



Tulsiramji Gaikwad - Patil College of Engineering and Technology

Wardha Road, Nagpur-441108

NAAC Accredited with A+ Grade

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Scheme of Instructions for Third Year of B.Tech.(UG) Programme CSE - Data Science

Sixth Semester

SN	Sem	Type	BoS/ Dept	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			Total
							L	SL	P	Hrs		CT/IA	C A	ESE	
1	6	PCC	DS	BDS33601	Software Engineering	T	2	0	0	2	2	14	6	30	2
2	6	PCC	DS	BDS33602	Big Data Computing	T	3	0	0	3	3	30	10	60	3
3	6	PCC	DS	BDS33603	Big Data Computing - Lab	P	0	0	2	2	1	25	-	25	-
4	6	PCC	DS	BDS33604	Data Visualization Technique	T	3	0	0	3	3	30	10	60	3
5	6	PCC	DS	BDS33605	Data Visualization Technique - Lab	P	0	0	2	2	1	25	-	25	-
6	6	PEC	DS	BDS33606-09	PEC –II	T	4	0	0	4	4	30	10	60	3
7	6	PEC	DS	BDS33610-13	PEC – III	T	4	0	0	4	4	30	10	60	3
8	6	MDM	ECE	BEC33611	Microprocessor and Microcontroller	T	2	0	0	2	2	14	6	30	2
9	6	VSEC	DS	BDS33614	Data Analysis using R- Lab/ Power BI - Lab	P	0	0	4	4	2	50	-	50	-
TOTAL							18	0	8	26	22	248	52	400	16

Course Category	BSC/ESC (Basic Science Course/Engineering Science Course)	PCC		Multidisciplinary courses		V SEC	Humanities Social Science & Management				Experiential				CC Co-Curricular Course(CC)
		Programme Core courses (PCC)	Programme Elective Course (PEC)	MDM	Open Elective (OE)		AEC Ability	Entrepreneurship [Course]	IKS (Indian knowledge System)	Value Education Course	Research Methodology	Common Engineering Project(CEP) /Field Projects(FP)	Project	Internship / OJT	
Credits	-	10	8	2	-	2	-	-	-	-	-	-	-	-	-
Cumulative Sum	16/13	39	12	6	6	8	4	4	2	4	-	2	-	-	4

PROGRESSIVE TOTAL CREDITS: 21+22=43

 Head of Department CSE - Data Science Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur	 Dean Academics Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur	 Vice Principal Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur	 Dr. Premanand Naktode Principal TGPCET, Nagpur	Aug,2023	1.00	Applicable for A Y 2023-24 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	

PEC List:-

Professional Elective Courses							
Sr. No	Domain wise Cluster		PEC-I	PEC-II	PEC-III	PEC-IV	PEC-V
	Semester		V	VI		VII	VIII
1	Domain-1	Course Code	BDS33506	BDS33606	BDS33610	BDS34702	BDS34803
		Network and Security	Cyber Law and Ethics	Cryptography	Computer Security	Cloud Security	Network Security Administration
2	Domain-2	Course Code	BDS33507	BDS33607	BDS33611	BDS34703	BDS34804
		AI ML	Artificial Intelligence	Machine Learning	Natural Language Processing	Neural Network	Deep Learning
3	Domain-3	Course Code	BDS33508	BDS33608	BDS33612	BDS34704	BDS34805
		IoT	TCP/IP	Mobile Computing	Ad-Hoc Sensor Networks	Internet of Things	Cloud Computing and IoT
4	Domain-4	Course Code	BDS33509	BDS33609	BDS33613	BDS34705	BDS34806
		Digital Healthcare	Introduction of Digital Healthcare	Medical Imaging Analysis with AI	Introduction to Internet of Medical Thing	Healthcare Data Management and Security	Mobile Health Applications

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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33601			Software Engineering	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	2Hrs/Week		CT-I	7	-	-	
Practical(P)	-		CT-II	7	-	-	
Total Credits	02		CA	6	-	-	
Duration of ESE: 3Hrs			ESE	30	-	-	
			Total Marks	50	-	-	
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand software engineering fundamentals and process models.						
CO2	Apply requirements engineering and modeling techniques.						
CO3	Design software architecture, UI, and apply testing methods.						
Course Content							
Unit I	Introduction to Software Engineering , Role of Software Engineer, software development phases, Process Models: Waterfall Model, RAD Model, Incremental model, Spiral Model, Agile Model.						
Unit II	Requirements Engineering : Eliciting Requirements, Negotiating, Validating requirements, Requirements Analysis, Analysis Modeling Approaches, Scenario-Based Analysis, Object Oriented Analysis, Requirements Modeling strategies, Types of Modeling, Flow Oriented Modeling, and Class based modeling.						
Unit III	Design Engineering : Design Engineering Concept, Effective modular design, Design models, Data and Architectural Design. User Interface Design: Rules, User Interface Analysis and Design. Software testing : Fundamentals, Internal and external views of Testing, white box testing, black box testing, Unit Testing, Integration Testing. Validation Testing, Debugging.						
Text Books							
1	Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, McGraw-Hill International Edition, 2010.						
2	Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.						
Reference Books							
1	Moh’d A. Radaideh, “Software Project Management: With PMI, IEEE-CS, and Agile-SCRUM”, De Gruyter,2024						
2	Roger S. Pressman, Bruce R. Maxim, “Software Engineering: A Practitioner’s Approach”, McGraw-Hill Education, 2020, 9th Edition						
Useful Links							
1	https://onlinecourses.nptel.ac.in/noc19_cs70/preview						
2	https://archive.nptel.ac.in/courses/106/105/106105218/						


