



# **Second Year (Lateral Entry) Curriculum**

## **Admission Year 2026-27**

**Bachelor of Technology (Lateral Entry)**  
**ECE (VLSI Design and Technology)**

**Faculty of Engineering & Technology**

**Parul University**

**Vadodara, Gujarat, India**

### Semester 3

- a. **Course Name: Analog and Digital Communication**
- b. **Course Code: 3019703P C01/03019703P C02**
- c. **Prerequisite:** Analog Electronics, Digital Electronics, Fourier Series, Fourier Transform.
- d. **Rationale:** The students need to learn basic concepts of analog and digital communication, components of Analog and Digital Communication systems, Advantages and disadvantages of Analog and Digital communication systems.

**e. Course Learning Objective:**

<b>CLOBJ 1</b>	To understand the fundamental concepts and components of analog and digital communication systems.
<b>CLOBJ 2</b>	To study amplitude and angle modulation techniques along with their demodulation methods.
<b>CLOBJ 3</b>	To understand sampling theory, quantization, and analog-to-digital conversion techniques.
<b>CLOBJ 4</b>	To analyze principles of digital data transmission, line coding, pulse shaping, and error detection concepts.
<b>CLOBJ 5</b>	To study digital modulation techniques such as ASK, FSK, PSK, BPSK, QPSK, and GMSK used in modern communication systems.

**f. Course Learning Outcomes:**

<b>CLO 1</b>	Understand the Basics of Analog and Digital Communication Systems
<b>CLO 2</b>	Analyse the various Analog and Digital Modulation and Transmission Techniques
<b>CLO 3</b>	Understand the Modulation as well as Transmission Techniques

**g. Teaching & Examination Scheme:**

Teaching and Examination Scheme										
Teaching Scheme					Examination Scheme					
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/	Credit	Internal Marks			External Marks		Total
					T	CE	P	T	P	
3	0	0	-	3	20	20	-	60	-	100

Semester

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Evaluation, CE-Continuous Evaluation, ESE- End Semester Examination

## h. Course Content:

Sr.	Topics	Weightage %	Teaching hours
1	<b>Introduction To Communication System.</b> Elements of communication system, Analog and Digital Messages, Channel Effect, Signal-to Noise ration and capacity, Concept of modulation, History of Communications. (Revision of Signal Transmission through a linear system, Signal distortion over a communication channel, Signal Energy and Energy spectra density, Signal power and power density).	20	7
2	<b>Amplitude modulation And Demodulations</b> Single and Double sideband Amplitude modulation, Amplitude modulation, Bandwidth-efficient Amplitude modulation, VSB, Local Carrier synchronization, FDM, PLL	15	7
3	<b>Angle Modulation and demodulation</b> Nonlinear Modulation, Bandwidth of Angle-modulated Waves, Generating FM waves, Demodulation of FM signals, Superheterodyne Receivers	15	7
4	<b>Sampling and Analog to digital Conversion</b> Sampling theorem, Sampling and signal reconstruction, Aliasing, Types of sampling, Quantization, PCM, Companding, DPCM, ADPCM, Delta modulation, Adaptive delta modulation	20	9
5	<b>Principal of Digital Data Transmission</b> Components of digital communication system, line coding, pulse shaping, Scrambling, Regenerative Repeater, Eye Diagram, Timing Extraction, Detection Error Probability, M-ary communication, Digital Carrier Systems	20	9
6	<b>Introduction to Digital Modulation Techniques</b> Modulation and Demodulation techniques for ASK,FSK, PSK, MSK, BPSK, QPSK, GMSK	10	6
	<b>Total</b>	<b>100</b>	<b>45</b>

### i. Text Book and Reference Book:

1. Modern Digital and Analog Communication Systems (TextBook) By B. P. Lathi, Zhi Ding | Oxford University Press | 4th Edition
2. Electronic Communications
3. By Dennis Roddy & John Coolen | PHI
4. Electronic Communication systems
5. By G. Kennedy | Tata McGraw-Hill Publishing Company Limited, 1996
6. Communication Systems by Simon Haykins
7. Electronic Communications Systems
8. By Wayne Tomasi | Pearson education India

