B.Tech. V Semester (Electronics Engineering/Electronics and Telecommunication)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
2200511	DC	Data Science	50	10	20	20	60	20	20	200	3	-	2	4

Data Science (2200511)

Course Objective: To equip students with the necessary skills and knowledge to effectively analyze and interpret data using Python, enabling them to make data-driven decisions and contribute to the field of data science.

Unit 1: Need for data science, benefits and uses, facets of data, data science process, Introduction of basics python tool, Setting working Directory, Creating and saving a script file, File execution, removing variables from environment, clearing environment, Commenting script files, Variable creation, Data types and associated operations, Arithmetic and logical operators.

Unit 2: Control structures, loop, Functions, data structures: Lists, Arrays, Tuples, Dictionary, Sets, NumPy library, Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering, Exploratory Data Analytics.

Unit 3: Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, inferential statistics: hypothesis testing, probability: probability theory, conditional probability, Pandas library, dataframe and dataframe related operations, Reading files.

Unit 4: Data Cleaning and Preparation, Handling Missing Data, Data Transformations using pandas and sklearn library, Removing Duplicates, Replacing Values, Detecting Outliers. Data visualization on different dataset using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.

Unit 5: Supervised learning: Regression, classification, Linear regression, logistic regression, decision tree, tree creation with entropy and information gain, ID3 algorithm, random forest, naïve bayes theorem, K-nearest neighbor and ensemble methods for solving real world problems, Unsupervised learning: Clustering, Reinforcement learning.

BOOKS AND REFERENCES

1. Mastering python for data science, Samir Madhavan
2. Introduction to linear algebra - by Gilbert Strang
3. Applied statistics and probability for engineers – by Douglas Montgomery
4. Pattern Recognition and Machine Learning, Christopher M. Bishop

COURSE OUTCOMES:

After completing the course, the student will be able to:

- **CO1.** **Analyze** data science basics and apply python for data manipulation
- **CO2.** **Apply** data structure for preprocessing and analysis of data
- **CO3.** **Build** exploratory data analysis for Data Science methods.
- **CO4.** **Apply** data visualization techniques to solve real world problems.
- **CO5.** **Apply** Data Science techniques for solving real world problems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
2200512	DC	Mobile Communication & 5G Networks	50	10	20	20	-	-	-	100	3	-	-	3

Mobile Communication & 5G Networks (2200512)

Course Objective: The objective of the course is to provide an understanding of wireless communication system, its evolution, standards, and comparison of recent technologies and overview of 5G technology.

Unit I: Introduction to cellular mobile systems: Basic Cellular System, Cellular communication infrastructure: Cells, Clusters, Cell Splitting, Frequency reuse concept, Cellular system components, Operations of cellular systems, Handoff/Handover, Channel assignment, Fixed and dynamic, Cellular interferences: Co-Channel and adjacent channel and sectorization.

Unit II: Channel Models: Properties of mobile radio channels – Intersymbol interference – Multipath and fading effects – Interleaving and diversity – Multiple access schemes (TDMA, FDMA, CDMA, SDMA,OFDMA) – Interuser interference – Traffic issues and cell capacity.

Unit III: Modulations techniques for mobile communication: Pulse shaping, Linear and non-linear Modulation techniques, constant envelop modulation, QPSK, MSK, GMSK. Spread spectrum modulation techniques - Direct sequence and Frequency Hopping Spread Spectrum and their applications.

Unit IV: Introduction to modern cellular standards: 2G Architecture such as GSM and CDMA based – 2.5G – GPRS: GPRS and its features –3G standard details such as UMTS – Introduction to LTE, Basic concept of massive MIMO.

Unit V: Overview of 5G Broadband Wireless Communications: 5G potential and applications; Usage scenarios: enhanced mobile broadband (eMBB), ultra reliable low latency communications (URLLC), massive machine type communications (MMTC), D2D communications, V2X communications; Spectrum for 5G and sharing.

