



People's Education Society's (Mumbai)

P. E. S. COLLEGE OF ENGINEERING

(An Autonomous Institute)

Nagsen Vana, Chhatrapati Sambhajnagar, Maharashtra, 431002

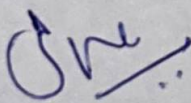
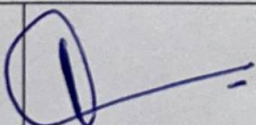
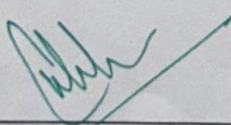
Tel. No. (+91) 240 2400031

Web: www.pescoe.ac.in



**CURRICULUM for UNDER GRADUATE PROGRAMME
B. Tech. Second Year Engineering
Department of Electronics Engineering
(VLSI Design and Technology)**

**In line with National Education Policy 2020 Guidelines
[With Effect from the Academic Year 2026-2027]**

			13/06/2026	1.00
Chairman Board of Studies	Dean Academics	Chairman Academic Council	Date of Release	Version

Vision and Mission of the Institute

VISION

To create sound technical manpower with global competitiveness, morality and social sense.

MISSION

- To provide the state-of art technical infrastructure and motivate students to realize their own potential.
- To provide an embellished academic and congenial environment to students for complete learning experience.
- To promote intellectual, moral and social democracy to ensure all round development of the students.

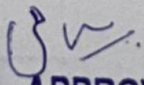
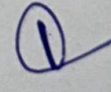
Vision and Mission of the Department

VISION

To help in making institute centre of excellence promoting and providing platform for preparation of globally competitive graduates with proficiency levels and research abilities.

MISSION

- To Provide quality and effective learning program through a well-designed curriculum.
- To develop state-of-the-art laboratories for Electronics, VLSI and allied technologies.
- To strengthen industrial collaboration for professional competency and career readiness.


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Grading and Evaluation Process:

i) Based on the Examinations and Evaluation, students will be awarded letter grades after combining the performance of all evaluations for the respective course.

These letter grades will be derived from quantitative and qualitative Evaluation converted into 10-point scale called as grade point for credit courses. The performance with grade points and equivalent letter grades for Absolute grading for admitted batches will be as mentioned in the following table:

Percentage of Marks	Letter Grade	Grade Points
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
0-39	FF	00

ii. Class is awarded based on CGPA of all eighth semester of B. Tech Program. CGPA for pass is minimum 5.0

CGPA upto <5.50	Pass class
CGPA ≥ 5.50 & <6.00	Second Class
CGPA ≥ 6.00 & <7.5	First Class
CGPA >7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

iii. Apart from credit courses, Non credit courses will be awarded with letter grades based on quantitative and qualitative Evaluations as PP (Pass) and NP (Not Passed).

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Passing Criteria:

Student should score minimum 20 out of 60 in End Semester Examination.

Passing Percentage: 40 out of 100

*Minimum 50% of total credits should be there to promote the student in the next class or year with maximum three theory and / or two practical/viva/oral subject remain backlog of a student.

*National / State level sports/ cultural events/ NSS/ NCC/ Yoga etc certificates shall be considered at department level by HOD or Subject teacher for attendance and internal assessment.

*If the student is passed in all subjects of First year then only that student can take admission in the Third year and if the student is passed in all subjects of Second year then only that student can take admission in the Fourth/Final year.

Gracing Rule:

Three marks grace to maximum three subjects(total 09 marks) for every year if the result of the student will change (e.g. fail to pass or pass class to second class or second class to first class or first class to distinction) .

If student fails in more than three subjects, no grace will be given.

Calculation of SGPA and CGPA:

a. Semester Grade Point Average (SGPA):

The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{\left[\sum_{i=1}^{i=n} c_i g_i \right]}{\left[\sum_{i=1}^{i=n} c_i \right]}$$

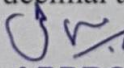
Where;

'n' is the number of subjects for the semester,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.


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b. Cumulative Grade Point Average (CGPA):

An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places). Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{\left[\sum_{i=1}^{i=m} c_i g_i \right]}{\left[\sum_{i=1}^{i=m} c_i \right]}$$

Where,

'm' is the total number of subjects from the first semester onwards up to and including the semesters,

'c_i' is the number of credits allotted to a particular subject, and

'g_i' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

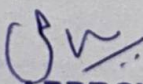
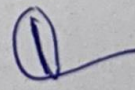
CGPA will be rounded off to the second place of decimal and recorded as such

It is to be noted that the CGPA is not the average of SGPA

CGPA to equivalent Percentage Conversion

CGPA shall be calculated with the following formula

$$\text{Percentage (\%)} = (\text{CGPA} \times 10.0)$$

 
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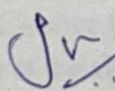
B.TECH. PROGRAM STRUCTURE
Second Year Teaching and Evaluation Scheme
Semester-III

Sr. No	Course Category	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	BTPES301T	Engineering Mathematics-III	3	0	0	20	20	60	100	3
2	PCC	BTPESV302T	Electronics Devices & Circuits	3	0	0	20	20	60	100	3
3	PCC LAB	BTPESV302L	Electronics Devices & Circuits Lab	0	0	2	30	-	20 [#]	50	1
4	PCC	BTPESV303T	Digital System Design & Microprocessor	3	0	0	20	20	60	100	3
5	PCC LAB	BTPESV303L	Digital System Design & Microprocessor Lab	0	0	2	30	-	20 [#]	50	1
6	MDM	BTPESMXX	MDM Bucket*	2	0	0	10	10	30	50	2
7	OE	BTPESOEXX	Open Elective**	4	0	0	20	20	60	100	4
8	HSSM	BTPESV304T	E-Business	2	0	0	10	10	30	50	1
9	VEC	BTPESUHVT	Universal Human Values	3	0	0	20	20	60	100	3
10	CEP	BTPESV305L	Community Engineering Project	0	0	2	60	-	40 [#]	100	1
			Total	20	0	6	240	120	440	800	22

NOTE: * Refer to Multidisciplinary Minor Bucket of other departments

** Refer to List of Open Elective Courses available on Institute Website

Practical/Oral evaluation at the end of the semester.

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B.TECH. PROGRAM STRUCTURE
Second Year Teaching and Evaluation Scheme
Semester-IV

Sr. No	Course Category	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	BTPES401T	Engineering Mathematics-IV	3	0	0	20	20	60	100	3
2	PCC	BTPESV402T	Analog Circuit	3	0	0	20	20	60	100	3
4	PCC LAB	BTPESV402L	Analog Circuit Lab	0	0	2	30	-	20 [#]	50	1
3	PCC	BTPESV403T	Network Theory	3	0	0	20	20	60	100	3
4	PCC LAB	BTPESV403L	Network Theory Lab	0	0	2	30	-	20 [#]	50	1
5	MDM	BTPESMXXXX	MDM Bucket*	2	0	0	10	10	30	50	2
6	OE	BTPESOEXX	Open Elective**	2	0	0	10	10	30	50	2
7	VSEC	BTPESV404L	PCB Design Lab	0	0	2	30	-	20 [#]	50	1
8	AEC	BTPESFLA	Japanese Language	2	0	0	50	-	50 [#]	100	2
		BTPESFLB	German Language								
		BTPESFLC	French Language								
		BTPESFLD	Spanish Language								
9	Entrepreneurship	BTPESV405T	Patents and IPR	3	0	0	20	20	60	100	3
10	VEC	BTPESCOIT	Constitution of India	2	0	0	50	-	-	50	1
			Total	20	0	6	290	100	410	800	22

NOTE: * Refer to Multidisciplinary Minor Bucket of other departments

** Refer to List of Open Elective Courses available on Institute Website

Practical/Oral evaluation at the end of the semester

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Department of Electronics Engineering (VLSI Design & Technology)

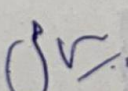
Open Electives

Table 1: List of Open Elective Courses

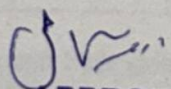
Semester	Category	Courses Name	Course Code
III	Management, Commerce & Entrepreneurship	Business Communication	BTPESOE2T
	Management, Commerce & Entrepreneurship	Digital Marketing and E-commerce	BTPESOE4T
	Humanities, Social Sciences & Life Skills	Employability and Skill Development	BTPESOE13T
IV	Humanities, Social Sciences & Life Skills	Educational Leadership	BTPESOE14T
	Humanities, Social Sciences & Life Skills	Sustainable Happiness	BTPESOE15T
	Design, Built Environment & Planning	Smart Cities & Urban Technologies	BTPESOE23T

List of Courses for Minor in EE(VLSI D and T) (Except EE(VLSI D and T))

SEM	Course Category	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
III	PCC	BTPESMV301	Electronics Devices and Circuit	2	0	0	10	10	30	50	2
IV	PCC	BTPESMV402	Digital System Design & Microprocessor	2	0	0	10	10	30	50	2
V	PCC	BTPESMV503	Linear Integrated Circuits	3	1	0	20	20	60	100	4
VI	PCC	BTPESMV604	Introduction to VLSI Life cycle	2	0	0	10	10	30	50	2
VII	Project	BTPESMV705	Project	0	0	4	20	-	30	50	2
VIII	PCC	BTPESMV806	SOC Design & Verification	2	0	0	10	10	30	50	2
Total				11	1	4	80	60	210	350	14


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Illustrative Semester wise Credit Distribution Structure For Four Year UG Program Department of Electronics Engineering (VLSI Design and Technology)											
Sr. No	Course Category	Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
1	BSC/ESC	Basic Science Course	7	7	3	3	-	-	-	-	20
2		Engineering Science Course	9	9	-	-	-	-	-	-	18
3	Program Courses	Programme Core Course (PCC)	-	-	8	8	12	10	3	6	47
4		Programme Elective Course (PEC)	-	-	-	-	4	8	2	6	20
5	Multi-disciplinary Courses	Multidisciplinary Minor (MDM)	-	-	2	2	4	2	2	2	14
6		Open Elective (OE) Other than a particular program	-	-	4	2	2	-	-	-	8
7	Skill Courses	Vocational and Skill Enhancement Course (VSEC)	2	2	-	01	-	2	-	-	7
8	Humanities Social Science and Management (HSSM)	Ability Enhancement Course (AEC -01, AEC-02)	2	-	-	2	-	-	-	-	4
9		Entrepreneurship/Economics/Management Courses	-	-	1	3	-	-	-	-	4
10		Indian Knowledge System (IKS)	-	2	-	-	-	-	-	-	2
11		Value Education Course (VEC)	-	-	3	1	-	-	-	-	4
12	Experiential Learning Courses	Research Methodology	-	-	-	-	-	-	-	4	4
13		Comm. Engg. Project (CEP)/Field Project (FP)	-	-	1	-	-	-	-	-	1
14		Project	-	-	-	-	-	-	1	4	5
15		Internship/ OJT	-	-	-	-	-	-	12	-	12
16	Liberal Learning Courses	Co-curricular Courses (CC)	2	2	-	-	-	-	-	-	4
		Total Credits	22	22	22	22	22	22	20	22	174


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शासन निर्णय क्रमांक : एनईपी-२०२२/(६७/२३) /तांशि-२. दिनांक : ४ जुलै, २०२३

Illustrative Semester wise Credit Distribution Structure for Four Year UG
Engineering Program - One Major, One Minor

