B.Tech. II Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3140221/3200221	DC	Digital Circuits & Systems	60	20	20	40	30	30	200	3	-	2	4

Digital Circuits & Systems (3140221/3200221)

Course Objective: To understand the concept of digital systems, design& analyze the combinational and sequential logic circuits.

Unit I: Boolean algebra and switching functions: Minimization of Boolean functions, Canonical & standard form, concept of prime implicant etc. Karnaugh's map method, Quine-McCluskey's method, Universal gates, NAND/NOR realization of Boolean functions.

Unit II: Combinational Logic circuits: Half adder, Half subtractor, Full adder, Full subtratctor circuits. Serial and parallel adder, BCD adders, look-ahead carry generator, Code Converters, Decoders, Encoders, Multiplexers & demultiplexers.

Unit III: Sequential Circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave, Characteristic table and equation, Application table, Edge triggering, Level Triggering, Realization of one flip flopusing other flip flops, Multivibrators**:** Monostable, Astable, Bistable (transistorized).

Unit IV: Registers and Counters: Asynchronous Ripple or serial counter, Asynchronous Up/Down counter, Synchronous counters, Synchronous Up/Downcounters, Programmable counters, Design of Synchronous counters: State diagram, State table, State minimization, State assignment, Excitation table and Maps Circuit, Implementation: Modulo-n-counter, Registers:Shift registers, Universal shift registers, Shift register counters, Ring counter, Shift counters, Sequence generators.

Unit V: Logic Families: RTL, DTL, all types of TTL circuits, ECL, HTL and PMOS, NMOS & CMOS logic etc. Comparison of various logic families, ROM organization- PROM, EPROM, EEPROM, EAPROM, RAM organization- Static RAM, Dynamic RAM.

Text Books:

1. Digital Design: M. Mano,4th Edition**,** Prentice Hall of India.
2. Logic & Computer Design Fundamental: M.Mano, 5th Edition, Pearson Education India.
3. Digital Circuits and Design: S. Salivahanan,5th Edition**,** Oxford University Press.

Reference Books:

1. Digital Electronics: W.H. Gothman, Prentice Hall of India.
2. Digital System Principles & Applications: R.J. Tocci,11th Edition**,** Pearson Education India.
3. Pulse, Digital & Switching Waveforms: Millman&Taub,McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

CO1. **Develop/implement** the Boolean expression using logic gates.

CO2. **Design** different combinational logic circuits such as adder, subtractor, decoder etc.

CO3. **Analyze** sequential circuits such as flip-flops, latches etc.

CO4. **Design** shift registers and counters using flip-flops.

CO5. **Compare** logic families, semiconductor memories, & multivibrators.

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3200222/ 3140222	DC	Electronics circuits	60	20	20	40	30	30	200	2	1	2	4

Electronics Circuits (3200222/3140222)

Course Objective: To understand different semiconductor circuits and grab the way to design circuits and perform measurements of circuit parameters.

Unit I: Diode Circuits: Review of P-N Junction Diodes, Power supply parameters, SMPS, Zener and Avalanche Breakdown, Zener voltage regulator, series pass regulator (with feedback) and shunt voltage regulators, Short circuit protection.

Unit II: Introduction to BJT Biasing and Stability: Review of BJTs, Transistor biasing and bias stabilization, the operating point, stability factor, analysis of fixed base bias, Voltage divider bias, collector to base bias, Emitter resistance bias circuit and Bias compensation techniques.

Unit III: BJT as an Amplifier: Low frequency BJT amplifiers, equivalent circuit of BJT using h parameter for CB, CE, CC configurations, calculation of transistor parameter for CB, CE, CC using h parameters. High frequency BJT amplifier: Hybrid-pi (π) common emitter transistor model, hybrid – π conductance and capacitance, gain-bandwidth product.

Unit IV: Feedback amplifiers: Introduction to Feedback Amplifiers & their design parameters, comparison of different feedback amplifier configuration viz (gain, input impedance, output impedance, current gain, voltage gain), cascading of BJT amplifier, Darlington Pair.

Unit V: Oscillators and Tuned Amplifiers: Barkhausen criterion, Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, resonant oscillator, Wien Bridge and crystal oscillators, Clapp oscillator, Tuned amplifier design using BJTs.