Text Books:

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. 4G, LTE-Advanced Pro and The Road to 5G Third Edition, Elsevier publication

Reference Books:

1. V.K.Garg, J.E.Wilkes, “Principle and Application of GSM”, Pearson Education, 5th edition, 2008.
2. T.S. Rappaport ,“Wireless Communications: Principles and Practice”, second edition, Prentice Hall publication, 2002.

Course Outcomes:

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

CO1. **Describe** mobile communication system.
CO2. **Compare** multiple access techniques for signal transmission.
CO3. **Explain** modulation techniques for mobile communication system.
CO4. **Analyze** modern cellular standards.
CO5. **Discuss** 5G technology in mobile communication.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work& Sessional Mark	Skill based mini project		L	T	P	
2200515	DC	VLSI Design	50	10	20	20	60	20	20	200	3	-	2	4

VLSI Design (2200515)

Course objectives: To understand the fundamental properties of digital CMOS logic circuits using basic MOSFET equations and to develop skills for various logic circuits using CMOS design.

Unit I: MOS Transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structureand Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small- Geometry Effects, MOSFET Capacitances.

Unit II: MOS Inverters Static Characteristics: Introduction, Voltage Transfer Characteristic (VTC), Noise Immunity and Noise margins, Resistive-Load Inverter, Inverters with n-Type MOSFET Load and CMOS Inverter, DC Characteristics of CMOS Inverter, Calculation of VIL, VIH, VOL, VOH and Vth, Design of CMOS Inverters, Supply Voltage Scaling in CMOSInverters, Power and Area considerations.

Unit III: MOS Inverters Dynamic Characteristics: Switching Characteristics and Interconnect Effects, Switching Characteristics of CMOS Inverter- Delay-Time Definitions, CMOS Propagation Delay, Calculation of Delay times, Power Dissipation-Switching, Short-Circuit and Leakage Components of Energy and Power, Power-Delay Product.

Unit IV: CMOS Logic Structures and Layout Design: Combinational MOS logic circuits- CMOS Logic circuits (NAND, NOR and Complex Logic Gates, Multiplexers etc.), CMOS Transmission Gates (Pass Gates). CMOS n-Well Process, layout design rules, layout design of CMOS Inverter, designing of stick diagram.

Unit V: Semiconductor Memories and Low-Power CMOS Logic Circuits: Semiconductor memories: non- volatile and volatile memory devices, flash memories, SRAM cell design, 1T DRAM cell design, dynamic CMOS logic circuits, domino logic CMOS circuits.

Text Books

1. Sung-Mo Kang & Yusuf Leblebici, “CMOS Digital Integrated Circuits – Analysis and Design”, 3rd Edition, Tata McGraw- Hill, New Delhi, 2003.
2. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, “Digital Integrated Circuits: a design perspective”, 2nd Edition,Pearson Education, 2003.

Reference Books

1. David A. Hodges, Horace G. Jackson, Resve A. Saleh, “Analysis and Design of Digital Integrated Circuits: In Deep Submicron Technology”, McGraw, 2003.
2. David A. Johns and Ken Martin, “Analog Integrated Circuit Design” John Wiley and Sons Inc., 1997. Neil Weste and David Harris, “CMOS VLSI Design: A Circuits and Systems Perspective”, 4th Edition, Addison-Wesley,2010.

Course Outcomes:

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

CO1. **Analyze** operating modes of CMOS transistors
CO2. **Compute** static characteristic parameters of CMOS inverters.
CO3. **Evaluate** the propagation delay and power dissipation of CMOS inverter.
CO4. **Design** CMOS logic circuit and layout.
CO5. **Compare** Semiconductor memories.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
2200519	DC	Electromagnetic Theory	50	10	20	20	-	-	-	100	2	1	_	3

Electromagnetic Theory (2200519)

Course objectives: To develop an understanding of fundamental concepts of electromagnetic fields with an emphasis on wave propagation and to create ability to relate basic electromagnetic concepts to the performance of devices, circuits, and systems.

Unit I Electrostatics: Coulomb‘s Law, Electric field intensity, Electric flux and flux density, Gauss law, Boundary relations, Concept of divergence, Curl, Scalar and vector potential, Divergence theorem, Stokes theorem, Electric field in dielectric and conductor, Continuity equation, Poisson‘s and Laplace‘s equations.