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	08-10		-	-	-	-	-	14-18
Engineering Science Course		10-08	06-04		-	-	-	-	-	16-12
Programme Core Course (PCC)	Program Courses	-	02	08-10	08-10	10-12	08-10	04-06	04-06	44-56
Programme Elective Course (PEC)		-	-	-	-	04	08	02	06	20
Multidisciplinary Minor (MDM)	Multidisciplinary Courses	-	-	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		-	-	04	02	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	Experimental Learning Courses	-	-	-	-	-	-	-	04	04
Comm. Engg. Project (CEP)/Field Project (FP)		-	-	02	-	-	-	-	-	02
Project		-	-	-	-	-	-	-	04	04
Internship/ OJT		-	-	-	-	-	-	12	-	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02	-	-	-	-	-	-	04
Total Credits (Major)		20-22	20-22	20-22	20-22	20-22	20-22	20-22	20-22	160-176

Abbreviations: Generic/ Open Elective: OE, Vocational and Skill Enhancement Course: VSEC, Vocational Skill Course: VSE, Skill Enhancement Course: VEC, Ability Enhancement Course: AEC, Indian Knowledge System: IKS, Value Education Course: VEC, On Job Training: OJT

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BTPESV301T	Engineering Mathematics-III	PCC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1. To equip students with the knowledge of integral transforms (Laplace and Fourier) and develop their ability to apply these transforms as tools for solving differential equations and evaluating complex integrals arising in engineering problems.
2. To introduce students to partial differential equations, their formation, and solution techniques, enabling them to model and analyze physical phenomena such as heat conduction and wave propagation in one dimension.
3. To develop student understanding of higher-order linear differential equations and their applications to real-world engineering systems, including electrical circuits, mechanical vibrations, and civil engineering structures, through analogous system analysis.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Apply Laplace transforms and their properties to evaluate integrals and solve problems involving special functions.	K3
CO2	Find inverse Laplace transforms using partial fractions and convolution theorem to solve linear differential equations.	K3
CO3	Compute Fourier transforms and apply their properties including Parseval's identity to engineering problems	K3
CO4	Form and solve partial differential equations and apply separation of variables to heat and wave equations.	K3
CO5	Analyze free, forced, and damped oscillations in mechanical and electrical systems using higher-order differential equations.	K3

Unit No.1: Laplace Transform

[09 Hours]

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms -Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , scale change property, transforms of functions divided by t , transforms of integral of functions, transforms of derivatives ;Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Unit No. 2: Inverse Laplace Transform

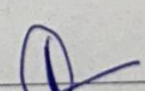
[09 Hours]

Introductory remarks ; Inverse transforms of some elementary functions ; theorems of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

Unit No. 3: Fourier Transform

[09 Hours]

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms.

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Unit No. 4: Partial Differential Equations and Their Applications**[09 Hours]**

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables applications to find solutions of one dimensional heat flow equation ($\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$) and one dimensional wave equation ($\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$).

Unit No. 5: Applications of Linear Differential Equations (Higher order)**[09 Hours]**

To Electrical circuits & to mechanical system (Analogous study of two systems) Free oscillations / vibrations, Forced oscillations / vibrations, Damped Free oscillations / vibrations, Damped Forced oscillations / vibrations, Applications of civil engineering.

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Text Book of Applied Mathematics (Volume-I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
4. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy. Knowledge ware, Mumbai.
5. A text Book of Engineering Mathematics by N. P. Bali, Dr. Manish Goyal, 8th edition, Laxmi Publications.
6. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

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BTPESV302T	Electronics Devices & Circuits	PCC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration-3 Hrs

Course Objectives:

1.	Build a strong foundation in semiconductor devices and electronic circuits.
2.	Understand the operation and characteristics of diode, BJT, JFET, and MOSFET devices.
3.	Develop the ability to analyze and design basic electronic circuits.
4.	Introduce MOS devices and CMOS concepts relevant to VLSI.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Levels
CO1	Explain semiconductor physics and analyze the characteristics of electronic devices.	K2
CO2	Analyze and design diode-based electronic circuits.	K3
CO3	Analyze BJT circuits for amplification and switching applications.	K2
CO4	Explain MOSFET operation and its application in CMOS VLSI circuits	K2
CO5	Apply electronic device concepts to basic analog circuit design.	K3

Course Contents:

Unit 1: Fundamentals of Electronics & Semiconductor Basics [6 Hours]
 Basic electrical quantities: Voltage, current, power, energy. Ohm's Law, Kirchhoff's Laws (KCL, KVL). Passive components: Resistors, capacitors, inductors. Network basics: Series-parallel circuits, voltage/current division. Introduction to semiconductors. Intrinsic and extrinsic semiconductors. Charge carriers: Electrons and holes. Drift and diffusion current

Unit 2 :PN Junction Diode & Applications [10 Hours]
 PN junction formation, V-I characteristics, Diode equation, Temperature effects ,Zener diode Breakdown mechanisms, Half-wave rectifier, Full-wave rectifier, Bridge rectifier Capacitor, LC and π filters, Clippers, Clampers

Unit 3:Bipolar Junction Transistor (BJT) [10 Hours]
 BJT structure and operation , Current components ,Transistor action ,CE, CB and CC Configurations, Input and Output characteristics , DC load line ,Q-point ,Fixed bias ,Voltage divider bias , Small-signal concept (Introduction) , BJT as amplifier , BJT as switch.

Unit 4 :Field Effect Transistors (FETs) & MOSFETs [12 Hours]
 Introduction to FET , Comparison of FET and BJT, JFET construction and characteristics MOSFET enhancement and depletion types ,MOS capacitor basics, I-V characteristics of MOSFET , Regions of operation, Basic MOSFET circuits, CMOS concept, CMOS inverter basics

Unit 5: Basic Electronic Circuits & Applications [7 Hours]
 Amplifier fundamentals ,Voltage, Current and Power Gain ,Single-stage BJT amplifier (Introduction) , Single-stage MOSFET amplifier (Introduction), Introduction to feedback ,Introduction to oscillators , Regulated and unregulated power supplies , Introduction to Integrated Circuits , Analog versus Digital Circuits

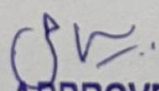
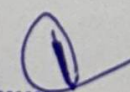
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Reference Books:

- | | |
|----|---|
| 1. | Electronic Devices and Circuits by J.B.Gupta |
| 2. | Electronic Devices and Circuits, A.P Godse, U.A Bakshi , Technical Publications |
| 3. | Electronic Devices and Circuits K.S. Srinivasan Anurdha Agencies |

Text Books:

- | | |
|----|---|
| 1. | Electronics Devices & Circuits , Jacob Millman and C. Halkias, Tata McGraw Hill. |
| 2. | Electronic Devices and Circuits Theory, Boylestad, Prentice Hall Publications. |
| 3. | Electronic Devices and Circuits, S.Salivahanan, N.Suresh kumar, McGraw Hill. |


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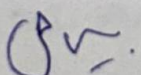
BTPESV302L	Electronics Devices & Circuits Lab	PCC Lab	0L- 0T - 2P	1 Credits
Evaluation Scheme	CA-30 Marks MSE-00 Marks ESE-20 Marks			ESE Time Duration- 3 Hrs

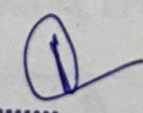
Course Objectives:	
1.	To provide hands-on experience in analyzing the characteristics of semiconductor devices and electronic circuits.
2.	To develop practical skills in designing, testing, and analyzing diode, BJT, JFET, and MOSFET based electronic circuits.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Design and analyze basic electronic circuits using semiconductor devices such as diode, BJT, JFET, and MOSFET.	K3

Minimum 8 - 10 experiments are to be performed based on contents from syllabus

Sample List of Experiments:	
1.	Study of PN junction diode characteristics (forward & reverse bias)
2.	Study of Zener diode characteristics and voltage regulation
3.	Design and analysis of Half-wave & Full-wave rectifiers
4.	Study of clippers and clampers circuits
5.	Input and output characteristics of BJT in CE configuration
6.	DC load line and Q-point determination of BJT
7.	Study of BJT as a switch
8.	Study of JFET characteristics
9.	Study of MOSFET characteristics (Enhancement type)
10.	Design and analysis of basic amplifier (single-stage BJT/MOSFET)



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BTPEsv303T	Digital System Design & Microprocessor	PCC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	Build a strong foundation in digital logic design
2.	Develop skills in designing combinational and sequential circuits
3.	Understand microprocessor architecture and programming
4.	Connect digital design principles with VLSI systems

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Explain number systems, Boolean algebra laws, and logic simplification techniques used in digital systems.	K2
CO2	Design and simplify combinational logic circuits using K-Maps and logic gates.	K3
CO3	Analyze the operation of sequential circuits such as flip-flops, registers, counters, and FSMs.	K4
CO4	Explain digital system design concepts, memory devices, and basic VLSI design flow.	K2
CO5	Analyze Intel 8085 microprocessor architecture and develop basic assembly language programs.	K4

Course Contents:

Unit 1: Number Systems & Boolean Algebra	[10 Hours]
Number systems: Binary, Octal, Decimal, Hexadecimal. Signed number representation (1's & 2's complement). Binary arithmetic. Boolean algebra: Laws, theorems. Canonical forms (SOP, POS) and simplification, Gray code and BCD code, Error detection concepts (Parity bit), Boolean function realization using NAND and NOR gates	
Unit 2: Combinational Logic Design	[9 Hours]
Logic gates and universal gates. Minimization using K-Maps (up to 4/5 variables). Design of: Adders and subtractors, Multiplexers & demultiplexers, Encoders & decoders, Code converters, Introduction to Hardware Description Language (HDL): Need for HDL, Basic Verilog HDL constructs (module, input/output, assign statement)	
Unit 3: Sequential Logic Design	[9 Hours]
Latches and Flip-Flops (SR, JK, D, T), Timing issues (setup, hold, race conditions), Registers and shift registers, Counters (asynchronous & synchronous), Finite State Machines (Moore & Mealy models)	
Unit 4: Digital System Design & Memory	[7 Hours]
Algorithmic State Machine (ASM) charts. Datapath, Control Unit and Register Transfer Level (RTL) Concepts. Memory devices: RAM, ROM, PLA, PAL. SRAM vs DRAM, PROM, EPROM, EEPROM. Introduction to VLSI design flow (overview)	


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Unit 5: Microprocessor (Architecture & Programming)**[10Hours]**

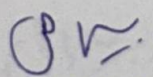
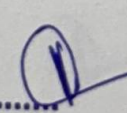
Overview of microprocessors. Architecture of Intel 8085. Instruction set and addressing modes. Timing diagrams and instruction cycles. Assembly language programming: Data transfer, arithmetic, logical operations.

