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 proj		L	T	P	
140511	DC	Data Science	50	10	20	20	60	20	20	200	2	1	2	4

Data Science (140511)

COURSE OBJECTIVES:

To provide the fundamental knowledge of Data Science. To present the basic representation and exploratory data analysis used in Data Science. To understand the working of techniques used in 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. Apply data visualization techniques to solve real world problems.
CO4. Build exploratory data analysis for Data Science methods.
CO5. Apply Data Science techniques for solving real world problems.
CO6. Evaluate the performance of algorithms in data science.

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 proj		L	T	P	
140512	DC	Microprocessor & Interfacing	50	10	20	20	60	20	20	200	2	1	2	4

Microprocessor and Interfacing (140512)

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

Unit I: Introduction to Microprocessor

Introduction to microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations, 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 interfacings chips: Programmable input/output ports 8255, Programmable interval timer 8253, 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: 8051 Microcontroller

Introduction to microcontrollers and embedded systems, 8051 architecture, pin description, 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 memory and I/O interfacing circuits using 8255, 8253/8254, 8257/8237 and 8259A with 8085 microprocessor
- **CO4.** Illustrate 8086 microprocessorarchitecture and programming skills.
- **CO5.** Discuss 8051 microcontroller architecture ant its application in Embedded systems.

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 proj		L	T	P	
140513	DC	Linear Control Theory	50	10	20	20	-	-	-	100	2	1	-	3

Linear Control Theory (140513)

Course Objectives: learning of control system theory and its implementation in practical systems using electronic devices.

UNIT I: Introduction to Control Systems: Basic control system terminology, Open loop and Closed loop system, Feedback control, Different modeling of physical systems, Linear approximation of physical systems. Transfer function of linear systems, Block diagram algebra and Signal flow graphs, Effects of negative feedback.

UNIT II: **Time Domain Analysis:** Test input signals, First order systems, Second order systems, Effects of addition of poles and zeros to open and closed loop transfer functions, Steady state error, Constant and error coefficients for type 0, 1, and 2 systems.

UNIT III: Stability Analysis: Concept of stability of linear systems, Relation between the closed loop poles and stability, Relative stability, Absolute stability, Routh Hurwitz criteria and its applications, Root locus plot.

UNIT IV: Frequency Domain Analysis: Performance specifications in frequency domain, Co-relation between frequency domain and time domain, Polar plots and Bode plots of transfer function, Nyquist stability criterion, Assessment of relative stability.

Unit V: Introduction to Controllers: Introduction to Proportional, Integral, and Derivative controller, PD controller, PI controller, PID controller, Design of various controllers and their limitations.

Text Books:

1. Control System Engineering- I. J. Nagrath & M. Gopal, New Age International.
2. Modern Control Engineering –K. Ogata, Prentice Hall.
3. Control System- A. Anand Kumar, PHI
4. Control System Engineering – B.S. Manke, Khanna publications.

Reference Books:

1. Automatic Control System— B. C. Kuo,Wiley.
2. Control System Engineering- Norman Nise, John Wiley & Sons.

Course Outcomes:

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

- **CO1.** **Determine** the transfer function of linear control system.
- **CO2.** **Evaluate** the time domain response of control system for different standard inputs.
- **CO3.** **Compute** the steady state error for type 0,1,2 systems.
- **CO4.** **Analyze** the stability of control system using time and frequency domain methods.
- **CO5.** **Design** proportional, integral, and derivative controller, PD, PI, PID controllers.

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 proj		L	T	P	
140514	DC	Digital Communication	50	10	20	20	60	20	20	200	2	1	2	4

Digital Communication (140514)

Course Objectives: The main objective of this course is to understand the basic concepts of digital modulations, signal-space analysis and digital transmission techniques.

Unit I Sampling: Sampling theorem for Low pass and Band pass signals, Ideal sampling, Natural sampling and Flat top sampling, Crosstalk, Aliasing, Time division multiplexing, PAM, PWM and PPM their generation and detection.

Unit II Digital Modulation Systems: Pulse Code Modulation, Quantization, Quantization noise, Companding, Inter symbol interference, Eye pattern, Delta modulation, Adaptive delta modulation and DPCM. Encoding techniques: On-Off signaling, Polar signaling, RZ signaling, Bipolar signaling, AMI, Manchester code, Differential encoding their advantage and disadvantages.