Unit II Magnetostatics: Lorentz force, Magnetic field intensity (H) – Biot–Savart‘s Law– Ampere‘s Circuit Law – H due to straight conductors, Circular loop, Infinite sheet of current, Magnetic flux density (B) –in free space and conductor, Magnetic materials – Magnetization.

Unit III Electrodynamic Fields: Magnetic field in multiple media – Boundary conditions, Scalar and vector potential, Poisson‘s equation, Magnetic force, force between current carrying wires, Magnetic circuits – Faraday‘s law, Displacement current – Maxwell‘s equations (differential and integral form) – for steady, time varying and time harmonic fields.

Unit IV Electromagnetic Wave Equation: General wave equation, Uniform plane wave in free space, Perfect dielectric, Lossy dielectric and conducting medium, Skin depth, Poynting vector and Poynting theorem.

Unit V Polarization and Reflection of Wave: Wave Polarization- linear-elliptic-circular, Reflection of uniform plane waves, Normal incidence and Oblique incidence, Brewster angle, Total internal reflection.

Text Books:

1. Elements of Engineering Electromagnetic Third Edition- N.N. Rao- Prentice Hall, India.
2. Elements of Electromagnetic, Second Edition- Matthew N.O. Sadiku- Saunders coll Publishing.

Reference Books:

1. Fields & Waves in Communication Electronics - S.Ramo, J.R. Whinnery& T. Van Duzer- John Wiley & Sons.
2. Electromagnetic - J.D. Kraus-McGraw Hill.
3. Electromagnetic Waves & Radiating Systems - E.C. Jordan & K.G. Balmain- Prentice Hall.

Course Outcomes:

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

CO1. Analyze the concepts of electrostatic fields in practical applications.
CO2. Analyze magnetic fields generated by steady currents and the influence of magnetic materials.
CO3. Apply the maxwell equations to solve problems of time varying fields.
CO4. Analyze electromagnetic wave propagation in different media.
CO5. Analyze polarization and reflection of electromagnetic waves in a practical field.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks	Skill based mini project		L	T	P	
2200520	DC	Digital Signal Processing	50	10	20	20	-	-	-	100	2	1	-	3

Digital Signal Processing (2200520)

Course Objectives: Understanding of the fundamental concepts of digital signal processing, designing of digital filters, and brief knowledge about the Multirate digital signal processing.

Unit I Review of Transform Domain Techniques: Review of discrete time signals and systems, Properties and applications of discrete time Fourier transform, Review of Z transform, Analysis of minimum phase, maximum phase and inverse system.

Unit II Discrete Fourier Transform (DFT): Introduction and properties of DFT, Computation of circular convolution using DFT, Decimation in time FFT algorithm, Decimation of frequency FFT algorithm with radix-2, and radix-4.

Unit III Digital Filters (Part-I): Characteristics of practical frequency selective filters, various signal flow graph structure of IIR filters. **IIR Filter design:** Overview of Butterworth, Chebyshev and Elliptic approximations, Design of discrete time IIR filters using Impulse invariant, and Bilinear transformation methods,

Unit IV Digital Filters (Part-II): Introduction and Signal flow graph structure of FIR Filter.

FIR Filter design: Symmetric, and Asymmetric FIR filters, Design of linear phase FIR filters using windows, and Frequency sampling method.

Unit V Multirate Digital Signal Processing: Introduction, Decimation and Interpolation, Sampling rate conversion by a Rational factor.

Implementation of Sampling rate Conversion: Sampling rate conversion with Cascaded integrator, Comb filters , Polyphase structures for decimation, and interpolation filters, Application of multirate signal processing.

Text Books:

1. John. G. Proakis, “Digital Signal Processing”, 4th Edition, Pearson Education.
2. Oppenheim and Schafer, “Digital Signal Processing”, 2nd Edition, PHI Learning.

Reference Books:

1. Johnny R. Johnson, “Introduction to Digital Signal Processing”, 1st Edition, PHI Learning.
2. Rabiner and Gold, “Theory and Application of Digital Signal Processing”,3rd Edition, PHI Learning.
3. Ingle and Proakis, ”Digital Signal Processing- A MATLAB based Approach”, 3rd Edition, Thompson, Cengage Learning.

