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	
140511/ 200511	DC	Data Science	50	10	20	20	60	20	20	200	3	-	2	4

Data Science (140511/200511)

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.** **Define** different Data Science techniques.
- **CO2.** **Illustrate** various tools used for Data Science technique.
- **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.

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	
140512 / 200512	DC	Microprocessor & Interfacing	50	10	20	20	60	20	20	200	2	1	2	4

Microprocessor and Interfacing (140512/200512)

Course objectives: To introduce the basic concepts of microprocessor and microcontroller and to develop assembly language programming skills along with their use in various applications.

Unit I: Introduction to Microprocessor: History and evolution of microprocessor and their classification, Introduction to microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations, Interrupts, Interrupts and interrupt service routine.

Unit II: 8085 Assembly Language Programming: 8085 instruction set, 8085 assembly language programming, Addressing modes, Counters and Time delays, Instruction cycle, Machine cycle, T-states, timing diagram for 8085 instructions.

Unit III: Peripheral Devices and their Interfacing: Introduction to memory interfacing and various interfacings chips like: Programmable input/output ports 8155/8255, Programmable interval timer 8253/8254, keyboard/display controller 8279, Programmable communication interface 8251 USART, Programmable interrupt controller 8259, DMA controller 8257.

Unit IV: Architecture and Programming of 16-Bit Microprocessor: 8086 Block diagram and Architecture, Pin configuration of 8086, Execution Unit (EU) and Bus Interface Unit(BIU), Minimum mode & Maximum mode operation, Memory segmentation, Instruction set and addressing modes of 8086, Introduction to 8086 assembly language programming.

Unit V: Microcontrollers & Embedded Systems: Introduction to microcontrollers and embedded systems, 8051 architecture, Pin description, I/O configuration, Interrupts, Addressing modes, an overview of 8051 instruction set, use of microcontrollers in real time embedded system design.

Text Book:

1. Ramesh. S. Gaonkar, Microprocessor architecture Programming and Application with 8085 Penram International Publishing, 4th Edition.
2. B. Ram, "Fundamentals of Microprocessors and Microcomputer" DhanpatRai, 5th Edition.

Reference Books:

1. Douglas V Hall., "Microprocessor and Interfacing" Tata Mcgraw Hill
2. A.K. Ray and K. M. Bhurchandi , "Advance Microprocessor and Peripheral", Tata Mcgraw Hill

Course Outcomes

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

- **CO1.** **Explain** the architecture and organization of 8085 microprocessors.
- **CO2.** **Develop** assembly language programming skill for 8085.
- **CO3.** **Design** the Interfacing circuitry of memory and I/O devices using interfacing chips/PICs with 8085.
- **CO4.** **Discuss** the architecture and organization of 8086 microprocessors.
- **CO5.** **Describe** the instruction set and architecture of 8051 microcontroller.

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	
140515 / 200515	DC	Electromagnetic Fields	50	10	20	20				100	2	1	-	3

Electromagnetic Fields (140515/200515)

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. **Solve** the problems associated with static electromagnetic fields in different engineering situation.
CO2. **Describe** static and dynamic electric and magnetic field.
CO3. **Apply** boundary conditions for electric and magnetic fields at the interface of two different media.
CO4. **Solve** diverse engineering problems with the help of Maxwell equations.
CO5. **Analyze** the behavior of plane waves in different media.

B.Tech. V 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	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140519/200519	DC	Data Communication	50	10	20	20	-	-	-	100	2	1	-	3

Data Communication (140519/200519)

Course objectives: To provide an introduction to fundamental computer network architecture concepts and their applications.

Unit I Introduction to Switching Techniques: Circuit switching, Message switching, Packet switching, Protocols, Layered network architecture and architecture OSI & TCP/IP reference model, Physical layer transmission medium, RS 232 C, Modem, Topologies.

Unit II Data Link Layer: Framing BSC, HDLC. ARQ: Stop and wait, Sliding window, Efficiency, Error detection and Error correction, Hamming codes, Parity checks – CRC, Checksum, HARQ.

Unit III MAC Layer: MAC sub layer – LAN protocols, ALOHA, Slotted and pure ALOHA, CSMA, CSMA/CD, Token bus, Token Ring, TDMA, CDMA, FDMA, Ethernet, Bridge, Router, Gateway, Switch.

Unit IV Network Layer: Routing – Data gram and Virtual Circuit, Distance vector and Link state Routing, Dijkstra's Algorithms, Congestion Control: Leaky bucket algorithm, Slow start, ATM model and ATM traffic management – AAL, X.25, IP layer, IP addressing.

Unit V Transport Layer: Connection oriented transport protocol mechanism, TCP, Transport flow regulation, UDP Segmentation & Reassemble, Session and Transport Interaction, Synchronization, Session protocols, FTP, Remote login.

Physical Layer: Signals and Transmission, Data Encoding, Transmission Media, Transmission Impairments, Multiplexing, Transmission Modes, Networking Devices, Error Detection and Correction, Physical Layer Protocols, Link Budget and Signal-to-Noise Ratio (SNR).

Text Books:

1. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
2. Data and Computer Communication – W. Stallings, Pearson

Reference Books:

1. LANs – Keiser,TataMc-Graw Hill
2. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
3. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stalling, Pearson

Course Outcome:

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

CO1. **Analyze** the error and flow control in communication network.
CO2. **Explain** the concepts of MAC layer.
CO3. **Identify** the different types of routing used in IP.
CO4. **Classify** the transport mechanism in TCP/UDP.
CO5. **Explore** the different application protocol used in internetworking.

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	
140520/200520	DC	Digital Signal Processing	50	10	20	20	-	-	-	100	2	1	-	3

Digital Signal Processing (140520/200520)

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 **s**ignal 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, Spectral transformation of IIR filters.

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, Design of Optimum Equiripple linear phase FIR filters, Design of FIR differentiators.

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 system using transform methods.
- **CO2.** **Compute** DFT using FFT algorithms.
- **CO3.** **Design** IIR Filters.
- **CO4.** **Design** FIR Filters.
- **CO5.** **Apply** the concept of multi-rate signal processing in practical applications.