Text Books:

1.	Digital Design, M. Morris Mano, Michael D. Ciletti, Pearson Publication-2017, 5th Edition
2.	Fundamentals of Digital Logic with Verilog Design, Stephen Brown, Zvonko Vranesic, McGraw-Hill Education Publication -2013, 3rd Edition
3.	Digital Principles and Applications, Albert Paul Malvino, Donald P. Leach, McGraw-Hill Education Publication-2011, 7th Edition

Reference Books:

1.	Digital Systems: Principles and Applications, Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Pearson Publication-2017, 12th Edition
2.	Modern Digital Electronics, R. P. Jain, McGraw-Hill Education, Publication- 2010, 4th Edition
3.	Microprocessor Architecture, Programming and Applications with the 8085, Ramesh S. Gaonkar, Penram International Publishing, Publication- 2013, 6th Edition


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BTPEVS303L	Digital System Design & Microprocessor Lab	PCC Lab	0L- 0T - 2P	1 Credits
Evaluation Scheme	CA-30 Marks MSE-00 Marks ESE-20 Marks			ESE Time Duration- 3 Hrs

Course Objectives:

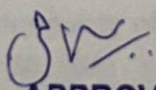
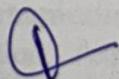
1.	To develop practical skills in designing, testing, and analyzing digital circuits and executing basic 8085 assembly language programs for arithmetic, logical, and data processing operations.
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Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Apply digital logic design principles and 8085 microprocessor programming techniques to design, implement, and verify combinational/sequential circuits and basic assembly language programs.	K3

Minimum 8 - 10 experiments are to be performed based on contents from syllabus

Sample List of Experiments:

	A. Digital Logic Design (Core Hardware/Simulation)
1.	Verification of basic logic gates and universal gates (NAND, NOR)
2.	Implementation and simplification of Boolean functions using K-Map (4 variables)
3.	Design and implementation of Half Adder and Full Adder
4.	Design and implementation of Multiplexer and Demultiplexer
5.	Design of Encoder and Decoder circuits
6.	Implementation of Code converters (e.g., Binary to Gray / Gray to Binary)
	B. Sequential Circuits
7.	Verification of Flip-Flops (SR, JK, D, T) and study of timing characteristics
8.	Design and implementation of Counters (asynchronous/synchronous) or Shift Registers
	C. Microprocessor (8085 Based)
9.	Write and execute 8085 Assembly Programs for: - Addition / subtraction - Logical operations
10.	Write and execute 8085 programs for: - Looping (e.g., sum of array) - Simple sorting or data transfer operations

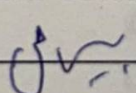
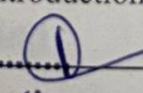


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BTPESOE2T	Business Communication	OE-I	4L- 0T – 0P	4 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives:	
1.	To build up comprehensive understanding of business correspondence and conditions
2.	To create influential oral, written and practical skills among students

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Explain the meaning, scope, importance, and characteristics of business communication.	K2
CO2	Demonstrate an understanding of intercultural communication, including key concepts, non-verbal communication, body language, and the relationship between language, thought, and speech in a business context.	K2
CO3	Explain different barriers to effective communication and listening, and demonstrate the communication principles such as the Four S's and Ten Golden Rules for effective interaction.	K3
CO4	Demonstrate professional business correspondence skills by drafting business letters, emails, job application letters, resumes, and business proposals using proper structure and language.	K3
CO5	Apply group communication skills in practical situations such as group discussions, interviews, meetings, conferences, and public relations, incorporating soft skills like teamwork, emotional intelligence, and problem-solving.	K3

Course Contents:
Unit 1 Introduction of Business Communication [10 hours] Meaning and Scope of Business Communication, Characteristics of Business Communication, Business Communication Need of Time, Five Ways to Improve your Business Communication Skills, Elements of Communication Process, Stages in Communication Process, Types of Business Communication along with example, Methods of Business Communication, Process of Characteristics of Business Communication.
Unit 2 Intercultural Communication [12 hours] Key Terms of Intercultural Communication, Importance of Intercultural Communication in Business, Non- Verbal Communication - Introduction to Non Verbal Communication, Aspects of Body Language, Non- Verbal Communication Codes, Thought and Speech - Introduction to Thought and Speech, Language is Ability.


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Unit 3 Conceptual Barrier to Effective Communication**[12 hours]**

Introduction and Types of Barriers,

Physical Barriers, Mechanical Barrier, Psychological Barrier, Listening - Introduction and Definitions to Listening, Types of Listening, Barriers to Listening, Communication Rules - Simple Rules for Better Communicator, Four S's of Communication, Ten Golden Rules of Communication.

Unit 4 Business Correspondence**[12 hours]**

Business Correspondence - Theory of Business Letter Writing Parts, Structure, Layouts, Principles of Effective Letter Writing, Principles of effective E - mail Writing

Personnel Correspondence - Job Application Letter and Resume, Letter of Acceptance of Job Offer, Letter of Resignation. Language and Writing Skill - Paragraph Writing, Business Proposals, Oral and Written

Vocabulary in Communication, Common Errors.

Unit 5 Group Communication**[12 hours]**

Group Discussions – Process of GD, Skills tested in GD.

Interviews - Preparing for an Interview, Types of Interviews – Selection, Appraisal, Grievance, Exit, Online. Soft Skills – Emotional Intelligence, Conflict Management, Teamwork, Problem-Solving.

Meetings - Types of Meetings, Agenda and Resolutions. Committees & Conferences. Public Relations

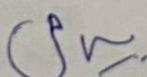
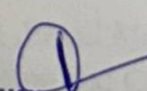
- Meaning and Functions of Public Relations (PR), External and Internal Measures of Promoting PR, Crisis Management

Text Books:

1. Kaul, Asha, Business Communication, Prentice-Hall of India, Delhi.

Reference Books:

1. Mary Ellen Guffey, Essentials of Business Communication, Sixth Edition, South-Western College Publishing.
2. Monippally, Matthukutty M. Business Communication Strategies. Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. Bahl, J.C. and Nagamia, S.M. (1974) Modern Business Correspondence and Minute Writing
4. Bovee Courtland, L and Thrill, John V (1989) Business Communication, Today McGrawHill, New York, Taxman Publication.


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BTPESOE4T	Digital Marketing and E-Commerce	OE-I	4L- 0T – 0P	4 Credits
Evaluation Scheme	CA-20 Marks MSE-20 Marks ESE-60 Marks			ESE Time Duration 3 Hrs

Course Objectives:

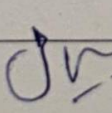
1.	To introduce students to the fundamentals of Digital Marketing and E-Commerce systems.
2.	To develop understanding of online business models, digital consumer behavior, and marketing strategies.
3	To enable students to apply digital tools, analytics, and e-commerce technologies for business growth and entrepreneurship

Course Outcomes:

At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Describe the fundamentals of Digital Marketing and E-Commerce ecosystems.	K2
CO2	Use SEO, SEM, email, and social media marketing techniques in online business platforms.	K3
CO3	Differentiate digital consumer behavior and various e-commerce business models	K4
CO4	Design simple digital marketing strategies using analytics and online tools	K4
CO5	Explain security, ethical, legal, and emerging trends in e-commerce and digital business.	K5

Course Contents:

UNIT-I: Introduction to Digital Marketing	[12 hours]
Fundamentals of Marketing and Digital Marketing ,Traditional Marketing vs Digital Marketing ,Digital Marketing Ecosystem ,Digital Business Models ,Consumer Behavior in Digital Environment ,Website Basics and Content Management Systems ,Introduction to Google Ads and Digital Platforms .	
UNIT-II: Search Engine and Social Media Marketing	[12 hours]
Search Engine Optimization ,On-page and Off-page ,Search Engine Marketing ,Pay Per Click, Advertising ,Social Media Marketing (Facebook, Instagram, LinkedIn, YouTube) ,Influencer Marketing ,Online Brand Building.	
UNIT-III: E-Commerce Fundamentals	[11 hours]
Introduction to E-Commerce ,Types of E-Commerce: B2B, B2C, C2C, C2B ,E-Commerce Business Models ,Electronic Payment Systems ,Digital Wallets and Payment Gateways ,E-Commerce Website Design ,Supply Chain and Logistics in E-Commerce.	
UNIT-IV: Digital Analytics and Online Advertising	[11 hours]
Web Analytics and Google Analytics ,Metrics and KPIs in Digital Marketing ,Email Marketing ,Affiliate Marketing ,Mobile Marketing ,Content Marketing Strategies ,Online Advertising and Campaign Management.	


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UNIT-V: Security, Ethics, and Emerging Trends**[12 hours]**

Cyber Security in E-Commerce ,Privacy and Data Protection ,Ethical Issues in Digital Marketing ,Legal Aspects of E-Commerce ,Artificial Intelligence in Digital Marketing ,Chatbots and Automation ,Future Trends in E-Commerce and Digital Business .

Text Books:

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|----|---|
| 1. | Seema Gupta, <i>Digital Marketing</i> , 3rd Edition, McGraw Hill Education, 2022. |
| 2. | Kenneth C. Laudon and Carol Guercio Traver, <i>E-Commerce: Business, Technology, Society</i> , 16th Edition, Pearson Education, 2021. |
| 3. | Simon Kingsnorth, <i>Digital Marketing Strategy: An Integrated Approach to Online Marketing</i> , 2nd Edition, Kogan Page, 2022. |
| 4. | Dave Chaffey, <i>E-Business and E-Commerce Management</i> , 7th Edition, Pearson Education, 2019. |

Reference Books:

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|----|---|
| 1. | Philip Kotler, Hermawan Kartajaya and Iwan Setiawan, <i>Marketing 4.0: Moving from Traditional to Digital</i> , 1st Edition, Wiley, 2017. |
| 2. | Tracy L. Tuten and Michael R. Solomon, <i>Social Media Marketing</i> , 4th Edition, Sage Publications, 2020. |
| 3. | Gary P. Schneider, <i>Electronic Commerce</i> , 12th Edition, Cengage Learning, 2017. |
| 4. | Ryan Deiss and Russ Henneberry, <i>Digital Marketing for Dummies</i> , 2nd Edition, Wiley, 2020. |

NPTEL Link

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| 1 | https://nptel.ac.in/courses/110105083 |
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BTPEOE13T	Employability and Skill Development	OE-I	4L- 0T – 0P	4 Credits
Evaluation Scheme	CA-20 Marks MSE-20 Marks ESE-60 Marks			ESE Time Duration 3 Hrs

Course Objectives:

1.	Develop employability skills among mechanical engineering students and Enhance communication, teamwork, and professional ethics.
2.	Build technical aptitude related to manufacturing, maintenance, quality, and industrial practices.
3.	Prepare students for internships, placements, and industrial environments.

Course Outcomes:

At the end of this course, the students will be able:			Bloom's Taxonomy Level
CO1	Demonstrate effective communication and interpersonal skills in professional settings.		K2
CO2	Apply aptitude, analytical, and problem-solving skills for employment opportunities.		K3
CO3	Understand industrial practices, workplace safety, and engineering ethics.		K2
CO4	Develop technical employability skills relevant to mechanical engineering industries.		K2
CO5	Demonstrate entrepreneurship, leadership, and lifelong learning abilities.		K2

Course Contents:

UNIT-I: Communication Skills and Personality Development	[10 hours]
Fundamentals of professional communication, Verbal and non-verbal, communication Technical communication and workplace etiquette ,Group discussion techniques Presentation skills and public speaking ,Resume writing and cover letter preparation ,Interview skills and mock interview practices, Personality development and confidence building.	
UNIT-II: Quantitative Aptitude and Problem-Solving Skills	[12 hours]
Quantitative aptitude fundamentals ,Numerical ability and logical reasoning ,Analytical thinking and decision making ,Basic data interpretation, Engineering problem-solving techniques, Time management and critical thinking, Introduction to psychometric and aptitude tests for placements .	
UNIT-III: Industrial Skills, Safety and Professional Ethics	[12 hours]
Industrial work culture and organizational behaviour , Basics of industrial safety practices, Occupational health and hazard identification, Safety standards in mechanical workshops, Introduction to quality concepts (5S, Kaizen, Lean Manufacturing), Professional ethics and workplace discipline ,Engineering ethics and sustainable practices.	
UNIT-IV: Technical Employability Skills	[12 hours]
Automation and Smart Manufacturing, Internet of Things (IoT) Basics, Green Engineering and Sustainable Technologies, Artificial Intelligence basics. Industrial automation and Industry 4.0 overview , Preventive and predictive maintenance concepts , Quality control tools and inspection techniques , Documentation and report writing.).	

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UNIT-V: Entrepreneurship, Innovation and Career Development**[12 hours]**

Concept and Meaning of Entrepreneurship, Characteristics and Types of Entrepreneurs, Entrepreneurship development, Role of Entrepreneurship in Economic Development Start-up ecosystem and innovation, Career planning and higher education opportunities , Professional networking and digital platforms, Leadership and teamwork skills ,Internship and project management basics.

