LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Computer Engineering (701)

Bachelor of Technology (B.E.) – Semester – V

Course Code:	**017012591**
Course Name:	**Fundamentals of Computer Science using Python - II**
Category of Course:	Engineering Science Course (ESC)
Prerequisite Course:	Database Management System (017013291), Fundamentals of Computer Science using Python -1 (017012491), Full Stack Development -1, Probability and Statistics

Teaching Scheme				
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**Total Hours**
3	**0**	**4**	**5**	**30**

Syllabus

Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	**Python Pandas**			**2.5 (9%)**
	1.1 Series, DataFrame, read_csv(), tail(), head(), info(), shape()			
	1.2 Cleaning Data -dropna(), fillna(), loc(), drop(), drop_duplicates()			
	1.3 Statistical Analysis -corr(), parallel_coordinates(), scatter_matrix(), describe()			
	1.4 Analyzing Qualitative v/s Quantitative Data -two-way cross tabulation			
	1.5 Detecting and Removing Outliers			
02	**Data Visualization with Python**			**2.5 (9%)**
	2.1 Basic Visualizations -Area Plots, Box Plots, Scatter Plots			
	2.2 Advanced Visualizations -Waffle Charts, Word Clouds, Regression Plots, Heatmaps			
	2.3 Geospatial Data with Folium -Maps with Markers, Choropleth Maps			
	2.4 Visualizing Graphs with NetworkX			
03	**Regular Expressions and Multi-threading**			**2 (7%)**
	3.1 Metacharacters – [] \ . ^ $ * + ? {} | Special Sequences -\d, \D, \s, \S, \w, \W Python re -findall(), search(), split(), sub()	---	---	
	3.2 Multithreading -threading module, start(), join(), Thread()			
04	**Web Programming using Python**			**6 (18%)**
	4.1 Introduction to Dynamic Content: Network Sockets and Connections, Building a Simple Web Browser in Python, Building a Simple HTTP Server in Python			
	4.2 Parsing HTML and web scraping with Beautiful Soup			
	4.3 Twitter Application Programming Interface Demo with Python			
05	**Introduction to Machine Learning with Python**			**2 (7%)**
	5.1 Basic Exploratory Data Analysis	---		
	5.2 Using Simple Linear Regression and Multiple Linear Regression for prediction and measuring error rate			
06	**Introduction to Game Development using Python**			**2.5 (8%)**
	6.1 Random module -seed(), randint(), random(), choice(), shuffle()		---	
	6.2 Introduction to SimpleGUI -Event-driven programming, buttons, input fields, visualizing events			
07	**Working with Timers, Drawing and Motion**			**2.5 (8%)**
	7.1 Canvas and Interactive Drawing, Visualizing Drawing and Timers		---	
	7.2 Keyboard Input, Motion, Collisions and Reflections, Velocity Control			
08	**Using sounds and images, Understanding Game Physics**			**2.5 (9%)**
	8.1 Mouse input, adding images to the game, adding sound to the game	---	---	
	8.2 Understanding acceleration, friction and animation			
09	**Getting Started with Django Framework**			**4.5 (13%)**
	9.1 Installing Django			
	9.2 Model View Controller (MVC) -Django Data Models, Django Migrations, Django Views, Using Templates in Django, The Django Template Language (DTL), Inheritance in Django Templates, Reversing Django Views and URLs, Django Generic Views			

	9.3 Python sqlite3 -Connect, cursor, execute, executemany, executescript, total_changes, commit, rollback, close, fetchone, fetchmany, fetchall			
10	**Django -Generic Views, Forms, Cookies and Sessions**			**3 (12%)**
	10.1 Django Forms -Using Django Forms Capabilities, Data Validation with Django Forms, Cross Site Request Forgery (CSRF) Support in Django			
	10.2 Django Cookies and Sessions, Users and Authentication - Creating and Managing Users in Django, Login and Logout URLs in Django, Using Django Login in Views			
	10.3 One to Many Data Model, Many to Many Data Model, Owned Rows			

Sr No.	Practical Title	Link to Theory Syllabus
1	Find the most frequent value in a NumPy array	Unit - 1
2	How to compare two NumPy arrays?	Unit - 1
3	Get row numbers of NumPy array having element larger than X	Unit - 1
4	Sort the values in a matrix.	Unit - 1
5	Calculate the sum of all columns in a 2D NumPy array	Unit - 1
6	How to get the floor, ceiling and truncated values of the elements of a numpy array?	Unit - 1
7	Calculate the average, variance and standard deviation in Python using NumPy	Unit - 1
8	Insert row at given position in Pandas Dataframe.	Unit - 2
9	Sorting rows in pandas DataFrame	Unit - 2
10	Select row with maximum and minimum value in Pandas dataframe	Unit - 2
11	Create a Pandas Series from array, from Dictionary , from Lists.	Unit - 2
12	How we can perform aggregation? Write a sample code showing use of aggregation.	Unit - 2
13	List the ways we can sort data using Pandas. Illustrate sorting concept with the help of an example	Unit - 2
14	Why do we need to filter the data? How we can filter data using pandas? Write a sample code to illustrate the filtering concept.	Unit - 2
15	How we can represent missing data using Pandas? Also write a sample for dealing with missing values.	Unit - 2
16	Explain imputation in detail with example.	Unit - 2
17	Draw Bar Plot using matplotlib.	Unit - 3
18	Draw Histogram using matplotlib.	Unit - 3
19	Draw Pie Chat using matplotlib.	Unit - 3
20	Draw Scatter Plot using matplotlib.	Unit - 3
21	Draw Box Plot using matplotlib.	Unit - 3
22	How we can download iris dataset in the form of a Pandas DataFrame with the help of python seaborn library.	Unit - 4
23	Explain LinearRegression Model with example in scikitlearn.	Unit - 4
24	Explain SGDClassifier module with example in scikitlearn.	Unit - 4
25	Explain SVM with example in scikitlearn.	Unit - 4
26	Explain classification with naïve bayes with example in scikitlearn.	Unit - 4
27	Explain Decision Tree algorithm with example in scikitlearn.	Unit - 4
28	The calorie counter app is a great way to keep track of all the calories you are burning every day. The user can add all the food they are eating and the app will count the calories.	Unit - 8
29	Build a login system using Django.	Unit - 9
30	Build an app which adds daily task and you can perform CRUD operation on task using Django.	Unit - 9
31	Show the example of arrays in Django.	Unit - 8
32	Make a student registration form using Django.	Unit - 9
33	Maintain session and cookie using Django with login in above mentioned practical.	Unit - 9
34	Write a practical to show usage of Listview, Detail view & Delete View.	Unit - 10
35	Write a practical to show usage of Django Templates.	Unit - 10
36	Write a practical to show usage of Django Models.	Unit - 10

