

Internship Report

Organized by,
Alva's Institute of Engineering and Technology

In association with
IIIT, Allahabad



7 days Workshop on
“Applications of Python programming in Data analytics and
Machine Learning”

22.1.20 -24.1.20 & 27.1.20 -30.1.20

Conducted for Registered Students of Circuit Branches,

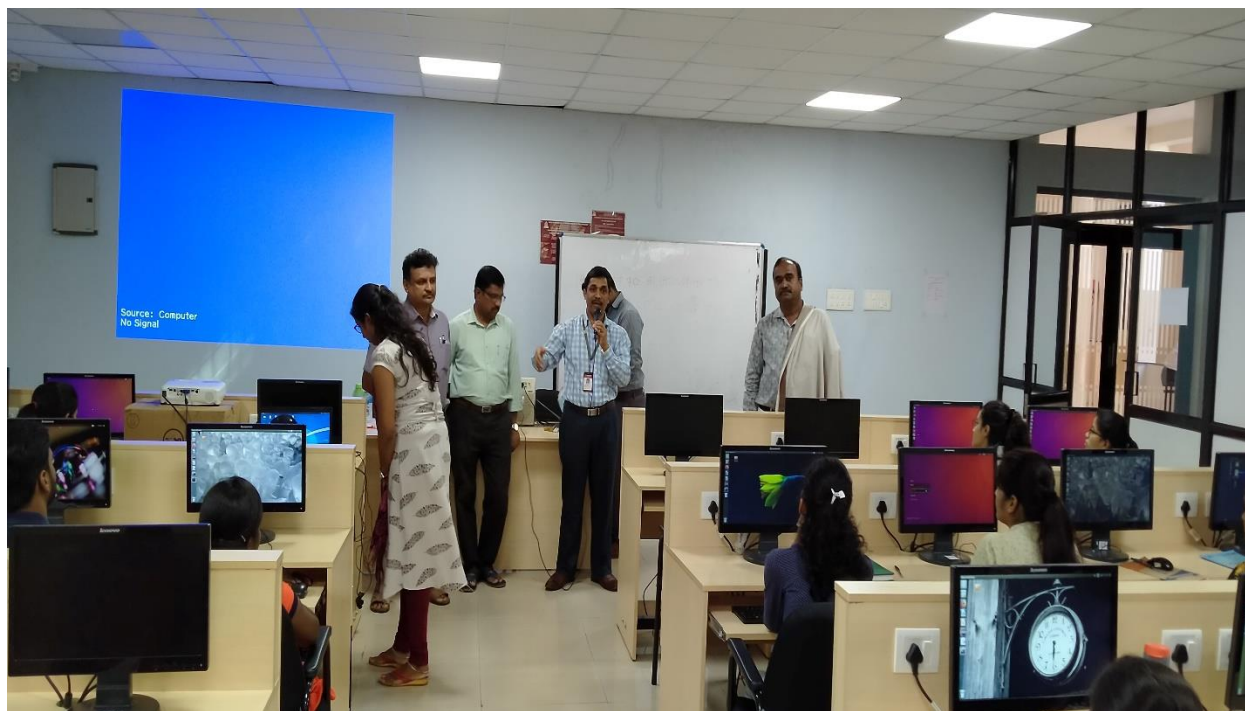
Resource Person
Dr. S. Mohideen Badhusha

