



# MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

*A Constituent Institution of Manipal University*

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### CERTIFICATE

This is to certify that Ms./Mr. ....

Reg. No. .... Section: .... Roll No: .... has

satisfactorily completed the lab exercises prescribed for INTERNET TECHNOLOGY

LAB [CSE 3262] of Third Year B. Tech. (Computer Science and Engineering) Degree at

MIT, Manipal, in the academic year 2020-2021.

Date: .....

Signature  
Faculty in Charge

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## Course Objectives

- Acquire in-depth understanding of web application architecture.
- Understand techniques to improve user experience in web applications.
- Gain knowledge about how to interact with database and ReST API's.

## Course Outcomes

At the end of this course, students will be able to

- Ability to develop a basic website using a modern web development tool.
- Ability to design websites with better look and feel.
- Ability to create real-world web applications that interacts with database and ReST API's.

## Evaluation plan

- Internal Assessment Marks : 60%

➤ Continuous Evaluation : 40%

Continuous evaluation component (for each evaluation):5 marks

The assessment will depend on punctuality, program execution, maintaining the observation note and answering the questions in viva voce.

➤ Project Evaluation : 20%

- End semester assessment of two hour duration: 40 %

## INSTRUCTIONS TO THE STUDENTS

### Pre- Lab Session Instructions

1. Students should carry the Lab Manual Book and the required stationery to every lab session
2. Be in time and follow the institution dress code
3. Must Sign in the log register provided

4. Make sure to occupy the allotted seat and answer the attendance
5. Adhere to the rules and maintain the decorum
6. Students must come prepared for the lab in advance

### **In- Lab Session Instructions**

- Follow the instructions on the allotted exercises
- Show the program and results to the instructors on completion of experiments
- On receiving approval from the instructor, copy the program and results in the Lab record
- Prescribed textbooks and class notes can be kept ready for reference if required

### **General Instructions for the exercises in Lab**

- Implement the given exercise individually and not in a group.
- The programs should meet the following criteria:
  - Programs should be interactive with appropriate prompt messages, error messages if any, and descriptive messages for outputs.
  - Observation book should be complete with program, proper input output clearly showing the parallel execution in each process.
- Plagiarism (copying from others) is strictly prohibited and would invite severe penalty in evaluation.
- The exercises for each week are divided under three sets:
  - Solved example
  - Lab exercises - to be completed during lab hours
  - Additional Exercises - to be completed outside the lab or in the lab to enhance the skill
- In case a student misses a lab class, he/ she must ensure that the experiment is completed during the repetition lab with the permission of the faculty concerned but credit will be given only to one day's experiment(s).
- Questions for lab tests and examination are not necessarily limited to the questions in the manual, but may involve some variations and / or combinations of the questions.
- A sample note preparation is given as a model for observation.

## **THE STUDENTS SHOULD NOT**

- Bring mobile phones or any other electronic gadgets to the lab.
- Go out of the lab without permission.

Lab No : 1

Date:

# JQuery

## Objectives:

In this lab, student will be able to

1. Develop responsive web pages using jquery
2. Familiarize with DOM manipulation and animations

jQuery is a fast and concise JavaScript library to develop web based application.

Here is the list of important core features supported by jQuery –

- *DOM manipulation* – The jQuery made it easy to select DOM elements, negotiate them and modifying their content by using cross-browser open source selector engine called Sizzle.
- *Event handling* – The jQuery offers an elegant way to capture a wide variety of events, such as a user clicking on a link, without the need to clutter the HTML code itself with event handlers.
- *AJAX Support* – The jQuery eases developing a responsive and feature rich site using AJAX technology.
- *Animations* – The jQuery comes with plenty of built-in animation effects which you can use in your websites.
- *Lightweight* – The jQuery is very lightweight library - about 19KB in size (Minified and gzipped).
- *Cross Browser Support* – The jQuery has cross-browser support, and works well in IE 6.0+, FF 2.0+, Safari 3.0+, Chrome and Opera 9.0+
- *Latest Technology* – The jQuery supports CSS3 selectors and basic XPath syntax.

