Certificate Course

On

Excel Data Analysis: Forecasting

Faculty Coordinator: Sri.A.Valli Basha

Sri.P.Krishna Teja

Duration:- 04/05/2021 to 19/05/2021

K.S.R.M. COLLEGE OF ENGINEERING

(UGC - AUTONOMOUS)
Kadapa, Andhra Pradesh, India - 516003

Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.

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Lr./KSRMCE/ (Department of ECE)/2020-21

Date: 30/04/2021

To
The Principal
KSRM College of Engineering
Kadapa, AP.

Sub: KSRMCE - (Department of ECE) – Permission to conduct certification course on Excel Data Analysis: Forecasting –Request – reg.

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Respected Sir,

With reference to the cited, the Department of ECE is planning to conduct a certification course on "Excel Data Analysis: Forecasting" for B.Tech IV sem ECE students from 04.05.2021 to 19.05.2021 in online mode. In this regard we kindly request you to grant permission to conduct a certification course. This is submitted for your kind perusal.

Thanking you sir,

Yours Faithfully,
A.V. Bhasha
Coordinators,
Sri A. Valli Basha

Sri P. Krishna Teja

forwarded to the Principal Sir
G. H.

Permitted
U.S.S. Murty

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KADAPA - 516 003. (A.P.)

Cc:

To The Director for Information

To All Deans/HODs

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Date: 30/04/2021

Circular

All the B.Tech IV sem ECE students are hereby informed that department of ECE is going to conduct 30 hours certification course on Excel Data Analysis: Forecasting from 04/05/2021 to 19/05/2021. Interested students may register their names with following link on or before 03/05/2021.

Registration Link: https://forms.gle/ZVmRhnPbktsRknVt8

For any queries contact,

Coordinators

Sri A. Valli Basha, Assistant Professor, ECE Dept.

Sri P. Krishna Teja, Assistant Professor, ECE Dept.

V. S. S. Murty

Principal

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KADAPA - 516 003. (A.P.)

Cc to:

The Management /Director / All Deans / All HODS/Staff / Students for information

The IQAC Cell for Documentation

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Department of Electronics and Communication Engineering

Certificate Course on Excel Data Analysis: Forecasting

Registered Student List

S.No.	Roll Number	Name of the Student	Year & Branch	Email id
1	199Y1A0401	AKULA VENKATESH	B.Tech IV sem, ECE	199Y1A0401@ksrmce.ac.in
2	199Y1A0402	AMBATI MOULEESWARA REDDY	B.Tech IV sem,ECE	199Y1A0402@ksrmce.ac.in
3	199Y1A0403	ANGAJALA KAVYA SREE (W)	B.Tech IV sem,ECE	199Y1A0403@ksrmce.ac.in
4	199Y1A0404	ANIMELA LAVANYA (W)	B.Tech IV sem,ECE	199Y1A0404@ksrmce.ac.in
5	199Y1A0405	ANNEMMAGARI MOUNIKA (W)	B.Tech IV sem,ECE	199Y1A0405@ksrmce.ac.in
6	199Y1A0406	AVULA VANAJA (W)	B.Tech IV sem,ECE	199Y1A0406@ksrmce.ac.in
7	199Y1A0407	AYYALURI VENKATA PAVAN KUMAR REDDY	B.Tech IV sem,ECE	199Y1A0407@ksrmce.ac.in
8	199Y1A0408	BALASAMUDRAM AJAY KUMAR	B.Tech IV sem,ECE	199Y1A0408@ksrmce.ac.in
9	199Y1A0409	BANDI SAI BALAJI	B.Tech IV sem,ECE	199Y1A0409@ksrmce.ac.in
10	199Y1A0410	BANDI SANGEETHA (W)	B.Tech IV sem,ECE	199Y1A0410@ksrmce.ac.in
11	199Y1A0411	BANDISEELA UDAYKUMAR	B.Tech IV sem,ECE	199Y1A0411@ksrmce.ac.in
12	199Y1A0412	BARIVENKULA SREENATH	B.Tech IV sem,ECE	199Y1A0412@ksrmce.ac.in
13	199Y1A0413	BINGIMALLA VENKATA THARUN KUMAR	B.Tech IV sem,ECE	199Y1A0413@ksrmce.ac.in
14	199Y1A0414	BOKKASAM SAI DEEPAK	B.Tech IV sem,ECE	199Y1A0414@ksrmce.ac.in
15	199Y1A0416	BUCHUPALLI MALATHI (W)	B.Tech IV sem,ECE	199Y1A0416@ksrmce.ac.in
16	199Y1A0417	C JASHWANTH VARMA	B.Tech IV sem,ECE	199Y1A0417@ksrmce.ac.in
17	199Y1A0418	CHAGANTI TEJESH KUMAR	B.Tech IV	199Y1A0418@ksrmce.ac.in

		REDDY	sem,ECE	
18	199Y1A0419	CHALLA STEPHEN KUMAR	B.Tech IV sem,ECE	199Y1A0419@ksrmce.ac.in
19	199Y1A0420	CHAVALI RAJESH	B.Tech IV sem,ECE	199Y1A0420@ksrmce.ac.in
20	199Y1A0421	CHAVVA SAI SUSMITHA (W)	B.Tech IV sem,ECE	199Y1A0421@ksrmce.ac.in
21	199Y1A0422	CHEEPATI VARAPRASAD REDDY	B.Tech IV sem,ECE	199Y1A0422@ksrmce.ac.in
22	199Y1A0423	CHENNABOINA GURU DEEKSHITH	B.Tech IV sem,ECE	199Y1A0423@ksrmce.ac.in
23	199Y1A0424	CHEPPALI ANKAIAH	B.Tech IV sem,ECE	199Y1A0424@ksrmce.ac.in
24	199Y1A0427	CHINNAKOTLA SAI DHEERAJ	B.Tech IV sem,ECE	199Y1A0427@ksrmce.ac.in
25	199Y1A0428	CHINNAULA SANDEEP REDDY	B.Tech IV sem,ECE	199Y1A0428@ksrmce.ac.in
26	199Y1A0429	CHINNIREDDY NEETHA (W)	B.Tech IV sem,ECE	199Y1A0429@ksrmce.ac.in
27	199Y1A0430	CHINTAKUNTA VEERA SIVA	B.Tech IV sem,ECE	199Y1A0430@ksrmce.ac.in
28	199Y1A0431	CHINTHALAPALLI MADHURIMA (W)	B.Tech IV sem,ECE	199Y1A0431@ksrmce.ac.in
29	199Y1A0432	DANDE MOUNIKA (W)	B.Tech IV sem,ECE	199Y1A0432@ksrmce.ac.in
30	199Y1A0433	DERANGULA SAI KUMAR	B.Tech IV sem,ECE	199Y1A0433@ksrmce.ac.in
31	199Y1A0434	DESURI VARSHINI (W)	B.Tech IV sem,ECE	199Y1A0434@ksrmce.ac.in
32	199Y1A0435	DEVALLA ANUSHA (W)	B.Tech IV sem,ECE	199Y1A0435@ksrmce.ac.in
33	199Y1A0469	KETHIREDDY PRASANTHI (W)	B.Tech IV sem,ECE	199Y1A0469@ksrmce.ac.in
34	199Y1A0470	KODURI LAKSHMI NARAYANA	B.Tech IV sem,ECE	199Y1A0470@ksrmce.ac.in
35	199Y1A0471	KOMPALA SAI CHARAN	B.Tech IV sem,ECE	199Y1A0471@ksrmce.ac.in
36	199Y1A0472	KONDA PRATHYUSHA (W)	B.Tech IV sem,ECE	199Y1A0472@ksrmce.ac.in
37	199Y1A0473	KONDAMUGARI EESHITHA RACHANA RAVINDRA (W)	B.Tech IV sem,ECE	199Y1A0473@ksrmce.ac.in
38	199Y1A0474	KONDURU SUMITHRA (W)	B.Tech IV sem,ECE	199Y1A0474@ksrmce.ac.in
39	199Y1A0475	KOTHAMADDI NEHA (W)	B.Tech IV sem,ECE	199Y1A0475@ksrmce.ac.in
40	199Y1A0476	KOTIREDDY CHANDRA SEKHAR REDDY	B.Tech IV sem,ECE	199Y1A0476@ksrmce.ac.in
41	199Y1A0477	KOTTHA REDDY ARCHANA (W)	B.Tech IV sem,ECE	199Y1A0477@ksrmce.ac.in
42	199Y1A0478	KUNDELLA DEEVAN	B.Tech IV	199Y1A0478@ksrmce.ac.in

		KUMAR	sem,ECE	
43	199Y1A0479	KUNDHARAPU VENKATESH	B.Tech IV sem,ECE	199Y1A0479@ksrmce.ac.in
44	199Y1A0480	KURUBA BYALLA YERRISWAMY	B.Tech IV sem,ECE	199Y1A0480@ksrmce.ac.in
45	199Y1A0469	KETHIREDDY PRASANTHI (W)	B.Tech IV sem,ECE	199Y1A0469@ksrmce.ac.in
46	199Y1A0496	MITTA VENKATA MANISHA (W)	B.Tech IV sem,ECE	199Y1A0496@ksrmce.ac.in
47	199Y1A0497	MOOLA GANGADHAR REDDY	B.Tech IV sem,ECE	199Y1A0497@ksrmce.ac.in
48	199Y1A0498	MOPURI GOWTHAM	B.Tech IV sem,ECE	199Y1A0498@ksrmce.ac.in
49	199Y1A04H0	VADAKUPPALA SARATH KUMAR YADAV	B.Tech IV sem,ECE	199Y1A04H0@ksrmce.ac.in
50	199Y1A04H1	VADLATHALA RAMAVARUN REDDY	B.Tech IV sem,ECE	199Y1A04H1@ksrmce.ac.in
51	199Y1A04H2	VANAM VISHNU NAGA VARDHAN REDDY	B.Tech IV sem,ECE	199Y1A04H2@ksrmce.ac.in
52	199Y1A04H3	VANTARAM HEMANTH SAI REDDY	B.Tech IV sem,ECE	199Y1A04H3@ksrmce.ac.in
53	199Y1A04H4	VATTALURU YUVARAJU	B.Tech IV sem,ECE	199Y1A04H4@ksrmce.ac.in
54	199Y1A04H5	VEMI REDDY VENKATA RAMANA REDDY	B.Tech IV sem,ECE	199Y1A04H5@ksrmce.ac.in
55	199Y1A04H6	VENNAPUSA NARESH	B.Tech IV sem,ECE	199Y1A04H6@ksrmce.ac.in

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Excel data analysis: Forecasting

Course Objectives:

- Learn the Microsoft Excel software.
- Understand the power of Excel.
- Gain knowledge to utilize the data analysis tool.
- Analyze and forecast the real time data using Excel software.