### j. List of Practical

1. To observe amplitude modulation wave forms for different modulation index.
2. observe frequency modulation waveform with VCO.
3. To extract information signal from AM signal using diode detector
4. To extract information signal from FM signal using ratio detector or PLL detector.
5. To observe frequency spectrum of AM and FM waveforms.
6. To perform sampling and reconstruction on analog signal
7. To perform PCM data regeneration
8. To perform delta modulation & demodulation
9. To perform Adaptive delta modulation & demodulation
10. To study different data formats

11. To perform Frequency Shift Keying
12. To perform Amplitude Shift Keying

- a. **Course Name:** Digital System Design
- b. **Course Code:** 03010703PC03
- c. **Prerequisite:** Fundamental Understanding of Number Systems, Basic electronics and Boolean Algebra.
- d. **Rationale:** The primary objective of this course is to provide a comprehensive understanding of the fundamental concepts of digital circuits and systems, which serve as the foundation for the design and analysis of complex digital systems such as microprocessors. The course is intended to equip students with a thorough knowledge of digital logic principles, including the analysis and design of combinational and sequential circuits.
- e. **Course Learning Objective:**

<b>CLOBJ 1</b>	To understand number systems, Boolean algebra, and logic gate operations used in digital systems.
<b>CLOBJ 2</b>	To simplify and design combinational logic circuits using K-maps and logic minimization techniques.
<b>CLOBJ 3</b>	To design sequential circuits including flip-flops, counters, and registers.
<b>CLOBJ 4</b>	To study different logic families, programmable logic devices, CPLDs, and FPGAs.
<b>CLOBJ 5</b>	To introduce VLSI design concepts and hardware description language modeling techniques.

f. **Course Learning Outcomes:**

<b>CLO 1</b>	Simplify Boolean functions using K-maps and De Morgan's theorems to design optimized digital circuits.
<b>CLO 2</b>	Design basic combinational circuits such as adders, multiplexers, encoders, and decoders.
<b>CLO 3</b>	Design sequential circuits including flip-flops, counters, and shift registers with hazard-free operation.
<b>CLO 4</b>	Compare TTL and CMOS logic families and implement logic using programmable devices.
<b>CLO 5</b>	Explain the fundamentals of VLSI design, including design flow and schematic representation.

g. **Teaching & Examination Scheme:**

Teaching and Examination Scheme										
Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	-	3	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE-Continuous Evaluation, ESE- End Semester Examination

## h. Course Content:

Sr.	Topics	Weightage %	Teaching hours
1	<b>Introduction</b> Number Systems, Logic gates – AND, OR, NOT, NAND, NOR etc. - NAND and NOR implementation of real life digital circuits, Review of Boolean Algebra and De Morgan's Theorem, Canonical forms, Karnaugh maps, Variable Entered –K map Quine McCluskey Method (Tabulation Method )Binary codes, Code Conversion.	15	7
2	<b>Combinational Logic Design</b> Half and Full Adders, Half and Full Subtractors, Serial and Parallel Adders, BCD Adder Comparators, Multiplexers/De-mux, Multiplexers Tree, Encoder/Decoder, Driver & Multiplexed Display, Parity Generator and checker , Code Converter	25	11
3	<b>Sequential Logic Design</b> Sequential logic - Basic latch - Flip-flops (SR, D, JK, T and Master-Slave) - Triggering of flip-flops, Registers - Shift registers - Registers with parallel load, Counters, Ripple counters , BCD and Binary - Synchronous counters, Johnson counter, Ring counter, Counter Design procedure, Finite state machines, Design of synchronous FSM.	25	11
4	<b>Logic Families and Memories</b> Tristate TTL, ECL, CMOS families and their interfacing TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Glitches, Hazards & Reliability in Digital Circuits ,Concept of Programmable logic devices, CPLD, FPGA, Logic implementation using Programmable Devices,	20	9
5	<b>Introduction to VLSI</b> Introduction to VLSI design, Schematic, Data Types and objects, Dataflow, Behavioral and Structural Modeling style, Synthesis and Simulation in VHDL: constructs and codes for combinational and sequential circuits.	15	7
		<b>100</b>	<b>45</b>