Workshop Coordinator
Mr. Sushant Mangasuli

2019-20 ODD

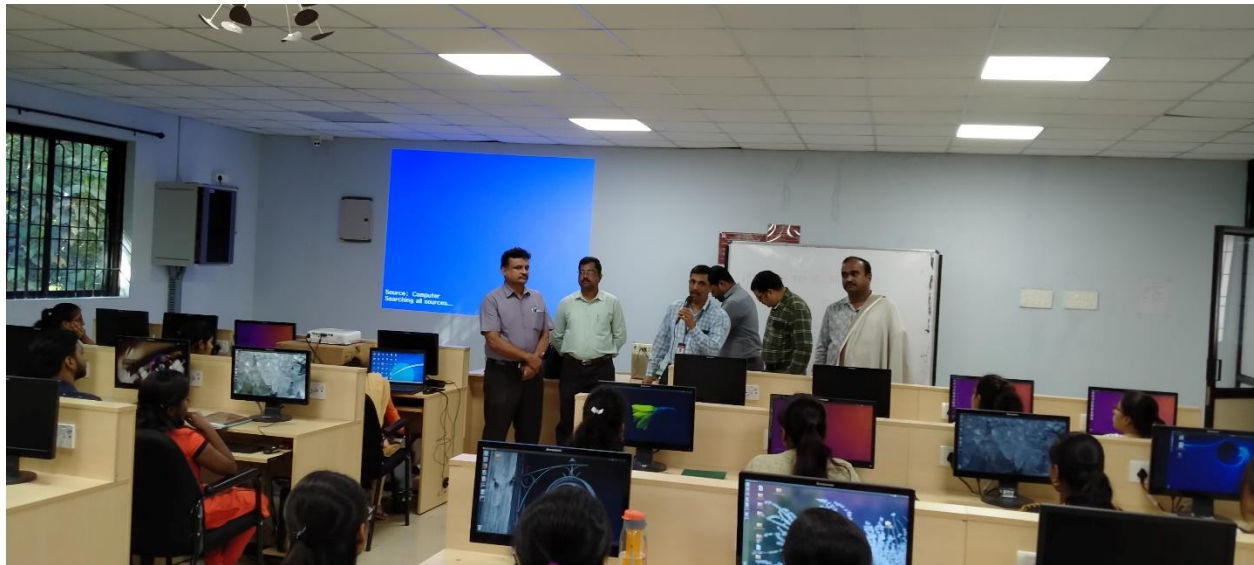
WORKSHOP BRIEF REPORT

A Seven days Internship Programme on “Applications of Python programming in Data analytics and Machine Learning” conducted on 22.1.20 -24.1.20 & 27.1.20 -30.1.20 Venue: ISE lab,4th floor was organized by Alva's Institute of Engineering and Technology for internal participants from circuit branch students organized by Department of Computer Science and Engineering in Association with IIIT Allahabad.



The workshop was inaugurated by Sri Vivek Alva, Managing Trustee, AEF. The Principal Dr. Peter Fernandes, AIET, Dr. Praveen J Dean (Aca), Prof. Manjunath Kothari, H.O.D/ CSE and the HoDs of various departments and all staff members and student volunteers were also present during the inauguration function along with the resource person **Dr. S. Mohideen Badhusha/Professor,CSE.**

Dr. Manjunath Kothari, Head Department of CSE has given a brief about internship programme and outcomes of this programme.



Objectives of the Workshop

- The workshop imparts a fundamental knowledge in Python required for Data Analytics and Machine Learning with Jupyter Notebook
- The practical programming exercises assigned amidst the lecture hours enhance the interest of solving problems in Data Analytics using python
- It provides hands-on training sessions which offer a basic data structures in Python (List, Tuple, Dictionary & files)
- It provides hands-on training sessions which implements data structures, Data Munging, Manipulation and Exploratory analysis using Pandas
- It finally imparts the knowledge of solving a Case-Study of Data science project and Machine Learning Model using different Python Libraries such as Pandas, Numpy, SkLearn and Matplotlib with Jupyter Notebook

Participants will be able to:

- Carry out data analysis/statistical analysis
- Effectively visualize the data using machine learning methods.

Workshop Schedule

Dates : 22.1.20 -24.1.20 & 27.1.20 -30.1.20 Venue: ISE lab,4th floor, AIET

Day	Session	Portions/ Activities		Duration
DAY 1 (22.1.20)	Session 1 (9.00 am -10.45 am)	Basic programming constructs in Python– Exercises. Dr.S.M.Badhusha		1 3/4 Hours
	Session 2 (11.00 am – 1.00 pm)	Hands-on training CSE/ISE Mrs. Reena Lobo	Hands-on training ECE Ms. Megha megha.ms592@gmail.com	2 Hours
	Session 3 (2.00 pm -3.15 pm)	Iteration & Strings – Exercises Dr.S.M.Badhusha		1 1/4 Hours
	Session 4 (3.30 pm – 5.00 pm)	Hands-on training CSE/ISE Ms. Shilpa	Hands-on training ECE Mrs. Vijetha T S tsvijetha@gmail.com	1 1/2 Hours
DAY 2 (23.1.20)	Session 1 (9.00 am -10.45 am)	Lists – Exercises. Dr.S.M.Badhusha		1 3/4 Hours
	Session 2 (11.00 am – 1.00 pm)	Hands-on training CSE/ISE Ms. Mangala Kini	Hands-on training ECE Ms. Shadhvala shadvala12@gmail.com	2 Hours
	Session 3 (2.00 pm -3.15 pm)	Tuples– Exercises. Dr.S.M.Badhusha		1 1/4 Hours
	Session 4 (3.30 pm – 5.00 pm)	Hands-on training CSE/ISE Mrs. Merlyn Melita M	Hands-on training ECE Mr. Yuvaraj T tyuvarajece@aiet.org.in	2 Hours