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33602			Big Data Computing	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	3	CT-I	15	-	-		
Practical(P)	0	CT-II	15	-	-		
Total Credits	3	CA	10	-	-		
Duration of ESE: 3Hrs		ESE	60	-	-		
		Total Marks	100	-	-		
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand Big Data fundamentals, characteristics, and applications.						
CO2	Explain Hadoop architecture and tools like Pig, Hive, and HBase.						
CO3	Analyze Big Data processing with Spark, Storm, and Flink.						
CO4	Classify NoSQL databases and apply Big Data storage formats.						
CO5	Use Big Data ingestion, analytics, and visualization tools.						
Course Content							
Unit I	Introduction to Big Data: Introduction to Big Data – Definitions and Evolution, 5Vs of Big Data (Volume, Variety, Velocity, Veracity, Value), Sources and Types of Big Data, Challenges in Big Data Management, Applications of Big Data in various domains (healthcare, retail, IoT, social media, etc.)						
Unit II	Hadoop Ecosystem and HDFS: Overview of Hadoop Architecture, Hadoop Distributed File System (HDFS), Introduction to MapReduce: Programming Model and Execution, Hadoop YARN Architecture, Hadoop Ecosystem Components: Pig, Hive, HBase						
Unit III	Advanced Big Data Processing Frameworks: Apache Spark: Introduction, Features, and Architecture, Spark RDDs, DataFrames, and Spark SQL, Transformations and Actions in Spark, Spark vs. MapReduce, Introduction to Real-time Processing with Apache Storm and Flink						
Unit IV	NoSQL Databases and Data Storage: Introduction to NoSQL and CAP Theorem, Types of NoSQL Databases: Key-Value Stores (Redis), Column-Oriented Stores (HBase, Cassandra), Document-Oriented Stores (MongoDB), Graph Databases (Neo4j), Data Serialization Formats: Avro, Parquet, JSON, ORC						
Unit V	Data Ingestion, Analytics, and Visualization: Data Ingestion Tools: Sqoop, Flume, Kafka, Data Analysis using Python or R on Big Data platforms, Introduction to Spark MLlib for Machine Learning, Visualization Tools: Tableau, Power BI, Case Studies on Real-world Big Data Applications						
Text Books							
1	Jure Leskovec, Anand Rajaraman, Jeff Ullman, “Mining of Massive Datasets”, Cambridge University Press, 3rd Edition, 2020						
2	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd, 1st Edition, 2015						
Reference Books							
1	Tom White, “Hadoop: The Definitive Guide”, O’Reilly Media, 4th Edition						
2	Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, “Big Data: Principles and Paradigms”, Morgan Kaufmann (Elsevier), 1st Edition						

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2	https://archive.nptel.ac.in/courses/106/104/106104189/


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Program: B.Tech Third Year (CSE- Data Science)																									
Semester				Course Code						Course Name															
VI				BDS33603						Big Data Computing - lab															
Teaching Scheme				Examination Scheme(Th)						Examination Scheme(P)															
Theory(Th)		-		CT-I		-		-		-															
Practical(P)		2		CT-II		-		-		-															
Total Credits		1		CA		-		CA		25															
Duration of ESE:				ESE		-		ESE		25															
				Total Marks		-		Total Marks		50															
Course Outcomes: After the completion of this course, students will be able to-																									
CO1		Install Apache Hadoop and its components.																							
CO2		Develop MapReduce programs for basic text and numeric processing.																							
CO3		Solve real-world problems using advanced MapReduce techniques.																							
CO4		Analyze structured data using MapReduce for actionable insights.																							
CO5		Perform large-scale log file analysis to extract user behavior metrics.																							
Pre-Requisites: Python																									
Sr.no		List of Experiments										COs													
1		Install Apache Hadoop										CO 1													
2		Develop a MapReduce program to calculate the frequency of a given word in agiven file.										CO 1													
3		Develop a MapReduce program to find the maximum temperature in each year.										CO 2													
4		Develop a MapReduce program to find the grades of student's.										CO 2													
5		Develop a MapReduce program to implement Matrix Multiplication										CO 3													
6		Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.										CO 3													
7		Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day.										CO 4													
8		Develop a MapReduce program to find the number of products sold in each country by considering sales data containing fields like <table border="1"><tr><td>Tranction Date</td><td>Prod uct</td><td>Pri ce</td><td>Payment Type</td><td>Na me</td><td>Ci ty</td><td>St ate</td><td>Cou ntry</td><td>Account Created</td><td>Last_L ogin</td><td>Latit ude</td><td>Longi tude</td></tr></table>										Tranction Date	Prod uct	Pri ce	Payment Type	Na me	Ci ty	St ate	Cou ntry	Account Created	Last_L ogin	Latit ude	Longi tude	CO 4	
Tranction Date	Prod uct	Pri ce	Payment Type	Na me	Ci ty	St ate	Cou ntry	Account Created	Last_L ogin	Latit ude	Longi tude														
9		Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.										CO 5													
10		XYZ.com is an online music website where users listen to various tracks, the data gets collected which is given below. The data is coming in log files and looks like as shown below.										CO 5													

UserId	TrackId	Shared	Radio	Skip
111115	222	0	1	0
111113	225	1	0	0
111117	223	0	1	1
111115	225	1	0	0
Write a MapReduce program to get the following • Number of unique listeners • Number of times the track was shared with others • Number of times the track was listened to on the radio • Number of times the track was listened to in total • Number of times the track was skipped on the radio				
Text Books				
1	Jure Leskovec, Anand Rajaraman, Jeff Ullman, “Mining of Massive Datasets”, Cambridge University Press, 3rd Edition, 2020			
2	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd, 1st Edition, 2015			
Reference Books				
1	Tom White, “Hadoop: The Definitive Guide”, O’Reilly Media, 4th Edition			
2	Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, “Big Data: Principles and Paradigms”, Morgan Kaufmann (Elsevier), 1st Edition			
Useful Links				
1	https://onlinecourses.nptel.ac.in/noc20_cs92/preview			
2	https://archive.nptel.ac.in/courses/106/104/106104189/			