Course Outcomes:

The students will be able to:

- Understand forecasts in Excel using different methods based on seasonal, linear or exponential data.
- Calculate forecast errors to update your forecast model to assure more accurate forecasts.
- Do trend analysis, break-even analysis, calculate correlation coefficient and create statistical analysis using Excel's analysis toolpak.
- Clearly visualise trends and forecasts in Excel charts.

Course Syllabus

1. Plan a forecast Model

- Which data can be forecasted?
- Set up the source data the right way to get an efficient model
- Decide which method is the right for your data or should I use more methods?
- How can I measure the accuracy of the forecast?
- Which measurement method is the best for my data?
- How can I track that I am using the right forecasting model over time
- Maintenance of the forecast models

2. Forecasting Methods

- Linear Regression
- Forecast Function
- Trend Function
- Slope & Intercept Function
- Exponential Regression
- Growth Function
- Exponential Smoothing
- Data Analysis Tool Exponential Smoothing
- Naïve Forecast
- Moving Average
- Data Analysis Tool Moving Average
- Seasonal Forecasting

3. Measuring Forecast Accuracy

- Forecast Error/Deviation
- Forecast Absolute Error/Deviation
- Forecast Percentage Error/Deviation
- Forecast absolute percentage error/deviation
- Square Error
- Standard Error
- MAD (Mean Absolute Deviation)
- MSQ (Mean Square Error)
- MPE (Mean Percentage Error)
- MAPE (Mean Absolute Percentage Error)
- TSE (Tracking Signal Error)

4. Using the solver to optimize forecasts

- Optimize Exponential Smoothing Forecasts
- Optimize Weighted Moving Average Forecasts
- Optimize Seasonal Forecasts

5. Trends and forecasting using charts

- Chart Types
- Trend lines
- Equations
- R2
- Visualize Forecasts & Forecast accuracy

6. Comparing Forecasting Methods and Models

- Accuracy and visualization

7. Correlation Coefficient

- Correl Function
- The Data Analysis Tool Correlation
- Display Correlation Coefficient in Scatter Chart

8. Data Analysis Tools

- Descriptive Statistics
- Histogram
- Regression
- Sampling
- Rank & Percentile

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Department of Electronics and Communication Engineering

Certificate Course on Excel Data Analysis: Forecasting

Schedule

S.No	Date	Time	Faculty	Topic
1	04/05/2021	4 PM to5PM	Dr. D. Arun Kumar Sri A. Valli Basha Sri P. Krishna Teja	Inauguration
2	05/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Introduction to Excel data analysis: Forecasting
3	06/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Plan a forecast Model
4	07/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Forecasting Methods
5	08/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Forecasting Methods
6	09/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Measuring Forecast Accuracy
7	10/05/2021	3PM to 5PM	Sri A. Valli Basha	Using the solver to optimise forecasts
8	11/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Trends and forecasting using charts
9	12/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Trends and forecasting using charts
10	13/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Comparing Forecasting Methods and Models
11	14/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Comparing Forecasting Methods and Models
12	15/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Comparing Forecasting Methods and Models
13	16/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Correlation Coefficient
14	17/05/2021	3PM to 5PM	Dr. D. Arun Kumar	Correlation Coefficient
15	18/05/2021	3PM to 5PM	Sri P. Krishna Teja	Data Analysis Tools
16	19/05/2021	4PM to 5PM	Dr. D. Arun Kumar	Certificate distribution

A. V. Bhaskar
Coordinator

HoD
Professor & H.O.D.
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ACTIVITY REPORT

Certification Course

On

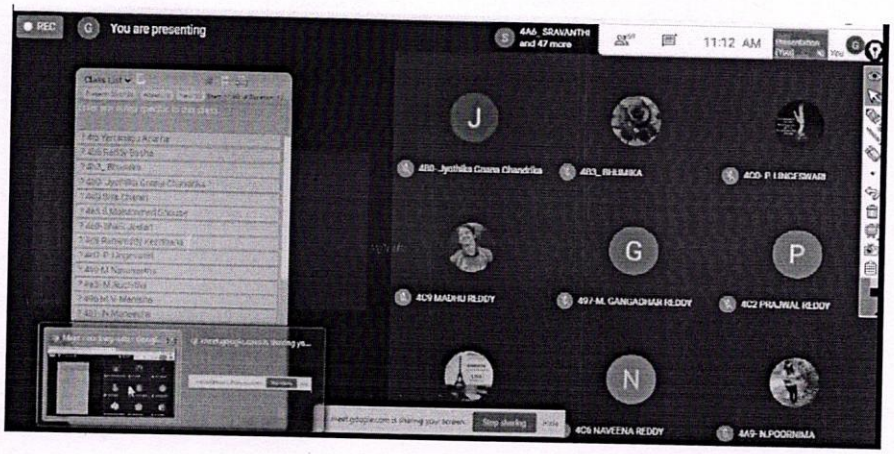
"Excel Data Analysis: Forecasting"

04th MAY, 2021 to 19th MAY, 2021

Target Group	:	Students
Details of Participants	:	55 Students
Coordinators	:	Sri A. Valli Basha, Asst. Prof, Dept. of ECE Sri P. Krishna Teja, Asst. Prof, Dept. of ECE
Organizing Department	:	Department of Electronics and Communication Engineering
Venue	:	Online mode (Google meet)

Description: Certification course on "**Excel Data Analysis: Forecasting**" was organized by Dept. of ECE from 04-05-2021 to 19-05-2021 in online mode. Dr. D. Arun Kumar, Sri. A. Valli Basha and Sri. P. Krishna Teja acted as Course instructor. The main aim of the course is to create awareness among students on the fundamental ideas behind forecasts in Excel using different methods based on seasonal, linear or exponential data. Thirty Hours course was successfully completed and participation certificates were provided to the participants.

Photo :



A.V. Bhasha

Sri A. Valli Basha,

Sri P. Krishna Teja

Coordinators

V.S.S. Murty

Principal

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Certificate Course on

EXCEL DATA ANALYSIS:FORECASTING

04/05/2021 TO 19/05/2021

Organized by

DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING

K.S.R.M. COLLEGE OF ENGINEERING

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Department of Electronics and Communication Engineering

Certificate Course on Excel Data Analysis: Forecasting

Attendance Sheet

S. No.	Roll Num	Name of the Student	04/05/2021	05/05/2021	06/05/2021	07/05/2021	08/05/2021	09/05/2021	10/05/2021	11/05/2021	12/05/2021	13/05/2021	14/05/2021	15/05/2021	16/05/2021	17/05/2021	18/05/2021	19/05/2021
1	199Y1A0401	AKULA VENKATESH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
2	199Y1A0402	AMBATI MOULEESWARA REDDY	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	199Y1A0403	ANGAJALA KAVYA SREE (W)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	199Y1A0404	ANIMELA LAVANYA (W)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	199Y1A0405	ANNEMMAGARI MOUNIKA (W)	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	199Y1A0406	AVULA VANAJA (W)	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	199Y1A0407	AYYALURI VENKATA PAVAN KUMAR REDDY	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
8	199Y1A0408	BALASAMUDRAM AJAY KUMAR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
9	199Y1A0409	BANDI SAI BALAJI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	199Y1A0410	BANDI SANGEETHA (W)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	199Y1A0411	BANDISEELA UDAYKUMAR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	199Y1A0412	BARIVENKULA SREENATH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓
13	199Y1A0413	BINGIMALLA VENKATA THARUN KUMAR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	199Y1A0414	BOKKASAM SAI DEEPAK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

15	199Y1A0416	BUCHUPALLI MALATHI (W)																
16	199Y1A0417	C JASHWANTH VARMA																
17	199Y1A0418	CHAGANTI TEJESH KUMAR REDDY																
18	199Y1A0419	CHALLA STEPHEN KUMAR																
19	199Y1A0420	CHAVALI RAJESH																
20	199Y1A0421	CHAVVA SAI SUSMITHA (W)																
21	199Y1A0422	CHEEPATI VARAPRASAD REDDY																
22	199Y1A0423	CHENNABOINA GURU DEEKSHITH																
23	199Y1A0424	CHEPPALI ANKAIAH																
24	199Y1A0427	CHINNAKOTLA SAI DHEERAJ																
25	199Y1A0428	CHINNAULA SANDEEP REDDY																
26	199Y1A0429	CHINNIREDDY NEETHA (W)																
27	199Y1A0430	CHINTAKUNTA VEERA SIVA																
28	199Y1A0431	CHINTHALAPALLI MADHURIMA (W)																
29	199Y1A0432	DANDE MOUNIKA (W)																
30	199Y1A0433	DERANGULA SAI KUMAR																
31	199Y1A0434	DESURI VARSHINI (W)																
32	199Y1A0435	DEVALLA ANUSHA (W)																
33	199Y1A0469	KETHIREDDY PRASANTHI (W)																
34	199Y1A0470	KODURI LAKSHMI NARAYANA																
35	199Y1A0471	KOMPALA SAI CHARAN																
36	199Y1A0472	KONDA PRATHYUSHA (W)																
37	199Y1A0473	KONDAMUGARI EESHITHA RACHANA RAVINDRA (W)																
38	199Y1A0474	KONDURU SUMITHRA (W)																
39	199Y1A0475	KOTHAMADDI NEHA (W)																
40	199Y1A0476	KOTIREDDY CHANDRA SEKHAR REDDY																
41	199Y1A0477	KOTTHA REDDY ARCHANA (W)																
42	199Y1A0478	KUNDELLA DEEVAN KUMAR (09-09-2020)																
43	199Y1A0479	KUNDHARAPU VENKATESH																
44	199Y1A0480	KURUBA BYALLA YERRISWAMY																
45	199Y1A0469	KETHIREDDY PRASANTHI (W)																