DAY 3 (24.1.20)	Session 1 (9.00 am -10.45 am)	Dictionary – Exercises. Dr.S.M.Badhusa		1 3/4 Hours
	Session 2 (11.00 am – 1.00 pm)	Hands-on training CSE/ISE Mr. Vivek Sharma S	Hands-on training ECE Mr. Santhosh S santhoshs.nayak@gmail.com	2 Hours
	Session 3 (2.00 pm -3.15 pm)	Files– Exercises. Dr.S.M.Badhusa		1 1/4 Hours
	Session 4 (3.30 pm – 5.00 pm)	Hands-on training CSE/ISE Ms. Ankitha Shetty	Hands-on training ECE Mrs. Bharghavi kvbhargavi25@gmail.com	2 Hours
Data analytics and Machine Learning techniques using Python framework				
Day	Session	Portions/ Activities		Duration
DAY 4 (27.1.20)	Session 1 (9.00 am -10.45 am)	Data Munging, Manipulation using pandas and numpy -Exercises in Jupyter Notebook : Dr.S.M.Badhusa		1 3/4 Hours
	Session 2 (11.00 am – 1.00 pm)	Hands-on training CSE/ISE Mrs. Harshitha G M	Hands-on training ECE Mrs. Nishma k nishmak90@gmail.com	2 Hours
	Session 3 (2.00 pm -3.15 pm)	Exploratory analysis using pandas and numpy -Exercises in Jupyter Notebook : Dr.S.M.Badhusa		1 1/4 Hours
	Session 4 (3.30 pm – 5.00 pm)	Hands-on training CSE/ISE Ms. Shruthi Shetty J	Hands-on training ECE Mr. Sachin K sachinec.aiet@gmail.com	1 1/2 Hours

DAY 5 (28.1.20)	Session 1 (9.00 am -10.45 am)	How to develop your data science project?- A case study 1- using jupyter notebook : Dr.S.M.Badhusha		1 3/4 Hours
	Session 2 (11.00 am – 1.00 pm)	Hands-on training CSE/ISE Mrs. Vidya	Hands-on training ECE Mrs. Shruthi K shruthicoorg36@gmail.com	2 Hours
	Session 3 (2.00 pm -3.15 pm)	How to develop your data science project?- A case study 2- using jupyter notebook : Dr.S.M.Badhusha		1 1/4 Hours
	Session 4 (3.30 pm – 5.00 pm)	Hands-on training CSE/ISE Ms JaishmaKumari B jaishma.kumari@gmail.com 9980781668	Hands-on training ECE Mr. Parvez Shariff parveez1shariff@gmail.com	1 1/2 Hours
DAY 6 (29.1.20)	Session 1 (9.00 am -10.45 am)	How to develop your machine learning model?- A case study 1- using jupyter notebook: Dr.S.M.Badhusha		1 3/4 Hours
	Session 2 (11.00 am – 1.00 pm)	Hands-on training CSE/ISE Mr. Pradeep Nayak pradeep@aiet.org.in 9964045371	Hands-on training ECE Mr. Aneesh Jain aneeshjain19@gmail.com	2 Hours
	Session 3 (2.00 pm -3.15 pm)	How to develop your machine learning model?- A case study 2- using jupyter notebook: Dr.S.M.Badhusha		1 1/4 Hours
	Session 4 (3.30 pm – 5.00 pm)	Hands-on training CSE/ISE Ms. Vanyashree vanyashreemardi97@gmail.com 8217786531	Hands-on training ECE Mr. Deepak Raj deepakraj@aiet.org.in	1 1/2 Hours
DAY 7 (30.1.20)	Session 1 (9.00 am -10.45 am)	Buliding a data science Model with Machine learning technique using Python Libraries such as Numpy, SciPy, Matplotlib, Pandas & SkLearn		1 3/4 Hours