Text Books:

1. Microelectronic Circuits: Theory and Application: Sedra & Smith, 7th Edition, Oxford University Press.
2. Electronics Devices and Circuits: Boylested &Nashelsky,11th Edition, Pearson Education India

Reference Books:

3. Electrical Engineering material: A.J Dekker, 1st Edition, Prentice Hall of India.
4. Micro Electronics: Millman, &Grabel,2nd Edition, McGraw Hill Education
5. Integrated Electronics: Millman & Halkias, McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

CO 1. **Implement** electronic circuits using diodes.
CO 2. **Analyze** BJTs biasing circuits for stability.
CO 3. **Analyze** BJTs amplifiers using equivalent circuit models.
CO 4. **Evaluate** design parameters of feedback amplifier configurations such as gain, input impedance, output impedance, current gain, voltage gain
CO 5. **Design** the Oscillator and Tuned amplifier circuits.

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B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Signals & Systems (3140223/ 3200223)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3140223/ 3200223	DC	Signals & Systems	60	20	20	-	-	-	100	3	-	-	3

Course objective: Coverage of continuous and discrete-time signals and systems, their properties and representations and methods that is necessary for the analysis of continuous and discrete-time signals and systems.

Unit-1 Introduction: Mathematical Description of Continuous& Discrete– Time Signals Definition, Classification of signals, Complex Exponential and Sinusoidal Function; Unit Step, Signum, Unit Ramp, Unit Impulse, Periodic Impulse or Impulse Train, Rectangle, Triangle, Sinc and Gaussian pulse functions, Even and Odd Functions, Periodic and non periodic Functions, Signal Energy and Power, Scaling and Shifting, Amplitude Scaling, Time Shifting, Differential and Integration.

Unit 2 Fourier series and Fourier transform: Fourier Transform: Exponential Fourier series, and Trigonometric Fourier series, properties of Fourier series, Introduction to Fourier transform, Fourier Transforms of elementary functions. Properties of Fourier Transform.

Unit 3: Z transforms: Introduction to Z-transform, relation between Laplace and Z-transform, relation between Fourier transform and Z-transform, ROC, properties of ROC, Properties of Z-transform, Inverse Z-transform, Unilateral Z-transform.

Unit-4 Properties of Continuous and Discrete Time Systems: System Modeling, System Properties, Homogeneity, Time Invariance, Additivity, Linearity & Superposition, Stability, Incremental Linearity, Causality, Memory, Static, Nonlinearity, Inevitability, continuous & discrete LTI system.

Unit-5 Continuous and Discrete system analysis: The Convolution Integral, and Convolution Sum, Impulse Response, Convolution & Properties, System Interconnections, Stability and Impulse Response, Response of Systems to Standard Systems, Realization of Differential Equations, Analysis of discrete time LTI system using Z-transform, Analysis of continuous time LTI system using Laplace transform.

Text Books:

1. Digital Signals and Systems, 2nd Edition: Simon Haykin, Barry Van Veen, 2nd Edition, Wiley India Pvt. Ltd.
2. Signals and Systems: Hwei. P. Hsu, Schaum's outlines, 2 nd Edition, Tata Mcgraw Hill Education.

Reference Books:

1. Fundamentals of Signals & Systems: Michael J Roberts, 2 nd Edition, Mc Graw Hill Education.
2. Signal and Systems: Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2 nd Edition,Pearson Education India.

Course Outcomes

After the completion of this course students will be able to:

CO1. **Describe** continuous and discrete time signals mathematically.

CO2. **Determine** the spectral characteristics of signals using Fourier series and Fourier transform.

CO3. **Apply** z-transform for analysis of discrete time signals.

CO4. **Evaluate** the performance parameters of LTI systems.

CO5. **Analyze** continuous and discrete time systems.

B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3140224/ 3200224	DC	Python Programming	60	20	20	40	30	30	200	3	-	2	4

Python Programming (3140224/ 3200224)

Course Objectives:

- To understand the structure and components of a Python program.
- To learn the basic construct of python programming for implementing interdisciplinary research-based problems.
- To plot data using appropriate Python visualization libraries for analysis.