## i. Text Book and Reference Book:

1. Modern Digital Electronics  
By R. P. Jain | Tata McGraw-Hill Education
2. Fundamentals of Logic Design  
By Charles H. Roth, Jr., & Larry L. Kinney | Cengage Learning
3. Digital Design  
Morris Mano and Michael D. Ciletti |5th edition, Prentice Hall of India,2012
4. Verilog HDL  
Samir Palnitkar, 2nd Edition, Pearson Education, 2003
5. Advanced Digital Design with the Verilog HDL  
Michael D. Ciletti |2nd Edition, Pearson Education, 2010

## j. List of Practical

1. Design and implementation of code convertors using logic gates.
2. To study, implement and verify half adder and full adder combinational circuit.
3. To study, implement and verify half subtractor and full subtractor combinational circuit.
4. To design and realize operation of multiplexer.

5. To design and realize operation of Decoder.
6. To design and implement SR flip flop and JK flip flop.
7. Design and implementation of counters using flipflops.
8. To design and implement Shift Register in various modes of operation.
9. To write VHDL code and study the functionality of Half Adder and Full Adder.
10. To write VHDL code and study the functionality of D- Flip Flop and T flip flop.

- a. **Course Name:** - Microprocessor and Computer organization  
 b. **Course Code:** 03019703PC05/03019703PC06  
 c. **Prerequisite:** Basic understanding of computer system, Numbers system.  
 d. **Rationale:** This course provides detail of computer system's functional components, their characteristics, performance and Interactions including system bus, different types of memory and input/output organization and CPU. This course also covers the architectural issues such as instruction set program and data types. On top that, the students are also introduced to the increasingly important area of parallel organization. This course also serves as a basic to develop hardware-related projects.

**Course Learning Objective:**

<b>CLOBJ 1</b>	To understand the fundamentals of computer organization, architecture, and microprocessor systems.
<b>CLOBJ 2</b>	To study the architecture, internal organization, and operation of 8085 and 8086 microprocessors.
<b>CLOBJ 3</b>	To understand 8086 instruction sets, addressing modes, and assembly language programming techniques.
<b>CLOBJ 4</b>	To analyze memory organization, interfacing methods, and peripheral communication using 8086 microprocessor.
<b>CLOBJ 5</b>	To study register transfer operations, arithmetic and logic micro-operations, and basic computer design concepts.

**e. Course Learning Outcomes:**

<b>CLO 1</b>	Understand the fundamentals of computer organization and architecture.
<b>CLO 2</b>	Explain the architecture and internal operation of the 8086 microprocessor.
<b>CLO 3</b>	Develop assembly language programs using 8086 instruction set.
<b>CLO 4</b>	Interface peripheral devices with 8086 microprocessor.
<b>CLO 5</b>	Apply microprocessor concepts to solve real-world engineering problems.
<b>CLO 6</b>	Understand the fundamentals of computer organization and architecture.

**f. Teaching & Examination Scheme:**

Teaching and Examination Scheme										
Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	3	4	20	20	--	60	--	100

**L-** Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-**Continuous Evaluation, **ESE-** End Semester Examination

**g. Course Content:**

Sr.	Topics	Weightage %	Teaching hours
1	<b>Introduction of Microprocessor:</b> Functional units of a computer, Block diagram of a digital computer, Instruction cycle and machine cycle, Memory hierarchy: Introduction to 8085 Microprocessor Architecture of 8085 microprocessor , Pin configuration of 8085	15	6
2	<b>8086 Microprocessor Architecture:</b> Evolution of 8086 microprocessors, Features of 8086 ,Internal architecture of 8086, Bus Interface Unit (BIU) and Execution Unit (EU), Register organization, Flag register and its functions, Pin configuration and signal description, Minimum and maximum mode operation,.	15	6
3	<b>8086 Addressing Modes and Instruction Set:</b> Addressing modes of 8086, Instruction format, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch and loop instructions, String manipulation instructions Stack and procedure instructions ,Interrupt instructions	20	9
4	<b>Assembly Language Programming:</b> <ul style="list-style-type: none"> <li>• Overview of 8086 Programming Model</li> <li>• Memory Segmentation and Addressing</li> <li>• 8086 Instruction Set Architecture (ISA)</li> <li>• Addressing Modes of 8086</li> <li>• Stack Operations and Subroutine Handling</li> <li>• String and Loop Instructions</li> </ul> I/O Programming Basics	20	9
5	<b>Memory and I/O Interfacing:</b> Memory organization of 8086, Address decoding techniques, Interfacing RAM and ROM, I/O mapped I/O and memory mapped I/O, Programmable Peripheral Interface (8255) – block diagram and modes, Interfacing keyboard and display, Introduction to interrupts and interrupt handling	10	5
6	<b>Computer Organization :</b> Register Transfer and Basic Computer Design: Register Transfer language, Bus design using multiplexer and Tri-state buffer, Memory Transfers, Arithmetic Micro- Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. <b>Basic Computer Design:</b> Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Register Reference Instructions, IO Reference Instructions, Interrupt, Design of Accumulator Unit.	20	10
<b>Total</b>		<b>100</b>	<b>45</b>