Major Components/ Equipment	
Sr. No.	**Component/Equipment**
1	Computer
2	Python compiler - Jupyter notebook, some Python Libraries

Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)

L :	2	T:	0	P:	6

Note : In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory	2	5	MCQ	24%	60
Theory			Theory Descriptive (Mainly Programming)	16%	40
Theory			Formulas and Derivation	0%	0
Theory			Numerical	0%	0
Expected Theory %	**40%**		**Calculated Theory %**	**40%**	**100**
Practical	3		Individual Project	30%	50
Practical			Group Project	18%	30
Practical			Internal Practical Evaluation (IPE)	12%	20
Practical			Viva	0%	0
Practical			Seminar	0%	0
Expected Practical %	**60%**		**Calculated Practical %**	**60%**	**100**
Overall %	**100%**			**100%**	**200**

Course Outcome	
1	Understand array functionalities using numpy and pandas libraries.
2	Learn data visualization using matplotlib.
3	Comprehend basic machine learning concepts through scikit-learn.
4	Learn to build HTML web pages styled by CSS and to deploy a Django application.
5	Learn to define sessions and cookies.
Suggested Reference Books	
1	Pandas for Everyone by Daniel Y. Chen; Pearson Addison Wesley Data & Analytics Series
2	Interactive Dashboards and Data Apps with Plotly and Dash by Elias Dabbas; Packt Publishing
3	Mastering Django by Nigel George; Packt Publishing
4	Mastering Matplotlib by Duncan M. McGreggor; Packt Publishing
5	Python for Geospatial Data Analysis by Bonny P. McClain; O'Reilly Media, Inc.

List of Open Source Software/Learning website	
1	
2	
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7	

Practical Project/Hands on Project		
Sr. No.	**Project List**	**Linked with Unit**
1	Create a GUI for the following program:	All Units

	A mini-game containing the following functions: ✓ a random function: to generate rock, paper, or scissors. ✓ valid function: to check the validity of the move. ✓ result function: to declare the winner of the round. ✓ scorekeeper: to keep track of the score. The program requires the user to make the first move before it makes one the move. Once the move is validated the input is evaluated, the input entered could be a string or an alphabet. After evaluating the input string a winner is decided by the result function and the score of the round is updated by the scorekeeper function.	
2	Create a GUI for the following two player game of tic-tac-toe: Each player chooses their move and with O or X and marks their square one at each chance. The player who succeeds in making their marks all in one line whether diagonally, horizontally, or vertically wins. The challenge for the other player is to block the game for their opponent and also to make their chain.	All Units
3	A survey was conducted to gauge an audience interest in different data science topics, namely: Big Data (Spark / Hadoop) Data Analysis / Statistics Data Journalism Data Visualization Deep Learning Machine Learning The participants had three options for each topic: Very Interested, Somewhat interested, and Not interested. 2,233 respondents completed the survey. This is the CSV file of the survey results: https://cocl.us/datascience_survey_data Create a bar chart to visualize this data. To create this bar chart, you can follow the following steps: 1. Sort the dataframe in descending order of Very interested. 2. Convert the numbers into percentages of the total number of respondents. Recall that 2,233 respondents completed the survey. Round percentages to 2 decimal places. 3. use a figure size of (20, 8), 4. bar width of 0.8, 5. use color #5cb85c for the Very interested bars, color #5bc0de for the Somewhat interested bars, and color #d9534f for the Not interested bars, 6. use font size 14 for the bar labels, percentages, and legend, 7. use font size 16 for the title, and,display the percentages above the bars and remove the left, top, and right borders.	All Units
4	For this practical, use the following dataset: https://www.un.org/en/development/desa/population/migration/data/empirical2/migrationflows.asp Dataset: Immigration to Canada from 1980 to 2013 - International migration flows to and from selected countries - The 2015 revision from United Nation's website. The dataset contains annual data on the flows of international migrants as recorded by the countries of destination. The data presents both inflows and outflows according to the place of birth, citizenship or place of previous / next residence both for foreigners and nationals. In this lab, we will focus on the Canadian Immigration data. Create a box plot to visualize the distribution of the top 15 countries (based on total immigration) grouped by the decades 1980s, 1990s, and 2000s.	All Units
5	Create a Django application with the following features: 1. A fully functioning blog: With the ability to create, update, and delete blog posts, and where users can leave comments on posts. 2. A portfolio of your work: Build a gallery style page with clickable links to projects that you have completed.	All Units