit diagram / system for it.
CO2	Build a project model, simulate and test it through software.
CO3	Test and troubleshoot electronic circuit on breadboard.
CO4	Demonstrate working of the project.

Detailed Syllabus:

Mini Project I-

A group of three or four students shall select a topic from the field of Electronics and Telecommunication engineering. They have to build a system / mini project and test it.

Term Work: It will consist of a report based on the study and actual work done on the selected topic, which will cover theoretical and analytical study of the system, specifications, applications, results etc.

Students are expected to design an IC based project of analogue / digital circuit/system (which can be used as experimental set-up in the laboratory). PCB design, fabrication, testing and implementation should be done. Students may use the software simulation for verification of hardware implementation. Documentation of the project is to be in standard IEEE format. Project report should include abstract in 100 words (max), key words, introduction, design, simulation, implementation, results/ results comparison, conclusion and references.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PS O3
CO1	2	3		2	2	1	2	2	2	2		1			
CO2	2	3		2					2	2		1			
CO3	1	2	2	2	2					2	1	1	2	2	2
CO4			2	3	2	1							2	2	2

3 – High 2 – Medium 1 – Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction

Approved in XXV IIIth Academic Council
Dated: 25th Jun 2024

with students till the end of the term.

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE III	ESE
S1	Imitation	05	05
S2	Manipulation	15	15
S3	Precision	05	05
S4	Articulation	-	-
S5	Naturalization	-	-
		25	25

Assessment table

Assessment Tool	S1	S2	S2	S3
	CO1	CO2	CO3	CO4
ISE II (25 Marks)	05	05	10	05
ISE III (25 Marks)	05	05	10	05

ETVSE2002 : Lab-Linear Integrated Circuits		
Teaching Scheme	**Examination Scheme**	
Practical: 02 hrs/week	**ISE II**	**25 Marks**
Credits : 01	**ISE III**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Conduct the measurement process for Op-Amp parameters.
CO2	Implement wave generator circuits.
CO3	Implement signal processing and wave shaping circuits.
CO4	Demonstrate the applications using linear ICs.

List of Experiments

Sr. No.	List of Experiments
1	Measure operational amplifiers parameters.
2	Implement non inverting amplifiers and to study Op-Amp as unity gain buffer.
3	Implement inverting amplifiers and to study Op-Amps as inverters (sign changer).
4	Implement adder/ subtractor amplifier circuit.
5	Plot output response of Integrator for square and sinusoidal inputs.
6	Plot output response of Differentiator for square and sinusoidal inputs.
7	Plot Frequency response of low pass Butterworth's 2^{nd} order active filter.
8	Plot Frequency response of high pass Butterworth's 2^{nd} order active filter.
9	Assemble Zero crossing detector and observe the input-output waveforms.
10	Implement and plot the output waveform for astablemultivibrator using IC 555.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-	-	1	1	
CO2	3	2	2	2	2	-	-	-	-	-	-	-	1	1	
CO3	3	2	2	2	1	-	-	-	2	-	-	-	2	1	
CO4	3	2	2	2	2	-	-	-	1	1	-	1	1	1	

3 – High 2 – Medium 1 - Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table:

Assessment Tool	S1	S2	S2	S2
	CO1	CO2	CO3	CO4
ISE III (25 Marks)	05	05	05	10
ESE (25 Marks)	05	05	05	05

Assessment Pattern:

Assessment Pattern / Level No.	**Skill Level**	**ISE III**	**ESE**
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

ETAEC1020: Sanskrit		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I**	**10 Marks**
Credits: 02	**ISE II**	**10 Marks**
	ISE III	**-**
	End Semester Examination	**30 Marks**

Course description: This course is planned as Ability enhancement course. It is an exposure to the Engineering students about important Indian language Sanskrit. In the era of AI & ML, Sanskrit is explored to be the language of algorithms. Fundamentals of the Sanskrit language will be covered through this course.

Course Objectives:

- To make the students understand simple text in Sanskrit
- To make the students aware of different aspects of Sanskrit language

Course Outcomes

After completing the course, students will be able to:

CO1	Learn daily vocabulary of Sanskrit
CO2	Understand declensions, tenses and concepts of grammar and practice verbs
CO3	Form small statements and read scriptures

Detailed Syllabus:

Course Contents:

UNIT 1	Some Unique characteristics of Sanskrit, Basic introduction of oneself, Simple verbs, Daily vocabulary, Introducing different declensions and tenses, Practice with various verbs in different moods and tenses
UNIT 2	Revision of Different verb forms, Introduction of different declensions in the plural and tenses, Vocabulary, conversations and stories, Paragraph writing, Poetic verses
UNIT 3	Introduction of words ending with consonants and their declensions, An Alternative Conjugation of verbs, Introduction to their different declensions in singular, dual and plural, Introduction to Sandhi, Vowel with vowel / Vowel with consonant / Consonant with consonant / Aspirant with vowel or consonant, Case study based on scientific scriptures in Sanskrit literature