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Program: B.Tech Third Year (CSE- Data Science)							
Semester		Course Code			Course Name		
VI		BDS33604			Data Visualization Technique		
Teaching Scheme		Examination Scheme(Th)			Examination Scheme(P)		
Theory(Th)	3HRS/week	CT-I	15	-	-		
Practical(P)	-	CT-II	15	-	-		
Total Credits	3	CA	10	-	-		
Duration of ESE: 3Hrs		ESE	60	-	-		
		Total Marks	100	-	-		
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand principles of effective data visualization.						
CO2	Design visualizations for complex, multivariate data.						
CO3	Create interactive dashboards for dynamic data exploration.						
CO4	Visualize geospatial data using maps and overlays to interpret location-based information.						
CO5	Integrate statistical analysis into visual representations.						
Course Content							
Unit I	Introduction to Data Visualization: Introduction to data visualization, The importance of visual communication in data science., Principles of effective data visualization, Types of visualizations (e.g., bar charts, line graphs, pie charts, histograms), Hands-On Activity Creating simple visualizations in Excel.						
Unit II	Understanding Data Types and Visualization Types: Types of data: Categorical vs. Numerical, Visualization choices based on data type, Introduction to color theory in data visualization.						
Unit III	Advanced Visualization with Python: Customizing visualizations in Python. Advanced chart types: Heat maps, Pair plots, and Violin plots, Introduction to Plotly for interactive visualizations.						
Unit IV	Exploratory Data Analysis (EDA): Principles of EDA, Visualizing distributions and relationships between variables, Visualizing missing data and outliers.						
Unit V	Dashboard Design and Data Storytelling: Principles of dashboard design. data: visualizing trends, comparisons, and insights .Introduction to Tableau for interactive dashboards.						
Text Books							
1	Data Visualization: A Practical Introduction" by Kieran Healy						
2	Interactive Data Visualization for the Web" by Scott Murray						
3	"Data Visualization: A Practical Introduction" by Kieran Healy						
Reference Books							
1	Data Visualization: A Practical Introduction" by Kieran Healy						
2	Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic.						
3	The Visual Display of Quantitative Information" by Edward Tufte						

4	Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics" by Nathan Yau
Useful Links	
1	https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/
2	https://onlinecourses.nptel.ac.in/noc25_bt43/preview
3	https://nptel.ac.in/courses/102105556
4	https://nptel.ac.in/courses/106107220
5	https://archive.nptel.ac.in/noc/courses/noc17/SEM2/noc17-mg24/


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33605			Data Visualization Technique - lab	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	-		CT-I	-		-	
Practical(P)	2		CT-II	-		-	
Total Credits	1		CA	-		CA	25
Duration of ESE:			ESE	-		ESE	25
			Total Marks	-		Total Marks	50
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand various data visualization tools with a focus on Tableau's features and interface.						
CO2	Demonstrate the ability to connect, prepare, and manipulate data in Tableau						
CO3	Apply data transformation techniques for meaningful chart design visualizations.						
CO4	Create visually engaging dashboards with diverse chart types.						
CO5	Design storytelling dashboards using actions and layouts.						
Pre-Requisites: Python							
Sr.no	List of Experiments						COs
1	Introduction to various Data Visualization tools.						CO 1
2	Introduction to Tableau and Installation						CO 1
3	Demonstration on connecting to Data and preparing data for visualization in Tableau						CO 2
4	Demonstrate to creating a View - formatting charts, adding filters, creating calculated fields and defining parameters.						CO 2
5	Implementation of data Aggregation and Statistical functions in Tableau.						CO 3
6	Demonstration on data Visualizations in Tableau.						CO 3
7	Implementation of basic Dashboards in Tableau						CO 4
8	Demonstrate to display calculated fields in visualizations (e.g., Profit Ratio = Profit/Sales).						CO 4
9	Demonstrate to create a parameter to control the chart (e.g., select measure: Sales or Profit).						CO 5
10	Dashboard Design and Storytelling – Components of Dashboard, Understanding how to place worksheets in Containers, Action filters and its types.						CO 5
Text Books							
1	Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018						
2	“Learning Tableau” by Joshua N. Milligan						
Reference Books							
1	Mamta Mittal, Abhishek Raheja, “Data Visualization and Storytelling with Tableau”, CRC Press, 2023						
Useful Links							
1	https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-to-dashboard-mastering-visual-storytelling-with-tableau-batch-2/?v=c86ee0d9d7ed						