46	199Y1A0496	MITTA VENKATA MANISHA (W)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
47	199Y1A0497	MOOLA GANGADHAR REDDY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓
48	199Y1A0498	MOPURI GOWTHAM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
49	199Y1A04H0	VADAKUPPALA SARATH KUMAR YADAV	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
50	199Y1A04H1	VADLATHALA RAMAVARUN REDDY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
51	199Y1A04H2	VANAM VISHNU NAGA VARDHAN REDDY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
52	199Y1A04H3	VANTARAM HEMANTH SAI REDDY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
53	199Y1A04H4	VATTALURU YUVARAJU	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
54	199Y1A04H5	VEMI REDDY VENKATA RAMANA REDDY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
55	199Y1A04H6	VENNAPUSA NARESH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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Learning Objectives OF EXCEL

- Identify Principles of Forecasting
- Explain the steps in the forecasting process
- Identify types of forecasting methods and their characteristics
- Describe time series and causal models

Learning Objectives con't

- Generate forecasts for data with different patterns: level, trend, seasonality, and cyclical
- Describe causal modeling using linear regression
- Compute forecast accuracy
- Explain how forecasting models should be selected

Principles of Forecasting

Many types of forecasting models that differ in complexity and amount of data & way they generate forecasts:

1. Forecasts are rarely perfect
2. Forecasts are more accurate for grouped data than for individual items
3. Forecast are more accurate for shorter than longer time periods

Types of Forecasting Methods

- Decide what needs to be forecast
  - Level of detail, units of analysis & time horizon required
- Evaluate and analyze appropriate data
  - Identify needed data & whether it's available
- Select and test the forecasting model
  - Cost, ease of use & accuracy
- Generate the forecast
- Monitor forecast accuracy over time

Types of Forecasting Methods

- Forecasting methods are classified into two groups:

	Qualitative Methods	Quantitative Methods
1. Characteristics	Based on human judgment, opinions; subjective and nonmathematical.	Based on mathematics; quantitative in nature.
2. Strengths	Can incorporate latest changes in the environment and "inside information."	Consistent and objective; able to consider much information and data at one time.
3. Weaknesses	Can bias the forecast and reduce forecast accuracy.	Often quantifiable data are not available. Only as good as the data on which they are based.

Types of Forecasting Models

- Qualitative methods – judgmental methods
  - Forecasts generated subjectively by the forecaster
  - Educated guesses
- Quantitative methods – based on mathematical modeling:
  - Forecasts generated through mathematical modeling

Qualitative Methods

Type	Characteristics	Strengths	Weaknesses
Executive opinion	A group of managers meet & come up with a forecast	Good for strategic or new-product forecasting	One person's opinion can dominate the forecast
Market research	Uses surveys & interviews to identify customer preferences	Good determinant of customer preferences	It can be difficult to develop a good questionnaire
Delphi method	Seeks to develop a consensus among a group of experts	Excellent for forecasting long-term product demand, technological	Time consuming to develop

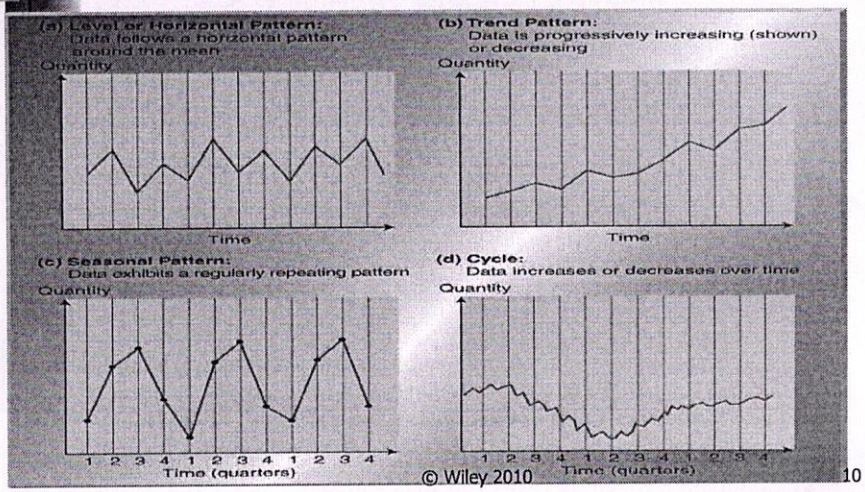
Quantitative Methods

- **Time Series Models:**
  - Assumes information needed to generate a forecast is contained in a time series of data
  - Assumes the future will follow same patterns as the past
- **Causal Models or Associative Models**
  - Explores cause-and-effect relationships
  - Uses leading indicators to predict the future
  - Housing starts and appliance sales

Time Series Models

- Forecaster looks for data patterns as
  - Data = historic pattern + random variation
- Historic pattern to be forecasted:
  - Level (long-term average) – data fluctuates around a constant mean
  - Trend – data exhibits an increasing or decreasing pattern
  - Seasonality – any pattern that regularly repeats itself and is of a constant length
  - Cycle – patterns created by economic fluctuations
- Random Variation cannot be predicted

Time Series Patterns



Time Series Models

- Naive: $F_{t+1} = A_t$
  - The forecast is equal to the actual value observed during the last period – good for level patterns
- Simple Mean: $F_{t+1} = \sum A_t / n$
  - The average of all available data - good for level patterns
- Moving Average: $F_{t+1} = \sum A_t / n$
  - The average value over a set time period (e.g.: the last four weeks)
  - Each new forecast drops the oldest data point & adds a new observation
  - More responsive to a trend but still lags behind actual data

Time Series Models con't

- **Weighted Moving Average:** $F_{t+1} = \sum C_t A_t$
- All weights must add to 100% or 1.00
  e.g. C_t **.5**, C_{t-1} **.3**, C_{t-2} **.2** (weights add to 1.0)
- Allows emphasizing one period over others; above indicates more weight on recent data (C_t=.5)
- Differs from the simple moving average that weighs all periods equally - more responsive to trends

Time Series Models con't

- **Exponential Smoothing:** $F_{t+1} = \alpha A_t + (1-\alpha)F_t$

Most frequently used time series method because of ease of use and minimal amount of data needed

- Need just three pieces of data to start:
  - Last period's forecast (**Ft**)
  - Last periods actual value (**At**)
  - Select value of smoothing coefficient, α between 0 and 1.0
- If no last period forecast is available, average the last few periods or use naive method
- Higher α values (e.g. .7 or .8) may place too much weight on last period's random variation

Time Series Problem

- **Determine forecast for periods 7 & 8**
- **2-period** moving average
- **4-period** moving average
- **2-period** weighted moving average with t-1 weighted 0.6 and t-2 weighted 0.4
- **Exponential smoothing** with alpha=0.2 and the period 6 forecast being 375

Period	Actual
1	300
2	315
3	290
4	345
5	320
6	360
7	375
8	

Time Series Problem Solution

Period	Actual	2-Period	4-Period	2-Per.Wgted.	Expon. Smooth.
1	300				
2	315				
3	290				
4	345				
5	320				
6	360				
7	375	**340.0**	**328.8**	**344.0**	**372.0**
8		**367.5**	**350.0**	**369.0**	**372.6**

Forecasting trend problem: a company uses exponential smoothing with trend to forecast usage of its lawn care products. At the end of July the company wishes to forecast sales for August. July demand was 62. The trend through June has been 15 additional gallons of product sold per month. Average sales have been 57 gallons per month. The company uses alpha+0.2 and beta +0.10. Forecast for August.

- **Smooth the level of the series:**

$$S_{July} = \alpha A_t + (1-\alpha)(S_{t-1} + T_{t-1}) = (0.2)(62) + (0.8)(57+15) = 70$$

- **Smooth the trend:**

$$T_{July} = \beta(S_t - S_{t-1}) + (1-\beta)T_{t-1} = (0.1)(70-57) + (0.9)(15) = 14.8$$

- **Forecast including trend:**

$$FIT_{August} = S_t + T_t = 70 + 14.8 = 84.8 \text{ gallons}$$

Linear Trend Line

A time series technique that computes a forecast with trend by drawing a straight line through a set of data using this formula:

Y = a + bx where

Y = forecast for period X

X = the number of time periods from X = 0

A = value of y at X = 0 (Y intercept)

B = slope of the line

Forecasting Trend

- Basic forecasting models for trends compensate for the lagging that would otherwise occur
- One model, **trend-adjusted exponential smoothing** uses a three step process
  - **Step 1 - Smoothing the level of the series**

$$S_t = \alpha A_t + (1-\alpha)(S_{t-1} + T_{t-1})$$

  - **Step 2 – Smoothing the trend**

$$T_t = \beta(S_t - S_{t-1}) + (1-\beta)T_{t-1}$$

  - **Forecast including the trend**

$$FIT_{t+1} = S_t + T_t$$

Forecasting Seasonality

- Calculate the average demand per season
  - *E.g.:* average quarterly demand
- Calculate a seasonal index for each season of each year:
  - Divide the actual demand of each season by the average demand per season for that year
- Average the indexes by season
  - *E.g.*: take the average of all Spring indexes, then of all Summer indexes, ...