You can download jQuery library from <https://jquery.com/download/> on your local machine and include it in your HTML code.

Solved Example:

```
<html>
<head>
<title>The jQuery Example</title>
```

```

<script type = "text/javascript" src = "jquery-3.4.1.js">
</script>
<script type = "text/javascript" language = "javascript">
    $(document).ready(function() {
        $("div").click(function() {alert("Hello, world!");});
    });
</script>
</head>
<body>
    <div id = "mydiv">
        Click on this to see a dialogue box.
    </div>
</body>
</html>

```

A good rule of thumb is to put your JavaScript programming (all your `<script>` tags) after any other content inside the `<head>` tag, but before the closing `</head>` tag.

The `$(document).ready()` function is a built-in jQuery function that waits until the HTML for a page loads before it runs your script.

When a web browser loads an HTML file, it displays the contents of that file on the screen and also the web browser remembers the HTML tags, their attributes, and the order in which they appear in the file—this representation of the page is called the *Document Object Model*, or DOM for short.

### **Selector:**

jQuery offers a very powerful technique for selecting and working on a collection of elements—CSS selectors. The basic syntax is like this:

`$('.selector')`

use a CSS class selector like this:

`$('.submenu')`

```

<script type = "text/javascript" language = "javascript">
    $(document).ready(function() {
        $("p").css("background-color", "yellow");
        $("#myid").css("background-color", "red");
    });
</script>
</head>
<body>
    <div>
        <p class = "myclass">This is a paragraph.</p>
        <p id = "myid">This is second paragraph.</p>
    </div>

```

```

    <p>This is third paragraph.</p>
  </div>
</body>

```

We can select tag available with the given class in the DOM. For example \$('some-class') selects all elements in the document that have a class name as some-class.

### ***Get And Set Attributes:***

```

<script type = "text/javascript" language = "javascript">
    $(document).ready(function() {
        var title = $("p").attr("title");
        $("#divid").text(title);
        $("#myimg").attr("src", "/jquery/images/jquery.jpg");
    });
</script>
</head>
<body>
  <div>
    <p title = "Bold and Brave">This is first paragraph.</p>
    <p id = "myid">This is second paragraph.</p>
    <div id = "divid"></div>
    <img id = "myimg" alt = "Sample image" />
  </div>
</body>
</html>

```

You can replace a complete DOM element with the specified HTML or DOM elements.

*selector.replaceWith( content )*

```

<script type = "text/javascript" language = "javascript">
    $(document).ready(function() {
        $("div").click(function () {
            $(this).replaceWith("<h1>JQuery is Great</h1>");
        });
    });
</script>

```

### ***Events***

To make your web page interactive, you write programs that respond to events.

Mouse events: click, dblclick, mousedown, mouseup, mouseover, etc

Document/Window Events: load, resize, scroll, unload etc

Form Events: submit, reset, focus, and change



```

<script type = "text/javascript" language = "javascript">
    $(document).ready(function() {
        $('#button').click(function() {
            $(this).val("Stop that!");
        }); // end click
    });
</script>
</head>
<body>
    <div id = "mydiv">
        Click on this to see a dialogue box.
        <input type="button" id="button">
    </div>
</body>

```

- The hover( over, out ) method simulates hovering (moving the mouse on, and off, an object).

```

<script type = "text/javascript" language = "javascript">
    $(document).ready(function() {
        $('div').hover(
            function () {
                $(this).css({ "background-color": "red" });
            },
            function () {
                $(this).css({ "background-color": "blue" });
            }
        );
    }); </script>

```

The bind() method is a more flexible way of dealing with events than jQuery's event specific functions like click() or mouseover(). It not only lets you specify an event and a function to respond to the event, but also lets you pass additional data for the event-handling function to use.

```

$('#theElement').bind('click', function() {
    // do something interesting
}); // end bind