2	https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/data-to-dashboard-mastering-visual-storytelling-with-tableau/?v=c86ee0d9d7ed
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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33606			PEC – II (Cryptography)	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory (Th)	4 Hrs./ Week		CT-I	15 Marks		-	-
Practical (P)	-		CT-II	15 Marks		-	-
Total Credits	4		CA	10 Marks		-	-
Duration of ESE: 3 Hrs			ESE	60 Marks		-	-
			Total Marks	100 Marks		-	-
Pre-Requisites: Basic understanding of computer networks and internet concepts.							
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Explain the fundamentals of cryptographic algorithms and network security.						
CO2	Analyze symmetric encryption algorithms and modern algorithms with modes of operation.						
CO3	Apply public key cryptography algorithms such as RSA and Diffie-Hellman.						
CO4	Implement hash functions and digital signatures.						
CO5	Understand authentication protocols and key management techniques.						
Course Content							
Unit I	Introduction to Cryptography: Security goals (confidentiality, integrity, availability, etc.), Attacks: passive and active, Security services and mechanisms, Introduction to cryptography, Substitution and transposition techniques						
Unit II	Symmetric Key Cryptography: Block ciphers and the Data Encryption Standard (DES) Advanced Encryption Standard (AES), Modes of operation (ECB, CBC, CFB, OFB, CTR) Modern symmetric algorithms (e.g., Blowfish, RC4)						
Unit III	Asymmetric Key Cryptography: Principles of public key cryptosystems, RSA algorithm Key distribution and management, Diffie-Hellman key exchange, ElGamal cryptosystem						
Unit IV	Cryptographic Hash Functions and Digital Signatures: Hash functions: SHA-1, SHA-2 MD5, Message Authentication Codes (MAC), Digital signatures and authentication protocols Digital Signature Standard (DSS)						
Unit V	Network Security Applications: Authentication applications (Kerberos), IP security (IPSec), Secure Socket Layer (SSL) and Transport Layer Security (TLS), Email security (PGP, S/MIME), Firewalls and intrusion detection systems (IDS)						
Text Books							
1	William Stallings, Cryptography and Network Security: Principles and Practice						
2	Behrouz A. Forouzan, Cryptography and Network Security						
Reference Books							
1	Charlie Kaufman, Network Security: Private Communication in a Public World						
2	Atul Kahate, Cryptography and Network Security						
Useful Links							

1	https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2	https://archive.nptel.ac.in/courses/106/105/106105162/


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Program: B.Tech Third Year (CSE- Data Science)					
Semester		Course Code		Course Name	
VI		BDS33607		PEC – II (Machine Learning)	
Teaching Scheme		Examination Scheme(Th)		Examination Scheme(P)	
Theory(Th)	4	CT-I	15	-	-
Practical(P)	0	CT-II	15	-	-
Total Credits	4	CA	10	CA	25 Marks
Duration of ESE: 3Hrs		ESE	60	ESE	25 Marks
		Total Marks	100	Total Marks	50 Marks
Pre-Requisites:					
Course Outcomes: After the completion of this course, students will be able to-					
CO1	Apply regression and decision trees across ML paradigms.				
CO2	Use PCA, LDA, and factor analysis for dimensionality reduction.				
CO3	Evaluate classifiers like Naïve Bayes and SVM with tuning.				
CO4	Analyze clustering methods for unsupervised learning.				
CO5	Apply association rules and recommendation techniques.				
Course Content					
Unit I	Introduction: ML Techniques and overview, Learn from data evaluation: Data Mining vs. Data Analysis Vs. Data Science, Types of Machine Learning: supervised, Unsupervised, Semi supervised and Reinforcement Learning, Types of supervised learning: Regression – Linear regression, design Linear regression model, Logistic Regression, design Logistic Regression model, Decision Tree Learning, design Decision Tree Learning model, Random Forest, design Random Forest model				
Unit II	Dimensionality Reduction: Feature selection, Feature extraction, Factor analysis, Regression vs Factor Analysis, Multicollinearity, PCA, Eigen vector, Eigen value, LDA, Maximum separable lines, Design PCA model				
Unit III	Supervised Learning: Naïve Bayes Classifier, Likelihood, Confusion Matrix, Evaluation Matrices – Accuracy, Precision, Recall, F1-Score, Specificity, Implementation of Navie Bayes, SVM, Hyperplane, Margin, Hyper parameter Optimization, Hyper parameter search and model building				
Unit IV	Unsupervised Learning: Cluster Analysis, classification of clustering, K-means Clustering, Euclidean Distance, centroid, implement k-means clustering, Fuzzy C-means Clustering, Hierarchical Clustering, dendrogram, implement hierarchical clustering				
Unit V	Association Rules: Association Rules Parameters, Association Rule Mining, Apriori Algorithm, Market Basket Analysis, implement Market Basket Analysis, Recommendation Engine, types of Recommendation Engine, User Based Collaborative Filtering, Content Based Filtering, implement Market Basket Analysis				
Text Books					
1	Tom M Mitchell, Machine Learning, McGraw – Hill Education (India) Private Limited, 2013.				
2	Machine Learning: An Algorithmic Prespective, CRC Press, 2009, by Stephen Marsland				
3	Chris Bishop, Pattern Recognition and Machine Learning				

4	Dr. Nilesh Shelke, Dr. Gopal Sakarkar, Dr N V Choudhari, Introduction to Machine Learning, Ganu Prakashan
Reference Books	
1	Ethem Adpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004
2	Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies by John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy
3	Machine Learning for Beginners, by Chris Sebastian, Kindle Edition
Useful Links	
1	https://nptel.ac.in/courses/106106139
2	https://onlinecourses.nptel.ac.in/noc23_cs18/preview