Unit III Band Pass Data Transmission: ASK, Binary phase shift keying (BPSK), QPSK, DPSK, Coherent and Non coherent BFSK, Minimum shift keying, QAM, Concept of M-ary PSK and M-ary FSK, Spectral properties of QPSK and MSK.

UNIT IV Detection Techniques: Matched filter and Correlator detector, Gram Schmidt orthogonalization procedure and Concept of signal space for the computation of probability of error, Calculation of error probability for BPSK, QPSK, QAM and coherent BFSK, Comparison of different modulation techniques.

Unit V Information Theory and Coding: Concept of information theory, Entropy and Information rate, Channel capacity, Shannon's theorem, Shannon Hartley theorem , BW and signal to noise ratio trade off, Sources encoding, Extension of zero memory source.
Error correcting codes: Properties of linear block codes, Encoding and Decoding of linear block codes and cyclic codes, Burst error correcting codes, Concept of convolution codes.

Text Books:

1. Singh, R.P. &Sapre, S.D, "Communication Systems: Analog & Digital", Tata McGraw-Hill, 5th reprint, 2000.
2. John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008.

Reference Books:

1. Simon Haykin, "Communication Systems", John Wiley & Sons, 4th Edition, 2000.
2. Taub& Schilling, "Principle of Communication Systems", 2nd Edition, 2003.

Course Outcomes:

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

CO1. **Explain** the process of sampling and pulse modulation.
CO2. **Analyze** digital modulation systems and line coding schemes.
CO3. **Describe** the different band pass data transmission techniques with spectral analysis.
CO4. **Determine** the base band pulse transmission techniques and error probability.
CO5. **Illustrate** the concepts of information theory and source coding.

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 proj		L	T	P	
140515	DC	Electromagnetic Theory	50	10	20	20	-	-	-	100	2	1	-	3

Electromagnetic Theory (140515)

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

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		L	T	P	
100007	MC	Disaster Management	70	20	10	-	-	100	3	-	-	3

Disaster Management (100007)

Course objectives:

- To understand basic concepts in Disaster Management
- To understand Definitions and Terminologies used in Disaster Management
- To understand Types and Categories of Disasters
- To understand the Challenges posed by Disaster
- To understand Impact of Disasters key skills

Unit 1: Introduction to disaster management, concepts and definitions: disaster, vulnerability, risk severity, frequency and details, capacity impact, prevention, mitigation.

Unit 2: Disasters – Disasters classification, demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends, hazard and vulnerability profile of India.

Unit 3: Disaster Impacts – Disaster impact (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues, impact of natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides etc.), impact of manmade disasters (industrial pollution, artificial flooding in urban areas, urban disasters, transportation accidents etc.).

Unit 4: Disaster Risk Reduction (DRR) - Disaster management cycle- its phases; prevention, mitigation, preparedness, relief and recovery; structural and non- structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders: Policies and legislation for disaster management. DRR programmes in India and the activities of National Disaster Management Authority.

Unit 5: Disasters, Environment and Development – Factors affecting vulnerability such as impact of development projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
3. Srivastava H.H. & Gupta G.D., Management of Natural Disasters in developing countries, Daya Publishers Delhi, 2006.

Reference Books:

1. http://ndma.gov.in (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in / (National Disaster Management in India)
3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.

4. National Disaster Management Policy, 2009, GOI.
5. Inter Agency Standing Committee (IASC) (Feb. 2007), IASC Guidelines on Mental Health and Psychosocial Support in Emergency Setting. Geneva: IASC

Course Outcomes:

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

CO1. Identify disaster prevention and mitigation approaches.
CO2. Classify global and national disasters, their trends and profiles.
CO3. Determine the impacts of various disasters.
CO4. Apply Disaster Risk Reduction in management.
CO5. Infer the linkage between disasters, environment and development.

B. Tech. V Semester (Electronics Engineering)

L	T	P	C
-	-	2	1

Subject Name: Microprocessor and Interfacing
Subject Code: 140512

Course Objectives
This course gives the ability to the students to learn the assembly language programming of 8085 and 8086 microprocessor and their interfacing with different peripherals.

List of Experiments

1. Write an assembly language program to perform different arithmetic operations on 8 bit numbers using 8085 microprocessor kit and simulator.
2. Write an assembly language program to find whether the number is even or odd using 8085 microprocessor kit.
3. Write an assembly language program to find largest Number in a given array using 8085 microprocessor kit.
4. To display standard waveform on CRO using 8085, 8255 and ADC card.
5. Write an assembly language program to interfacing 8253 Timer with 8085 microprocessor kit in different modes.
6. Write an assembly language program to obtain 2's complement of a given number using 8086 microprocessor kit.
7. Write an assembly language program to perform arithmetic operations of two BCD numbers using 8086 microprocessor kit and simulator.