```

- checked selector selects all checked check-boxes or radio buttons. Let us understand this with an example.

```

<html>
<head>

```

```

<title></title>
<script src="jquery-1.11.2.js"></script>
<script type="text/javascript">
    $(document).ready(function () {
        $('#btnSubmit').click(function () {
            var result = $('input[type="radio"]:checked');
            if (result.length > 0) {
                $('#divResult').html(result.val() + " is checked");
            }
            else {
                $('#divResult').html("No radio button checked");
            }
        });
    });
</script>
</head>
<body style="font-family:Arial">
    Gender :
    <input type="radio" name="gender" value="Male">Male
    <input type="radio" name="gender" value="Female">Female
    <input id="btnSubmit" type="submit" value="submit" />
    <div id="divResult">
</div>
</body>
</html>

```

- The each() method in jQuery is used to execute a function for each matched element.

```

<html>
<head>
<title></title>
<script src="jquery-1.11.2.js"></script>
<script type="text/javascript">
    $(document).ready(function () {
        $('#btnSubmit').click(function () {
            var result = $('input[type="checkbox"]:checked');
            if (result.length > 0) {
                var resultString = result.length + " checkboxe(s) checked<br/>";
                result.each(function () {
                    resultString += $(this).val() + "<br/>";
                });
                $('#divResult').html(resultString);
            }
        });
    });

```

```

        else {
            $('#divResult').html("No checkbox checked");
        }
    });
});
</script>
</head>
<body style="font-family:Arial">
    Skills :
    <input type="checkbox" name="skills" value="JavaScript" />JavaScript
    <input type="checkbox" name="skills" value="jQuery" />jQuery
    <input type="checkbox" name="skills" value="C#" />C#
    <input type="checkbox" name="skills" value="VB" />VB
    <br /><br />
    <input id="btnSubmit" type="submit" value="submit" />
    <br /><br />
    <div id="divResult">
    </div>
</body>
</html>

```

### ***The animate() Method***

The jQuery `animate()` method is used to create custom animations.

`$(selector).animate({params},speed,callback);`

The required `params` parameter defines the CSS properties to be animated.

The optional `speed` parameter specifies the duration of the effect. It can take the following values: "slow", "fast", or milliseconds.

The optional `callback` parameter is a function to be executed after the animation completes.

```

$("button").click(function(){
    $("div").animate({left:'250px'});
});

```

### **Exercises:**

1. Write a web page which contains table with 3 X 3 dimensions (fill some data) and one image. Style the rows with alternate color. Move the table and image together from right to left when button is clicked.
2. Design a calculator to perform basic arithmetic operations. Use textboxes and buttons to design web page.

3. Create a web page to design a birthday card shown below.

The screenshot shows a web form for creating a birthday card. On the left, there are several controls: a dropdown menu for 'Choose a background color:' set to 'Yellow', a dropdown for 'Choose a font:' set to 'Verdana', a text input for 'Specify a numeric font size:' with '25', radio buttons for 'Choose a border style:' with 'Double' selected, and a checked checkbox for 'Add the Default Picture'. Below these is a text area for 'Enter the greeting text below:' containing 'Happy Birthday, and many more', and an 'Update' button. On the right, a preview of the birthday card is shown, featuring a yellow background, the text 'Happy Birthday, and many more', and a drawing of a birthday cake with candles.

4. Design a webpage. The page contains:

- Dropdown list with HP, Nokia, Samsung, Motorola, Apple as items.
- Checkbox with Mobile and Laptop as items.
- Textbox where you enter quantity.
- There is a button with text as 'Produce Bill'.

On Clicking Produce Bill button, alert should be displayed with total amount.

### Additional Exercise:

1. Implement the bouncing ball using animate() function.
2. Write a web page which displays image and show the sliding text on the image.

