

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/Engg./Elective/24/2018

It is hereby inform to all concerned that, on the recommendation of the Dean, Faculty of Science & Technology the **Academic Council** at its **meeting held on 30 June & 02 July 2018** has accepted the 'Data Analytics with R' as an Open Elective-I for semester VII & Data Science as an open Elective -II for semester VIII to the Computer Science & Engineering branch and 'Internet of Things Using Embedded System' as an Open Elective-I for semester VII to the Electronics and Telecommunication branch for B.E. Final Year under the Faculty of Science & Technology as enclosed herewith.

This is effective from the Academic Year 2018-19 and onwards.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2018/19358-82
Date:- 18-09-2018.

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[Signature]
**Deputy Registrar,
Syllabus Section**

Copy forwarded with compliments to :-

- 1] **The Principals, affiliated concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University.**
- 2] The Director, University Network & Information Centre, UNIC, with a **request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation,
- 2] **The Section Officer, [Engineering Unit] Examination Branch,**
- 3] The Section officer, [Eligibility Unit],
- 4] **The Programmer [Computer Unit-1] Examinations,**
- 5] **The Programmer [Computer Unit-2] Examinations,**
- 6] The In-charge, [E-Suvidha Kendra],
- 7] The Public Relation Officer,
- 8] The Record Keeper,

**D.R. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD.**



Elective-II

Data Science

B.E. Final Year

Computer Science & Engineering

for Semester - VIII

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY.

[Effective from 2018-19 & onwards]

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
Final Year Engineering (CSE)
Semester – II

Course Code:
Teaching Scheme:
Theory: 4 Hours/Week

Title: Data Science (Elective-II)
Examination Scheme
Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hrs

Prerequisite:

- Fundamentals of database
- Basic Programming Skills
- Linux (Suggested)

Objectives:

- Able to apply fundamental algorithmic ideas to process data.
- Learn to apply hypotheses and data into actionable predictions.
- Document and transfer the results and effectively communicate the findings using visualization techniques.
- Provide Insights about the Roles of a Data Scientist and enable to analyze the Big Data.
- Understand the principles of Data Science for the data analysis and learn cutting edge tools and techniques for data analysis.
- Learn business decision making and Data Visualization

CONTENTS

SECTION-A:

Unit 1: Introduction to Data Science:

[6 Hrs]

What is Data Science? What does Data Science involve? Era of Data Science, Business Intelligence vs Data Science, Life cycle of Data Science, Big Data, Tools of Data Science.

UNIT 2: Recommender Engines:

[8 Hrs]

Association Rule Mining, Apriori Algorithm, Market Basket Analysis, Recommendation Engine & its working? **Recommendation Engines Types:** User-Based Collaborative Filtering, Content-Based Filtering, Building a Recommender System, Difference: User-Based and Item- Based Recommendation, Recommendation Use-case.

UNIT 3: Text Mining

[6 Hrs]

What is Text-Mining? Why Text-Mining? The concepts of text-mining, Use cases, Text Mining Algorithms, Sentiment Analysis: Reading Tweets, Positive & Negative Words Quantifying text, TF-IDF, Beyond TF-IDF.

SECTION-B:

Unit 4: Time Series Analysis

[6 Hrs]

Time Series: What is Time Series data? Time Series variables, Different components of Time Series data, Visualize the data to identify Time Series Components, Implement ARIMA model for forecasting, Exponential smoothing models.

UNIT 5: Data Visualization: Tableau

[8 Hrs]

What is Tableau? Data Sources, Worksheets, Calculations, Sorting, Filters: Basic, Quick, Context, Condition, Top. Charts: Bar Chart, Line Chart, Pie Chart, CrossTab, Scatter Plot, Box Plot, Histogram. Advanced Concepts: Dashboards, Formatting, Forecasting.

UNIT 6: Deep Learning:

[6 Hrs]

Reinforced Learning, Reinforcement learning Process Flow, Reinforced Learning Use cases, Deep Learning, Biological Neural Networks, Understand Artificial Neural Networks, Building an Artificial Neural Network, How ANN works, Important Terminologies of ANN's

Text Books:

1. "R for Data Science", Dan Toomey, PACKT Publication.
2. Data science and big data analytics, EMC
3. Doing Data Science, *Rachel Schutt and Cathy O'Neil*
4. Introducing Data Science, Davy Cielen
5. Data Science for Business, Foster Provost and Tom Fawcett, O'Reilly. Copyright © 2013

Reference Books:

1. Regression Analysis by Example,
2. Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann
3. An Introduction to Statistical Learning with Applications in R , Gareth James • Daniela Witten • Trevor Hastie, Robert Tibshirani, Springer

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section-A questions shall be set on first part and Section-B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions from each section, 15 marks each.