Seasonality con't

- Forecast demand for the next year & divide by the number of seasons
  - Use regular forecasting method & divide by four for average quarterly demand
- Multiply next year's average seasonal demand by each average seasonal index
  - Result is a forecast of demand for each season of next year

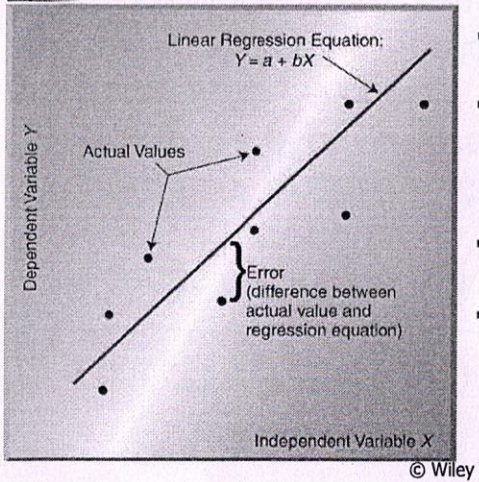
Seasonality problem: a university must develop forecasts for the next year's quarterly enrollments. It has collected quarterly enrollments for the past two years. It has also forecast total enrollment for next year to be 90,000 students. What is the forecast for each quarter of next year?

Quarter	Year 1	Seasonal Index	Year 2	Seasonal Index	Avg. Index	Year3
Fall	24000	**1.2**	26000	**1.238**	**1.22**	**27450**
Winter	23000		22000			
Spring	19000		19000			
Summer	14000		17000			
Total	80000		84000			90000
Average	**20000**		**21000**			**22500**

Causal Models

- Often, leading indicators can help to predict changes in future demand e.g. housing starts
- Causal models establish a cause-and-effect relationship between independent and dependent variables
- A common tool of causal modeling is linear regression: $\mathbf{Y = a + bx}$
- Additional related variables may require multiple regression modeling

Linear Regression



- Identify dependent **(y)** and independent **(x)** variables
- Solve for the slope of the line

$$\mathbf{b} = \frac{\sum \mathbf{XY} - \mathbf{n}\overline{\mathbf{X}}\overline{\mathbf{Y}}}{\sum \mathbf{X}^2 - \mathbf{n}\overline{\mathbf{X}}^2}$$

- Solve for the y intercept

$$\mathbf{a} = \overline{\mathbf{Y}} - \mathbf{b}\overline{\mathbf{X}}$$

- Develop your equation for the trend line

Y=a + bX

Linear Regression Problem: A maker of golf shirts has been tracking the relationship between sales and advertising dollars. Use linear regression to find out what sales might be if the company invested $53,000 in advertising next year.

	Sales $ (Y)	Adv.$ (X)	XY	X^2	Y^2
1	130	32	4160	2304	16,900
2	151	52	7852	2704	22,801
3	150	50	7500	2500	22,500
4	158	55	8690	3025	24964
5	**153.85**	53			
Tot	589	189	28202	9253	87165
Avg	**147.25**	**47.25**			

$$\mathbf{b} = \frac{\sum \mathbf{XY} - \mathbf{n}\overline{\mathbf{X}}\overline{\mathbf{Y}}}{\sum \mathbf{X}^2 - \mathbf{n}\overline{\mathbf{X}}^2}$$

$$b = \frac{28202 - 4(47.25)(147.25)}{9253 - 4(47.25)^2} = 1.15$$

$$a = 147.25 - 1.15(47.25) = 92.9$$

$$Y = 92.9 + 1.15X$$

$$Y = 92.9 + 1.15(53) = 153.85$$

Correlation Coefficient How Good is the Fit?

- Correlation coefficient **(r)** measures the direction and strength of the linear relationship between two variables. The closer the r value is to 1.0 the better the regression line fits the data points.

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{n(\sum X^2) - (\sum X)^2} * \sqrt{n(\sum Y^2) - (Y)^2}}$$

$$r = \frac{4(28{,}202) - 189(589)}{\sqrt{4(9253) - (189)^2} * \sqrt{4(87{,}165) - (589)^2}} = .982$$

$$r^2 = (.982)^2 = .964$$

- Coefficient of determination (r^2) measures the amount of variation in the dependent variable about its mean that is explained by the regression line. Values of (r^2) close to 1.0 are desirable.

Multiple Regression

- An extension of linear regression but:
  - Multiple regression develops a relationship between a dependent variable and multiple independent variables. The general formula is:

$$Y = B_0 + B_1X_1 + B_2X_2 + \cdots + B_KX_K$$

Measuring Forecast Error

- Forecasts are never perfect
- Need to know how much we should rely on our chosen forecasting method
- Measuring forecast error:

$$E_t = A_t - F_t$$

- Note that over-forecasts = negative errors and under-forecasts = positive errors

Measuring Forecasting Accuracy

- Mean Absolute Deviation (MAD) $\quad MAD = \frac{\sum|\text{actual} - \text{forecast}|}{n}$
  - measures the total error in a forecast without regard to sign
- Cumulative Forecast Error (CFE) $\quad CFE = \sum(\text{actual} - \text{forecast})$
  - Measures any bias in the forecast
- Mean Square Error (MSE) $\quad MSE = \frac{\sum(\text{actual} - \text{forecast})^2}{n}$
  - Penalizes larger errors
- Tracking Signal $\quad TS = \frac{CFE}{MAD}$
  - Measures if your model is working

Accuracy & Tracking Signal Problem: A company is comparing the accuracy of two forecasting methods. Forecasts using both methods are shown below along with the actual values for January through May. The company also uses a tracking signal with ±4 limits to decide when a forecast should be reviewed. Which forecasting method is best?

Month	Actual sales	Method A				Method B			
		F'cast	Error	Cum. Error	Tracking Signal	F'cast	Error	Cum. Error	Tracking Signal
Jan.	**30**	**28**	**2**	**2**	**2**	**27**	**2**	**2**	**1**
Feb.	**26**	**25**	**1**	**3**	**3**	**25**	**1**	**3**	**1.5**
March	**32**	**32**	**0**	**3**	**3**	**29**	**3**	**6**	**3**
April	**29**	**30**	**-1**	**2**	**2**	**27**	**2**	**8**	**4**
May	**31**	**30**	**1**	**3**	**3**	**29**	**2**	**10**	**5**
MAD			**1**				**2**		
MSE			**1.4**				**4.4**		

Selecting the Right Forecasting Model

1. The amount & type of available data
   - Some methods require more data than others
2. Degree of accuracy required
   - Increasing accuracy means more data
3. Length of forecast horizon
   - Different models for 3 month vs. 10 years
4. Presence of data patterns
   - Lagging will occur when a forecasting model meant for a level pattern is applied with a trend

Forecasting Software

- Spreadsheets
  - Microsoft Excel, Quattro Pro, Lotus 1-2-3
  - Limited statistical analysis of forecast data
- Statistical packages
  - SPSS, SAS, NCSS, Minitab
  - Forecasting plus statistical and graphics
- Specialty forecasting packages
  - Forecast Master, Forecast Pro, Autobox, SCA

Guidelines for Selecting Software

- Does the package have the features you want?
- What platform is the package available for?
- How easy is the package to learn and use?
- Is it possible to implement new methods?
- Do you require interactive or repetitive forecasting?
- Do you have any large data sets?
- Is there local support and training available?
- Does the package give the right answers?

Other Forecasting Methods

- **Focus Forecasting**
  - Developed by Bernie Smith
  - Relies on the use of simple rules
  - Test rules on past data and evaluate how they perform
- **Combining Forecasts**
  - Combining two or more forecasting methods can improve accuracy

Collaborative Planning Fore-casting & Replenishment (CPFR)

- Establish collaborative relationships between buyers and sellers
- Create a joint business plan
- Create a sales forecast
- Identify exceptions for sales forecast
- Resolve/collaborate on exception items
- Create order forecast
- Identify exceptions for order forecast
- Resolve/collaborate on exception items
- Generate order

Forecasting within OM: How it all fits together

Forecasts impact not only other business functions but all other operations decisions. Operations managers make many forecasts, such as the expected demand for a company's products. These forecasts are then used to determine:

- product designs that are expected to sell (Ch 2),
- the quantity of product to produce (Chs 5 and 6),
- the amount of needed supplies and materials (Ch 12).

Forecasting within OM con't

Also, a company uses forecasts to

- determine future space requirements (Ch 10),
- capacity and
- location needs (Ch 9), and
- the amount of labor needed (Ch 11).

Forecasting within OM con't

Forecasts drive strategic operations decisions, such as:

- choice of competitive priorities, changes in processes, and large technology purchases (Ch 3).
- Forecast decisions serve as the basis for tactical planning; developing worker schedules (Ch 11).

Virtually all operations management decisions are based on a forecast of the future.

Forecasting Across the Organization

- Forecasting is critical to management of all organizational functional areas
  - Marketing relies on forecasting to predict demand and future sales
  - Finance forecasts stock prices, financial performance, capital investment needs..
  - Information systems provides ability to share databases and information
  - Human resources forecasts future hiring requirements

1. DATA ANALYSIS – OVERVIEW

Data Analysis is a process of inspecting, cleaning, transforming and modeling data with the goal of discovering useful information, suggesting conclusions and supporting decision-making.

Types of Data Analysis

Several data analysis techniques exist encompassing various domains such as business, science, social science, etc. with a variety of names. The major data analysis approaches are-

- Data Mining
- Business Intelligence
- Statistical Analysis
- Predictive Analytics
- Text Analytics

Data Mining

Data Mining is the analysis of large quantities of data to extract previously unknown, interesting patterns of data, unusual data and the dependencies. Note that the goal is the extraction of patterns and knowledge from large amounts of data and not the extraction of data itself.

Data mining analysis involves computer science methods at the intersection of the artificial intelligence, machine learning, statistics, and database systems.

The patterns obtained from data mining can be considered as a summary of the input data that can be used in further analysis or to obtain more accurate prediction results by a decision support system.

Business Intelligence

Business Intelligence techniques and tools are for acquisition and transformation of large amounts of unstructured business data to help identify, develop and create new strategic business opportunities.