Lab No:2

Date:

# **Bootstrap**

## **Objectives:**

In this lab, student will be able to

1. Develop web pages using design templates
2. Learn how to use bootstrap elements

## ***What is Bootstrap?***

- Bootstrap is a free front-end framework for faster and easier web development
- Bootstrap includes HTML and CSS based design templates for typography, forms, buttons, tables, navigation, modals, image carousels and many other, as well as optional JavaScript plugins
- Bootstrap also gives you the ability to easily create responsive designs(automatically adjust themselves to look good on all devices)

**Bootstrap Containers** are used to pad the content inside of them, and there are two container classes available:

- The .container class provides a responsive fixed width container
- The .container-fluid class provides a full width container, spanning the entire width of the viewport

Example:

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>
```

```
<title>Bootstrap Example</title>
```

```
<meta charset="utf-8">
```

```

<meta name="viewport" content="width=device-width, initial-scale=1">

<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.4.1/css/bootstrap.min.css">

<script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>

<script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.16.0/umd/popper.min.js"
></script>

<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.4.1/js/bootstrap.min.js"></scr
ipt>

</head>

<body>

<div class="container">

  <h1>My First Bootstrap Page</h1>

  <p>This part is inside a .container class.</p>

  <p>The .container class provides a responsive fixed width container.</p>

  <p>Resize the browser window to see that its width (max-width) will change at
different breakpoints.</p>

</div>

</body></html>

```

### ***Bootstrap Tables***

The .table-striped class adds zebra-stripes to a table.

Firstname	Lastname	Email
John	Doe	john@example.com
Mary	Moe	mary@example.com
July	Dooley	july@example.com

```

<!DOCTYPE html>
<html lang="en">
<head>
  <title>Bootstrap Example</title>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.4.1/css/bootstrap.min.css">
  <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
  <script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.16.0/umd/popper.min.js"></scrip
t>
  <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.4.1/js/bootstrap.min.js"></script>
</head>
<body>

<div class="container">
  <h2>Dark Striped Table</h2>
  <p>Combine .table-dark and .table-striped to create a dark, striped table:</p>
  <table class="table table-dark table-striped">
    <thead>
      <tr>
        <th>Firstname</th>
        <th>Lastname</th>
        <th>Email</th>
      </tr>
    </thead>

```

```

<tbody>
  <tr>
    <td>John</td>
    <td>Doe</td>
    <td>john@example.com</td>
  </tr>
</tbody>
</table>
</div>
</body>
</html>

```

## Button Styles

Bootstrap 4 provides different styles of buttons:

Basic   **Primary**   Secondary   Success   Info   Warning   Danger   Dark   Light   [Link](#)

```

<button type="button" class="btn btn-outline-primary">Primary</button>
<button type="button" class="btn btn-outline-secondary">Secondary</button>
<button type="button" class="btn btn-outline-success">Success</button>
<button type="button" class="btn btn-outline-info">Info</button>
<button type="button" class="btn btn-outline-warning">Warning</button>
<button type="button" class="btn btn-outline-danger">Danger</button>
<button type="button" class="btn btn-outline-dark">Dark</button>
<button type="button" class="btn btn-outline-light text-dark">Light</button>

```

## Exercise:

1. Design the student bio-data form using button, label, textbox, radio button, table and checkbox.
2. Design a web page which shows the database oriented CRUD operation. Consider Employee data.
3. Create a web page using bootstrap as mentioned. Divide the page in to 2 parts top and bottom, then divide the bottom into 3 parts and design each top and bottom part using



different input groups, input, badges, buttons and button groups. Make the design more attractive.

4. Design your class timetable using bootstrap table and carousel.

### **Additional Exercise:**

1. Design an attractive 'train ticket booking form' using different bootstrap elements.
2. Design an attractive 'magazine cover page' using different bootstrap elements.

Lab No:3

Date:

## Python Basics

### Objectives:

In this lab, student will be able to

1. Familiarize with the python programming language
2. Understand the usage of python primitives, data structures and functions

Python was created by Guido van Rossum in the early 90s. It is now one of the most popular languages in existence.

# Single line comments start with a number symbol.