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33608			PEC – II (Mobile Computing)	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory (Th)	4 Hrs./ Week	CT-I	15 Marks	-	-		
Practical (P)	-	CT-II	15 Marks	-	-		
Total Credits	4	CA	10 Marks	-	-		
Duration of ESE: 3 Hrs		ESE	60 Marks	-	-		
		Total Marks	100 Marks	-	-		
Pre-Requisites: Basic understanding of computer networks and internet concepts.							
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand mobile computing concepts, applications, and platforms.						
CO2	Explain wireless communication and mobile network standards.						
CO3	Analyze mobile IP and routing in MANETs.						
CO4	Evaluate transport protocols for mobile environments.						
CO5	Develop basic mobile apps using Android and iOS features.						
Course Content							
Unit I	Introduction to Mobile Computing: Overview of Mobile Computing: Definition and scope, Applications and benefits, Evolution of mobile computing, Mobile Devices and Systems: Types of mobile devices, Mobile operating systems (Android, iOS), Mobile application development platforms						
Unit II	Mobile Communication and Networks: Wireless Communication Fundamentals: Radio wave propagation, Modulation techniques, Multiple access techniques (FDMA, TDMA, CDMA, OFDMA) Cellular Networks: Architecture of cellular systems GSM, GPRS, UMTS, LTE, and 5G, Handoff and roaming						
Unit III	Mobile Network Layer: Mobile IP: Mobile IP protocol, Agent discovery, registration, and tunneling, Route optimization, Mobile Ad-hoc Networks (MANETs): Characteristics and challenges, Routing protocols (DSDV, AODV, DSR), Applications of MANETs						
Unit IV	Mobile Transport Layer Transport Protocols for Mobile Computing: Traditional TCP and its limitations in mobile environments, TCP enhancements for wireless networks (e.g., Indirect TCP, Mobile TCP), Overview of other transport protocols (UDP, SCTP)						
Unit V	Overview of Mobile Application Development, User Interface Design: Principles of mobile UI/UX design, Responsive design and adaptation for different screen sizes, Mobile Application Programming: Basics of Android and iOS development, Using APIs and web services, Accessing device features (GPS, camera, sensors)						
Text Books							
1	"Mobile Computing: Principles, Devices, and Systems" by Asoke K. Talukder, Roopa R. Yavagal, and Hasan Ahmed						
2	"Fundamentals of Mobile and Pervasive Computing" by Frank Adelstein, Sandeep K. S. Gupta, Golden G. Richard III, and Loren Schwiebert						
3	"Mobile Computing" by Asoke K. Talukder, Hasan Ahmed, and Roopa R. Yavagal						

Reference Books	
1	"Mobile Computing Handbook" edited by Mohammad Ilyas and Imad Mahgoub
2	"Handbook of Wireless Networks and Mobile Computing" edited by Ivan Stojmenovic
3	"Mobile Computing: Technology, Applications, and Service Creation" by Asoke K. Talukder and Manish Chaitanya
4	"Mobile Computing and Wireless Networks: Concepts, Methodologies, Tools, and Applications" edited by Information Resources Management Association
Useful Links	
1	https://archive.nptel.ac.in/courses/106/106/106106147/
2	https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code		Course Name		
VI			BDS33609		PEC-II (Medical Imaging Analysis with AI)		
Teaching Scheme			Examination Scheme(Th)		Examination Scheme(P)		
Theory(Th)	4Hrs/Week		CT-I	15	-	-	
Practical(P)	-		CT-II	15	-	-	
Total Credits	04		CA	10	-	-	
Duration of ESE: 3Hrs			ESE	60	-	-	
			Total Marks	100	-	-	
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand the concepts of medical imaging modalities and their applications in healthcare.						
CO2	Apply image pre-processing and enhancement techniques to improve the quality of medical images.						
CO3	Implement CNNs, GANs, and Transformers for medical image analysis.						
CO4	Apply AI techniques for medical image classification and anomaly detection.						
CO5	Evaluation of case studies and real-world applications of AI in medical image processing.						
Course Content							
Unit I	Fundamentals of Medical Imaging: Overview of medical imaging modalities (X-ray, MRI, CT, etc.), Image acquisition techniques and parameters, Characteristics of medical image data						
Unit II	Image Preprocessing and Enhancement : Noise reduction and image denoising techniques, Contrast, enhancement and histogram equalization, Image normalization techniques, Image registration techniques						
Unit III	AI Techniques for Medical Image Analysis: Introduction to convolutional neural networks (CNNs), Image segmentation using CNNs and other techniques, Feature extraction and representation learning, Medical Image Generation						
Unit IV	Medical Image Classification and Anomaly Detection: Binary and multiclass classification of medical images using Transformer, Detection of abnormalities and lesions, Case studies on AI applications in medical imaging analysis						
Unit V	AI in Clinical Imaging Practice – Case Studies and Applications: Case study: AI in radiology – automated tumor detection (e.g., lung, brain, breast cancer), AI for retinal disease diagnosis (e.g., diabetic retinopathy using fundus images), Role of AI in COVID-19 chest X-ray/CT scan analysis, Generative models (e.g., GANs) for data augmentation in rare disease diagnosis, Transformer-based approaches for organ segmentation and 3D reconstruction, Ethical and performance evaluation of AI models on real clinical datasets, Deployment of AI tools in hospitals: workflow integration and user feedback						
Text Books							
1	S. Kevin Zhou. Deep Learning for Medical Image Analysis. Cham: Springer International Publishing, 2017						
Reference Books							
1	Atam P. Dhawan. Medical Image Analysis. Hoboken, NJ: Wiley-IEEE Press, 2003.						
2	Jacob Beutel, Harold L. Kundel, and Richard L. Van Metter, eds. Handbook of Medical Imaging, Volume 1: Physics and Psychophysics. Bellingham, WA: SPIE Press, 2000.						
Useful Links							
1	https://onlinecourses.nptel.ac.in/noc22_bt34/preview						