Text Books:

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| 1. | Sanjay Kumar & Pushp Lata, Communication Skills –Oxford University Press. |
| 2. | S. P. Dhanavel, Soft Skills – Orient Black Swan. |
| 3. | R. S. Aggarwal, S. Chand., Quantitative Aptitude for Competitive Examinations. |
| 4. | Charles E. Harris Jr., Engineering Ethics –Cengage Learning. |
| 5. | S. S. Khanka, S. Chand..Entrepreneurship Development. |

Reference Books:

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|----|---|
| 1. | Barun K. Mitra , Personality Development and Soft Skills –,Oxford University Press. |
| 2. | Dr. M. Sen Gupta.Skills for Employability. |
| 3. | L. M. Deshmukh.,Industrial Safety Management . |
| 4. | Stephen R. Covey The 7 Habits of Highly Effective People. |

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BTPESV304T	E-Business	HSSM	2L- 0T - 0P	1 Credits
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Time Duration- 2 Hrs

Course Objectives:

1.	To understand the role of E Business
2.	To study modern technologies used in E Business
3.	To analyze decision support mechanisms in E Business

Course Outcomes: At the end of this course, the students will be able:

**Bloom's
Taxonomy
Level**

CO1	Explain E-Business functional areas, value chain, supply chain, ERP, E-Procurement, E-Marketing, and related web-based business systems.	K2
CO2	Demonstrate understanding of E-Business technologies including security, electronic payment systems, EDI, RFID, IoT, GPS, GIS, Web Services, and Cloud Computing.	K2
CO3	Analyze decision support techniques in E-Business using web analytics, customer behaviour modelling, auctions, and recommender systems.	K4

Course Contents:

Unit 1 Making Functional Areas E-Business Enabled

[7 Hours]

Value chain and supply chain, inter and intra organizational business processes, ERP, E-Procurement, E-marketing, E-Selling, E-Supply Chain Management, Technologies for E-Business: Internet and Web based system.

Unit 2 Technologies and Decision Support for E-Business

[8 Hours]

Security and payment systems, Supply chain integration technologies (EDI, RFID, Sensors, IoT, GPS, GIS), Supply chain integration technologies (Web services and cloud). Web analytics, Customer behaviour modelling, Auctions, Recommender systems.

Text Books:

1.	Electronic Commerce: A Managerial and Social Networks Perspective, Efraim Turban, David King, Jae Kyu Lee, Ting-Peng Liang, Deborrah C. Turban, Springer, 2018, 9th Edition.
2.	E-Business and E-Commerce Management: Strategy, Implementation and Practice, Dave Chaffey, Pearson Education, 2019, 7th Edition.

Reference Books:

1.	Management Information Systems: Managing the Digital Firm, Kenneth C. Laudon, Jane P. Laudon, Pearson Education, 2020, 16th Edition.
2.	Supply Chain Management: Strategy, Planning, and Operation, Sunil Chopra, Peter Meindl, Pearson Education, 2019, 7th Edition.

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BTPEHUVT	Universal Human Values	VEC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	To develop right understanding through self-exploration and cultivate harmony with self, society, and nature, enabling students to apply universal human values and ethical principles in personal and professional life.
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Course Outcomes: At the end of this course, the students will be able:

		Bloom's Taxonomy Level
CO1	Analyse self and surroundings to understand personal and societal harmony.	K2
CO2	Evaluate human aspirations and happiness to enhance well-being.	K2
CO3	Assess universal values in relationships and design strategies for trust, respect, and justice.	K2
CO4	Analyse human impact on nature and propose sustainable practices.	K3
CO5	Evaluate eco-friendly systems and develop strategies for sustainable technologies.	K2

Course Contents:

Unit 1 Introduction

[9 Hours]

Purpose and motivation for the course. Self-Exploration, 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity. Right understanding, Relationship and Physical Facility. Understanding Happiness and Prosperity correctly.

Understanding and living in harmony at various levels.

Unit 2 Understanding Harmony

[9 Hours]

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. Prosperity in detail, Programs to ensure Sanyam and Health.

Unit 3 Values in relationships

[9 Hours]

Understanding nine universal values in human-human relationship. Justice and program for its fulfilment to ensure mutual happiness. Trust and Respect as the foundational values of relationship, difference between intention and competence, respect and differentiation. 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.

Unit 4 Co-existing with nature

[9 Hours]

Understanding the harmony in Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence. Human being as cause of imbalance in nature, pollution, depletion of resources and role of technology etc.

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Unit 5 Holistic approach for Engineers**[9 Hours]**

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education. Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order. b. 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. 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

Text Books:

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|----|--|
| 1. | Human Values and Professional Ethics, Gaur, Sangal, Bagaria, 2010, Excel Books, New Delhi. |
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Reference Books:

- | | |
|----|---|
| 1. | Jeevan Vidya: Ek Parichaya, A. Nagaraj, 1999, Jeevan Vidya Prakashan, Amarkantak |
| 2. | Human Values, A.N. Tripathi, 2004, New Age Intl. Publishers, New Delhi |
| 3. | The Story of My Experiments with Truth, M.K.Gandhi, 2009, Fingerprint Publishers. |

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BTPEV305L	Community Engineering Project	CEP	0L- 0T - 2P	1 Credits
Evaluation Scheme	CA-60 Marks	MSE-00 Marks	ESE-40 Marks	ESE Time Duration -3 Hrs

Course Objectives:

1.	To develop social responsibility and community awareness among students through active participation in community-based activities.
2.	To encourage students to identify real-life social problems and apply their knowledge and skills to provide practical solutions.
3.	To enhance teamwork, leadership, communication, and project management skills through community engagement projects.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Identify community problems and propose suitable solutions using technical and social knowledge.	K4
CO2	Demonstrate teamwork, leadership, communication, and organizational skills while working on community projects.	K3
CO3	Analyze the social impact of community engagement activities and prepare proper project documentation and reports.	K4

Course Guidelines:

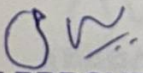
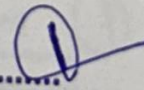
A Community Engagement Project helps students connect with society and develop social responsibility. The main aim is "Campus to Community," where students use their knowledge and skills to help solve real-life community problems.

Students work under the guidance of teachers to identify social issues and provide solutions or create awareness. These projects improve teamwork, leadership, communication skills, and understanding of social needs.

Projects may include:

- Health awareness and free check-up camps.
- Teaching digital literacy or career guidance
- Skill development and support for small businesses
- Environmental activities like tree plantation and rainwater harvesting awareness
- Cultural and heritage programs

These activities help both students and the community, creating a better and more responsible society.


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Step-by-Step Execution Plan:

1) Planning Phase:

a. Team Formation:

Form a group of 3–4 students with different skills and interests. All members should work together and actively participate in the project.

b. Project Selection:

Select a community-based project topic and decide clear objectives based on local needs.

c. Proposal Submission:

Prepare and submit a one-page project proposal including:

Title of the project

Objectives and expected outcomes

Plan of activities and timeline

Resources required (if any)

The proposal should be approved by the assigned faculty mentor.

2) Execution Phase

a. Phase 1 Activities:

Connect with the community or target group and start initial interaction.

Carry out the planned activities through teamwork and maintain proper records/documentation.

b. Phase 2 Activities:

Continue project activities and collect feedback from participants.

Summarize and analyze the outcomes and impact of the project.

3) Documentation:

Prepare a detailed project report including:

Title, objectives, and scope of the project

Activities conducted and project timeline

Methods used and community participation

Results, outcomes, and feedback received

Challenges faced and solutions provided

Conclusion and learning experience gained from the project.

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BTPESV401T	Engineering Mathematics-IV	PCC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	To introduce functions of a complex variable, analytic functions, and conformal mappings, and develop skills in complex integration using classical theorems.
2.	To develop the ability to apply vector differentiation and integration in analyzing scalar and vector fields using fundamental theorems of vector calculus.
3.	To equip students with the knowledge of Z-transforms and their application in solving difference equations arising in discrete engineering systems.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Analyze complex functions, verify Cauchy-Riemann equations, identify harmonic functions, and apply conformal and bilinear transformations.	K4
CO2	Evaluate complex line and contour integrals using Cauchy's integral theorem, integral formula, and residue theorem.	K3
CO3	Compute gradient, divergence, and curl of vector functions and classify vector fields as irrotational or solenoidal.	K3
CO4	Evaluate line, surface, and volume integrals and apply Gauss's divergence theorem, Stoke's theorem, and Green's theorem.	K3
CO5	Apply Z-transforms and their properties to find inverse Z-transforms and solve difference equations.	K3

Unit No 1: Function of complex variable (Differential calculus) [09 Hours]

Introduction, Analytic function, Cauchy's Riemann equations in Cartesian and Polar form, Harmonic function, Laurent's series (without proof), conformal mapping: Translation, Magnification, Rotation and inversion, bilinear transformation.

Unit No 2: Function of complex variable: (Integral calculus) [09 Hours]

Line integral, contour integral: Cauchy's integral theorem, Cauchy's integral formula, Residues, Cauchy's residue theorem (All theorems without proof).

Unit No 3: Vector Differentiation [09 Hours]

Differentiation of vectors, Gradient of scalar point functions, Directional derivative, Divergence of vector point function, Curl of a vector point function, Irrotational and solenoid vector field.

Unit No 4: Vector Calculus (Integral calculus) [09 Hours]

The line integral, Surface integral, volume integral, Gauss Divergence theorem, Stoke's theorem, Green's theorem (all theorems without proof).

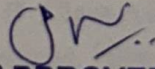
Unit No.5: Z-transform [09 Hours]

Definition, Z transform of elementary functions, properties of Z transform, Inverse Z transform, Solution of difference equation by Z transform.

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Text Books:	
1.	A Text Book of Engineering Mathematics (Volume-I, II,III) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2.	Higher Engineering Mathematics by B. S. Grewal, Khanna Publications, New Delhi.
3.	Advanced Engineering Mathematics by H.K. Das, S. Chand & Company.

Reference Books:	
1.	Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
2.	Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd.
3.	Engineering Mathematics A Tutorial Approach by Ravish-R Singh, Mukul Bhat, Mc Graw Hill
4.	A text Book of Engineering Mathematics by N.P. Bali, Dr. Manish Goyal, 8 th Edition, Laxmi Publications.


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BTPEV402T	Analog Circuit	PCC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration-3 Hrs

Course Objectives:

1.	Analyze transistor amplifiers using small-signal models.
2.	Design multistage and differential amplifiers used in analog and VLSI systems.
3.	Analyze amplifier frequency response and bandwidth limitations
4.	Understand feedback techniques and oscillator circuits.
5.	Analyze power amplifiers used in analog electronic systems.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Analyze BJT and MOSFET amplifiers using small-signal models	K4
CO2	Design multistage and differential amplifiers	K3
CO3	Analyze frequency response and bandwidth of transistor amplifiers	K4
CO4	Apply feedback concepts and design oscillator circuits..	K3
CO5	Analyze power amplifier circuits for analog applications.	K4

Course Contents:

Unit 1 Small-Signal Models and Single-Stage Amplifiers

[9 Hours]

Review of BJT and MOSFET operation. Hybrid- π model of BJT .Small-signal MOSFET model . CE amplifier, CB amplifier, CC amplifier, CS amplifier, CG amplifier, CD amplifier. Voltage gain, Input resistance, Output resistance, Effect of emitter/source degeneration .

Unit 2 Multistage and Differential Amplifiers

[9 Hours]

RC coupled amplifiers, Direct coupled amplifiers, Cascade amplifier, Cascode amplifier Differential amplifier, Common-mode gain, Differential gain, CMRR , Current mirrors Active loads, Introduction to biasing in integrated circuits.