The goal of business intelligence is to allow easy interpretation of large volumes of data to identify new opportunities. It helps in implementing an effective strategy based on insights that can provide businesses with a competitive market-advantage and long-term stability.

Statistical Analysis

Statistics is the study of collection, analysis, interpretation, presentation, and organization of data.

In data analysis, two main statistical methodologies are used-

- Descriptive statistics: In descriptive statistics, data from the entire population or a sample is summarized with numerical descriptors such as-
  - Mean, Standard Deviation for Continuous Data
  - Frequency, Percentage for Categorical Data

- **Inferential statistics:** It uses patterns in the sample data to draw inferences about the represented population or accounting for randomness. These inferences can be-
  - answering yes/no questions about the data (hypothesis testing)
  - estimating numerical characteristics of the data (estimation)
  - describing associations within the data (correlation)
  - modeling relationships within the data (E.g. regression analysis)

Predictive Analytics

Predictive Analytics use statistical models to analyze current and historical data for forecasting (predictions) about future or otherwise unknown events. In business, predictive analytics is used to identify risks and opportunities that aid in decision-making.

Text Analytics

Text Analytics, also referred to as Text Mining or as Text Data Mining is the process of deriving high-quality information from text. Text mining usually involves the process of structuring the input text, deriving patterns within the structured data using means such as statistical pattern learning, and finally evaluation and interpretation of the output.

Data Analysis Process

Data Analysis is defined by the statistician John Tukey in 1961 as "Procedures for analyzing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more accurate, and all the machinery and results of (mathematical) statistics which apply to analyzing data."

Thus, data analysis is a process for obtaining large, unstructured data from various sources and converting it into information that is useful for-

- Answering questions

- Test hypotheses
- Decision-making
- Disproving theories

Data Analysis with Excel

Microsoft Excel provides several means and ways to analyze and interpret data. The data can be from various sources. The data can be converted and formatted in several ways. It can be analyzed with the relevant Excel commands, functions and tools - encompassing Conditional Formatting, Ranges, Tables, Text functions, Date functions, Time functions, Financial functions, Subtotals, Quick Analysis, Formula Auditing, Inquire Tool, What-if Analysis, Solvers, Data Model, PowerPivot, PowerView, PowerMap, etc.

You will be learning these data analysis techniques with Excel as part of two parts-

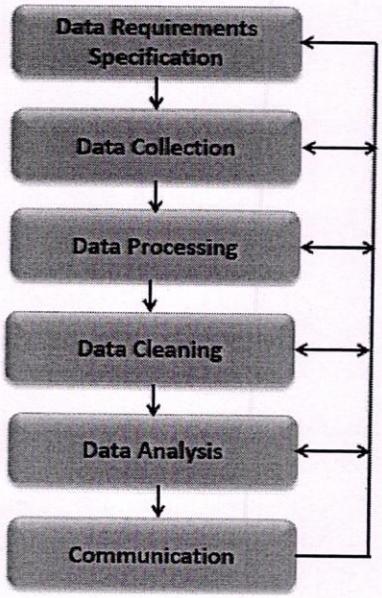
- Data Analysis with Excel and
- Advanced Data Analysis with Excel

2. DATA ANALYSIS PROCESS

Data Analysis is a process of collecting, transforming, cleaning, and modeling data with the goal of discovering the required information. The results so obtained are communicated, suggesting conclusions, and supporting decision-making. Data visualization is at times used to portray the data for the ease of discovering the useful patterns in the data. The terms Data Modeling and Data Analysis mean the same.

Data Analysis Process consists of the following phases that are iterative in nature-

- Data Requirements Specification
- Data Collection
- Data Processing
- Data Cleaning
- Data Analysis
- Communication



Data Requirements Specification

The data required for analysis is based on a question or an experiment. Based on the requirements of those directing the analysis, the data necessary as inputs to the analysis is identified (e.g., Population of people). Specific variables regarding a population (e.g., Age and Income) may be specified and obtained. Data may be numerical or categorical.

Data Collection

Data Collection is the process of gathering information on targeted variables identified as data requirements. The emphasis is on ensuring accurate and honest collection of data. Data Collection ensures that data gathered is accurate such that the related decisions are valid. Data Collection provides both a baseline to measure and a target to improve.

Data is collected from various sources ranging from organizational databases to the information in web pages. The data thus obtained, may not be structured and may contain irrelevant information. Hence, the collected data is required to be subjected to Data Processing and Data Cleaning.

Data Processing

The data that is collected must be processed or organized for analysis. This includes structuring the data as required for the relevant Analysis Tools. For example, the data might have to be placed into rows and columns in a table within a Spreadsheet or Statistical Application. A Data Model might have to be created.

Data Cleaning

The processed and organized data may be incomplete, contain duplicates, or contain errors. Data Cleaning is the process of preventing and correcting these errors. There are several types of Data Cleaning that depend on the type of data. For example, while cleaning the financial data, certain totals might be compared against reliable published numbers or defined thresholds. Likewise, quantitative data methods can be used for outlier detection that would be subsequently excluded in analysis.

Data Analysis

Data that is processed, organized and cleaned would be ready for the analysis. Various data analysis techniques are available to understand, interpret, and derive conclusions based on the requirements. Data Visualization may also be used to examine the data in graphical format, to obtain additional insight regarding the messages within the data.

Statistical Data Models such as Correlation, Regression Analysis can be used to identify the relations among the data variables. These models that are descriptive of the data are helpful in simplifying analysis and communicate results.

The process might require additional Data Cleaning or additional Data Collection, and hence these activities are iterative in nature.

Communication

The results of the data analysis are to be reported in a format as required by the users to support their decisions and further action. The feedback from the users might result in additional analysis.

The data analysts can choose data visualization techniques, such as tables and charts, which help in communicating the message clearly and efficiently to the users. The analysis tools provide facility to highlight the required information with color codes and formatting in tables and charts.

3. DATA ANALYSIS WITH EXCEL – OVERVIEW

Excel provide commands, functions and tools that make your data analysis tasks easy. You can avoid many time consuming and/or complex calculations using Excel. In this tutorial, you will get a head start on how you can perform data analysis with Excel. You will understand with relevant examples, step by step usage of Excel commands and screen shots at every step.

Ranges and Tables

The data that you have can be in a range or in a table. Certain operations on data can be performed whether the data is in a range or in a table.

However, there are certain operations that are more effective when data is in tables rather than in ranges. There are also operations that are exclusively for tables.

You will understand the ways of analyzing data in ranges and tables as well. You will understand how to name ranges, use the names and manage the names. The same would apply for names in the tables.

Data Cleaning – Text Functions, Dates and Times

You need to clean the data obtained from various sources and structure it before proceeding to data analysis. You will learn how you can clean the data

- With Text Functions
- Containing Date Values
- Containing Time Values

Conditional Formatting

Excel provides you conditional formatting commands that allow you to color the cells or font, have symbols next to values in the cells based on predefined criteria. This helps one in visualizing the prominent values. You will understand the various commands for conditionally formatting the cells.

Sorting and Filtering

During the preparation of data analysis and/or to display certain important data, you might have to sort and/or filter your data. You can do the same with the easy to use sorting and filtering options that you have in Excel.

Subtotals with Ranges

As you are aware, PivotTable is normally used to summarize data. However, Subtotals with Ranges is another feature provided by Excel that will allow you to group / ungroup data and summarize the data present in ranges with easy steps.

Quick Analysis

With Quick Analysis tool in Excel, you can quickly perform various data analysis tasks and make quick visualizations of the results.

Understanding Lookup Functions

Excel Lookup Functions enable you to find the data values that match a defined criteria from a huge amount of data.

PivotTables

With PivotTables you can summarize the data, prepare reports dynamically by changing the contents of the PivotTable.

Data Visualization

You will learn several Data Visualization techniques using Excel Charts. You will also learn how to create Band Chart, Thermometer Chart, Gantt chart, Waterfall Chart, Sparklines and PivotCharts.

Data Validation

It might be required that only valid values be entered into certain cells. Otherwise, they may lead to incorrect calculations. With data validation commands, you can easily set up data validation values for a cell, an input message prompting the user on what is expected to be entered in the cell, validate the values entered with the defined criteria and display an error message in case of incorrect entries.

Financial Analysis

Excel provides you several financial functions. However, for commonly occurring problems that require financial analysis, you can learn how to use a combination of these functions.

Working with Multiple Worksheets

You might have to perform several identical calculations in more than one worksheet. Instead of repeating these calculations in each worksheet, you can do it one worksheet and have it appear in the other selected worksheets as well. You can also summarize the data from the various worksheets into a report worksheet.

Formula Auditing

When you use formulas, you might want to check whether the formulas are working as expected. In Excel, Formula Auditing commands help you in tracing the precedent and dependent values and error checking.

Inquire

Excel also provides Inquire add-in that enables you compare two workbooks to identify changes, create interactive reports, and view the relationships among workbooks, worksheets, and cells. You can also clean the excessive formatting in a worksheet that makes Excel slow or makes the file size huge.

4. WORKING WITH RANGE NAMES

While doing Data Analysis, referring to various data will be more meaningful and easy if the reference is by Names rather than cell references – either a single cell or a range of cells. For example, if you are calculating Net Present Value based on a Discount Rate and a series of Cash Flows, the formula

Net_Present_Value = NPV (Discount_Rate, Cash_Flows)

is more meaningful than

C10 =NPV (C2, C6:C8)

With Excel, you can create and use meaningful names to various parts of your data. The advantages of using range names include-

- A meaningful Range name (such as Cash_Flows) is much easier to remember than a Range address (such as C6:C8).
- Entering a name is less error prone than entering a cell or range address.
- If you type a name incorrectly in a formula, Excel will display a **#NAME?** error.
- You can quickly move to areas of your worksheet by using the defined names.
- With Names, your formulas will be more understandable and easier to use. For example, a formula Net_Income = Gross_Income – Deductions is more intuitive than C40 = C20 – B18.
- Creating formulas with range names is easier than with cell or range addresses. You can copy a cell or range name into a formula by using formula Autocomplete.