	Session 2 (11.00 am – 1.00 pm)		2 Hours
	Session 3 (2.00 pm -5.00 pm)		3 Hours





Name of the Event : Internship on “DATA ANALYTICS AND MACHINE LEARNING”
In Association With : Indian Institute Of Information Technology (IIIT), Allahabad
Duration : 22nd Jan 2020 to 29th Feb 2020 – 25-days

Registered Student list

Sl. No.	USN	Name	Branch	Sem
1	4AL18IS005	Bhuvan S T	ISE	3
2	4AL18IS008	Dhananjay Kumar P S	ISE	3
3	4AL18IS011	K Shirisha Shetty	ISE	3
4	4AL18IS012	Mahanthesh G	ISE	3
5	4AL18IS013	Manasa B	ISE	3
6	4AL18IS017	Pooja KS	ISE	3
7	4AL18IS020	Ranjitha	ISE	3
8	4AL18IS022	Shetty Ramyashree	ISE	3
9	4AL17IS001	Ahimsa Jain	ISE	5
10	4AL17IS027	Melody	ISE	5
11	4AL17IS005	Albin George	ISE	5
12	4AL17CS007	Anjali	ISE	5
13	4AL17IS009	Ashwini	ISE	5
14	4AL17IS014	Dikshit Govind Kotian	ISE	5
15	4AL17IS022	Kavyashree S	ISE	5
16	4AL17IS031	Navya	ISE	5
17	4AL17IS032	Nikitha Shetty	ISE	5
18	4AL17IS036	Rachana Shetty	ISE	5
19	4AL17IS035	Priya	ISE	5

20	4AL17IS037	Rachitha Shetty	ISE	5
21	4AL17CS043	Shetty Rachana	ISE	5
22	4AL17IS051	Thangsabam Bikumar Singh	ISE	5
23	4AL17IS056	Melisha D'souza	ISE	5
24	4AL16IS058	Varada	ISE	5
25	4AL16CS015	Anusha P S	CSE	5
26	4AL17CS002	Ajeyashree K	CSE	5
27	4AL17CS010	Apeksha Rajendra Rane	CSE	5
28	4AL16CS063	Pooja Rajeev	CSE	5
29	4AL17CS079	Rousha	CSE	5
30	4AL17CS084	Shaifa Shala	CSE	5
31	4AL17CS099	Shrilatha K Kamath	CSE	5
32	4AL18CS401	Sandhy	CSE	5
33	4AL15CS031	Dhanush V U	CSE	7
34	4AL14CS001	Aishwarya Hosamani	CSE	7
35	4AL16CS078	S. Harshit	CSE	7
36	4AL17EC001	Abhishek Acharya	ECE	5A
37	4AL17EC005	Akshan Sandeep	ECE	5B
38	4AL17EC006	Akshatha M Deshpande	ECE	5A
39	4AL17EC009	Bhavith	ECE	5A
40	4AL17EC010	Bhoomika R Hebbar	ECE	5A
41	4AL17EC015	Chandan C	ECE	5A
42	4AL17EC020	Channabasava	ECE	5A
43	4AL17EC023	Dharshan HB	ECE	5A

44	4AL17EC025	Dhamini CL	ECE	5A
45	4AL17EC024	Deeksha J Acharya	ECE	5A
46	4AL17EC031	Divyashri Bahubli Samajage	ECE	5A
47	4AL17EC034	Harsha P	ECE	5A
48	4AL17EC036	Jagadeesh Hegde	ECE	5A
49	4AL17EC038	K Muthu	ECE	5A
50	4AL17EC041	Kishan shetty	ECE	5A
51	4AL17EC046	Madiwalar Akshatha	ECE	5A
52	4AL17EC050	Manjunatha HK	ECE	5A
53	4AL17EC061	Nichenametla Bhargavi	ECE	5A
54	4AL16EC037	Mirza Sibgathulla KR	ECE	5B
55	4AL17EC074	Prashanth	ECE	5B
56	4AL17EC075	Princia Melita D'souza	ECE	5B
57	4AL17EC077	Rashmitha	ECE	5B
58	4AL17EC084	Sankeeth	ECE	5B
59	4AL17EC096	Yalpi Nandika	ECE	5B
60	4AL18EC400	Sushanth Poojari	ECE	5B
61	4AL16EC409	Rakshith B	ECE	5B
62	4AL16EC011	B S Nagarakshitha	ECE	7A
63	4AL16EC012	Bhanupriya	ECE	7A
64	4AL16EC061	Safiya Banu	ECE	7B