Unit 3 Frequency Response of Amplifier

[9 Hours]

Frequency response basics. Low-frequency response: Coupling and bypass capacitors. High-frequency response: Parasitic capacitances , Miller effect . Bandwidth and gain-bandwidth product . Frequency response of multistage amplifiers

Unit 4 Feedback Amplifiers and Oscillators

[9 Hours]

Positive feedback , Negative feedback ,Voltage-series feedback , Voltage-shunt feedback. Current-series feedback , Current-shunt feedback ,Effects of negative feedback: Gain . Bandwidth , Noise reduction ,Distortion reduction ,Improved stability (qualitative), Barkhausen criterion, RC Phase Shift Oscillator, Wien Bridge Oscillator , Hartley Oscillator ,Colpitts Oscillator ,(Gain margin, Phase margin, Bode plots, and Stability analysis are intentionally excluded because they are covered in the Third-Year Control Systems course.)

Unit 5 Power Amplifiers

[9 Hours]

Classification of power amplifiers , Class A, Class B ,Class AB ,Class C ,Push-pull amplifiers, Efficiency ,Crossover distortion, Thermal considerations, Heat sinks

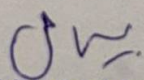
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Text Books:

1.	Microelectronic Circuits, Adel S. Sedra, Kenneth C. Smith, Oxford University Press, 2020, 8th Edition.
2.	Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, Pearson Education, 2019, 11th Edition.
3.	Analog Electronic Circuits, U.A. Bakshi, A.P. Godse, Technical Publications, 2018, 2nd Edition.

Reference Books:

1.	Fundamentals of Microelectronics, Behzad Razavi, Wiley India, 2015, 2nd Edition.
2.	Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman, Christos C. Halkias, McGraw Hill Education, 2017, 2nd Edition.
3.	Electronic Principles, Albert Malvino, David Bates, McGraw Hill Education, 2016, 8th Edition.


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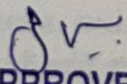
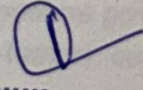
BTPESV402L	Analog Circuit Lab	PCC Lab	0L- 0T - 2P	1 Credits
Evaluation Scheme	CA-30 Marks	MSE-00 Marks	ESE-20 Marks	ESE Time Duration- 3 Hrs

Course Objectives:	
1.	To develop practical skills in analyzing, designing, and testing analog electronic circuits such as amplifiers, oscillators, feedback circuits, power amplifiers, and Op-Amp based applications.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Analyze and implement analog electronic circuits including amplifiers, oscillators, feedback circuits, power amplifiers, and Op-Amp applications using appropriate design and measurement techniques.	K4

Minimum 8 - 10 experiments are to be performed based on contents from syllabus

Sample List of Experiments:	
1.	Analysis of CE amplifier using small-signal model (gain, R_{in} , R_{out})
2.	Analysis of CS MOSFET amplifier
3.	Study of frequency response of single-stage amplifier
4.	Design and analysis of RC coupled multistage amplifier
5.	Study of differential amplifier (CMRR measurement)
6.	Implementation of current mirror circuit
7.	Study of negative feedback on amplifier performance
8.	Design and analysis of RC phase shift oscillator / Wien bridge oscillator
9.	Study of Class A / Class B power amplifier
10.	Implementation of Op-Amp applications: - Inverting & non-inverting amplifier - Integrator / Differentiator


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BTPESV403T	Network Theory	PCC	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration-3 Hrs

Course Objectives:

1.	To understand the fundamental laws, techniques, and methods used for electrical network analysis.
2.	To apply various network theorems for simplifying and analyzing electrical circuits.
3.	To analyze transient and steady-state behavior of electrical networks using time-domain and frequency-domain techniques.
4.	To study resonance phenomena and power concepts in AC circuits.
5.	To understand two-port network parameters and their applications in electronic and communication systems.

Course Outcomes: At the end of this course, the students will be able:

		Bloom's Taxonomy Level
CO1	Apply Kirchhoff's laws, nodal analysis, and mesh analysis techniques to solve electrical networks.	K3
CO2	Analyze electrical circuits using various network theorems such as Superposition, Thevenin's, Norton's, and Maximum Power Transfer theorem.	K4
CO3	Evaluate transient response characteristics of RL, RC, and RLC circuits under different excitation conditions.	K4
CO4	Analyze sinusoidal steady-state circuits, resonance conditions, and power relationships in AC networks.	K4
CO5	Determine and analyze two-port network parameters for modeling and interconnection of electrical systems.	K4

Course Contents:

Unit 1 Network Fundamentals and Circuit Analysis

[9 Hours]

Review of electrical quantities, passive and active elements, voltage and current sources, source transformation, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), mesh analysis, nodal analysis, supermesh and supernode concepts, network terminology, linearity and superposition principle.

Unit 2 Network Theorems

[9 Hours]

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, analysis of DC and AC circuits using network theorems.

Unit 3 Transient Analysis

[9 Hours]

Transient response of RL and RC circuits using differential equations, time constant, initial and final conditions, transient response of series and parallel RLC circuits, natural and forced response, step and impulse response, concept of damping in second-order systems.

Unit 4 Sinusoidal Steady-State Analysis and Resonance

[9 Hours]

Representation of sinusoidal signals, phasor analysis, impedance and admittance concepts, analysis of series and parallel AC circuits, power and power factor, real, reactive and apparent power, resonance in series and parallel RLC circuits, bandwidth and quality factor (Q-factor), coupled circuits and mutual inductance.

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Unit 5 Two-Port Networks**[9 Hours]**

Introduction to two-port networks, open-circuit impedance (Z) parameters, short-circuit admittance (Y) parameters, hybrid (H) parameters, transmission (ABCD) parameters, relationship between parameters, interconnection of two-port networks, applications in communication and electronic circuits.

Text Books:

1.	Engineering Circuit Analysis, William H. Hayt Jr., Jack E. Kemmerly, Steven M. Durbin, McGraw-Hill Education, 2019, 9th Edition.
2.	Network Analysis, M.E. Van Valkenburg, Pearson Education, 2015, 3rd Edition (Reprint).
3.	Network Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai Publications, 2018, 7th Edition.

Reference Books:

1.	Electric Circuits, James W. Nilsson, Susan A. Riedel, Pearson Education, 2023, 12th Edition.
2.	Fundamentals of Electric Circuits, Charles K. Alexander, Matthew N.O. Sadiku, McGraw-Hill Education, 2021, 7th Edition.
3.	Engineering Circuit Analysis, Irwin David J., R. Mark Nelms, Wiley India, 2020, 12th Edition.

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BTPESV403L	Network Theory Lab	PCC Lab	0L- 0T - 2P	1 Credits
Evaluation Scheme	CA-30 Marks	MSE-00 Marks	ESE-20 Marks	ESE Time Duration- 3 Hrs

Course Objectives:	
1.	To enable students to verify and analyze fundamental electrical network laws, theorems, transient response, resonance, and two-port network parameters through hands-on laboratory experiments.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Apply fundamental circuit laws, network theorems, transient analysis, and two-port network parameters to analyze and verify electrical circuit behavior through experiments.	K4

Minimum 8 - 10 experiments are to be performed based on contents from syllabus

Sample List of Experiments:	
1.	Verification of Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).
2.	Analysis of electrical networks using Mesh Current Method.
3.	Analysis of electrical networks using Nodal Voltage Method.
4.	Verification of Superposition Theorem for linear circuits.
5.	Verification of Thevenin's Theorem and Norton's Theorem.
6.	Verification of Maximum Power Transfer Theorem in DC/AC circuits.
7.	Study of transient response of RC circuits for charging and discharging conditions.
8.	Study of transient response of RL circuits and determination of time constant.
9.	Study of resonance characteristics of Series RLC circuit and determination of resonant frequency, bandwidth, and Q-factor.
10.	Determination of Z-parameters and ABCD parameters of Two-Port Networks.

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BTPEOE14T	Educational Leadership	OE-II	2L- 0T – 0P	2 Credits
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Duration 2Hr

Course Objectives

1.	To introduce students to the concepts, principles, and theories of educational leadership.
2.	To develop leadership, communication, and decision-making skills required in academic and professional environments and promote ethical leadership, teamwork, and conflict management.
3.	To understand innovation, change management, and quality practices in educational institutions

COs	Course Outcomes	Bloom's Taxonomy Level
1	Explain the concepts, theories, and styles of educational leadership	K2
2	Demonstrate leadership, communication, teamwork, ethical decision-making, and conflict management skills	K2
3	Apply innovation, change management, and quality practices for effective leadership and continuous professional development	K4

Course Contents:

Unit I: Foundations of Educational Leadership [10 Hours]

Concept, meaning, and scope of educational leadership. Leadership vs. Management Characteristics and qualities of an effective leader Leadership theories: Trait Theory, Behavioral Theory, Situational Leadership, Transformational Leadership, Vision, mission, values, and goal setting, Leadership styles and their applications in educational institutions.

Unit II: Leadership Skills and Professional Development [10 Hours]

Effective communication and interpersonal skills, Team building and collaborative leadership Decision making and problem-solving techniques, Time management and stress management Conflict resolution and negotiation skills, Emotional intelligence and ethical leadership Professional ethics and social responsibility.

Unit III: Innovation, Change Management and Quality in Education [10 Hours]

Innovation and creativity in educational leadership, Change management: Need, process, and overcoming resistance to change, Quality assurance and continuous improvement in, educational institutions, Leadership for sustainable development and inclusive education. Digital leadership and technology-enabled learning, Lifelong learning and leadership for personal and professional growth.

Text Books:

1. Tony Bush, Theories of Educational Leadership and Management, Sage Publications
2. Peter G. Northouse, Leadership: Theory and Practice, Sage Publications
3. James M. Kouzes and Barry Z. Posner, The Leadership Challenge, Wiley

Reference Books:

1. Stephen R. Covey, The 7 Habits of Highly Effective People.
2. John C. Maxwell, Developing the Leader Within You
3. UNESCO, Educational Leadership and School Improvement

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BTPEOE15T	Sustainable Happiness	OE-II	2L- 0T – 0P	2 Credits
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Duration 2Hr

Course Objectives	
1.	To understand the concept of sustainable happiness and its importance in personal and social well-being.
2.	To develop awareness about balanced living through emotional, social, environmental, and ethical practices.
3.	To encourage positive thinking, mindfulness, healthy relationships, and responsible citizenship for a sustainable future.

COs	Course Outcomes	Bloom's Taxonomy Level
1	Explain E-Business functional areas, value chain, supply chain, ERP, E-Procurement, E-Marketing, and related web-based business systems.	K2
2	Demonstrate understanding of E-Business technologies including security, electronic payment systems, EDI, RFID, IoT, GPS, GIS, Web Services, and Cloud Computing.	K2
3	Analyze decision support techniques in E-Business using web analytics, customer behaviour modelling, auctions, and recommender systems.	K4

Course Contents:	
Unit I: Introduction to Sustainable Happiness	[10 Hours]
Meaning and concept of happiness ,Difference between temporary pleasure and sustainable happiness, Importance of mental, emotional, and physical well-being, Role of values, ethics, and positive thinking , Stress management and work-life balance.	
Unit II: Sustainable Living and Social Well-being	[10 Hours]
Sustainable lifestyle and responsible consumption ,Environmental awareness and conservation, Healthy relationships and emotional intelligence, Community participation and social responsibility, Digital well-being and balanced use of technology.	
Unit III: Practices for Sustainable Happiness	[10 Hours]
Mindfulness and meditation ,Yoga and healthy habits ,Gratitude, empathy, and self-awareness , Time management and goal setting , Happiness through service, creativity, and lifelong learning.	