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33610			PEC – III (Computer Security)	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory (Th)	4 Hrs./ Week		CT-I	15 Marks		-	-
Practical (P)	-		CT-II	15 Marks		-	-
Total Credits	4		CA	10 Marks		-	-
Duration of ESE: 3 Hrs			ESE	60 Marks		-	-
			Total Marks	100 Marks		-	-
Pre-Requisites: Basic understanding of computer networks and internet concepts.							
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand information security needs and OSI security architecture.						
CO2	Analyze of various cryptography algorithms, key management.						
CO3	Describe message authentication, hash functions, and PKI.						
CO4	Analyze network security protocols, firewalls, IDS/IPS, and classical cryptography.						
CO5	Adapting software vulnerability, Electronic Payment, Electronic Mail Security						
Course Content							
Unit I	Need of Information Security: Introduction, History of Information security, Attributes of security- authentication, access control, confidentiality, authorization, integrity, non-reproduction. OSI Security Architecture: attacks, services and mechanisms. Security Attacks, Security services, A model of Internetwork Security. Conventional Encryption: Classical Encryption Techniques and Problems on classical ciphers, Security architecture.						
Unit II	Introduction to Secret key and cryptography: Encrypt given messages using DES, AES, IDEA, Problems on cryptography algorithms, Principles, finite fields, stream cipher, block cipher modes of operation, DES, Triple DES, AES, IDEA, RC5, key distribution. Introduction to Public key and Cryptography: Encrypt given messages using ECC, Problems on key generation, cryptography algorithms Principles, Introduction to number theory, RSA algorithm, security of RSA, Key management- Diffie-Hellman key exchange, man-in-the-middle attack, Elliptical curve cryptography						
Unit III	Message Authentication and Hash Functions: Authentication Requirements and Functions, Hash Functions and their Security, MD5 Message Digest Algorithm, Kerberos. Key Management: Digital Certificates-Certificate types, X.509 Digital Certificate format, Digital Certificate in action, Certificate Authentication.						
Unit IV	Introduction to Network Security: Network, Transport and Periphery Security, Study of IPSEC, TLS, and SSL. Firewalls - design principles, trusted systems, Intrusion Detection System, Intrusion Prevention System. Implementation and analysis of IPSEC, TLS and SSL, Introduction to cryptography - Classical cryptography.						
Unit V	Software Vulnerability: Phishing, Buffer Overflow, Cross-site Scripting (XSS), SQL Injection. Electronic Payment: Payment Types, Enabling Technologies-Smart Cards and Smart Phones, Cardholder Present E-Transaction-Attacks, Chip Card Transactions, Payment over Internet-Issues and Concerns, Secure Electronic Transaction, Online Rail Ticket Booking, Electronic Mail Security: Pretty Good Privacy, S/MIME.						
Text Books							

1	Cryptography and network security - principles and practices, William Stallings, Pearson Education, 2002.
2	Network Security and Cryptography, Bernard Menezes, Cengage Learning.
Reference Books	
1	Information System Security, Nina Godbole, Wiley India, 2008.
2	Network security, private communication in a public world, Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall, 2002.
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104139/
2	http://nptel.ac.in/courses/117107095


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33611			PEC–III (Natural language Processing)	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	4Hrs/Week		CT-I	15	-	-	
Practical(P)	0		CT-II	15	-	-	
Total Credits	4		CA	10	-	-	
Duration of ESE: 3Hrs			ESE	60	-	-	
			Total Marks	100	-	-	
Pre-Requisites:							
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand morphology, regex, and apply finite-state automata in NLP.						
CO2	Apply n-gram models and POS tagging for syntactic analysis.						
CO3	Analyze syntax using context-free grammars and parse trees.						
CO4	Interpret semantics using predicate logic and word sense disambiguation.						
CO5	Evaluate discourse, dialogue systems, and machine translation methods.						
Course Content							
Unit I	OVERVIEW AND MORPHOLOGY: Introduction – Models -and Algorithms, Regular Expressions, Basic Regular Expression Patterns, Finite State Automata Understand the wireless sensor network principles. Morphology, Inflectional Morphology, Derivational Morphology, Finite-State Morphological Parsing, Porter Stemmer.						
Unit II	WORD LEVEL AND SYNTACTIC ANALYSIS: N-grams Models of Syntax ,Counting Words , L T P C 3 0 0 3 Unsmoothed N-grams .Smoothing- Back-off Deleted Interpolation ,Entropy - English Word Classes - Tag sets for English Part of Speech Tagging, Rule Based Part of Speech Tagging ,Stochastic Part of Speech Tagging, Transformation, Based Tagging.						
Unit III	CONTEXT FREE GRAMMARS: Context Free Grammars for English Syntax- Context, Free Rules and Trees, -Understand the network simulation tools. Sentence, Level Constructions– Agreement, Sub Categorization .Parsing, Top-down – Early Parsing, feature Structures, Probabilistic Context-Free Grammars.						
Unit IV	SEMANTIC ANALYSIS: Representing Meaning, Meaning Structure of Language-First Order Predicate Calculus Representing Linguistically Relevant Concepts, Syntax-Driven Semantic Analysis, Semantic Attachments, and Syntax-Driven Analyzer. Robust Analysis, Lexemes and Their Senses, Internal Structure - Word Sense Disambiguation, Information Retrieval.						
Unit V	LANGUAGE GENERATION AND DISCOURSE ANALYSIS: Discourse, Reference Resolution, Text Coherence, Discourse Structure, Coherence. Dialog and Conversational Agents, Dialog Acts, Interpretation -Conversational Agents. Language Generation, Architecture-Surface Realizations ,Discourse Planning .Machine Translation, Transfer Metaphor, Interlingua – Statistical Approaches.						
Text Books							
1	Daniel Jurafsky and James H Martin, ”Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice						

	Hall, 2nd Edition, 2008.
2	C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA:,1999.
Reference Books	
1	C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA:,1999.
2	Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000.
Useful Links	
1	https://nptel.ac.in/courses/106105158
2	https://archive.nptel.ac.in/courses/106/106/106106211/