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
Final Year Engineering (CSE)

Semester – I

Course Code:

Title: - LAB-I Data Science (Elective-II)

Teaching Scheme

Examination Scheme

Practical: 2 Hours/Week

Term Work: 50 Marks

List of Practical Assignments:

- 1) Perform the following activities using Association Rule Mining
 - Load Adult data into R (Adult data is a built-in data set in the arules package of R).
 - Plot a graph of ten items with highest support.
 - Generate association rules with lhs values as "capital-loss=None" and "native-country=United-States"
 - Use arulesViz package to generate some visualizations from patterns.
- 2) Perform the following activities using Recommendation Engine
 - Load some dataset into R and convert the file into realRatingMatrix
 - Explore the data and plot a histogram of normalized ratings
 - Build a User based collaborative filter which recommends 5 items to user100 and user101
- 3) Create a corpus of the documents stored in folder "tm" in the "D:" drive. Create a document term matrix. Determine the number of documents, frequency of the terms in the documents, the terms in the documents.
- 4) To add a list of custom stop words to the original list of stop words. Remove these stop words from the file, "a1.txt" stored in folder, "tm1" in the "D:" drive.
- 5) Perform Text acquisition and wrangling on sample dataset also Convert data into a corpus or Vcorpus as well as perform the following text cleaning techniques
 - o Remove punctuations
 - o Remove numbers
 - o Convert it into lower case
 - o Strip white spaces
 - o Also convert the words to stem values
 - o Create a DocumentTermMatrix using it
- 6) Apply ARIMA and HoltWinters model analyse some dataset and check which model can give higher accuracy.
- 7) Apply various visualization techniques in Tableau.
- 8) Case Study on Deep Learning Techniques.

Term Work:

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above.

Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.

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**Elective-I
Data Analytics with R
B.E. Final Year
Computer Science & Engineering
for Semester - VII**

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY.

[Effective from 2018-19 & onwards]

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY

Final Year Engineering (CSE)

Semester – I

Course Code:

Teaching Scheme:

Theory: 4 Hours/Week

Title: Data Analytics with R (Elective-I)

Examination Scheme

Class Test: 20 Marks

Theory Examination (Marks): 80 Marks

Theory Examination (Duration): 03 Hrs

Prerequisite:

- Fundamentals of database
- Basic Programming Skills
- Linux (Suggested)

Objectives:

- Able to apply fundamental algorithmic ideas to process data.
- Learn to apply hypotheses and data into actionable predictions.
- Provide Insights about the Roles of a Data Analyst and enable to analyze the Big Data.
- Figure Out Machine Learning Algorithms.

CONTENTS

SECTION-A:

Unit 1: Statistics Essential for Analytics:

[8 Hrs]

Statistical Analysis: Inferential Statistics, Descriptive Statistics. **Measures of Central Tendency:** Mean, Median, Mode. **Measures of Spread:** Range, Inter-quartile Range, Standard Deviation, Variance, Skewness & Kurtosis. **Probability:** Introduction to Probability, Probability Distributions, Conditional Probability, Bayesian Inference, Normal Distribution, Poisson distribution and Binary Distribution. ANOVA, t-test, f-Test, Chi-Square Test, MANOVA.

Unit 2: Introduction to Data Analytics & R

[6 Hrs]

Introduction to Data Analytics: Introduction to terms like Business Intelligence, Business Analytics, Data Analytics, understanding Business Analytics and R, compare R with other software's in analytics.

Introduction to R Programming: The various kinds of data types in R and its appropriate uses, the built-in functions in R like: seq(), cbind (), rbind(), merge(), subsetting methods.

Data Manipulation in R: The various steps involved in Data Cleaning, functions used in Data Inspection, tackling the problems faced during Data Cleaning. **Data Import**

Techniques in R: Import data from spreadsheets and text files into R, basics of Web Scraping.

Unit 3 Data Extraction, Wrangling and Exploration

[6 Hrs]

What is Data? Types of Data, What is a Variable? Sampling Methods, Point Estimation, Hypothesis Testing, Parametric Testing, Non-Parametric Testing, Experimental designing,

Data Analysis Pipeline, What is Data Extraction, Raw and Processed Data, Data Wrangling, Exploratory Data Analysis, Visualization of Data.

SECTION-B:

Unit 4: Machine Learning

[6 Hrs]

Introduction to Machine Learning: What is Machine Learning? Machine Learning Use-Cases, Machine Learning Process Flow, Machine Learning Categories, **Supervised Learning:** Linear Regression (Univariate and multivariate Regression), Logistic Regression (Binary and Multivalued).

Unit 5: Classification

[8 Hrs]

Classification: What is Classification? Use cases of Classification, **Types of Classifier:** CHAID, CART (Classification & Regression Tree), Decision Tree, Random Forest, Navies Bayes, Support Vector Machine, Discriminant Analysis, XGBoost.

Unit 6: Clustering & Factor Analysis

[6Hrs]

Unsupervised Learning: What is Clustering? K-means Clustering, Fuzzy C-means Clustering, and Hierarchical Clustering.

Text Books:

1. "Statistics Unplugged", Sally Caldwell, 3rd Edition, WADSWORTH Cengage Learning.
2. Data Analytics Using R, Seema Acharya, Mc Graw Hill Education.
3. Data science and big data analytics, EMC
4. Introducing Data Science, Davy Cielen
5. Data Science for Business, Foster Provost and Tom Fawcett, O'Reilly.