Session Exercises:

Hands-on Session 22.1.20 FN

1. Find the compound interest for the given p,n,i (formula : $p(1+n*r/100)^n$)
2. Convert centegrade to farenheit ($f= 9/5*c+32$)
3. Find the greater of two nos
4. Write a program for finding surface areas of cylinder and cone ($2*PI*r*h$, $1/3*PI*r*r*h$) using function.
5. Find the greatest of four nos (using and operator) using function.
6. Write a menu program to find Area-Circle, Circumference-Circle, Area- Square, Circumference-Square using functions with menu choice

Hands-on Session 22.1.20 AN

1. Find the compound interest for the given p,n,i (formula : $p(1+n*r/100)^n$)
2. Convert centegrade to farenheit ($f= 9/5*c+32$)
3. Find the greater of two nos

```
a=int(input("enter value for a:"))
```

```
b=int(input("enter value for b:"))
```

```
if (a>b):
```

```
    print("{0} is greater than {1}".format(a,b))
```

```
else:
```

```
    print("{0} is greater than {1}".format(b,a))
```

4. Write a program for finding surface areas of cylinder and cone ($2*PI*r*h$, $1/3*PI*r*r*h$) using function.
5. Find the greatest of four nos (using and operator) using function.
6. Write a menu program to find Area-Circle, Circumference-Circle, Area- Square, Circumference-Square using functions with menu choice

Hands-on Session 23.1.20 FN

- 1.print multiples of 3 upto 200 using a list
- 2.print the nos only divisable by 5 and 7 between 1000 and 2000 using a list(both inclusive)
- 3.Add the n number of names in a list and print them alphabetically and reverse alphabetically.
- 4.Print perfect squares and divisible by 5 between 500 and 1000((both inclusive) using list comprehension
- 5.Calculate the Average of the numbers in a List by getting the elements of list from keyboard .
- 6.Print lists of odd,even and multiples of 5 numbers from 1 to 1000 using list comprehension

Hands-on Session 23.1.20 AN

1. Python Program to Create a List of Tuples with the First Element as the Number and Second Element as the Square of the Number
2. Write python program to have a list of words to sort them from shortest to longest using list of tuples
3. Write python program to get a list of tuples of Rollno,Name for 5 students through keyboard and sort them Rollno wise ascending order
4. Write python program to get a list of tuples of Rollno,Name for 5 students through keyboard and sort them by Rollno wise descending order
5. Write python program to get a list of tuples of Rollno,Name for 5 students through keyboard and sort them by Name wise ascending order
6. Write python program to get a list of tuples of Rollno,Name for 5 students through keyboard and sort them by Name wise descending order
7. Create a user defined module sample.py to accommodate the functions func() and post() to find the facotorial of a number and to check a number is positive or not and call them from the program main1.py

Hands-on Session 24.1.20 FN

- 1.Add rollno and marks {name:mark} for n number of students through keyboard in a dictionary and print the marks in descending order with respective name.

2. Add name and salary {name:salary} for n number of employees through keyboard in a dictionary and print them in name alphabetical order with salary
3. Add name and salary {name:salary} for n number of employees through keyboard in a dictionary and print them in salary ascending order and sum, max, min and average of the salaries
4. Add name and salary {name:salary} for n number of employees through keyboard in a dictionary and print only the employees whose salary is greater than 2000 but less than 4000
5. Python program to convert a 3 digit number into words

Hands-on Session 24.1.20 AN

1. Python Program to count the total number of characters (except blank space) in a text file.
2. Python Program to print all the numbers present in a text file with its total number of occurrence.
3. Python Program to append the contents of one file to another file by getting the both file names through keyboard .
4. Python Program to count the number of blank spaces in a text file.
5. Python Program to read a file and capitalize the first letter of every word in the file and copy the every word capitalized content into another file and read it .