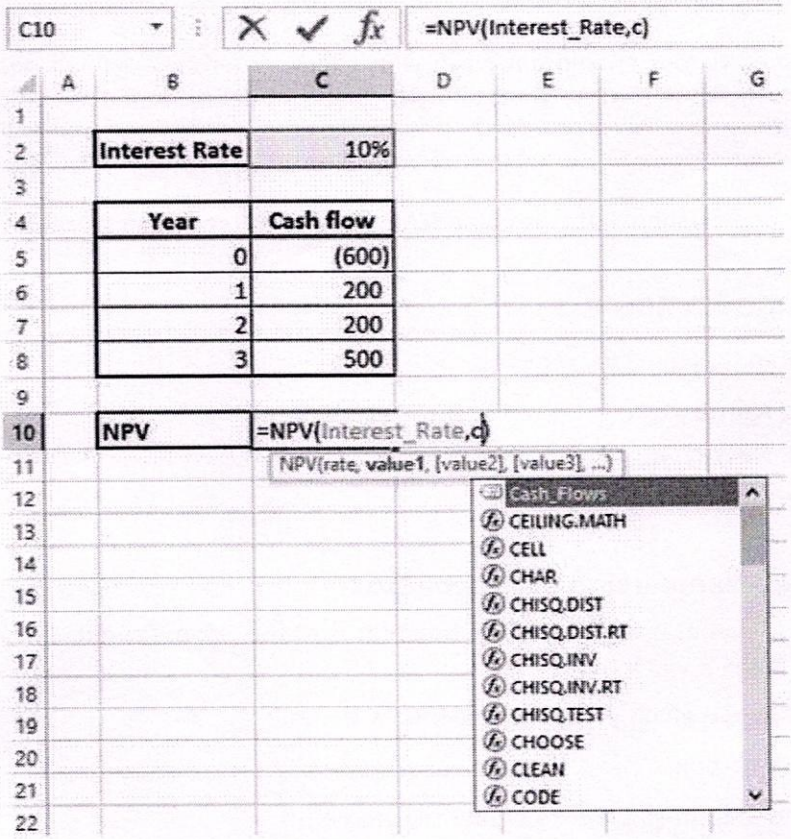
In this chapter, you will learn-

- Syntax rules for names.
- Creating names for cell references.
- Creating names for constants.
- Managing the names.
- Scope of your defined names.
- Editing names.
- Filtering names.

- Deleting names.
- Applying names.
- Using names in a formula.
- Viewing names in a workbook.
- Using paste names and paste list.
- Using names for range intersections.
- Copying formulas with names.

Copying Name using Formula Autocomplete

Type the first letter of the name in the formula. A drop-down box appears with function names and range names. Select the required name. It is copied into your formula.



Range Name Syntax Rules

Excel has the following syntax rules for names-

- You can use any combination of letters, numbers and the symbols - underscores, backslashes, and periods. Other symbols are not allowed.
- A name can begin with a character, underscore or backslash.
- A name cannot begin with a number (example- 1stQuarter) or resemble a cell address (example- QTR1).
- If you prefer to use such names, precede the name with an underscore or a backslash (example- \1stQuarter, _QTR1)
- Names cannot contain spaces. If you want to distinguish two words in a name, you can use underscore (example- Cash_Flows instead of Cash Flows)
- Your defined names should not clash with Excel's internally defined names, such as **Print_Area, Print_Titles, Consolidate_Area, and Sheet_Title.** If you define the same names, they will override the Excel's internal names and you will not get any error message. However, it is advised not to do so.
- Keep the names short but understandable, though you can use up to 255 characters

Creating Range Names

You can create Range Names in two ways-

- Using the **Name box.**
- Using the **New Name** dialog box.
- Using the **Selection** dialog box.

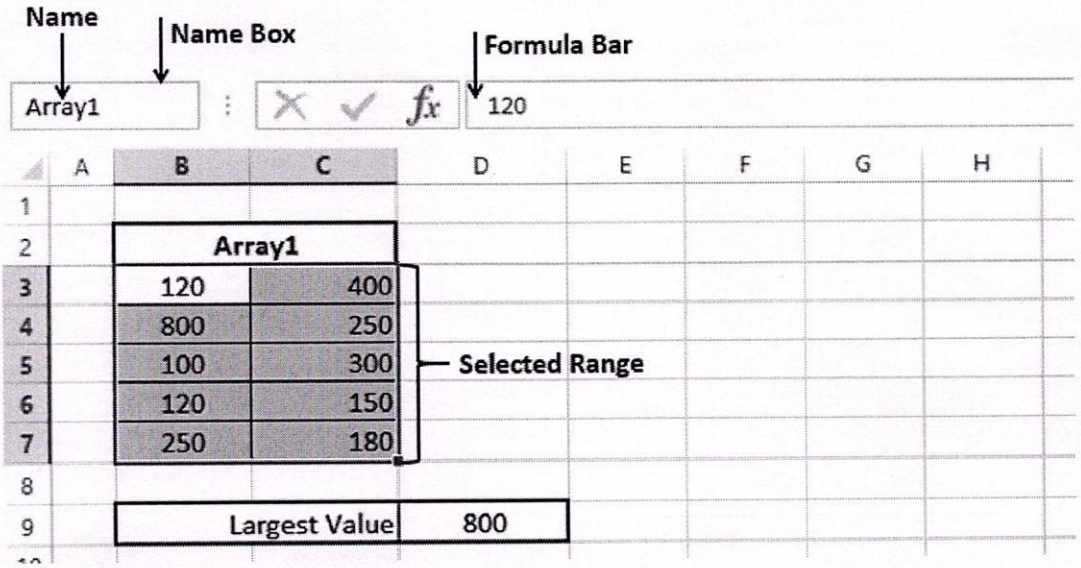
Create a Range Name using the Name Box

To create a Range name, using the **Name** box that is to the left of formula bar is the fastest way. Follow the steps given below-

1. Select the range for which you want to define a Name.

2. Click on the Name box.

3. Type the name and press Enter to create the Name.



Create a Range Name using the New Name dialog box

You can also create Range Names using the New Name dialog box from Formulas tab.

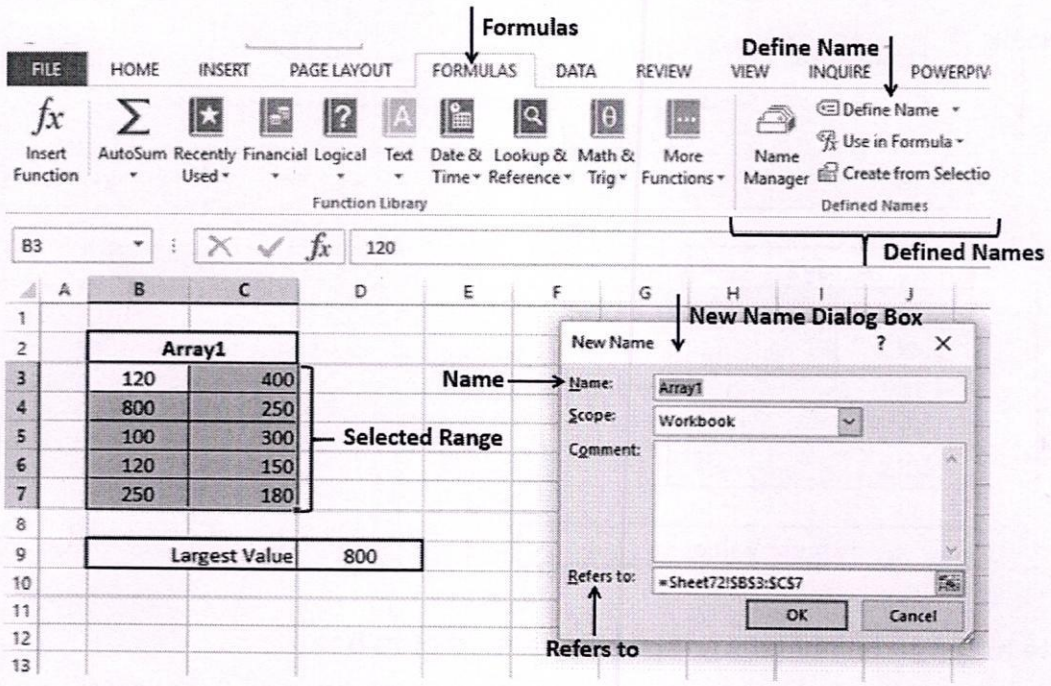
1. Select the range for which you want to define a name.

2. Click the Formulas tab.

3. Click Define Name in the Defined Names group. The **New Name** dialog box appears.

4. Type the name in the box next to Name

5. Check that the range that is selected and displayed in the Refers box is correct. Click OK.



Create a Range Name using the Create Names from Selection dialog box

You can also create Range names using the **Create Names** from the Selection dialog box from Formulas tab, when you have Text values that are adjacent to your range.

