NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR

(AN AUTONOMOUS INSTITUTE)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW

Evaluation Scheme & Syllabus

For

Bachelor of Technology

Electronics and Communication Engineering (ECE)

Fourth Year

(Effective from the Session: 2024-25)

NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR

(AN AUTONOMOUS INSTITUTE)

Bachelor of Technology
Electronics and Communication Engineering
EVALUATION SCHEME
SEMESTER-VII

Sl. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
		WEEKS COMPULSORY INDUCTION PROGRAM												
1	AEC0701	Optical Communication and Network	Mandatory	3	0	0	30	20	50		100		150	3
2		Departmental Elective-V	Departmental Elective	3	0	0	30	20	50		100		150	3
3		Open Elective - II	Open Elective	3	0	0	30	20	50		100		150	3
4		Open Elective - III	Open Elective	3	0	0	30	20	50		100		150	3
5	AEC0751	Optical Communication & Networking Lab	Mandatory	0	0	2				25		25	50	1
6	AEC0759	Industrial Assessment-III	Mandatory	0	0	2				50			50	1
7		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		GRAND TOTAL											**700**	**14**

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year B. Tech Students (Semester-VII)**

S. No.	Subject Code	Course Name (IoT)	University / Industry Partner Name	No of Hours	Credits
1.	AMC0306	Fundamentals of Data Networking	Infosys Wingspan (Infosys Springboard)	35h 42m	2.5
2.	AMC0307	Kubernetes Course from a DevOps guru (Kubernetes + Docker)	Infosys Wingspan (Infosys Springboard)	7h 56m	0.5
3.	AMC0308	Mastering Go Programming	Infosys Wingspan (Infosys Springboard)	21h 12m	1.5

PLEASE NOTE: -

- **Internship (3-4 weeks) shall be conducted during summer break after semester-VI and will be assessed during semester-VII.**

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

List of Departmental Electives- V

S. No.	Subject Codes	Subject Name	Type of Subject	Bucket Name	Branch	Semester
1.	AEC0711	Big Data Analytics For IoT and Internet of Everything	Departmental Elective-V	Internet of Things	ECE	7
2.	AEC0712	Industrial Automation and Programming	Departmental Elective-V	Embedded& Robotics	ECE	7
3.	AEC0713	Data Analytics	Departmental Elective-V	Artificial Intelligence	ECE	7

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Bachelor of Technology
Electronics and Communication Engineering
EVALUATION SCHEME
SEMESTER-VIII

Sl. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1		Open Elective - IV	Open Elective	2	0	0	30	20	50		100		150	2
2	AEC0858/ AEC0859	Industrial Internship/ Capstone Project	Mandatory	0	0	20				200		300	500	10
		*Massive Open Online Courses (For B. Tech. Hons. Degree)	*MOOCs			2								
		TOTAL											**650**	**12**

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year B. Tech Students (Semester-VIII)**

S.No.	Subject Code	Course Name	University/Industry Partner Name	No. of Hours	Credit
1	AMC0223	Fundamentals of Routing 101	Infosys Wingspan (Infosys Springboard)	46h 54m	3.5
2	AMC0222	Network Fundamentals	Infosys Wingspan (Infosys Springboard)	37h 57m	3
3	AMC0309	Network Fundamentals 101	Infosys Wingspan (Infosys Springboard)	32h 35m	3

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

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AICTE Guidelines in Model Curriculum:

A student will be eligible to get Under Graduate degree with Honors only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honors Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credit

B.TECH FOURTH YEAR			
Course Code	**AEC0701**	**L T P**	**Credits**
Course Title	**Optical Communication and Network**	**3 0 0**	**3**

Course Objectives: The student will learn about

1	The basic concepts of optical communication.
2	The different types of signal losses and dispersion mechanism occurring inside the optical fiber cable.
3	The optical sources used in optical communication with their comparative study.
4	Different multiplexing techniques, second generation optical networks, optical layer, and optical packet switching
5	Different types of optical network technologies

Pre-requisites: Analog and Digital Communication

Course Contents / Syllabus

UNIT-I	**Introduction to Optical Communication**	**8 hours**

Optical Spectral Band with Operating Windows, General Communication System, Optical Communication System with its advantages.