Unit I Introduction to Python: Setting up programming environment, running python programs from a terminal, variables and simple data types: variables, strings, numbers and maths, comments.

Unit II Tuples and Lists: Tuples, lists, list operations, using if statements with lists, organizing a list, working with lists: looping through an entire list, making numeric lists, working with part of a list. Dictionaries and sets.

Unit III Functions: Defining a function, passing arguments, return values, passing a list, passing an arbitrary number of arguments, storing your functions in module, inbuilt functions.

Unit IV Files and Exceptions: Reading from a file, writing to a file, file operations, assertions, exceptions, exception example, debugging.

Unit V Data Visualization: Installing matplotlib, plotting a simple line graph, random walks, making histogram, graphical user interfaces.

Reference Books

1. Python Crash Course:A Hands-On, Project-Based Introduction to Programming, By Eric Matthes
2. Learn Python the Hard Way :3rd Edition
3. T. R. Padmanabhan, Programming with Python, Springer, 1st Ed., 2016.
4. Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, 1st Ed., 2012.

Course Outcomes

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

CO 1. Describe data types of python programming.

CO 2. Describe sequential and non-sequential data types.

CO 3. Implement in-built and user defined functions.

CO 4. Apply File handling operations

CO 5. Illustrate the data using Matplotlib.

Annexure XV

Item 16

To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses to be offered in Batch II semester **(for batch admitted in 2023-24)**

S. No	Category	Subject Code	Subject Name
1	DC	3140221/3200221	Digital Circuits &Systems
2	DC	3140222/3200222	Electronics Circuits
3	DC	3140224/3200224	Python Programming

Subject Name: Digital Circuits &Systems
Subject Code: 3140221/3200221

List of Experiment

1 To Verify the truth tables for logic gates – AND, OR, NOT, EX-OR, EX- NOR, NAND, NOR
2 To realize basic logic gates using universal gates
3 To verify the truth table of half adder and full adder
4 To verify the truth table of half subtractor and full subtractor
5 To design R-S Flip-Flop
6 To design J-K Flip-Flop
7 To examine parity generator / checker
8 To design ripple counter using J-K Flip-Flop.

Course Outcomes:

After completing the lab, students will be able to

CO1. Verify the DE Morgan's theorem.
CO2. Design the basic and universal gates.
CO3. Design adder & subtractor circuits.
CO4. Verify the truth table of flip-flops.
CO5. Design Counters and Registers.

Subject Name: Electronic Circuit Design
Subject Code: 3140222/3200222

List of Experiment

1. To design a voltage regulator using BJT and Zener Diode.
2. To design BJT as a switch.
3. To design a Common Emitter amplifier and determine its voltage gain and output resistance.
4. To determine the gain and bandwidth of 2-stage RC coupled amplifier.
5. To verify the working operation of Crystal Oscillator.
6. To analyse the working of RC Phase shift Oscillator using BJT.
7. To analyse the working of Hartley and Colpitt's Oscillators.
8. To analyse the working of Clapp Oscillator.

Course Outcomes:

After completing the lab, students will be able to

CO1. **Design** the voltage regulator with specific voltage range.
CO2. **Design** switch using BJT.
CO3. **Implement** the voltage amplifier using BJT.
CO4. **Design** RC, LC and Clapp oscillator using BJT for given frequency.

Subject Name: Python Programming
Subject Code: 3140224/3200224

List of Experiments

1. Write python programming to declare various data type and display it's data type.
2. Write python programming to declare sequential data types and display its data type.
3. Write python programming to perform addition and subtraction and display the result.
4. Write python programming to perform multiplication and division and display the result.
5. Write a python programming to perform Boolean operation and display the result.
6. Write a python programming to perform logical operations and display the result.
7. Write a python programming to declare a string, display it's different index position and also change the letter of string with some other letter.

8. Write python programming to declare array and display it's different index position.
9. Write python programming to declare a string then.
    - Capitalize it
    - Convert into title format
    - Swap the case of string
10. Write a python programming to declare a string use slice object to slice the given sequence.

Course Outcomes:

After successful completion of the course, student will be able to:

CO1. Write basic programs in Python.
CO2. Visualize data using Python packages.