Session 27.1.20 FN

[These questions do not require Key as it is just a model questions of the Day 4 FN worked out example. Please refer to Day 4 FN worked out example.pdf sent along with it]

1. Write a Pandas program to create and display a one-dimensional array-like object containing an array of data [2, 4, 6, 8, 10]
2. How to convert Pandas Series [2, 4, 6, 8, 10] to Python list
3. Write a Pandas program to add, subtract, multiple and divide two Pandas Series.

Sample Series: [2, 4, 6, 8, 10], [1, 3, 5, 7, 9]

4. Program to Create Data Frame with two dictionaries

English={ram:45,ravi:78,balu:43,ragu:67}

maths= {ram:85,ravi:98,balu:73,ragu:47}

5. Program to create Dataframe of three series

ODD-[1,3,5,7,9]

EVEN-[0,2,4,6,8]

MUL3-[3,6,9,12,15]

6. Write a Pandas program to compare the elements of the two Pandas Series.

Sample Series: [1, 3, 5, 7, 9],[5, 10, 6, 8, 10]

7. Write a Pandas program to convert a dictionary to a Pandas series.

Sample dictionary: d1 = {ram:85,ravi:98,balu:73.ragu:47}

8. Write a Pandas program to convert a NumPy array to a Pandas series.

Sample NumPy array: d1 = [5, 10, 6, 8, 10]

9. Write a Pandas program to change the data type of the given Series into numeric

['100', '200', 'conda', '300.12', 'ram']

10. Write a Pandas program to sort a given Series. ['100', '200', 'conda', '300.12', 'ram']

11. Write a Pandas program to create the mean and standard deviation, maximum and minimum of the data of a given Series.[5, 10, 6, 8, 10]

12. Write a Pandas program to get the columns of the DataFrame (property_data.csv file).

13. show the fields of CSV files and sorted by the field ST_NAME

14. Write a Pandas program to get the details of the 4 th call of the DataFrame (property_data.csv file).

15. Write a Python Pandas program to get the details of all the ST_NAME

16. Write a Pandas program to display the first 5 rows of the DataFrame.

(property_data.csv file).

Session 27.1.20 AN

[These questions do not require Key as it is just a model questions of the Day 3 a AN Worked out example. Please refer to Day 3 a AN worked out example.pdf sent along with it]

Apply and Work out all the exercises given in Day 4 a AN worked out example.pdf

Session 28.1.20 FN and AN

Apply and Work out all the exercises given in the Day 4 and 5 FN worked out example.pdf for the same

data set Images-Books.csv for the data set DOB_Job_Application_Filings_subset1.csv

Session 29.1.20 and 30.1.20 FN and AN

[This questions do not require Key as it is just a model questions of the Day 4 and 5 b AN Explonatory analysis Example. Please refer to Day 4 b AN Explonatory analysis Example sent along with it]

Apply and workout Explonatory Data Analysis which has been carried in Day 5 b AN Explonatory analysis Example for the data set Chile.csv and find correlation matrix for multivariates

Performance Rubrics

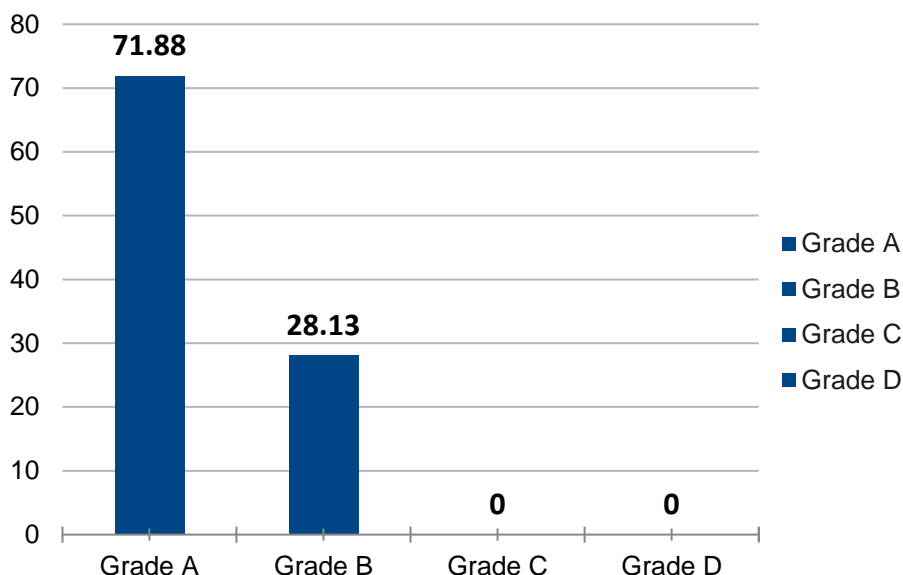
Workshop Hands-on LAB PERFORMANCE RUBRIC