Optical Fiber Waveguides: Ray Theory of Transmission with TIR, Acceptance Angle, Numerical Aperture and Skew Rays, Electromagnetic Mode Theory for Optical Propagation, Modes in a Planar Guide, Phase and Group Velocity, Phase Shift with Total Internal Reflection, Evanescent Field, Goos-Haenchen Shift, Cylindrical Fiber Modes, Mode Coupling, Step Index fibers Vs Graded Index fibers, Single Mode Fibers- Cut off wavelength, MFD & Spot Size.

UNIT-II	**Signal Loss in Optical Fibers**	**8 hours**

Attenuation, Material Absorption Losses (Intrinsic and Extrinsic absorption), types of Linear and Non-Linear Scattering Losses, Fiber Bending Losses, Kerr Effect.

Dispersion: Introduction with its types: Chromatic / Intramodal Dispersion (Material and Waveguide Dispersion), Intermodal dispersion (for MSI and MGI fibers), Overall (Total) FiberDispersion in Multimode and Singe Mode Fiber, Dispersion Modified Single Mode Fibers, Polarization & Fiber Birefringence.

UNIT-III	**Optical Sources**	**8 hours**

LEDs-Introduction to LEDs & Materials used for fabrication, LED Power and Efficiency, LED Structures, LED Characteristics, Modulation Bandwidth, Laser Diodes and Photo Detector-Introduction, Optical Feedback & Laser Oscillations, Resonant Frequencies, Physical Principles of Photodiodes: The PIN Photo Detector, Avalanche Photodiodes, Temperature Effect on Avalanche Gain, Detector Response Time.

UNIT-IV	**Introduction to Optical Network**	**8 hours**

Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Nonlinear Effects: Effective length and area, stimulated Brillouin scattering, stimulated Raman scattering, Propagation in a nonlinear medium, self-phase modulation, cross phase modulation Four wave mixing.

UNIT-V	**Optical Networks Technologies**	**8 hours**

SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers, Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.

Course Outcomes: At the end of this course students will demonstrate the ability to

CO 1	Define and explain the basic concepts of optical communication.	K1, K2

CO 2	Describe the signal losses and dispersion mechanism occurring inside the optical fiber cable.	K1, K2
CO 3	Compare the optical sources used in optical communication with their comparative study.	K1, K4
CO 4	Different multiplexing techniques, second generation optical networks, optical layer, and optical packet switching.	K1, K3
CO 5	Analyze the working of Different types of optical network technologies.	K1, K4

Text books

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd
2. R. Ramaswami, & K. N. Siva rajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3Ed.
3. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.
2. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.

NPTEL/ Youtube/ Faculty Video Link:

Unit I	https://www.youtube.com/watch?v=PnBxq0-FisA&list=PLbMVogVj5nJQxs7jmzJkGENCYYL-WnP_F&index=4
Unit II	https://www.youtube.com/watch?v=BGUhTDWkwx8&list=PLbMVogVj5nJQxs7jmzJkGENCYYL-WnP_F&index=9
Unit III	https://www.youtube.com/watch?v=wwdtDcu5yAE&list=PLbMVogVj5nJQxs7jmzJkGENCYYL-WnP_F&index=12
Unit IV	https://www.youtube.com/watch?v=4W7hieXDAmc&list=PLHj96QRJ0kOhH8xoXXrOgkMf9ZOvjhqYl&index=114
Unit V	https://www.youtube.com/watch?v=f5EmFoXlYyQ&list=PLHj96QRJ0kOhH8xoXXrOgkMf9ZOvjhqYl&index=115

B.TECH FOURTH YEAR			
Course Code	**AEC0751**	**L T P**	**Credit**
Course Title	**Optical Communication & Networking Lab**	**0 0 2**	**1**

Course Objectives: The student will learn

1.	The concept of optical fiber communication and setup of the link.
2.	Applications of Time-Division Multiplexing and Line Coding schemes in optical communication
3.	The effect of electromagnetic interference on the optical fiber medium.
4.	The implementation of Memory management & I/O management in optical communication.