Annexure XVI

Item 17

To review and finalize the suggestive list of projects which can be offered under the '**Skill based mini-project**' category in various laboratory components based courses to be offered in B. Tech IV Semester ***(for the batch admitted in 2023-24)***.

S. No	Category	Subject Code	Subject Name
1	DC	3140221/3200221	Digital Circuits &Systems
2	DC	3140222/3200222	Electronics Circuits
3	DC	3140224/3200224	Python Programming

Subject Name: Digital Circuits & Systems
Subject Code: 3140221/3200221

Skill Based Mini Project

1. Design ring counter using J-K flip flop
2. Design Johnson counter using J-K flip flop
3. Design mod 11 counter using S-R flip flop
4. Design mod 11 asynchronous counter using SR flip flop
5. Design twisted tail counter using SR flip
6. Design Johnson counter using SR flip flop
7. Design ring counter using SR flip flop
8. Implement 3 input AND gate using multiplexer
9. Implement 3 input OR gate using multiplexer
10. Implement 3 input XOR gate using multiplexer
11. Implement universal gates using multiplexer
12. Design an ADDER using multiplexer
13. Design a SUBSTRACTOR using multiplexer
14. Design BCD to 7 Segment Decoder
15. Design a BCD to Excess 3 Code Convertor
16. Design a BCD to Gray Code Convertor
17. Design a mod 7 counter using JK flip flop
18. Design a ADDER using universal logic gate
19. Design a ADDER using Encoder
20. Design a 4:1 multiplexer using NAND gate.

Subject Name: Electronic Circuit
Subject Code: 3140222/3200222

Skill Based Mini Project

1. Design a +5V/+9/+12 V regulated power supply.
2. Design a Voltage Doubler Circuit.
3. Design a Voltage Tripler Circuit.
4. Build a LED Blinking Circuit using basic circuit components
5. Build a Light Detector (LDR) using basic circuit components
6. Build a LED based Water Level Indicator
7. Build a Traffic Light Simulator using resistors and LEDs
8. Build a Simple Audio Amplifier using transistor resistor & speaker
9. Build a Temperature Sensor to read ambient temperature using sensor and display
10. Build a Digital Dice using 7-Segment Display and microcontroller
11. Turn on/off a device with a clap sound using microphone, amplifier and relay.
12. Infrared (IR) Remote Tester IR sensor & LED.
13. Water Flow Sensor to measure the flow of water in a pipe
14. Build a Rain Detector using water sensor & LED
15. Detect smoke and trigger an alarm using smoke sensor and buzzer (Fire Alarm)
16. Design a single stage RC coupled amplifier circuit
17. Design an oscillator circuit to generate 1 kHz sine wave
18. Design a voltage regulator for variable load using Zener diode
19. Design a voltage regulator for variable line voltage using Zener diode
20. Design a sound generator circuit

Subject Name: Python Programming
Subject Code: 3140224/3200224

Skill Based Mini Project

1. Write a code to Generate palindrome word using Python.
2. Write a python code to convert roman number to Decimal.
3. Write a python code using Matplotlib library for scatter annotations plot.
4. Write a python code to generate sine, cosine and exponential functions
5. Write a python code that counts the number of words in the input sentence.
6. Write a python code that performs operations of inversing the matrix
7. Write a python code to implement a simple text-based Hangman game.
8. Write a python code to determine the prime factors of a given number.
9. Write a python code that generates the calendar for the month by taking the month and year as the input.
10. Write a python code that takes converts an amount from one currency to the other currency.
11. Write a python code that converts a binary number to decimal number.
12. Write a python code that reverses the words in the sentence.
13. Write a python code that converts the decimal number into any other number system of choice.
14. Write python program that imports data from Excel file and calculate the mean, mode and median.
15. Write python program that imports data from Excel file draw line chart, scatter plot, box plot.
16. Write a python program that takes the voltage across the diode as the input a calculate the current through it (use the diode current equation)
17. Write a python program that converts the height from inch to cms.
18. Write a python program that performs addition that solves the system of linear equation using matrix method.
19. Write a python program to determine the exact age of the person based on the user date of birth.
20. Write a python code that converts the hexadecimal number into any other number system of choice.