The following are the parameters and criterion to evaluate the performance of the students in the hands-on sessions.
The faculty members evaluate the students performance by considering the following rubric in hands-on sessions as A,B,C and D.
Your score will be determined using the following rubric. The criteria for the grades are given as follows

Category	Criterion	Excellent (A) (4 pts)	Good (B) (3 pts)	Fair (C) (2 pts)	To be improved (D) (1 pt)
Preparation & completion Time management	Read and understand the problem; Start the program promptly; Complete the task by using time wisely.	All aspects are satisfied.	Missing one aspect	Missing two aspects	Missing any three or more aspects.
Quality of work	Correct the bugs by themselves; Be able to follow the instruction; complete all assigned tasks.				
Observation & problem solving skills	Make careful observations; clear Demonstration of data; provide useful new ideas; self-reliance in solving the given Exercises.				
Understanding of concepts and the applications	Fully involved in the writing and execution of the programs ;Understanding application of the concept.				

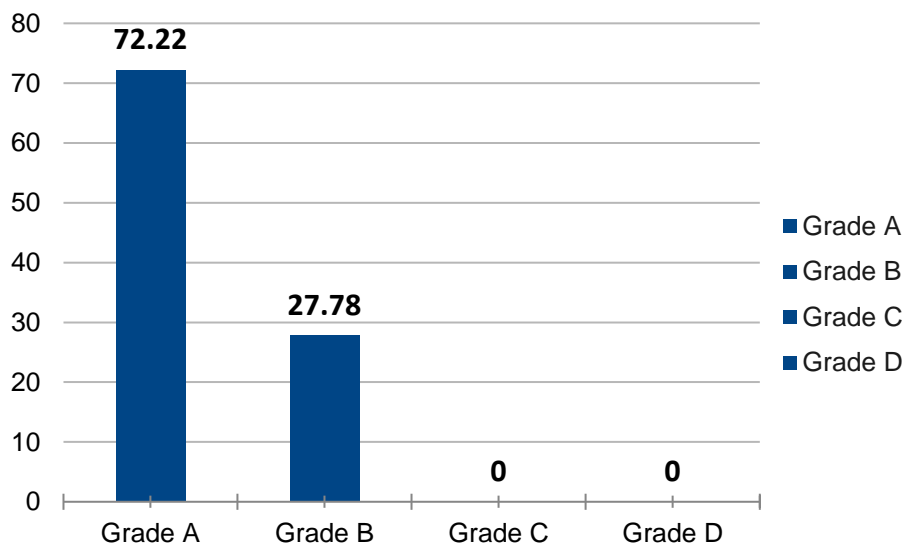
Name of the Event		: Internship on “DATA ANALYTICS AND MACHINE LEARNING”	
In Association With		: Indian Institute Of Information Technology (IIIT), Allahabad	
Sl. No.	USN	Name of the Student	Grade
1	4AL18IS005	Bhuvan S T	A

2	4AL18IS008	Dhananjay Kumar P S	B
3	4AL18IS011	K Shirisha Shetty	A
4	4AL18IS012	Mahanthesh G	A
5	4AL18IS013	Manasa B	A
6	4AL18IS017	Pooja KS	A
7	4AL18IS020	Ranjitha	A
8	4AL18IS022	Shetty Ramyashree	B
9	4AL17IS001	Ahimsa Jain	A
10	4AL17IS027	Melody	A
11	4AL17IS005	Albin George	B
12	4AL17CS007	Anjali	A
13	4AL17IS009	Ashwini	A
14	4AL17IS014	Dikshit Govind Kotian	A
15	4AL17IS022	Kavyashree S	A
16	4AL17IS031	Navya	A
17	4AL17IS032	Nikitha Shetty	A
18	4AL17IS036	Rachana Shetty	A
19	4AL17IS035	Priya	B
20	4AL17IS037	Rachitha Shetty	B
21	4AL17CS043	Shetty Rachana	A
22	4AL17IS051	Thangsabam Bikumar Singh	A
23	4AL17IS056	Melisha D'souza	B
24	4AL16IS058	Varada	A
25	4AL16CS015	Anusha P S	A
26	4AL17CS002	Ajeyashree K	B
27	4AL17CS010	Apeksha Rajendra Rane	B
28	4AL16CS063	Pooja Rajeev	A
29	4AL17CS079	Rousha	B
30	4AL17CS084	Shaifa Shala	A
31	4AL17CS099	Shrilatha K Kamath	A
32	4AL18CS401	Sandhya Kapse	A
	Count	Grade	PERCENTAGE
	23	Grade A	71.88
	9	Grade B	28.13
	0	Grade C	0
	0	Grade D	0