```
""" Multiline strings can be written
    using three "s, and are often used
    as documentation.
"""
```

```
#####
## 1. Primitive Datatypes and Operators
#####
```

```
# You have numbers
3 # => 3
```

```
# Math is what you would expect
1 + 1 # => 2
8 - 1 # => 7
10 * 2 # => 20
35 / 5 # => 7.0
```

```
# Integer division rounds down for both positive and negative numbers.
5 // 3 # => 1
-5 // 3 # => -2
5.0 // 3.0 # => 1.0 # works on floats too
-5.0 // 3.0 # => -2.0
```

# The result of division is always a float

10.0 / 3 # => 3.3333333333333335

# Modulo operation

7 % 3 # => 1

# Exponentiation (x\*\*y, x to the yth power)

2\*\*3 # => 8

# Enforce precedence with parentheses

1 + 3 \* 2 # => 7

(1 + 3) \* 2 # => 8

# Boolean values are primitives (Note: the capitalization)

True # => True

False # => False

# negate with not

not True # => False

not False # => True

# Boolean Operators

# Note "and" and "or" are case-sensitive

True and False # => False

False or True # => True

# True and False are actually 1 and 0 but with different keywords

True + True # => 2

True \* 8 # => 8

False - 5 # => -5

# Comparison operators look at the numerical value of True and False

0 == False # => True

1 == True # => True

2 == True # => False

-5 != False # => True

# Using boolean logical operators on ints casts them to booleans for evaluation, but their non-cast value is returned

# Don't mix up with bool(ints) and bitwise and/or (&,&|)

bool(0) # => False

```
bool(4)    # => True
bool(-6)   # => True
0 and 2    # => 0
-5 or 0    # => -5
```

```
# Equality is ==
1 == 1     # => True
2 == 1     # => False
```

```
# Inequality is !=
1 != 1     # => False
2 != 1     # => True
```

```
# More comparisons
1 < 10     # => True
1 > 10     # => False
2 <= 2     # => True
2 >= 2     # => True
```

```
# Seeing whether a value is in a range
1 < 2 and 2 < 3 # => True
2 < 3 and 3 < 2 # => False
# Chaining makes this look nicer
1 < 2 < 3     # => True
2 < 3 < 2     # => False
```

```
# (is vs. ==) is checks if two variables refer to the same object, but == checks
# if the objects pointed to have the same values.
a = [1, 2, 3, 4] # Point a at a new list, [1, 2, 3, 4]
b = a           # Point b at what a is pointing to
b is a          # => True, a and b refer to the same object
b == a          # => True, a's and b's objects are equal
b = [1, 2, 3, 4] # Point b at a new list, [1, 2, 3, 4]
b is a          # => False, a and b do not refer to the same object
b == a          # => True, a's and b's objects are equal
```

```
# Strings are created with " or '
"This is a string."
'This is also a string.'
```

```
# Strings can be added too! But try not to do this.
"Hello " + "world!" # => "Hello world!"
```

# String literals (but not variables) can be concatenated without using '+'

"Hello " "world!" # => "Hello world!"

# A string can be treated like a list of characters

"This is a string"[0] # => 'T'

# You can find the length of a string

len("This is a string") # => 16

# You can also format using f-strings or formatted string literals (in Python 3.6+)

name = "Reiko"

f"She said her name is {name}." # => "She said her name is Reiko"

# You can basically put any Python statement inside the braces and it will be output in the string.

f"{name} is {len(name)} characters long." # => "Reiko is 5 characters long."

# None is an object

None # => None

# Don't use the equality "==" symbol to compare objects to None

# Use "is" instead. This checks for equality of object identity.

"etc" is None # => False

None is None # => True

# None, 0, and empty strings/lists/dicts/tuples all evaluate to False.

# All other values are True

bool(0) # => False

bool("") # => False

bool([]) # => False

bool({}) # => False

bool(()) # => False

#####

## 2. Variables and Collections

#####

# Python has a print function

print("I'm Python. Nice to meet you!") # => I'm Python. Nice to meet you!

# By default the print function also prints out a newline at the end.

# Use the optional argument end to change the end string.