Text Books:	
1.	The How of Happiness: A Scientific Approach to Getting the Life You Want
2.	The Happiness Advantage: The Seven Principles of Positive Psychology That Fuel Success and Performance at Work
3.	Ikigai: The Japanese Secret to a Long and Happy Life
Reference Books:	
1.	Flourish: A Visionary New Understanding of Happiness and Well-being
2.	Emotional Intelligence: Why It Can Matter More Than IQ
3.	Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life, Jon Kabat-Zinn, Hachette Books, 2016, Revised 2nd Edition.

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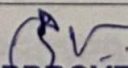
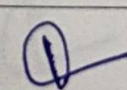
BTPESOE23T	Smart Cities & Urban Technologies	OE-II	2L- 0T – 0P	2 Credits
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Time Duration 2 Hrs

Course Objectives	
1.	To introduce the fundamental concepts, dimensions, stakeholders, and sustainability principles of smart cities and urban development.
2.	To develop understanding of smart city planning, governance, financing, infrastructure development, policies, and regulatory frameworks for sustainable urban management.
3.	To familiarize students with smart transportation, energy, communication technologies, and intelligent systems used in modern smart city applications through practical case studies.

COs	Course Outcomes At the end of this course, the students will be able:	Bloom's Taxonomy Level
1	Explain the concepts, dimensions, stakeholders, sustainability principles, and performance benchmarks of smart cities.	K2
2	Analyze smart city planning, urban infrastructure development, governance, financing mechanisms, regulations, and sustainable development policies.	K4
3	Apply intelligent transportation systems, smart energy management, renewable energy integration, and wireless communication technologies in smart city solutions through case studies.	K3

Course Contents:	
Unit 1 Introduction to Smart cities	[10 Hours]
Introduction, Definition, dimensions, scope, Performance Benchmarks, Practice Code, Principal stakeholders, Concept of Sustainable cities	
Unit 2 Smart Cities Planning and Development	[10 Hours]
Planning for Urban Infrastructure, key trends in smart cities developments, Sustainable features for smart cities. Planning for major infrastructure projects, Various Infrastructure Program and policies. Dimension of smart cities, Financing smart cities development, Governance of smart cities, Smart Cities Regulations & Smart Techniques.	
Unit 3 Smart Transportation, Energy & Communication Systems	[10 Hours]
Intelligent Transportation Systems (ITS), Smart Traffic Management and Parking Systems, GPS and Vehicle Tracking Systems, Smart Grid and Smart Energy Management, Renewable Energy Integration in Smart Cities, Smart Street Lighting Systems, Wireless Communication Technologies: Wi-Fi, ZigBee, LoRa, 5G, Machine-to-Machine (M2M) Communication. Case Study.	

Text Books:	
1.	Introduction to smart cities by P.P.Anilkumar, Pearson Publication
2.	Smart cities and Urban Development in India by N.Mani , New Century Publications


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Reference Books:

1. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony M. Townsend.
2. GIS for Urban and Regional Planning" by Peter O'Connell.
3. Artificial Intelligence in the 21st Century" by Stephen Lucci and Danny Kopec
4. Internet of Things for Smart Cities: Technologies, Big Data and Security by Zaigham Mahmood.
5. <https://tomorrow.city/a/technology-for-smart-cities-the-pillars-of-urban-planning-of-the-future>
6. <https://www1.nyc.gov/assets/forward/documents/NYC-Smart-Equitable-City-Final.pdf>
7. <https://smartcity.go.kr/wp-content/uploads/2019/08/Smart-city-broschureENGLISH.pdf>

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BTPEV404L	PCB Design Lab	VSEC Lab	0L- 0T - 2P	1 Credits
Evaluation Scheme	CA-30 Marks MSE-00 Marks ESE-20 Marks			ESE Time Duration- 3 Hrs

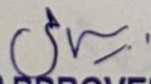
Course Objectives:	
1.	To enable students to verify and analyze fundamental electrical network laws, theorems, transient response, resonance, and two-port network parameters through hands-on laboratory experiments.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Apply fundamental circuit laws, network theorems, transient analysis, and two-port network parameters to analyze and verify electrical circuit behavior through experiments.	K4

Minimum 8 - 10 experiments are to be performed based on contents from syllabus

Sample List of Experiments:

1.	Introduction to PCB Design Software Familiarization with schematic capture and PCB layout tools using KiCad, EAGLE, or Altium Designer
2.	Design of Single Layer PCB for Power Supply Circuit Schematic creation, component placement, and routing
3.	Design of Double Layer PCB for Amplifier Circuit PCB layout with proper grounding and track width selection
4.	PCB Design Rule Check (DRC) and Electrical Rule Check (ERC) Verification of PCB layout using standard design rules
5.	Generation of Manufacturing Files Creation of Gerber files, drill files, and BOM (Bill of Materials)
6.	Fabrication of PCB Using Toner Transfer or Photoresist Method Printing, etching, drilling, and finishing of PCB
7.	Soldering and Assembly Techniques Through-hole component mounting and soldering practice
8.	Testing and Troubleshooting of Fabricated PCB Continuity testing, short-circuit checking, and debugging
9.	Design of PCB for Digital Logic Circuit PCB layout for combinational or sequential logic circuit using CMOS ICs
10.	Mini Project: Complete PCB Design and Fabrication Design, fabrication, assembly, and testing of a functional electronic circuit


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FOREIGN LANGUAGE COURSE – LEVEL I

BTPEFLA	JAPANESE	AEC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-50 Marks	MSE-00 Marks	ESE-50 Marks	ESE (Practical/Oral evaluation at the end of the semester)

Course Objectives:

1. Develop basic communication skills in an international language
2. Enhance employability and global industry readiness.
3. Build confidence in multicultural communication.
4. Prepare students for higher studies, internships, and placements abroad.
5. Develop understanding of international workplace culture and etiquette.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Understand and use basic greetings and expressions.	K2
CO2	Communicate simple personal and professional information.	K2
CO3	Read and write basic words and short conversations.	K3
CO4	Develop listening and pronunciation skills.	K3
CO5	Understand basic cultural etiquette and workplace communication.	K2

Course Contents:

Unit 1 Introduction to Japanese Language

- Hiragana and Katakana basics
- Greetings and introductions
- Numbers and time
- Classroom expressions
- Pronunciation practice

Unit 2 Vocabulary & Daily Expressions

- Family and occupations
- Colors and places
- Daily routine vocabulary
- Asking simple questions
- Common expressions

Unit 3 Grammar Fundamentals

- Particles and sentence patterns
- Verb forms
- Pronouns and nouns
- Present tense usage
- Basic sentence construction

Unit 4 Practical Communication

- Travel communication
- Asking directions
- Shopping conversations
- Workplace etiquette
- Role play practice

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Unit 5 Reading, Writing & Culture

- Reading basic Japanese sentences
- Writing practice
- Listening comprehension
- Japanese culture and discipline
- Industry-oriented communication

Text Books:

1.	Minna no Nihongo I
2.	Genki I
3.	JLPT N5 Material

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BTPESFLB	GERMAN	AEC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-50 Marks MSE-00 Marks ESE-50 Marks			ESE (Practical/Oral evaluation at the end of the semester)

Course Objectives:

1.	Develop basic communication skills in an international language
2.	Enhance employability and global industry readiness.
3.	Build confidence in multicultural communication.
4.	Prepare students for higher studies, internships, and placements abroad.
5.	Develop understanding of international workplace culture and etiquette.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Understand and use basic greetings and expressions.	K2
CO2	Communicate simple personal and professional information.	K2
CO3	Read and write basic words and short conversations.	K3
CO4	Develop listening and pronunciation skills.	K3
CO5	Understand basic cultural etiquette and workplace communication.	K2

Course Contents:

Unit 1 Introduction to German Language

- German alphabets and pronunciation
- Greetings and introductions
- Numbers and basic expressions
- Days, months, and time
- Classroom vocabulary

Unit 2 Basic Vocabulary & Communication

- Family and professions
- Colors and nationalities
- Daily routine expressions
- Asking simple questions
- Basic conversational phrases

Unit 3 Basic Vocabulary & Communication

- Family and professions
- Colors and nationalities
- Daily routine expressions
- Asking simple questions
- Basic conversational phrases

Unit 4 Practical Communication

- Shopping conversations
- Asking directions
- Restaurant communication
- Workplace vocabulary
- Role play activities

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Unit 5 Reading, Writing & Culture

- Reading simple passages
- Writing short emails/messages
- Listening practice
- German culture and etiquette
- Industry communication basics

Text Books:

1.	Netzwerk AI
2.	Alliance Française Material
3.	Goethe Institute Material

Course Outcomes: At the end of the course, the students will be able to:

CO#	Course Outcome	Level
CO1	Understand and use basic greetings and expressions	B1
CO2	Communicate simple personal and professional information	B1
CO3	Read and write basic texts and short conversations	B1
CO4	Develop listening and present listening skills	B1
CO5	Understand basic cultural etiquette and workplace communication	B1

Course Contents:

Unit 1 Introduction to French Language

- Signs, alphabets and pronunciation
- Greetings and introductions
- Numbers and dates
- Time expressions
- Common vocabulary

Unit 2 Basic Vocabulary & Daily Communication

- Family vocabulary
- Professions and nationalities
- Colors and objects
- Daily routine expressions
- Asking and answering questions

Unit 3 Grammar Fundamentals

- Articles and pronouns
- Verb conjugations
- Prepositions
- Adjectives
- Negation

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BTPESFLC	FRENCH	AEC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-50 Marks MSE-00 Marks ESE-50 Marks			ESE (Practical/Oral evaluation at the end of the semester)

Course Objectives:

1.	Develop basic communication skills in an international language
2.	Enhance employability and global industry readiness.
3.	Build confidence in multicultural communication.
4.	Prepare students for higher studies, internships, and placements abroad.
5.	Develop understanding of international workplace culture and etiquette.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Understand and use basic greetings and expressions.	K2
CO2	Communicate simple personal and professional information.	K2
CO3	Read and write basic words and short conversations.	K3
CO4	Develop listening and pronunciation skills.	K3
CO5	Understand basic cultural etiquette and workplace communication.	K2

Course Contents:

Unit 1 Introduction to French Language

- French alphabets and pronunciation
- Greetings and introductions
- Numbers and dates
- Time expressions
- Classroom vocabulary

Unit 2 Basic Vocabulary & Daily Communication

- Family vocabulary
- Professions and nationalities
- Colours and objects
- Daily routine expressions
- Asking and answering questions

Unit 3 Grammar Fundamentals

- Articles and gender
- Pronouns and verbs
- Sentence construction
- Singular and plural forms
- Basic tense usage

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Unit 4 Practical Communication

- Travel communication
- Shopping dialogues
- Restaurant communication
- Asking directions
- Role play sessions

Unit 5 Reading, Writing & Culture

- Reading simple French passages
- Writing emails and paragraphs
- Listening exercises
- French culture and etiquette
- Professional communication basics

Text Books:

1.	Alter Ego A1
2.	Saison A1
3.	Alliance Française Material

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BTPEFLD	SPANISH	AEC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-50 Marks MSE-00 Marks ESE-50 Marks			ESE (Practical/Oral evaluation at the end of the semester)

Course Objectives:

1.	Develop basic communication skills in an international language
2.	Enhance employability and global industry readiness.
3.	Build confidence in multicultural communication.
4.	Prepare students for higher studies, internships, and placements abroad.
5.	Develop understanding of international workplace culture and etiquette.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Understand and use basic greetings and expressions.	K2
CO2	Communicate simple personal and professional information.	K2
CO3	Read and write basic words and short conversations.	K3
CO4	Develop listening and pronunciation skills.	K3
CO5	Understand basic cultural etiquette and workplace communication.	K2