Course Outcomes:

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

CO1. **Analyze** discrete-time systems using transform methods.
CO2. **Compute** DFT using FFT algorithms.
CO3. **Design** IIR Filters.
CO4. **Design** FIR Filters.
CO5. **Apply** multi-rate signal processing techniques to design the systems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Subject Name: Data Science

L	T	P	C
-	-	2	1

Subject Code: 2200511

Course Objective: To equip students with the necessary skills and knowledge to effectively analyze and interpret data using Python, enabling them to make data-driven decisions and contribute to the field of data science.

LIST OF EXPERIMENTS

1. Write a Python Program to perform various arithmetic operations (+, -, * / …) and display the results.
2. Create a List using Python program and perform following operations:
   (a) Reverse the items of the list
   (b) Find consonants and vowels in the list
   (c) Change a particular character/number in the list
3. Write a Python Program to create a Matrix (using Numpy Library) and perform multiplication of two matrices.
4. Write a Python Program to create a Matrix (using Numpy Library) and perform Transpose of a matrix.
5. Write a Python Program to create a Matrix (using Numpy Library) perform inverse of a matrix.
6. Write a Python Program using Pandas Library to perform arithmetic operations on two Pandas Series.
7. Write a Python Program using Pandas Library to join the two given dataframes along rows and assign all data.
8. Write a Python program to generate a Line Plot for random data points using MatPlotLiB Library, also customize line style, color, markers and labels.
9. Write a Python program to generate a Bar Plot for random data points using MatPlotLiB Library, also customize line style, color, markers and labels.
10. Write a Python program to create multiple subplots (for standard functions like sine, cosine…) and display it in a single figure, also customize titles, layouts and axes of subplots.

Course Outcomes:

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

CO1. Write a program in Python.
CO2. Analyze and evaluate datasets using Python for data science tasks.

B.Tech. V Semester (Electronics & Telecommunication Engineering)
VLSI Design Lab (2200512)

Course Objectives

To learn the fundamental principles of CMOS VLSI circuit design using SYMICA EDA CAD tool.

List of Experiments:

Digital CMOS logic circuit design using SYMICA CAD tool:

1. Write and simulate basic CMOS logic Gates: AND, OR, NOT.
2. Write and simulate CMOS logic universal gates: NAND and NOR.
3. Write and simulate CMOS logic 2:1 MUX.
4. Write and simulate CMOS logic 2 x 4 Decoder.
5. Write and simulate CMOS logic Half-Adder and Full Adder.
6. Write and simulate CMOS logic RS, JK and D flip-flops.

Gate level design using SYMICA CAD tool:

1. Write and simulate a Verilog program for the following combinational designs: a) 2 to 4 decoder
   b) 8 to 1 multiplexer
   c) 4 bit binary to gray converter
2. Write and simulate a Verilog code to describe the functions of a full adder using three modeling styles.
3. Write and simulate a model for 32 bit ALU.

Course Outcomes

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

CO1. **Demonstrate** a clear understanding in hardware design language Verilog and SPICE.

CO2. Model a combinational circuit using hardware description language Verilog and SPICE Netlist.

CO3. Model a sequential circuit using hardware description language Verilog and SPICE Netlist.

CO4. **Model** a computational circuit using hardware description language verilog and SPICE Netlist.

CO5. Simulate and validate the functionality of the CMOS VLSI circuits using CAD tools.

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Departmental Lab Course

L	T	P	C
-	-	2	1

Subject Name: Minor Project-I
Subject Code: 2200516

Course objective

This course gives the basic introduction of electronics hardware system and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such system by making use of the various tools and instruments available in the electronics workshop.