**h. List of Practical**

1. Study of 8086 simulator (MASM or TASM)
2. Write an ALP to Add Two 16-bit Numbers, Two 16 bit subtraction.
3. Write an ALP to Multiply Two 16-bit Numbers, 16 bit divide 8 bit Number.
4. Write an ALP to Find the Largest of Series Numbers, Smallest of Series Numbers.
5. Write an ALP to Copy a Block of Data from One Memory Location to Another Memory.
6. Write an ALP to Count Number of Positive and Negative Numbers in an Array
7. Write an ALP to Convert Binary to BCD, Hexadecimal to ASCII, BCD to Binary

8. Write an ALP to Sort Numbers in Ascending Order, Descending Order Numbers.
9. Write an ALP to Find Length of a String
10. Write an ALP to Find Factorial of a Number

**i. Text Book and Reference Book:**

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8086, Wiley
2. Douglas V. Hall, Microprocessors and Interfacing, McGraw Hill
3. Barry B. Brey, The Intel Microprocessors, Pearson
4. Computer System Architecture: By M.Morris Mano | PHI | 3rd Edition

**a. Course Name: Analog Circuit**

**b. Course Code: 03010703PC05/03010703PC06**

**c. Prerequisite:** Fundamental Understanding of Number Systems and Basic electronics

**b. Rationale:** The primary objective of this course is to provide a comprehensive understanding of the fundamental concepts of digital circuits and systems, which serve as the foundation for the design and analysis of complex digital systems such as microprocessors. The course is intended to equip students with a thorough knowledge of digital logic principles, including the analysis and design of combinational and sequential circuits.

**c. Course Learning Objective:**

<b>CLOBJ 1</b>	To understand the operating principles, characteristics, and configurations of operational amplifiers.
<b>CLOBJ 2</b>	To analyze op-amp circuits with different feedback techniques and evaluate their performance parameters.
<b>CLOBJ 3</b>	To design and implement linear and non-linear applications of operational amplifiers.
<b>CLOBJ 4</b>	To study active filters, oscillators, waveform generators, and signal conditioning circuits using op-amps.
<b>CLOBJ 5</b>	To understand the principles and operation of DACs, ADCs, and timer ICs such as the 555 timer.

**d. Course Learning Outcomes:**

<b>CLO 1</b>	Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.
<b>CLO 2</b>	Analyse operational amplifier circuit with feedback in different configurations and solve problems related to it.
<b>CLO 3</b>	Elucidate the linear and non-linear applications of an OPAMP.
<b>CLO 4</b>	Design the active filters and oscillators.
<b>CLO 5</b>	Comprehend the working principle of various data converters.