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FACULTY OF ENGINEERING AND TECHNOLOGY
Final Year Engineering (CSE)
Semester – I

Course Code:

Title: - LAB-I Data Analytics with R (Elective-I)

Teaching Scheme

Examination Scheme

Practical: 2 Hours/Week

Term Work: 50 Marks

List of Practical Assignments:

- 1) Installing R and running basic commands in R.
- 2) Import the following data into R and calculate the mean, median, mode and standard deviation

The dataset looks like this:

	Rural Male	Rural Female	Urban Male	Urban Female
50-54	11.7	8.7	15.4	8.4
55-59	18.1	11.7	24.3	13.6
60-64	26.9	20.3	37.0	19.3
65-69	41.0	30.9	54.6	35.1
70-74	66.0	54.3	71.1	50.0

- 3) Perform Data wrangling, clean the data, Analyse and Visualization using appropriate type of graph on Some Dataset.
- 4) Perform Linear Regression methods by considering appropriate dataset.
- 5) Perform Logistic Regression methods by considering appropriate dataset.
- 6) Create a classifier on some dataset using Decision tree algorithm and another classifier on same dataset using random forest algorithm.
- 7) Perform K-means clustering on some dataset.
- 8) Perform C-means clustering on some dataset and save the membership data frame in csv format.

Term Work:

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above.

Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.

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Elective-I
Internet of Things Embedded System
B.E. Final Year
Electronics and Telecommunication
for Semester - VII

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY.

[Effective from 2018-19 & onwards]

Semester - I	
Internet of Things Using Embedded System	
Teaching Scheme: 4 Hrs/Week Practical: 2 Hrs/Week	Examination Scheme: Theory Examination: 80 Marks Class Test: 20 Marks Term Work: 25 Marks
Unit: 1	
Introduction to C and Python: C: Introduction, Data types, variable, operator, branches, loops, functions, Debugging and Optimization of C programs. Python: Python IDE, Data types, variable, operator, branches, loops, functions, List, Dictionary, Writing to a File, Reading from a File, handling exceptions.	
Unit: 2	
Arduino Uno: Architecture, pin configuration, Arduino IDE, Arduino Ethernet shield, Arduino Wi-Fi shield. NodeMCU: 8266 Wi-Fi module, hardware and pin diagram, Interface with Arduino IDE. Interfacing of analog and digital sensors, Interfacing of DC, Stepper and Servo motor, Interfacing of Display.	
Unit: 3	
Raspberry Pi: Models of Raspberry pi, R Pi 3 hardware, GPIO pins, operating system for R pi3, Installation of operating system on R pi3, Basic of Linux commands, configuring R pi3, Interfacing of Digital and Analog sensors, Interfacing of DC and servo motor.	
Unit: 4	
Networking & Protocol: UART, Wi-Fi, Ethernet, Bluetooth Low Energy (BLE), Message Queue Telemetry Transport, Extensible Messaging and Presence Protocol (XMPP), Data Distribution Service (DDS), Advanced Message Queuing Protocol (AMQP), Client and Server.	
Unit: 5	
Interfacing: Connecting Arduino to Internet using Ethernet shield and Wi-Fi module, Configuring NodeMCU to connecting to server, NodeMCU interfacing with web services, configuring R pi 3 Wi-Fi and Ethernet, publishing and subscribing data from web using R pi3, interfacing R Pi 3 with twitter and whatsapp.	

Unit: 6

Case study and Application of IOT:

Cloud data logging, Home automation, waste management system, Internet connected smart water system, Smart farming, Industrial internet, smart Wearables.

Text Books:

1. Get Started With ESP8266 Programming NodeMCU Using Arduino, Up skill Learning
2. Internet of Things with Arduino Cookbook, Marco Schwartz
3. Internet of Things with Raspberry Pi 3, ManeeshRao, pack
4. Internet of Things with ESP8266, Marco Schwartz

Reference Books:

1. Raspberry Pi Cookbook for Python Programmers by Tim Cox
2. Learning Internet of Things, Peter Waher
3. Arduino: A Technical Reference: A Handbook for Technicians, Engineers, and Makers. J. M. Hughes

List of Experiments: Any 8 practicals to be performed for semester

1. Interfacing of Digital and Analog sensor to Arduino
2. Interfacing of 8266 Wi-Fi module to Arduino
3. Interfacing of Ethernet module to Arduino
4. Interfacing of Analog sensor to 8266 Wi-Fi module
5. Interfacing of analog and digital sensor to raspberry Pi
6. Interfacing of Servo motor to Raspberry Pi
7. Data transfer to cloud using 8266 Wi-Fi module
8. Home automation using Raspberry Pi
9. SECURITY SURVEILLANCE using Raspberry Pi
10. To study Interfacing between 8266 Wi-Fi module and Raspberry Pi
11. To study Interfacing of Raspbey pi to whats app and twitter