Text and Reference Books

1. Sanskrit in 30 Lectures* by DharmendraNathShastri, Publisher: BharatiyaVidyaSamsthana, Institute of Indology, Delhi
2. Handbook for The Online Sanskrit Audio Course Part Two: Sandhi Rules By Carol Whitfield, Ph.D
3. Smskrita-Vyavahara-Sahasree, SamskritBharti, Banglore
4. Sanskrit for Technical Knowledge by Mohan Khedkar&Kalyani Kale: ShriMangeshPrakashan, Nagpur.
5. A Higher Sanskrit Grammar: For the Use of School and College Students by M. R. Kale, Publisher: MotilalBanarsidass, Delhi.

Assessment:

ISEI:	Shall be based on Class Tests/ Assignments/Quizzes/Field visits/Presentations/ Course Projects
ISEII:	Shall be based on class test.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
COI										1		1			
CO2										1		1			
CO3										1		1			

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISEI**	**ISEII**	**ESE**
Kl	Remember	05	05	10
K2	Understand	05	05	20
K3	Apply	-	-	-
K4	Analyze	-	-	-
KS	Evaluate	-	-	-
K6	Create	-	-	-
Total Mars50		10	10	30

Assessment table

Assessment Tool	**K2**	**K2**	**K2**
	CO1	**CO2**	**CO3**
ISEI(10Marks)	05	05	-
ISEII(10Marks)	-	05	05
ESE(30Marks)	05	15	10

INVEC1020: ENVIRONMENTAL STUDIES	
Teaching Scheme Lectures: 2 Hrs/Week Tutorial : - Total Credits : 2	Examination Scheme ISE I : 10Marks ISE II: 10 Marks End-Semester Exam: 30 Marks

Course Objectives:

1. To become aware about the various types of pollution, its sources, effects and control measures
2. To become aware about present environmental issues
3. To become aware of the importance of natural resources and environmental legislation
4. To become aware about environmental biotechnology and bio monitoring
5. To become aware of the biodiversity, conservation methods and factors for the loss of biodiversity

Unit wise Course Outcomes expected:

After completion of this course students will be able to-

CO1. Learn about the basics of environment

CO2. Understand the harmful effects of human activities on environment and their solutions

CO3. Understand the biodiversity, conservation methods and factors for the loss of biodiversity

CO4. Understand the concept of climate change, global warming, acid rain, various disasters and its mitigation measures

Detailed syllabus:

UNIT-I	**A) Understanding Environment** - Environment: concept and importance - Components of environment: Physical, Biological and Social - Ecosystem Concept, Structure and Function - Producers, Consumers and Decomposers - Food chain, Food web and Ecological pyramids - Energy flew in an Ecosystem. - Ecosystem services Ecological, economic, social, aesthetic and informational **B) Natural Resources** - Land resources: global land use patterns, concept land degradation and desertification - Forest resources: Use and consequences of over-exploitation - Water resources: Use and consequences of over-utilization, concept of water harvesting and watershed management, water conflicts - Energy resources Renewable and non-renewable energy sources, growing energy needs and alternate energy sources
UNIT-II	**A) Biodiversity and its conservation** - Biodiversity definition, levels (genetic, species and ecosystem) and values - Threats to biodiversity :habitat loss, poaching of wildlife, biological invasions - Concept of endemism and hot spots of biodiversity - Conservation of biodiversity: In-situ and Ex-situ concepts **B) Environmental Pollution** -Causes, effects and control measures of Air, water, soil, noise, thermal, nuclear; -Solid waste management

	-Liquid waste management
UNIT-III	**Environmental issues, policies and practices** - Global environmental issues: Increase in greenhouse gases, climate change, Acid rain and stratospheric ozone layer depletion - Salient features of Environment Protection Act, 1986 - Environmental education: Formal and Informal education - Environmental Movements (Chipko Movement, Silent valley) and Environmental ethics

Text books & Reference books:

1. A Text Book of Environmental Studies by Bharucha E, University Press (India) Pvt. Ltd, 2005
2. A Text Book of Environmental Studies by Nadaf F. M., Pawaskar V. R., Intellectual Book Bureau, Bhopal,2006
3. Fundamental of Ecology by Odum E. P, Natraj Publishers, Dehradun, 1996
4. Introduction to Environmental Engineering and science by Gilbert M and Wendell P., Pearson Education India, 2015
5. Environmental Science by S.C Santra, New Central Book Agency, 2011
6. Environmental Education by Sharma R. A, 1998

Mapping of Course outcome with program outcomes:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PO13	PO14
CO1	3		1											
CO2	3		1											
CO3	3		1											
CO4	3		1											
CO5	3		1											

3- High 2- Medium 1-Low