**e. Teaching & Examination Scheme:**

Teaching and Examination Scheme										
Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	-	3	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

\*Continuous Evaluation:

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

**f. Course Content:**

Sr.	Topics	Weightage %	Teaching hours
1	<b>Introduction to Operational Amplifier:</b> Introduction, Block diagram representation of a typical op-amp, its equivalent circuit, types of ICs, Manufacturers' designations and package types for ICs, Power supplies for ICs, Interpreting datasheet, Ideal op-amp, Equivalent circuit of an op-amp, Ideal voltage transfer curve, Open-loop op-amp configurations	15	7
2	<b>Analysis of Op-amp Circuit with Feedback:</b> Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Differential amplifier, Practical Characteristic of Op-amp i.e. Input offset voltage, Input bias current, Input offset current, Total output offset, Slew Rate, CMRR, Change in Characteristic of Op-amp w.r.t time, temperature, power supply.	15	7
3	<b>Linear Applications Op-Amp</b> Peaking amplifier, Summing, Scaling and Averaging amplifier, Instrumentation amplifier, Voltage-to-current converter, Integrator, Differentiator	20	9
4	<b>Op-Amp as Comparator &amp; Converter:</b> Comparator, Zero Crossing Detector, Schmitt Trigger, Voltage limiters, Clipper and Clampers, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision Rectifier – Half/Full Wave, Square, Triangular and Saw tooth Wave Generator, Log/Antilog Amplifier.	15	6
5	<b>Active Filters &amp; Oscillators :</b> Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien Bridge and quadrature type, waveform generators - triangular, sawtooth, square wave and VCO.	20	9
6	<b>D-A and A-D Converters</b> Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and slope ADC. DAC and ADC specifications	15	7

**Reference Books:**

- Op-Amps & Linear ICs (TextBook)  
By Ramakanth A. Gayakwad | PHI
- Linear Integrated Circuits  
By D. Roy Chowdhury | New Age International(p) Ltd
- Operational Amplifiers & Linear Integrated Circuits: Theory & Applications  
By Denton J. Daibey | TMH
- Design with Operational Amplifiers & Analog Integrated Circuits  
By Sergio Franco | McGraw Hill
- Digital Fundamentals  
By Thomas L Floyd | Pearson
- Operational Amplifiers and Linear IC's  
By David A. Bell | Oxford University Press | 3rd edition

### **g. List of Experiments:**

1. Measurement of input and output offset voltage of OP-AMP IC 741 C.
2. To configure OP-AMP in voltage follower mode and measure its slew rate.
3. To configure OP-AMP in inverting and non-inverting amplifier mode and measure its gain and bandwidth.
4. To prepare precision half & full-wave rectifier using OP-AMP and verify its operation.
5. To design & implement summing & averaging amplifier using OP-AMP in inverting and noninverting configuration.
6. To design & implement Schmitt Trigger circuit using OP-AMP and verify its operation.
7. To design & implement Butterworth low-pass filter (Sallen-key circuit) and take necessary measurements.
8. To study and verify operation of ADC & DAC
9. To design Monostable and Astable multi-vibrators using 555 timer IC and verify their operation using measurements by observing waveforms
10. OEP: To design and implement any real time application of OP-AMP on printed circuit board as temperature detector, indicator , street light etc

- a. **Course Name:** Introduction to Python Programming
- b. **Course Code:** 03010703ES05/03010703ES06
- c. **Prerequisite:** Basic knowledge of mathematics including algebra and logical reasoning is expected. Familiarity with fundamental computer concepts such as variables, operators, and flowcharts is desirable. No prior programming experience is mandatory.
- d. **Rationale:** Python has emerged as a dominant programming language in engineering and technology due to its simplicity, readability, and extensive ecosystem of libraries. This course introduces Python programming with a focus on problem-solving and engineering applications relevant to Electronics and Communication Engineering. Students will develop the ability to write structured programs, manipulate data, and apply Python for analysis, automation, and basic signal processing tasks. The course lays a strong foundation for advanced subjects such as machine learning, embedded systems, data analytics, and research-oriented projects.
- e. **Course Learning Objective:**

<b>CLOBJ 1</b>	To understand the fundamentals of programming concepts and Python syntax.
<b>CLOBJ 2</b>	To develop problem-solving skills using control structures and iterative techniques in Python.
<b>CLOBJ 3</b>	To apply Python data structures such as strings, lists, tuples, sets, and dictionaries for engineering applications.
<b>CLOBJ 4</b>	To develop modular programs using functions, recursion, modules, and packages.
<b>CLOBJ 5</b>	To implement file handling, exception handling, and basic engineering applications using Python libraries such as NumPy.