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

- **CO1.** **Execute** the assembly language programs for arithmetic and logical operations with 8085 and 8086 microprocessor.
- **CO2.** **Design** interfacing circuits using 8255 and 8253 with 8085 microprocessors.

B.Tech. V Semester (Electronics Engineering)

L	T	P	C
-	-	2	1

Subject Name: Digital Communication Lab
Subject Code: 140514/

Course Objectives
The main objective of course is to give hardware knowledge of various pulse and digital modulation techniques. Students will also learn the implementation using MATLAB software.

List of Experiments

1. To perform sampling and reconstruction.
2. To identify the various encoding schemes for a given data stream.
3. To analyze pulse amplitude modulation.
4. To analyze pulse width modulation.
5. To generate amplitude shift key signal.
6. To generate amplitude shift key signal using MATLAB.
7. To generate phase shift key signal using MATLAB.
8. To generate frequency shift key signal using MATLAB.
9. To generate quadrature phase shifted key signal using MATLAB.

Course Outcome:
After successful completion of the lab, students will be able to:

CO1. **Understand** sampling theorem.

CO2. **Perform** lines coding technique.

CO3. **Construct** different pulse modulation technique.

CO4. **Implement** different digital modulation technique

CO5. **Evaluate** the performance of the digital communication system using MATLAB.

B.Tech. V Semester (Electronics Engineering)

Departmental Lab Core

L	T	P	C
-	-	2	1

Subject Name: Minor Project-I
Subject Code: 140515

Course objectives

This course gives the ability to the students to learn hardware and software implementation of electronic circuits.

List of Exercise/ Experiments

1. To develop interactive software and hardware based projects.

Course Outcomes

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

CO1. **Simulate** electronics circuits using software.

CO2. **Design** hardware based electronics circuits.

ANNEXURE X

Item 11

To prepare and recommend the suggestive list of projects which can be assigned under the 'Skill based mini-project' category in various laboratory component based courses to be offered in B.Tech. V Semester ***(for the batch admitted in 2020-21)***.

S.No	Category	Subject Code	Subject Name
1	DC	140512	Microprocessor and Interfacing
2	DC	140514	Digital Communication

Microprocessor and Interfacing

1. Develop an 8085 microprocessor assembly language program to generate Fibonacci series using 8085 Simulator.
2. Develop an 8085 microprocessor assembly language program to calculate the square root using 8085 Simulator.
3. Develop an 8086 microprocessor assembly language program to interface a virtual stepper motor on Emu86 simulator.
4. Develop an 8086 microprocessor assembly language program to check a string as palindrome or not.
5. Write an assembly language program to interface ADC card with 8085 and display the digital value of the LCD.

Digital Communication

1. Implementation of sampling theorem.
   (a) Sampling at Nyquist rate (b) Over sampling and (c) Under sampling.
2. Implementation of Eye Diagram/Eye Pattern for any of the modulation technique.
3. PPM using IC 555.
4. PAM using IC 555.
5. PWM using IC 555.
6. Generation of On-off Keying signal.
7. Generation of ASK, FSK and PSK signal.
8. Generation of QAM signal and its constellation diagram.
9. To develop a GUI based project in MATLAB for PCM.
10. To develop a GUI based project in MATLAB for Differential-PCM.
11. To develop a GUI based project in MATLAB for Delta Modulation.
12. To develop a GUI based project in MATLAB for Adaptive Delta Modulation.

Item 12

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered ***(for batch admitted in 2020-21)*** in online mode under ***Self-Learning/ Presentation***, in the B.Tech. ***V Semester***

Category	Semester	Name of The course	Duration of the Course in weeks	Course Registration		Name of the Mentor Faculty
				Start Date	End Date	
Electronics Engineering (V Semester)						
Self Learning	V	Demystifying Networks	4	20-05-2022	01-08-2022	Dr. Deepak Batham
	V	Basics of Software defined Radios and Practical applications	4	20-05-2022	01-08-2022	Dr. Shubhi Kansal
	V	Foundation of Cognitive robotics	4	20-05-2022	01-08-2022	Dr. Sushmita Chaudhari