Pre-requisites: Basics of Communication Lab & Networking

List of Experiments

Sr. No.	Name of Experiment	CO
1.	Setting up fiber optic analog link using ST-2502 Fiber Optics Trainer and Digital Multimeter.	CO1
2.	Study of a 650nm fiber optic analog link in this experiment and establish the relation between the input signal and received signal.	CO1
3.	Study and perform time division multiplexing (digital) through optical fiber link with help of ST-2502 Fiber	CO2
4.	Manchester coding and decoding by using ST-2502 Fiber Optics Trainer and CRO/DSO	CO2
5.	Measure the characteristics offiber optic LED's and photodetector. Study and draw I-V Characteristics of Fiber optic LED and Photodetector.	CO2
6.	To compare the effect of Electromagnetic Interference on a copper medium and on an optical fibre medium and Measurement of bending loss and propagation loss in the fiber.	CO3
7.	Identify Cat5 cable, RJ 45 Connector, Crimping Tool , Wire Stripper	CO3
8.	Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable	CO4
9.	Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector	CO4
10.	Working of a router & method to access the router via console or using telnet, different types of cables used for connectivity	CO4
11.	Internet Information Services tool and its installation	CO4
12.	To implement a simple file transfer protocol (FTP) using connection-oriented and connectionless sockets	CO4

Course Outcome: After successful completion of this Lab students will be able to		**Blooms Level**
CO 1	Perform Multiplexing in optical fiber communication.	K2,K3
CO 2	Demonstrates the concept of Electromagnetic Interference on an optical fibre medium.	K3,K4
CO 3	Implement File transfer protocol Configuration in optical networking .	K1,K2,K4
CO 4	Design optical communication system.	K1,K5,K6

B.TECH FOURTH YEAR			
Course Code	**AEC0711**	**L T P**	**Credits**
Course Title	**Big Data Analytics for IoT and Internet of Everything**	**3 0 0**	**3**
Course objective: Student will learn about			
1	The concepts of big data platforms for IoT.		
2	The concepts of Sustainability Data and Analytics.		
3	YARN and HDFS in data management system.		
4	The Hadoop and Map reduce and its uses in features extraction.		
5	The various types of Google and AWS data analytics tools.		
Pre-requisites:			
Basic Knowledge of IoT and IoT Protocols			
Course Contents / Syllabus			
UNIT-I	**Big data platforms for the internet of things**		**8 hours**
Big Data Platforms for the Internet of Things: network protocol, data dissemination, current state of art Improving Data and Service Interoperability with Structure, Compliance, Conformance and Context Awareness, interoperability problem in the IoT context, Big Data Management Systems for the Exploitation of Pervasive Environments, Big Data challenges and its requirements, Types of data			
UNIT-II	**Sustainability Data and Analytics**		**8 hours**
Sustainability Data and Analytics: Sustainability Data and Analytics in Cloud-Based M2M Systems, Potential stakeholders and their complex relationships to data and analytics applications, Social Networking Analysis, Building a useful understanding of a social network, Leveraging Social Media and IoT to Bootstrap Smart Environments, Lightweight Cyber Physical Social Systems, Citizen actuation			
UNIT-III	**Hadoop Architecture**		**8 hours**
Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 3.x, New Features – Name Node high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. HDFS (Hadoop Distributed File System): Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java Interfaces to HDFS, command-line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures.			
UNIT-IV	**Hadoop and Map Reduce**		**8 hours**
Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. Map Reduce: Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce			

UNIT-V	Google and AWS Data Analytics Tools	8 hours
Google Data Analytics Tools: Google Analytics, Google Search Console, Looker, Google Ads, Google Data Studio, Google Optimize, Google Surveys, Google tag manager, Google Big Query AWS Data Analytics Tools: Amazon Athena, Amazon EMR, Amazon Redshift, Amazon Kinesis, Amazon Open Search Service, Amazon Quick sight, AWS Glue Data Brew		
Course Outcomes: After completion of this course students will be able to		
CO 1	Identify the concept of big data platforms for IoT.	K1,K2
CO 2	lyze the concept of Sustainability Data and Analytics in Cloud-Based M2M Systems.	K2,K3
CO 3	Explain the YARN and HDFS in Data management.	K1,K2
CO 4	Analyze Map Reduce framework and demonstrate its use in features extraction.	K2, K3
CO 5	Describe the various types of Google and AWS data analytics tools.	K1,K2

Text books

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013. 2. Big-Data Black Book, DT Editorial Services, Wily India
2. Tom White, "Hadoop: The Definitive Guide", Third Edition, O' Reilley, 2012. 5. Eric Sammer, "Hadoop Operations", O' Reilley, 2012.

Reference Books

1. Stackowiak R, Licht A, Mantha V, Nagode L" Big Data and The Internet of Things Enterprise Information Architecture for A New Age", A press, 2015.
2. Dr. John Bates, "Thingalytics - Smart Big Data Analytics for the Internet of Things", John Bates, 2015.