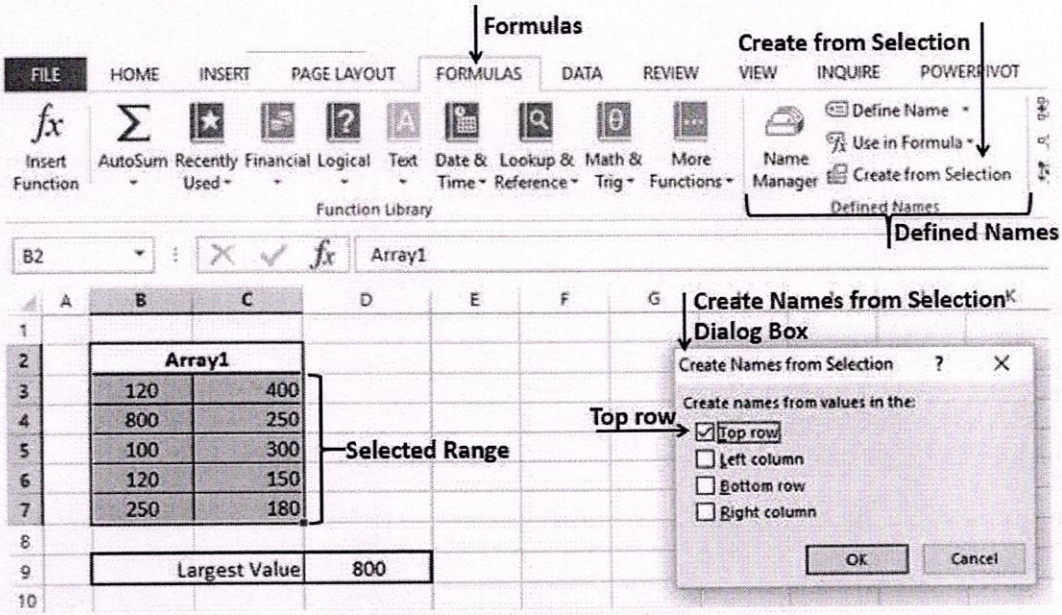
1. Select the range for which you want to define a name along with the row / column that contains the name.

2. Click the Formulas tab.

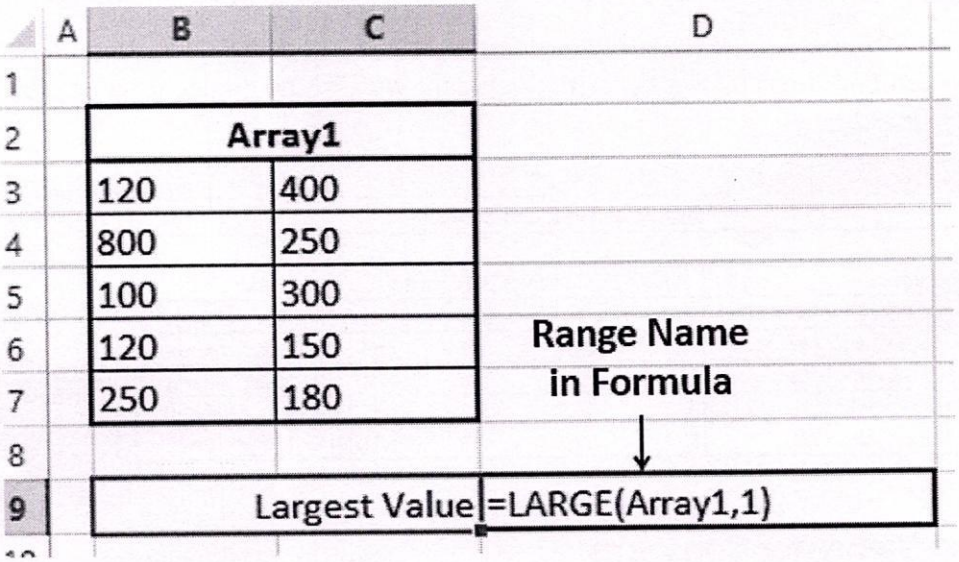
3. Click **Create from Selection** in the Defined Names group. The **Create Names from Selection** dialog box appears.

4. Select top row as the Text appears in the top row of the selection

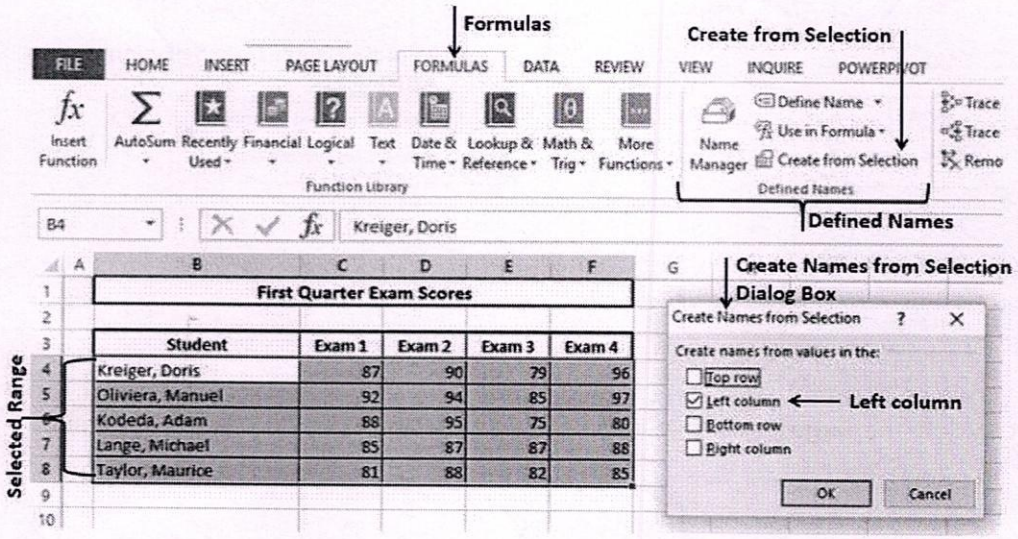
5. Check the range that got selected and displayed in the box next to Refers to be correct. Click OK.



Now, you can find the largest value in the range with **=Sum** (Student Name), as shown below-



You can create names with multiple selection also. In the example given below, you can name the row of marks of each student with the student's name.



Now, you can find the total marks for each student with **=Sum** (student name), as shown below.

	A	B	C	D	E	F	G
1		First Quarter Exam Scores					
2							
3		Student	Exam 1	Exam 2	Exam 3	Exam 4	Total
4		Kreiger, Doris	87	90	79	96	=SUM(Kreiger_Doris)
5		Oliviera, Manuel	92	94	85	97	=SUM(Oliviera_Manuel)
6		Kodeda, Adam	88	95	75	80	=SUM(Kodeda_Adam)
7		Lange, Michael	85	87	87	88	=SUM(Lange_Michael)
8		Taylor, Maurice	81	88	82	85	=SUM(Taylor_Maurice)

Range Names in Formulas

Creating Names for Constants

Suppose you have a constant that will be used throughout your workbook. You can assign a name to it directly, without placing it in a cell.

In the example below, Savings Bank Interest Rate is set to 5%.

K.S.R.M. COLLEGE OF ENGINEERING

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Certificate of Completion

This is to certify that

Mr/Ms. KETHIREDDY PRASHANTHI

Bearing the Roll No 19Y1A0469

has Succesfully completed certification course on

Excel data Analysis : Forecasting.

From 04/05/2021 ***to*** 19/05/2021 , ***Organized by Department of***

Electronics and communication Engineering.

A.V. Bhaskar		V. S. S. Murty
Coordinator	Head Of Department	Principal

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Certificate of Completion

This is to certify that

Mr/Ms. BANDI SNAGEETHA

Bearing the Roll No 199Y1A0410

has Succesfully completed certification course on

Excel Data Analysis : Forecasting

From 04/05/2021 ***to*** 19/5/2021 ***, Organized by Department of***

Electronics and communication Engineering

A.V. Bhaskar		V. S. S. Murthy
Coordinator	Head Of Department	Principal

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Kadapa, Andhra Pradesh, India - 516003

Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.

Department of Electronics and Comunication Engineering

Feedback Form

S.No.	Email address	Name of the student	Year & Semester	Branch	Roll Num	Is the course content met your expectation	Is the lecture sequence well planned	The contents of the course is explained with examples	Is the level of course high	Is the course exposed you to the new knowledge and practices	Is the lecturer clear and easy to understand	Rate the value of course in increasing your skills	Any issues
1	199Y1A0401@ksrmce.ac.in	AKULA VENKATESH	B.Tech IV sem	ECE	199Y1A0401	Yes	Yes	Agree	Agree	Strongly agree	4	5	Nothing
2	199Y1A0402@ksrmce.ac.in	AMBATI MOULEESWARA	B.Tech IV sem	ECE	199Y1A0402	Yes	Yes	Agree	Agree	Strongly agree	5	5	Nothing
3	199Y1A0403@ksrmce.ac.in	ANGAJALA KAVYA SREE (W)	B.Tech IV sem	ECE	199Y1A0403	Yes	Yes	Agree	Agree	Strongly agree	4	5	Good
4	199Y1A0404@ksrmce.ac.in	ANIMELA LAVANYA (W)	B.Tech IV sem	ECE	199Y1A0404	Yes	Yes	Agree	Agree	Strongly agree	5	5	nothing
5	199Y1A0405@ksrmce.ac.in	ANNEMMAGARI MOUNIKA (W)	B.Tech IV sem	ECE	199Y1A0405	Yes	Yes	Agree	Agree	Strongly agree	5	5	Good
6	199Y1A0406@ksrmce.ac.in	AVULA VANAJA (W)	B.Tech IV sem	ECE	199Y1A0406	Yes	Yes	Agree	Agree	Strongly agree	4	5	very good
7	199Y1A0407@ksrmce.ac.in	AYYALURI VENKATA PAVAN KUMAR REDDY	B.Tech IV sem	ECE	199Y1A0407	Yes	Yes	Strongly agree	Agree	Strongly agree	4	3	Nothing