List of Exercise/ Experiments

1. Familiarization/Identification of electronics component with specification (Functionally, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electronic-Mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.]
2. Drawing of electronic circuit diagrams using symbols, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/application of testing instruments and commonly used tools. (Multimeter, function generator, power supply, CRO etc.) (soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.)
4. Testing of electronic component (Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.)
5. Inter-connecting methods and soldering practices.[Bread board, Wrapping, Crimping, Soldering – types-selections of materials and safety precautions, Soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit board (PCB) [Types, Single sided, Double sided, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]

Course Outcomes

After successful completion of the workshop, students will be able to:

CO1. **Identify** electronics components and their testing.

CO2. **Operate** measuring instruments (such as multi-meter) and electronics equipments likes CRO, dual-power tracking power supply & function generator.

CO3. **Design** the electronics circuits on bread-board.

CO4. **Perform** soldering and de-soldering of the circuit components properly.

CO5. **Troubleshoot** a not working electronic circuit and to rectify it.

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Data Science (2200511)
Skill Based Mini Project

1. Download the IRIS dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
2. Download the IRIS dataset from kaggel and read detail/information, draw scatter plot for any column, find median for all column
3. Download the diabetes dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
4. Download the diabetes dataset from kaggel and read detail/information, draw scatter for any column, find median for all column
5. Download the ODI men's cricket match data from kaggel and read detail/information, draw boxplot for any column, find mean for all column
6. Download the ODI men's cricket match data from kaggel and read detail/information, draw scatter for any column, find median for all column
7. Load the Toyota dataset from kaggle/Internet, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
8. Load the Diabetes data analysis dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
9. Load the IRIS dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
10. Load the given TITANIC dataset from Kaggle, find the correlation between any two columns values and do the plotting pair-wise using SEABORN Library.
11. Download the IRIS dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
12. Download the IRIS dataset from kaggel and read detail/information, draw scatter plot for any column, find median for all column
13. Download the diabetes dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
14. Download the diabetes dataset from kaggel and read detail/information, draw scatter for any column, find median for all column
15. Download the ODI men's cricket match data from kaggel and read detail/information, draw boxplot for any column, find mean for all column
16. Download the ODI men's cricket match data from kaggel and read detail/information, draw scatter for any column, find median for all column
17. Load the Toyota dataset from kaggle/Internet, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
18. Load the Diabetes data analysis dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
19. Load the IRIS dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
20. Load the given TITANIC dataset from Kaggle, find the correlation between any two columns values and do the plotting pair-wise using SEABORN Library.

VLSI Design Lab (2200512)

Skill Based Mini Project

1. Design and Verify the 180 nm CMOS based NAND gate on LTSpice.
2. Design and Verify the 180 nm CMOS based NOR gate on LTSpice.
3. Design and Verify the 180 nm CMOS based Half-adder on LTSpice.
4. Design and Verify the 180 nm CMOS based 1-bit Shift Register on LTSpice.
5. Design and Verify the 180 nm CMOS based XOR gate on LTSpice.
6. Design and Verify the 180 nm CMOS based EXNOR gate on LTSpice.
7. Design and Verify the 180 nm CMOS based Full-adder on LTSpice.
8. Design and Verify the 180 nm CMOS based 2-bit Shift Register on LTSpice.
9. Design and Verify the 180 nm CMOS based OR gate on LTSpice.
10. Design and Verify the 180 nm CMOS based AND gate on LTSpice.
11. Design and Verify the 180 nm CMOS based half-substractor on LTSpice.
12. Design and Verify the 180 nm CMOS based 1 bit comparator on LTSpice.
13. Design and Verify the 180 nm CMOS based Inverter on LTSpice and measure the delay at 100 MHz Frequency.
14. Design and Verify the 180 nm CMOS based Inverter on LTSpice and measure the total power dissipation at 100 MHz Frequency.
15. Design and Verify the 180 nm CMOS based full-substractor on LTSpice.
16. Design and Verify the 180 nm CMOS based 2 bit comparator on LTSpice.
17. Design and Verify the 180 nm CMOS based domino logic 2- input NAND gate on LTSpice.
18. Design and Verify the 180 nm CMOS based domino logic 2- input NOR gate on LTSpice.
19. Design and Verify the 180 nm CMOS based domino logic 4- input NAND gate on LTSpice.
20. Design and Verify the 180 nm CMOS based domino logic 2- input NOR gate on LTSpice.