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In Association With		: Indian Institute Of Information Technology (IIIT), Allahabad	
Sl. No.	USN	Name of the Student	Grade
1	4AL15CS031	Dhanush V U	B
2	4AL14CS001	Aishwarya Hosamani	A
3	4AL16CS078	S. Harshit	A
4	4AL17EC001	Abhishek Acharya	A
5	4AL17EC005	Akshan Sandeep	A
6	4AL17EC006	Akshatha M Deshpande	B
7	4AL17EC009	Bhavith	A
8	4AL17EC010	Bhoomika R Hebbar	A
9	4AL17EC015	Chandan C	A
10	4AL17EC020	Channabasava	A
11	4AL17EC023	Dharshan HB	B
12	4AL17EC025	Dhamini CL	A
13	4AL17EC024	Deeksha J Acharya	A
14	4AL17EC031	Divyashri Bahubli Samajage	A
15	4AL17EC034	Harsha P	A
16	4AL17EC036	Jagadeesh Hegde	B
17	4AL17EC038	K Muthu	A
18	4AL17EC041	Kishan shetty	A
19	4AL17EC046	Madiwalar Akshatha	B
20	4AL17EC050	Manjunatha HK	A

21	4AL17EC061	Nichenametla Bhargavi	A
22	4AL16EC037	Mirza Sibgathulla KR	A
23	4AL17EC074	Prashanth	A
24	4AL17EC075	Princia Melita D'souza	A
25	4AL17EC077	Rashmitha	A
26	4AL17EC084	Sankeeth	B
27	4AL17EC096	Yalpi Nandika	A
28	4AL18EC400	Sushanth Poojari	A
29	4AL16EC409	Rakshith B	B
30	4AL16EC011	B S Nagarakshitha	B
31	4AL16EC012	Bhanupriya	A
32	4AL16EC061	Safiya Banu	A
33	4AL16EC002	Anand Kumar	A
34		Madhu B	B
35		Mamatha	A
36		Lepakshi	B
	Count	Grade	PERCENTAGE
	26	Grade A	72.22
	10	Grade B	27.78
	0	Grade C	0
	0	Grade D	0





Alva's Institute of Engineering & Technology

Shobhavana Campus, Mijar, Moodbidri, D.K – 574225

The day was ended with a valedictory function and event was narrated by Ms. Megha Hegde, Mrs. Mangala Kini and and Mr. Sushant Mangasuli and at the end of the function Dr. Manjunath Kothari H.O.D Department of CSE, Resource Person Dr. S. Mohideen Badhusha Department of CSE and Dr. Praveen J Dean (Aca) were given suggestions regarding programme.

FEEDBACK ANALYSIS

7 days Workshop on “Applications of Python programming in Data analytics and Machine Learning”

Date: 22.1.20 -24.1.20 & 27.1.20 -30.1.20

Resource Person: Dr. S. Mohideen Badhusha

Participants: Internal Participants Circuit Branch Students.

Q. Number	Option 1 NOT AT ALL	Option 2 GOOD	Option 3 VERY GOOD
Workshop Content	02	16	118
Workshop Design	0	36	156
Workshop Facilitator	0	17	239
AVG	02 /64 = 1.56%	69 / 64 = 19%	513 / 64= 80.15%

Overall Students understood fundamentals of data analytics and internship helped students to develop programming skills.

Co-ordinator
[Mr. Sushant Mangasuli]

Resource person
[Dr. S. MohideenBadhusha]

H.O.D
[Dr. Manjunath Kothari]