8	199Y1A0408@ksrmce.ac.in	BALASAMUDRAM AJAY KUMAR	B.Tech IV sem	ECE	199Y1A0408	Yes	Yes	agree	Agree	Strongly agree	4	4	no
9	199Y1A0409@ksrmce.ac.in	BANDI SAI BALAJI	B.Tech IV sem	ECE	199Y1A0409	Yes	Yes	Strongly agree	Agree	Strongly agree	5	5	Nothing
10	199Y1A0410@ksrmce.ac.in	BANDI SANGEETHA (W)	B.Tech IV sem	ECE	199Y1A0410	Yes	Yes	Strongly agree	Agree	Strongly agree	5	5	Good
11	199Y1A0411@ksrmce.ac.in	BANDISEELA UDAYKUMAR	B.Tech IV sem	ECE	199Y1A0411	Yes	Yes	Agree	Agree	Strongly agree	5	4	Good
12	199Y1A0412@ksrmce.ac.in	BARIVENKULA SREENATH	B.Tech IV sem	ECE	199Y1A0412	Yes	Yes	agree	Agree	Strongly agree	5	5	Good
13	199Y1A0413@ksrmce.ac.in	BINGIMALLA VENKATA THARUN KUMAR	B.Tech IV sem	ECE	199Y1A0413	Yes	Yes	agree	Agree	Strongly agree	3	5	Good
14	199Y1A0414@ksrmce.ac.in	BOKKASAM SAI DEEPAK	B.Tech IV sem	ECE	199Y1A0414	Yes	Yes	agree	Agree	Strongly agree	5	4	very good
15	199Y1A0416@ksrmce.ac.in	BUCHUPALLI MALATHI (W)	B.Tech IV sem	ECE	199Y1A0416	Yes	Yes	agree	Agree	Strongly agree	4	4	very good
16	199Y1A0417@ksrmce.ac.in	C JASHWANTH VARMA	B.Tech IV sem	ECE	199Y1A0417	Yes	Yes	agree	Agree	Strongly agree	5	4	very good
17	199Y1A0418@ksrmce.ac.in	CHAGANTI TEJESH KUMAR REDDY	B.Tech IV sem	ECE	199Y1A0418	Yes	Yes	agree	Agree	Strongly agree	3	5	no
18	199Y1A0419@ksrmce.ac.in	CHALLA STEPHEN KUMAR	B.Tech IV sem	ECE	199Y1A0419	Yes	Yes	agree	Agree	Strongly agree	4	5	nithing
19	199Y1A0420@ksrmce.ac.in	CHAVALI RAJESH	B.Tech IV sem	ECE	199Y1A0420	Yes	Yes	Strongly agree	Agree	Strongly agree	4	5	Good
20	199Y1A0421@ksrmce.ac.in	CHAVVA SAI SUSMITHA (W)	B.Tech IV sem	ECE	199Y1A0421	Yes	Yes	Strongly agree	Agree	Strongly agree	4	4	Good
21	199Y1A0422@ksrmce.ac.in	CHEEPATI VARAPRASAD REDDY	B.Tech IV sem	ECE	199Y1A0422	Yes	Yes	Strongly agree	Agree	Strongly agree	4	3	Good
22	199Y1A0423@ksrmce.ac.in	CHENNABOINA GURU DEEKSHITH	B.Tech IV sem	ECE	199Y1A0423	Yes	Yes	agree	Agree	Strongly agree	4	4	Good
23	199Y1A0424@ksrmce.ac.in	CHEPPALI ANKAIAH	B.Tech IV sem	ECE	199Y1A0424	Yes	Yes	agree	Agree	Strongly agree	5	4	Good

24	199Y1A0427@ksrmce.ac.in	CHINNAKOTLA SAI DHEERAJ	B.Tech IV sem	ECE	199Y1A0427	Yes	Yes	Strongly agree	Agree	Strongly agree	5	4	Good
25	199Y1A0428@ksrmce.ac.in	CHINNAULA SANDEEP REDDY	B.Tech IV sem	ECE	199Y1A0428	Yes	Yes	agree	Agree	Strongly agree	5	5	Good
26	199Y1A0429@ksrmce.ac.in	CHINNIREDDY NEETHA (W)	B.Tech IV sem	ECE	199Y1A0429	Yes	Yes	agree	Agree	Strongly agree	5	5	Nothing
27	199Y1A0430@ksrmce.ac.in	CHINTAKUNTA VEERA SIVA	B.Tech IV sem	ECE	199Y1A0430	Yes	Yes	agree	Agree	Strongly agree	5	5	no
28	199Y1A0431@ksrmce.ac.in	CHINTHALAPALLI MADHURIMA (W)	B.Tech IV sem	ECE	199Y1A0431	Yes	Yes	agree	Agree	Strongly agree	3	4	no
29	199Y1A0432@ksrmce.ac.in	DANDE MOUNIKA (W)	B.Tech IV sem	ECE	199Y1A0432	Yes	Yes	Strongly agree	Agree	Strongly agree	3	4	no
30	199Y1A0433@ksrmce.ac.in	DERANGULA SAI KUMAR	B.Tech IV sem	ECE	199Y1A0433	Yes	Yes	Strongly agree	Agree	Strongly agree		5	no
31	199Y1A0434@ksrmce.ac.in	DESURI VARSHINI (W)	B.Tech IV sem	ECE	199Y1A0434	Yes	Yes	Strongly agree	Agree	Strongly agree	5	4	nothing
32	199Y1A0435@ksrmce.ac.in	DEVALLA ANUSHA (W)	B.Tech IV sem	ECE	199Y1A0435	Yes	Yes	agree	Agree	Strongly agree	5	5	Nothing
33	199Y1A0469@ksrmce.ac.in	KETHIREDDY PRASANTHI (W)	B.Tech IV sem	ECE	199Y1A0469	Yes	Yes	agree	Agree	Strongly agree	5	4	no
34	199Y1A0470@ksrmce.ac.in	KODURI LAKSHMI NARAYANA	B.Tech IV sem	ECE	199Y1A0470	Yes	Yes	agree	Agree	Strongly agree	5	4	Nothing
35	199Y1A0471@ksrmce.ac.in	KOMPALA SAI CHARAN	B.Tech IV sem	ECE	199Y1A0471	Yes	Yes	agree	Agree	Strongly agree	5	4	Good
36	199Y1A0472@ksrmce.ac.in	KONDA PRATHYUSHA (W)	B.Tech IV sem	ECE	199Y1A0472	Yes	Yes	agree	Agree	Strongly agree	5	5	Good
37	199Y1A0473@ksrmce.ac.in	KONDAMUGARI EESHITHA RACHANA RAVINDRA (W)	B.Tech IV sem	ECE	199Y1A0473	Yes	Yes	agree	Agree	Strongly agree	5	5	Good

38	199Y1A0474@ksrmce.ac.in	KONDURU SUMITHRA (W)	B.Tech IV sem	ECE	199Y1A0474	Yes	Yes	Strongly agree	Agree	Strongly agree	5	5	Good
39	199Y1A0475@ksrmce.ac.in	KOTHAMADDI NEHA (W)	B.Tech IV sem	ECE	199Y1A0475	Yes	Yes	Strongly agree	Agree	Strongly agree	5	5	Good
40	199Y1A0476@ksrmce.ac.in	KOTIREDDY CHANDRA SEKHAR REDDY	B.Tech IV sem	ECE	199Y1A0476	Yes	Yes	Strongly agree	Agree	Strongly agree	5	5	Good
41	199Y1A0477@ksrmce.ac.in	KOTTHA REDDY ARCHANA (W)	B.Tech IV sem	ECE	199Y1A0477	Yes	Yes	agree	Agree	Strongly agree	4	4	Good
42	199Y1A0478@ksrmce.ac.in	KUNDELLA DEEVAN KUMAR	B.Tech IV sem	ECE	199Y1A0478	Yes	Yes	agree	Agree	Strongly agree	4	5	Good
43	199Y1A0479@ksrmce.ac.in	KUNDHARAPU VENKATESH	B.Tech IV sem	ECE	199Y1A0479	Yes	Yes	agree	Agree	Strongly agree	4	5	Good
44	199Y1A0480@ksrmce.ac.in	KURUBA BYALLA YERRISWAMY	B.Tech IV sem	ECE	199Y1A0480	Yes	Yes	agree	Agree	Strongly agree	3	5	Good
45	199Y1A0469@ksrmce.ac.in	KETHIREDDY PRASANTHI (W)	B.Tech IV sem	ECE	199Y1A0469	Yes	Yes	agree	Agree	Strongly agree	3	5	Nothing
46	199Y1A0496@ksrmce.ac.in	MITTA VENKATA MANISHA (W)	B.Tech IV sem	ECE	199Y1A0496	Yes	Yes	Strongly agree	Agree	Strongly agree	2	5	Nothing
47	199Y1A0497@ksrmce.ac.in	MOOLA GANGADHAR REDDY	B.Tech IV sem	ECE	199Y1A0497	Yes	Yes	agree	Agree	Strongly agree	2	5	very good
48	199Y1A0498@ksrmce.ac.in	MOPURI GOWTHAM	B.Tech IV sem	ECE	199Y1A0498	Yes	Yes	agree	Agree	Strongly agree	4	5	very good
49	199Y1A04H0@ksrmce.ac.in	VADAKUPPALA SARATH KUMAR YADAV	B.Tech IV sem	ECE	199Y1A04H0	Yes	Yes	Strongly agree	Agree	Strongly agree	5	5	very good
50	199Y1A04H1@ksrmce.ac.in	VADLATHALA RAMAVARUN REDDY	B.Tech IV sem	ECE	199Y1A04H1	Yes	Yes	Strongly agree	Agree	Strongly agree	4	5	nothing
51	199Y1A04H2@ksrmce.ac.in	VANAM VISHNU NAGA VARDHAN REDDY	B.Tech IV sem	ECE	199Y1A04H2	Yes	Yes	agree	Agree	Strongly agree	4	5	Good

52	199Y1A04H3@ksrmce.ac.in	VANTARAM HEMANTH SAI REDDY	B.Tech IV sem	ECE	199Y1A04H3	Yes	Yes	agree	Agree	Strongly agree	4	5	Good
53	199Y1A04H4@ksrmce.ac.in	VATTALURU YUVARAJU	B.Tech IV sem	ECE	199Y1A04H4	Yes	Yes	agree	Agree	Strongly agree	4	5	nothing
54	199Y1A04H5@ksrmce.ac.in	VEMI REDDY VENKATA RAMANA REDDY	B.Tech IV sem	ECE	199Y1A04H5	Yes	Yes	agree	Agree	Strongly agree	4	5	nothing
55	199Y1A04H6@ksrmce.ac.in	VENNAPUSA NARESH	B.Tech IV sem	ECE	199Y1A04H6	Yes	Yes	agree	Agree	Strongly agree	4	5	nothing

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