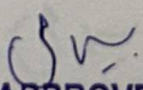
Course Contents:

Unit 1 Introduction to Spanish Language

- Spanish alphabets and pronunciation
- Greetings and introductions
- Numbers and dates
- Time expressions
- Classroom vocabulary

Unit 2 Vocabulary & Daily Communication

- Family and professions
- Nationalities and colors
- Daily use expressions
- Asking questions
- Basic conversation skills


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Unit 3 Grammar Fundamentals

- Articles and pronouns
- Verb conjugation basics
- Sentence structure
- Singular and plural forms
- Present tense basics

Unit 4 Practical Communication

- Shopping conversations
- Travel communication
- Asking directions
- Restaurant communication
- Role plays

Unit 5 Reading, Writing & Culture

- Reading simple passages
- Writing short emails/messages
- Listening activities
- Spanish culture and etiquette
- Workplace communication basics

Text Books:

1.	Aula Internacional A1
2.	Español en Marcha A1
3.	DELE A1 Preparation Material

Course Contents:

Unit 1 Introduction to Intellectual Property Rights

Meaning and concept of IPR, Importance and need of IPR, Role of IPR in innovation and economic development, Types of Intellectual Property Rights: Patents, Copyrights, Trademarks, Industrial Designs, Geographical Indications, Trade Secrets

Unit 2 Patent System and Indian Patent Act

Meaning and characteristics of patents, Patentable and non-patentable inventions, Rights and duties of patent holder, Overview of Indian Patent Act, International agreements: WTO and TRIPS, Patent Cooperation Treaty (PCT)

Unit 3 Patent Filing Procedure

Steps involved in patent filing: Patent search and patent clearance, Provisional and complete specifications, Patent examination and publication, Grant of patent and renewal process, Patent infringement and remedies

Unit 4 Copyrights, Trademarks and Industrial Designs

Copyright: meaning, protection and remedies, Trademarks: meaning, protection and remedies, Industrial Designs: meaning, protection and remedies

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BTPESV405T	Patents and IPR	Entrepreneurship	3L- 0T - 0P	3 Credits
Evaluation Scheme	CA-20 Marks MSE-20 Marks ESE-60 Marks			ESE Time Duration- 3 Hrs

Course Objectives:

1.	To provide students with fundamental knowledge of Intellectual Property Rights and its importance in innovation and economic growth.
2.	To familiarize students with patent systems, Indian Patent Act, and international agreements related to IPR.
3.	To develop understanding of patent filing procedures and documentation practices.
4.	To enable students to differentiate and evaluate various forms of intellectual property including copyrights, trademarks, and designs.
5.	To develop awareness of the role of IPR in research, entrepreneurship, commercialization, and ethical practices.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Explain the fundamental concepts of Intellectual Property Rights (IPR), its types, and its role in innovation and economic development.	K2
CO2	Analyze the provisions of patent systems, Indian Patent Act, and international agreements such as TRIPS and PCT.	K4
CO3	Apply the patent filing process including patent search, documentation, and understanding of examination procedures.	K3
CO4	Compare and evaluate copyrights, trademarks, industrial designs, and geographical indications along with ethical issues in IPR.	K4
CO5	Analyze the role of IPR in research, industry, entrepreneurship, and commercialization of innovations.	K4

Course Contents:

Unit 1 Introduction to Intellectual Property Rights	[9 Hours]
Meaning and concept of IPR, Importance and need of IPR, Role of IPR in innovation and economic development, Types of Intellectual Property Rights: Patents, Copyrights, Trademarks, Industrial Designs, Geographical Indications, Trade Secrets	
Unit 2 Patent System and Indian Patent Act	[9Hours]
Meaning and characteristics of patents, Patentable and non-patentable inventions, Rights and duties of patent holders, Overview of Indian Patent Act, International agreements: WTO and TRIPS, Patent cooperation treaty (PCT)	
Unit 3 Patent Filing Procedure	[9 Hours]
Steps involved in patent filing, Patent search and patent databases, Provisional and complete specifications, Patent examination and publication, Grant of patent and renewal process, Patent infringement and remedies	
Unit 4 Copyrights, Trademarks, and Industrial Designs	[9 Hours]
Copyright: meaning, ownership, and protection, Trademark: registration and protection, Industrial design and geographical indications, Licensing and technology transfer, Plagiarism and ethical issues in IPR	

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Unit 5 IPR in Research, Industry, and Entrepreneurship

[9 Hours]

Role of IPR in research and development, Innovation and startup ecosystem, Commercialization of intellectual property, Case studies of successful patents and innovations, Challenges and future trends in IPR

Text Books:

1.	Intellectual Property Rights, Deborah E. Bouchoux, Cengage Learning, 2019, 3rd Edition.
2.	Understanding Intellectual Property Rights, N. S. Gopalakrishnan & T. G. Ajitha, Eastern Book Company, 2018, 2nd Edition.
3.	Law Relating to Intellectual Property, P. Narayanan, Eastern Law House, 2017, 6th Edition.

Reference Books:

1.	Intellectual Property: Patents, Copyrights, Trademarks and Allied Rights, W. R. Cornish, David Llewelyn, Sweet & Maxwell, 2019, 8th Edition.
2.	Patent Law, David Pressman, Oxford University Press, 2017, 7th Edition.
3.	Intellectual Property Rights in the Global Economy, Keith E. Maskus, Institute for International Economics, 2016, 2nd Edition.

Course Contents:

Unit 1: Introduction and Basic Information about Indian Constitution

Constitution Law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act-1935 and Indian Independence Act-1947, Evolution of the Constitution, Indian Constitution and its Basic Features, The Structure of the Constitution, Fundamental Rights, Directive Principles of State Policy, Parliamentary System, Federal Structure, Centre-State Relations, Amendment of the Constitution, Powers and Functions, The Historical perspective of the constitutional structure in India, Emergency Provisions, National Emergency, President Rule, Financial Emergency, and Local Self Government.

Unit 2: Union Executive and State Executive

Structure of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, Lok Sabha, The Lokpal and Lokayuktas Act 2013, State Executive – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Powers of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Intellectual Property Laws and Regulation in India

Introduction, Legal Aspects of Patents, Filing of Patent Applications, Patent Examination, Management of Patents, Copyright and its Enforcement, Infringement of Copyright, Trademark, Regulation in Information Technology Act 2008, Electronic Copyright, Digital Signature Certificate, Cyber Regulation, Information Technology Act.

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Dated :- 13/06/2026

BTPESCOIT	Constitution of India	VEC	2L- 0T - 0P	1 Credits
Evaluation Scheme	CA-50 Marks	MSE-00 Marks	ESE-50 Marks	ESE Time Duration-00 Hrs

Course Objectives:

1.	To familiarize the students with the legacy of India's constitutional development and assist them in comprehending the country's most varied legal text and its underlying philosophy.
2.	To educate students about the Indian Parliamentary System's theoretical and practical features.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Establish and explore the fundamental aspects and procedures of the Indian constitution.	K2
CO2	Compare and relate the operation of India's parliamentary system at the national and state levels.	K2
CO3	Learn about and implement the various laws and rules pertaining to engineering procedures relevant with IPR.	K2

Course Contents:

Unit 1: Introduction and Basic Information about Indian Constitution.

[6 hours]

Constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act-1935 and Indian Independence Act-1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government

Unit 2: Union Executive and State Executive:

[9 hours]

Powers of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, LokAyukta, The Lokpal and Lokayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Intellectual Property Laws and Regulation to Information: Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

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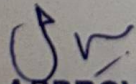
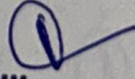
Dated :-.....13/06/2026.....

Text Books:

1.	Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition
2.	Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
3.	P M Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
4.	V. K. Ahuja: Law Relating to Intellectual Property Rights (2007)
5.	P.Narayan: Intellectual Property Law, Eastern Law House, New Delhi

Reference Books:

1.	Granville Austin: The Indian Constitution: Corner stone of a Nation. 1966, Oxford Clarendon Press.
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Minor in EE(VLSI D and T) (*Except EE(VLSI D and T)*)

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Dated :-.....13/06/2026.....

BTPESMV301	Electronics Devices & Circuits	PCC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-20 Marks	MSE-00 Marks	ESE-30 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

3.	Build foundational understanding of electronic components and circuit behaviour
4.	Develop analytical skills for diode and transistor circuits

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Students gain the minimum required foundation to understand devices and circuits.	K2
CO2	Ability to analyze and design basic diode-based circuits.	K3
CO3	Understanding of BJT behaviour for amplification and switching applications.	K2

Course Contents:

Unit 1 Fundamentals of Electronics & Semiconductor Basics [10 Hours]
 Basic electrical quantities: Voltage, current, power, energy. Ohm's Law, Kirchhoff's Laws (KCL, KVL).
 Passive components: Resistors, capacitors, inductors. Network basics: Series-parallel circuits, voltage/current division. Introduction to semiconductors. Intrinsic and extrinsic semiconductors. Charge carriers: Electrons and holes. Drift and diffusion current

Unit 2 PN Junction Diode & Applications [10 Hours]
 PN junction formation and operation. V-I characteristics of diode, Diode equation and parameters, Temperature effects, Zener diode and breakdown mechanisms, Rectifiers: Half-wave, full-wave, bridge, Filters: Capacitor, LC, π filters, Clippers and clippers.

Unit 3 Bipolar Junction Transistor (BJT) [10 Hours]
 Structure and operation of BJT (NPN/PNP), Current components and transistor action, Configurations: CE, CB, CC, Input/output characteristics, DC load line and Q-point, Biasing techniques: Fixed bias, voltage divider bias, Small signal analysis (basic), BJT as amplifier and switch.

Text Books:

1.	Integrated Electronics Analog Digital Circuits, Jacob Millman and D. Halkias, McGraw Hill.
2.	Electronic Devices and Circuits Theory, Boylestad, Prentice Hall Publications.
3.	Electronic Devices and Circuits, S.Salivahanan, N.Suresh kumar, McGraw Hill.

Reference Books:

1.	Electronic Devices and Circuits by J.B.Gupta Author
2.	Electronic Devices and Circuits, A.P Godse, U.A Bakshi, Technical Publications
3.	Electronic Devices and Circuits K.S. Srinivasan Anuradha Agencies

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BTPESMV402	Digital System Design & Microprocessor	PCC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-20 Marks	MSE-00 Marks	ESE-30 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	Build a strong foundation in digital logic design
2.	Develop skills in designing combinational and sequential circuits
3.	Understand microprocessor architecture and programming

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Simplify and analyze digital circuits	K4
CO2	Design combinational and sequential logic systems	K4
CO3	Understand microprocessor architecture and operations	K2

Course Contents:

Unit 1 Number Systems & Boolean Algebra

[10 Hours]

Number systems: Binary, Octal, Decimal, Hexadecimal. Signed number representation (1's & 2's complement). **Combinational Logic Design** : Logic gates and universal gates. Minimization using K-Maps (up to 4/5 variables). Design of: Adders and subtractors, Multiplexers & demultiplexers, Encoders & decoders

Unit 2 Sequential Logic Design

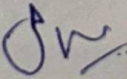
[10 Hours]

Latches and Flip-Flops (SR, JK, D, T), Timing issues (setup, hold, race conditions), Registers and shift registers, Counters (asynchronous & synchronous), Finite State Machines (Moore & Mealy models)

Unit 3 Microprocessor (Architecture & Programming)

[10 Hours]

Overview of microprocessors. Architecture of Intel 8085. Instruction set and addressing modes. Timing diagrams and instruction cycles. Assembly language programming: Data transfer, arithmetic, logical operations. Simple programs (addition, looping, sorting basics) . Basics of I/O interfacing and interrupts


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Text Books:

1.	Digital Design — M. Morris Mano, Michael D. Ciletti, Pearson Education, 2013, 5th Edition
2.	Digital Principles and Applications — Donald P. Leach, Albert Paul Malvino, Goutam Saha, McGraw Hill Education, 2015, 8th Edition
3.	Microprocessor Architecture, Programming and Applications with the 8085 — Ramesh S. Gaonkar, Penram International Publishing, 2013, 6th Edition

Reference Books:

1.	Fundamentals of Digital Logic with Verilog Design — Stephen Brown, Zvonko Vranesic, McGraw Hill Education, 2013, 3rd Edition
2.	Digital Electronics — William H. Gothmann, PHI Learning, 2009, 2nd Edition
3.	Advanced Microprocessors and Peripherals — A. K. Ray, K. M. Bhurchandi, McGraw Hill Education, 2012, 3rd Edition

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Dated :- 13/06/2026

BTPEMV503	Linear Integrated Circuits	PCC	3L- 1T - 0P	4 Credits
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	To introduce the fundamentals of linear integrated circuits and operational amplifiers.
2.	To understand the working and applications of op-amp based linear and non-linear circuits.
3.	To develop basic skills in designing signal conditioning and waveform generation circuits using ICs.
4.	To familiarize students with timer ICs, voltage regulators, and analog IC applications.
5.	To encourage practical understanding of electronic circuit applications in real-world systems.