f. **Course Learning Outcomes:**

<b>CLO 1</b>	Understand fundamental programming concepts and Python syntax.
<b>CLO 2</b>	Apply control structures and data structures to solve engineering problems.
<b>CLO 3</b>	Develop modular programs using functions and Python modules.
<b>CLO 4</b>	Implement file handling and exception handling techniques.
<b>CLO 5</b>	Use Python libraries for basic engineering and data analysis applications

**g. Teaching & Examination Scheme:**

<b>Teaching and Examination Scheme</b>										
<b>Teaching Scheme</b>					<b>Examination Scheme</b>					<b>Total</b>
<b>Lecture Hrs/Week</b>	<b>Tutorial Hrs/Week</b>	<b>Lab Hrs/Week</b>	<b>Hrs/Week</b>	<b>Credit</b>	<b>Internal Marks</b>			<b>External Marks</b>		
					<b>T</b>	<b>CE</b>	<b>P</b>	<b>T</b>	<b>P</b>	
3	0	0	-	3	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

**h. Course Content:**

<b>Sr.</b>	<b>Topics</b>	<b>Weightage %</b>	<b>Teachinghours</b>
<b>1</b>	<b>Introduction to Programming &amp; Python Basics :</b> Overview of programming languages, compilers vs interpreters, applications of Python in engineering, Python features, installation and IDEs, first Python program, Python syntax and indentation, keywords and identifiers, comments, variables and data types, type conversion, input/output functions, arithmetic relational logical assignment and bitwise operators, expressions and operator precedence	<b>15</b>	<b>8</b>
<b>2</b>	<b>Control Flow and Decision Making :</b> Conditional statements if-else nested if, elif ladder, for loop, while loop, infinite loops, loop control statements break continue pass, range function and iteration techniques, basic problem solving using loops, introduction to time complexity	<b>20</b>	<b>9</b>
<b>3</b>	<b>Data Structures in Python :</b> Strings indexing slicing and operations, string methods and formatting, lists creation indexing slicing and operations, list methods and list comprehension, tuples and their applications, sets and set operations, dictionaries key-value pairs, dictionary methods, comparison of Python data structures	<b>25</b>	<b>10</b>
<b>4</b>	<b>Functions and Modular Programming :</b> Introduction to functions, function definition and calling, built-in and user-defined functions, function arguments positional keyword and default, return statement and multiple return values, lambda functions, recursion, scope of variables local and global, modules and packages, importing modules	<b>20</b>	<b>9</b>
<b>5</b>	<b>File Handling, Exceptions and Engineering Applications :</b> File handling concepts, opening and closing files, reading and writing text files, working with CSV files, exception handling using try except finally, user-defined exceptions, introduction to NumPy arrays and basic operations, Python for simple engineering calculations, overview of Python applications in Electronics and Communication Engineering	<b>20</b>	<b>9</b>
<b>Total</b>		<b>100</b>	<b>45</b>

**i. Text Book and Reference Book:**

1. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press
2. E. Balagurusamy, Programming with Python, McGraw-Hil
3. Mark Lutz, Learning Python, O'Reilly Media
4. Wes McKinney, Python for Data Analysis, O'Reilly Media
5. Guido van Rossum, Python Documentation, Python Software Foundation

**j. List of Practical**

1. Introduction to Python and Google Co-LAB.
2. Basic Python Programs Using Conditional Statements
3. Write a python program to check whether the given string is palindrome or not..
4. Write a python program to find factorial of a given number using functions
5. Programs Using Lambda, Map, and Filter Functions in Python
  - A. Write a python program to implement insertion sort and merge sort using lists
  - B. Write a program to convert roman numbers in to integer values using dictionaries.
6. File Handling and ZIP File Creation using Python
7. Object-Oriented Programming in Python – Using Classes and Inheritance
8. Program to Check Whether the Given Input is Palindrome or Not (for both String and Integer) using Polymorphism and Inheritance
  - A. Write a Python program to download all XKCD comics
  - B. Demonstrate Python program to read data from a spreadsheet and write data into a spreadsheet
  - C. Create a list and perform different list methods.
  - D. Create a dictionary and apply various dictionary methods.