NPTEL Links

Unit 1	**https://www.youtube.com/live/e3D0gNqfnzo?feature=share**
Unit 2	**https://youtu.be/CDgtvl4c9Pg**
Unit 3	**https://youtu.be/FispS3Jx_3g**
Unit 4	**https://www.youtube.com/watch?v=mNP44rZYiAU**
Unit 5	**https://youtu.be/K-FhMegdlJo**

B.TECH FOURTH YEAR			
Course Code	**AEC0712**	**L T P**	**Credits**
Course Title	**Industrial Automation and Programming**	**3 0 0**	**3**
Course objective: Student will learn about			
1	The basic concepts of automation.		
2	Different types of circuits & cylinders in pneumatics.		
3	The basic concepts of Electro pneumatics.		
4	Different types of circuits in Electro pneumatics.		
5	Discrete control using PLC and ladder programming.		
Pre-requisites:			
Basic Electronics & Basics of mechanical system			
Course Contents / Syllabus			
UNIT-I	**Introduction to Automation**		**8 hours**
Review and Definitions: Robots & its Kinds, Definition of Levels, Manipulators, Structure of Automatic Industrial Systems, Non-industrial Representatives of the Robot Family, Relationship between the Level of Robot "Intelligence" and the Product **Concepts and Layouts**: Processing Layout, Concept of an Automatic Manufacturing Process, Productivity of a Manufacturing Process, The Kinematic Layout, Rapid Prototyping			
UNIT-II	**Pneumatics Automation**		**8 hours**
Pneumatic Devices: Different types of valves, Actuators and auxiliary elements in Pneumatics & hydraulics, their applications and use of their ISO symbols Synthesis and design of circuits (up to 3 cylinders). **Introduction to Material storage**: Handling and transport systems and its automation using AS/RS, AGVS and conveyors etc.			
UNIT-III	**Electro Pneumatics Automation**		**8 hours**
Introduction to Electro Pneumatics, Classification Of Electro-Pneumatic Elements, Fundamentals of Electrical Technology, Electrical Symbols, Solenoid Valves, Switches, Sensors and Relays, Electro - Pneumatics Circuits, Rules for creating Relay logic diagram			
UNIT-IV	**Electro Pneumatics**		**8 hours**
Timer, Counter, Design of Electro-Pneumatic Circuits using single solenoid and double solenoid valves with and without grouping. **Industrial control systems**: Process industries versus discrete manufacturing industries, Continuous verses discrete control, Computer process control, Forms of computer process control.			
UNIT-V	**PLC**		**8 hours**
Introduction, Definition, Advantages of PLC, Structures of PLC, Modes of Operation, Resources of PLC, PLC Programming Languages, Communication: Need for Communication, Data Transmission Commissioning: Types of Commissioning, Ladder digs, Ladder Logic, Programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming			
Course Outcomes: After completion of this course students will be able to			

CO 1	Apply the knowledge of basic concepts of industrial automation and explore the direction of flow in components.	K_1, K_3
CO 2	Design different types of circuits with pneumatics elements.	K_4
CO 3	Analyze the use of different types of circuits with the help of Electro pneumatics elements.	K_4
CO 4	Analyze the Industrial control systems using electro-pneumatics technique.	K_4
CO 5	Implement Discrete control using PLC and ladder programming.	K_4

Text books

1. "Automation, Production Systems and Computer Integrated Manufacturing"- M.P. Grover, Pearson Education.

Reference Books

1. "Computer Based Industrial Control" – Krishna Kant, EEE-PHI
2. Principles and Applications of PLC – Webb John, Mcmillan 1992
3. "An Introduction to Automated Process Planning Systems" – Tiess Chiu Chang & Richard A. Wysk.
4. "Anatomy of Automation" – Amber G.H & P.S. Amber, PrenticeHall.

NPTEL Links

Unit 1	https://www.youtube.com/watch?v=br-ezdmEq7A
Unit 2	https://www.youtube.com/watch?v=se9XxkpXP74
Unit 3	https://www.youtube.com/watch?v=jKb-KLVzCtw
Unit 4	https://slideplayer.com/slide/3374651/
Unit 5	https://slideplayer.com/slide/3374651/