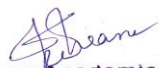

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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33612			PEC–III (Ad-Hoc Sensor Networks)	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	4Hrs/Week		CT-I	15	-	-	
Practical(P)	0		CT-II	15	-	-	
Total Credits	4		CA	10	-	-	
Duration of ESE: 3Hrs			ESE	60		-	
			Total Marks	100		-	
Pre-Requisites:							
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand Ad-hoc network fundamentals and MAC protocol design.						
CO2	Analyze routing protocols and power-aware strategies.						
CO3	Examine multicast routing architectures and approaches.						
CO4	Evaluate transport protocols and security in Ad-hoc networks.						
CO5	Assess QoS and energy-efficient techniques at MAC and network layers.						
Course Content							
Unit I	Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet, MAC protocols for Ad-hoc Wireless Networks, Issues in designing a MAC protocol, Design goals of MAC Protocols, Classification of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention -Based protocols With Scheduling Mechanisms, MAC Protocols that use directional Antennas.						
Unit II	Routing Protocols for Ad-hoc Wireless Networks Introduction, Issues in designing a Routing Protocol for Ad-hoc Wireless Networks, Classification of Routing Protocols, Table Driven Routing Protocols, On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power - Aware Routing Protocols.						
Unit III	Multicast Routing in Ad-hoc Wireless Networks Introduction, Issues in Designing a Multicast routing Protocol, Operation of Multicast Routing Protocols Architecture Reference Model for Multicast Routing protocols, Classification of Multicast Routing Protocols, Tree based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols.						
Unit IV	Transport Layer and Security Protocols for Ad-hoc Networks Introduction, Issues in Designing a Transport Layer Protocol, Design Goals of Transport Layer Protocol, Classification of Transport Layer Solution, TCP over Transport Layer Solutions, Other Transport Layer Protocols for Ad-hoc Networks, Security in Ad-hoc Wireless Networks, Issues and Challenges in security provisioning, Network Security attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.						
Unit V	Quality of Service and Energy Management in Ad-hoc Wireless Networks Introduction, Issues and Challenges In Providing Quality of Service in Ad-hoc Wireless Networks, Classification of QOS Solutions, MAC Layer Solutions, Network Layer Solutions, Energy Management in Ad-hoc Wireless Networks Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery						

	management schemes, Transmission Management Schemes, System Power Management Schemes
Text Books	
1	Ramjee Prasad, Anand Raghawa Prasad, Albena Mihovska, Nidhi, “6G Enabling Technologies: New Dimensions to Wireless Communication, River Publishers
2	Prashant Ranjan, Ram Shringar Rao, Krishna Kumar, Pankaj Sharma, “Wireless Communication: Advancements and Challenges”, CRC Press
Reference Books	
1	Mohammed Usman, Mohd Wajid, Mohd Dilshad Ansari, “Enabling Technologies for Next Generation Wireless Communications”, CRC Press
2	Vandana Sharma, Balamurugan Balusamy, Gianluigi Ferrari, “Wireless Communication Technologies: Roles, Responsibilities, and Impact of IoT, 6G, and Blockchain Practices”, CRC Press
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee66/preview
2	https://archive.nptel.ac.in/courses/108/106/106106167/


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33613			PEC–III (Introduction to Internet of Medical Things)	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	4Hrs/Week	CT-I	15	-	-	-	-
Practical(P)	-	CT-II	15	-	-	-	-
Total Credits	04	CA	10	-	-	-	-
Duration of ESE: 3Hrs			ESE	60	-	-	-
			Total Marks	100	-	-	-
Pre-Requisites:							
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Understand IoMT concepts, evolution, and healthcare impact.						
CO2	Evaluate wearable sensors and smart medical devices.						
CO3	Apply sensor and communication technologies to IoMT systems.						
CO4	Analyze IoMT in disease management and real-time monitoring.						
CO5	Design secure, scalable IoMT architectures with real-time analytics.						
Course Content							
Unit I	Introduction to Internet of Medical Things (IoMT): Definition and scope of IoMT, Evolution and current trends, Opportunities and challenges of IoMT adoption.						
Unit II	IoMT Devices and Applications : Wearable sensors and health trackers, Remote patient monitoring devices, Smart medical devices for home healthcare						
Unit III	Design and Implementation of IoMT Systems: Sensor technologies and data acquisition methods, Communication protocols for IoMT devices, Cloud-based platforms and analytics						
Unit IV	IoMT in Clinical Practice: IoMT applications in disease management, Real-time monitoring and intervention, Case studies on successful implementation						
Unit V	IoMT System Architecture and Development: Architecture of IoMT systems: sensing layer, network layer, data processing, and application layer, Communication protocols in IoMT (e.g., Bluetooth Low Energy, Zigbee, LoRaWAN, MQTT), Embedded system design for medical devices (e.g., microcontrollers, edge devices), IoMT data security and privacy: encryption, access control, HIPAA compliance, Cloud and edge computing integration for real-time analytics						
Text Books							
1	Sudip Misra and Subhadeep Sarkar. Internet of Things in Healthcare: Technologies, Applications, and Challenges. Boca Raton: CRC Press, 2017.						
Reference Books							
1	Eric Topol and Steven R. Steinhubl. Wearable Sensors in Healthcare. Cambridge, MA: Academic Press, 2019.						
2	Athanasios V. Vasilakos and Jun Peng, eds. The Internet of Things in Healthcare: Potentials and Challenges. Cham: Springer International Publishing, 2020.						