Course Outcomes:

		Bloom's Taxonomy Level
CO1	Explain the characteristics and operation of linear integrated circuits and operational amplifiers.	K2
CO2	Analyze and design basic op-amp circuits such as amplifiers, filters, and comparators.	K4
CO3	Implement waveform generation and timing circuits using IC 555 and related ICs.	K3
CO4	Describe the operation of voltage regulators and analog integrated circuit applications.	K2
CO5	Apply linear integrated circuits in practical electronic and instrumentation systems.	K3

Course Contents:

Unit 1 Introduction to Linear Integrated Circuits

[12 Hours]

Introduction to IC fabrication and classification, Characteristics of integrated circuits, Operational Amplifier: block diagram and symbol, Ideal and practical op-amp characteristics, Parameters of op-amp: offset voltage, bias current, slew rate, CMRR, PSRR, Introduction to IC 741

Unit 2 Op-Amp Applications

[12 Hours]

Inverting and non-inverting amplifiers, Voltage follower, Summing and differential amplifiers, Integrator and differentiator circuits, Comparator and Schmitt trigger, Instrumentation amplifier

Unit 3 Active Filters and Oscillators

[12 Hours]

Introduction to active filters, Low-pass, high-pass, band-pass filters, RC phase shift oscillator, Wien bridge oscillator, Function generator circuits, Wave shaping circuits

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Unit 4 Timer and Voltage Regulator ICs**[12 Hours]**

IC 555 timer: block diagram and operation, Monostable and astable multivibrators, Applications of IC 555, Fixed and variable voltage regulators, IC 78XX and 79XX series regulators, Introduction to SMPS and voltage regulation concepts

Unit 5 Applications of Linear ICs**[12 Hours]**

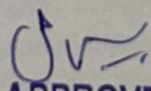
Analog computation circuits, Signal conditioning circuits, Data conversion basics: DAC and ADC concepts, Audio and instrumentation applications, Introduction to PLL and communication applications, Case studies of IC applications in modern electronics

Text Books:

1.	Linear Integrated Circuits — D. Roy Choudhury, Shail Jain, New Age International Publishers, 2018, 5th Edition
2.	Op-Amps and Linear Integrated Circuits — Ramakant A. Gayakwad, Pearson Education, 2015, 4th Edition
3.	Operational Amplifiers and Linear Integrated Circuits — Robert F. Coughlin, Frederick F. Driscoll, Pearson Education, 2008, 6th Edition

Reference Books:

1.	Design with Operational Amplifiers and Analog Integrated Circuits — Sergio Franco, McGraw Hill Education, 2014, 4th Edition
2.	Electronic Devices and Circuit Theory — Robert L. Boylestad, Louis Nashelsky, Pearson Education, 2013, 11th Edition
3.	Integrated Electronics: Analog and Digital Circuits and Systems — Jacob Millman, Christos C. Halkias, McGraw Hill Education, 2010, 2nd Edition


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BTPESMV604	Introduction to VLSI Life cycle	PCC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-20 Marks	MSE-00 Marks	ESE-30 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	To introduce the fundamentals of VLSI technology and semiconductor fabrication processes.
2.	To understand the complete VLSI design life cycle including front-end and back-end design flow.
3.	To provide practical exposure to HDL-based digital design, verification, testing, and modern VLSI industry trends.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Explain the basics of VLSI technology, CMOS fabrication, and semiconductor processes.	K2
CO2	Describe and apply front-end and back-end VLSI design methodologies using HDL and EDA tools.	K3
CO3	Analyze testing, verification, packaging techniques, and emerging trends in VLSI systems.	K4

Course Contents:

Unit 1 Fundamentals of VLSI & Semiconductor Fabrication [10 Hours]

Introduction to VLSI Technology, Evolution of Integrated Circuits, SSI, MSI, LSI, VLSI and ULSI ,Moore's Law and Technology Scaling, Applications of VLSI Systems, CMOS Technology Overview, Semiconductor Materials, Silicon Wafer Preparation, Oxidation Process, Diffusion and Ion Implantation, Photolithography, Etching Techniques, Thin Film Deposition ,CMOS Fabrication Process Flow, Clean Room Concepts

Unit 2 Front-End VLSI Design Flow [10 Hours]

Introduction to VLSI Design Methodology, Design Abstraction Levels, Behavioral, RTL and Gate-Level Modeling, HDL Basics: Verilog Introduction, VHDL Introduction, Combinational Circuit Design, Sequential Circuit Design, Simulation Concepts, Functional Verification, Logic Synthesis, FPGA vs ASIC, Introduction to EDA Tools

Unit 3 Back-End Design, Testing & Industry Trends [10 Hours]

Introduction to Physical Design Flow, Floor Planning, Placement and Routing, Clock Tree Synthesis, Timing Analysis, Power Analysis, Signal Integrity, Physical Verification: DRC, LVS, Chip Packaging Basics, Design Verification Concepts, Design for Testability (DFT), Built-In Self-Test (BIST), Yield and Reliability, Emerging Trends: FinFET Technology, Low Power VLSI, System-on-Chip (SoC), AI Hardware Accelerators, Hardware Security, Career Opportunities in VLSI Industry

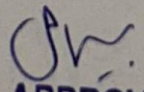
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Text Books:

1.	CMOS VLSI Design: A Circuits and Systems Perspective — Neil H. E. Weste, David Harris, Pearson Education, 2015, 4th Edition
2.	Principles of CMOS VLSI Design — Neil H. Weste, Kamran Eshraghian, Addison-Wesley, 2011, 2nd Edition
3.	A Verilog HDL Primer — J. Bhasker, BS Publications, 2008, 3rd Edition

Reference Books:

1.	Digital Integrated Circuits: A Design Perspective — Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, Pearson Education, 2016, 2nd Edition
2.	Basic VLSI Design — Douglas A. Pucknell, Kamran Eshraghian, PHI Learning, 2009, 3rd Edition
3.	VLSI Design — M. Michael Vai, CRC Press, 2015, 1st Edition


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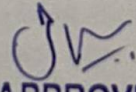
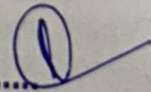
BTPESMV705	Project	PCC	0L- 0T - 4P	2 Credits
Evaluation Scheme	CA-20 Marks	MSE-00 Marks	ESE-30 Marks	ESE Time Duration- 2 Hrs

Course Guidelines:

Students shall work individually or in a group of maximum two members on a special topic related to Electronics Engineering (VLSI Design and Technology) or interdisciplinary areas beyond the prescribed syllabus. The topic should preferably address a real-world or local problem related to the University, College, or nearby community.

Under the guidance of a faculty member, students are expected to complete the following tasks:

1.	Identify a suitable problem statement or innovative idea.
2.	Carry out literature survey using technical journals, research papers, and reference books.
3.	Design an appropriate solution for the identified problem.
4.	Implement the solution using modern tools and technologies.
5.	Prepare a detailed project report of approximately 20–25 pages.
6.	Present and demonstrate the project work before faculty members and classmates using suitable audio-visual aids or presentation tools.


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BTPESMV806	SOC Design & Verification	PCC	2L- 0T - 0P	2 Credits
Evaluation Scheme	CA-20 Marks	MSE-00 Marks	ESE-30 Marks	ESE Time Duration- 3 Hrs

Course Objectives:

1.	To introduce the fundamentals of System-on-Chip (SoC) architecture and design methodology.
2.	To understand front-end design, integration, and verification techniques used in SoC development.
3.	To provide practical exposure to HDL-based SoC implementation, simulation, and testing tools.

Course Outcomes: At the end of this course, the students will be able:		Bloom's Taxonomy Level
CO1	Explain SoC architecture, components, and design flow used in modern embedded systems.	K2
CO2	Apply HDL and verification methodologies for SoC design and functional validation.	K3
CO3	Analyze SoC integration, testing, power optimization, and emerging industry trends.	K4

Course Contents:

Unit 1 Fundamentals of SoC Design

[10 Hours]

Introduction to System-on-Chip (SoC), Evolution of Embedded Systems and SoC, SoC Design Methodology, Components of SoC: Processor Core, Memory Units, Bus Architecture ,Peripherals and Interfaces, FPGA vs ASIC based SoC, SoC Architecture and Design Flow, Hardware-Software Co-Design, IP Core Concepts: Soft IP, Firm IP, Hard IP, Introduction to AMBA Bus Architecture, Power, Area, and Performance Considerations, Applications of SoC: Mobile Devices, Automotive Systems, IoT Applications, AI Hardware

Unit 2 SoC Design & Verification Techniques

[10 Hours]

HDL-Based SoC Design, Verilog/SystemVerilog Basics, RTL Design Methodology, Simulation and Functional Verification ,Testbench Development, Assertions and Coverage Concepts,Verification Flow, Universal Verification Methodology (UVM) Basics,Static Timing Analysis, Design for Testability (DFT), Scan Chain Concepts, Built-In Self-Test (BIST),FPGA-Based Prototyping, Introduction to EDA Tools for Verification

Unit 3 SoC Integration, Physical Design & Industry Trends

[10 Hours]

SoC Integration Challenges, Floor Planning and Physical Design Basics, Placement and Routing, Clock Tree Synthesis, Power Optimization Techniques, Low Power SoC Design, Signal Integrity and Timing Closure, Physical Verification: DRC, LVS, Packaging and Reliability, Security in SoC Design, AI Accelerators and Edge Computing SoC, Network-on-Chip (NoC) ,Emerging Trends: FinFET Technology, Chiplet Architecture, 3D ICs,

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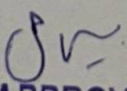
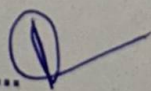
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Text Books:

1.	CMOS VLSI Design: A Circuits and Systems Perspective — Neil H. E. Weste, David Harris, Pearson Education, 2015, 4th Edition
2.	Principles of CMOS VLSI Design — Neil H. Weste, Kamran Eshraghian, Addison-Wesley, 2011, 2nd Edition
3.	A Verilog HDL Primer — J. Bhasker, BS Publications, 2008, 3rd Edition

Reference Books:

1.	Digital Integrated Circuits: A Design Perspective — Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, Pearson Education, 2016, 2nd Edition
2.	Basic VLSI Design — Douglas A. Pucknell, Kamran Eshraghian, PHI Learning, 2009, 3rd Edition
3.	VLSI Design — M. Michael Vai, CRC Press, 2015, 1st Edition


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