B.TECH FOURTH YEAR			
Course Code	**AEC0713**	**L T P**	**Credits**
Course Title	**Data Analytics**	**3 0 0**	**3**
Course Objective: In this course, the student will learn about			
1	Various basic concepts & fundamentals of Data analytics		
2	Various types of data formats and their manipulations.		
3	Exploratory data analysis and visualization techniques		
4	R/Python/Tableau programming language.		
Pre-requisites: Basic Knowledge of Statistics and Probability			
Course Contents / Syllabus			**Hours**
UNIT-I	**Introduction To Data Science**		**8**
Introduction to Data Science, Evolution of Data Science, Datafication, Skillsets needed, Data Science Lifecycle, types of Data Analysis, Data Science Tools and technologies, Need for Data Science, Analysis Vs Analytics Vs Reporting, Data classification, Future of Data Science, Applications of Data Science in various fields, Use cases of Data science-Facebook, Netflix, Amazon, Uber, AirBnB.			
UNIT-II	**Data Handling & Statistical Analysis**		**8**
Types of Data: structured, semi-structured, unstructured data, Numeric, Categorical, Graphical, High Dimensional Data, Transactional Data, Spatial Data, Social Network Data, standard datasets, Data Classification, Sources of Data, Data manipulation in various formats, for example, CSV file, import and export data in R/Python. Measure of central tendency (Mean, Median, Mode), Central limit theorem, Skewness, Variance, SD, Covariance, Correlation, Histogram Analysis, Normal distribution, Students T distribution, Margin of Error			
UNIT-III	**Data Pre-processing & Data Analysis**		**8**
Form of Data Pre-processing, data Attribute and its types, understanding and extracting useful variables, KDD, process, Data Cleaning: Missing Values, Noisy Data, Discretization and Concept hierarchy generation (Binning, Clustering, Histogram), Inconsistent Data, Data Integration and Transformation. Data Reduction: Data Cube, Aggregation, Data Compression, Numerosity Reduction, R-Square, Adjusted R-Square, Significance of p-value, Introduction to data visualization and various graphical ways of data representation.			
UNIT-IV	**Exploratory Data Analysis**		**8**
Handling Missing data, Removing Redundant variables, variable Selection, identifying outliers, Removing Outliers, Time series Analysis, Data transformation and dimensionality reduction techniques such as Principal Component Analysis (PCA), Factor Analysis (FA) and Linear Discriminant Analysis (LDA), Univariate and Multivariate Exploratory Data Analysis. Data Munging, Data Wrangling- APIs and other tools for scrapping data from the web/ internet using R/Python**.**			

UNIT-V	Data Visualization	8

Introductions and overview, Debug and troubleshoot installation and configuration of the Tableau. Creating Your First visualization: Getting started with Tableau Software, Using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps), Using the Show me panel. Tableau Calculations: Overview of SUM, AVR, and Aggregate Features Creating custom calculations and fields, Applying new data calculations to your visualization. Manipulating Data in Tableau: Cleaning-up the data with the Data Interpreter, structuring your data, Sorting, and filtering Tableau data, Pivoting Tableau data. Advanced Visualization Tools: Using Filters, Using the Detail panel Using the Size panels, customizing filters, Using and Customizing tooltips, formatting your data with colors, Creating Dashboards & Stories, Distributing & Publishing Your Visualization

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

CO1	Understand the fundamental concepts of data analytics in the areas that plays major role within the realm of data science.	K1
CO2	Explain and exemplify the most common forms of data and its representations.	K2
CO3	Apply data pre-processing techniques on heterogenous datasets.	K3
CO4	Analyze data using exploratory data analysis.	K4
CO5	Apply visualization tool to analyze and draw inference from different types of data sets w.r.t different application scenarios.	K3

Textbooks:

1. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.
2. Data Analysis and Data Mining, 2nd Edition, John Wiley & Sons Publication, 2014.

Reference Books:

1. Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann, 2012.
2. The Data Science Handbook, Field Cady, John Wiley & Sons, Inc, 2017

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=3Bh_viwz6_0&ab_channel=NPTELIITGuwahati
Unit 2	https://www.youtube.com/watch?v=eo2tOPV3AoE&ab_channel=nptelhrd
Unit 3	https://www.youtube.com/watch?v=WwMz2fJwUCg&ab_channel=MITOpenCourseWare
Unit 4	https://www.youtube.com/watch?v=ARU0BEVxasQ&ab_channel=ConstrainedandUnconstrainedOptimization https://www.youtube.com/watch?v=bZMRHWu7hvg&list=PLIgDtce9BR0dZv1aZwVTmuWXc_vJPbB3q&index=34&ab_channel=ConstrainedandUnconstrainedOptimization

Unit 5	https://www.youtube.com/watch?v=3-NiZPbkr7A&ab_channel=KimiaLab