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2	https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-cs66/


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Program: B.Tech Third Year (CSE- Data Science)					
Semester		Course Code		Course Name	
VI		BEC33611		Microprocessor and Microcontroller	
Teaching Scheme		Examination Scheme(Th)		Examination Scheme(P)	
Theory(Th)	2	CT-I	7	-	-
Practical(P)	-	CT-II	7	-	-
Total Credits	2	CA	6	-	-
Duration of ESE: 2 Hrs		ESE	30	-	-
		Total Marks	50	-	-
Pre-Requisites:					
Course Outcomes: After the completion of this course, students will be able to-					
CO1	Explain the structure, organization, and instruction set of 8086 microprocessor.				
CO2	Implement interfacing of 8086 microprocessor with input output devices by using program Peripheral devices.				
CO3	Analyze the organizational structure & instruction set of microcontroller 8051.				
Course Content					
Unit I	8086 microprocessor, Pin diagram, Architecture, features and operating modes, Flag Register, memory organization & interfacing, Addressing modes, complete instruction set, Interrupt structure.				
Unit II	I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & Matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.				
Unit III	Comparison of microprocessor & micro-controller, Introduction to 8051 microcontroller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051. 8051, Interrupt structure, Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes.				
Text Books					
1	M.A. Mazidi & J.G. Mazidi, the 8051 Micro-controller and Embedded system, 3rd Indian reprint, Pearson Education				
2	Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson.				
3	Programming PIC Micro-controllers with XC8 by Authors: Subero, Armstrong.				
Reference Books					
1	Micro-controllers – Peatman, Mc Graw Hill.				
2	Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.				
3	Introduction to Microprocessors for Engineers and Scientists, P. K. Ghosh, P. R. Sridhar, PHI Publication.				
Useful Links					
1	https://onlinecourses.nptel.ac.in/noc22_ee12/preview				
2	https://nptel.ac.in/courses/108105102				

3	https://nptel.ac.in/courses/108/105/108105159/
4	https://nptel.ac.in/courses/108/104/108104139/
5	https://nptel.ac.in/courses/117/106/117106108/


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Program: B.Tech Third Year (CSE- Data Science)							
Semester			Course Code			Course Name	
VI			BDS33614			Data Analysis using R- Lab	
Teaching Scheme			Examination Scheme(Th)			Examination Scheme(P)	
Theory(Th)	-		CT-I	-		-	
Practical(P)	4		CT-II	-		-	
Total Credits	2		CA	-		CA	50
Duration of ESE:			ESE	-		ESE	50
			Total Marks	-		Total Marks	100
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Demonstrate configure of the R environment and essential packages for data analysis.						
CO2	Apply basic R programming concepts to solve problems.						
CO3	Work with R data structures and perform string operations.						
CO4	Import data and perform exploratory data analysis in R.						
CO5	Create visualizations such as bar charts and pie charts and perform basic statistical analysis using R.						
Sr.no	List of Experiments						COs
1	Download and install R-Programming environment and install basic packages using install. Packages () command in R.						CO 1
2	Learn al the basics of R-Programming (Data types, Variables, Operators etc.)						CO 1
3	Implement R-Loops with different examples						CO 2
4	Learn the basics of functions in R and implement with examples.						CO 2
5	Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R.						CO 3
6	Implement different String Manipulation functions in R.						CO 3
7	Implement different data structures in R(Vectors ,Lists ,Data Frames)						CO 4
8	Write a program to read acsv file and analyze the data in the file in R						CO 4
9	Create pie charts and bar charts using R.						CO 5
10	Create a data set and do statistical analysis on the data using R.						CO 5
Text Books							
1	Hadley Wickham, Mine Çetinkaya-Rundel, and Garrett Grolemund, “R for Data Science”, (2nd Edition)						
2	Jonathon Love and Michael J. Crawley, “Data Analysis Using R”						
Reference Books							
1	Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, 2nd edition, Pearson Education, 2018.						
2	S. R. Mani Sekhar and T. V. Suresh Kumar, Programming with R, 1 st Edition, CENGAGE, 2017						
Useful Links							

1	https://nptel.ac.in/courses/111104147
2	https://onlinecourses.nptel.ac.in/noc22_ma34/preview


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Program: B.Tech Third Year (CSE- Data Science)							
Semester		Course Code			Course Name		
VI		BDS33614			Power BI - Lab		
Teaching Scheme		Examination Scheme(Th)			Examination Scheme(P)		
Theory(Th)	-	CT-I	-	-	-		
Practical(P)	4	CT-II	-	-	-		
Total Credits	2	CA	-	CA		50	
Duration of ESE:		ESE	-	ESE		50	
		Total Marks	-	Total Marks		100	
Course Outcomes: After the completion of this course, students will be able to-							
CO1	Import and clean data from various sources like Excel and CSV using Power Query for effective data preparation.						
CO2	Develop a variety of visualizations and interactive dashboards to explore and present data insights.						
CO3	Apply DAX formulas to create calculated columns and time-based metrics for advanced data analysis.						
CO4	Build data models by establishing relationships between multiple tables to enable comprehensive analysis						
CO5	Publish reports using Power BI Service, and enhance reports with custom visuals, themes, and interactivity						
Sr.no	List of Experiments					COs	
1	Load data from an Excel or CSV file and perform basic data cleaning in Power Query.					CO 1	
2	Create common chart types to explore the data visually.					CO 1	
3	Create an interactive sales dashboard.					CO 2	
4	Use DAX to create time-based metrics.					CO 2	
5	Build a data model from multiple related tables.					CO 3	
6	Add advanced formatting to enhance report interactivity.					CO 3	
7	Create complex DAX expressions.					CO 4	
8	Enable detailed exploration of data.					CO 4	
9	Import custom visuals and apply report themes.					CO 5	
10	Publish reports to Power BI Service.					CO 5	
Text Books							
1	Daniil Maslyuk, “Microsoft Power BI Data Analyst Certification Guide: PL-300 Exam Guide”, Packt Publishing						
2	Alberto Ferrari & Marco Russo, “Analyzing Data with Power BI and Power Pivot for Excel”, Microsoft Press						
Reference Books							
1	Alberto Ferrari & Marco Russo, “The Definitive Guide to DAX”, Microsoft Press						
2	Adam Aspin, “Pro Power BI Desktop”, Apress						
Useful Links							

1	https://elearn.nptel.ac.in/shop/completed-courses/partnering-closed/unleash-your-datas-potential-mastering-transformations-with-power-query-editor/?v=c86ee0d9d7ed
2	https://nielit.gov.in/calicut/content/powerbi


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