```
print("Hello, World", end="!") # => Hello, World!
```

```
# Simple way to get input data from console
```

```
input_string_var = input("Enter some data: ") # Returns the data as a string
```

```
# Note: In earlier versions of Python, input() method was named as raw_input()
```

```
# There are no declarations, only assignments.
```

```
# Convention is to use lower_case_with_underscores
```

```
some_var = 5
```

```
some_var # => 5
```

```
# Accessing a previously unassigned variable is an exception.
```

```
# See Control Flow to learn more about exception handling.
```

```
some_unknown_var # Raises a NameError
```

```
# if can be used as an expression
```

```
# Equivalent of C's '?' ternary operator
```

```
"yahoo!" if 3 > 2 else 2 # => "yahoo!"
```

```
# Lists store sequences
```

```
li = []
```

```
# You can start with a prefilled list
```

```
other_li = [4, 5, 6]
```

```
# Add stuff to the end of a list with append
```

```
li.append(1) # li is now [1]
```

```
li.append(2) # li is now [1, 2]
```

```
li.append(4) # li is now [1, 2, 4]
```

```
li.append(3) # li is now [1, 2, 4, 3]
```

```
# Remove from the end with pop
```

```
li.pop() # => 3 and li is now [1, 2, 4]
```

```
# Let's put it back
```

```
li.append(3) # li is now [1, 2, 4, 3] again.
```

```
# Access a list like you would any array
```

```
li[0] # => 1
```

```
# Look at the last element
```

```
li[-1] # => 3
```

```
# Looking out of bounds is an IndexError
```

```
li[4] # Raises an IndexError
```

```

# You can look at ranges with slice syntax.
# The start index is included, the end index is not
# (It's a closed/open range for you mathy types.)
li[1:3] # Return list from index 1 to 3 => [2, 4]
li[2:] # Return list starting from index 2 => [4, 3]
li[:3] # Return list from beginning until index 3 => [1, 2, 4]
li[::2] # Return list selecting every second entry => [1, 4]
li[::-1] # Return list in reverse order => [3, 4, 2, 1]
# Use any combination of these to make advanced slices
# li[start:end:step]

# Make a one layer deep copy using slices
li2 = li[:] # => li2 = [1, 2, 4, 3] but (li2 is li) will result in false.

# Remove arbitrary elements from a list with "del"
del li[2] # li is now [1, 2, 3]

# Remove first occurrence of a value
li.remove(2) # li is now [1, 3]
li.remove(2) # Raises a ValueError as 2 is not in the list

# Insert an element at a specific index
li.insert(1, 2) # li is now [1, 2, 3] again

# Get the index of the first item found matching the argument
li.index(2) # => 1
li.index(4) # Raises a ValueError as 4 is not in the list

# You can add lists
# Note: values for li and for other_li are not modified.
li + other_li # => [1, 2, 3, 4, 5, 6]

# Concatenate lists with "extend()"
li.extend(other_li) # Now li is [1, 2, 3, 4, 5, 6]

# Check for existence in a list with "in"
1 in li # => True

# Examine the length with "len()"
len(li) # => 6

```

# Tuples are like lists but are immutable.

```
tup = (1, 2, 3)
```

```
tup[0]    # => 1
```

```
tup[0] = 3 # Raises a TypeError
```

# Note that a tuple of length one has to have a comma after the last element but

# tuples of other lengths, even zero, do not.

```
type((1)) # => <class 'int'>
```

```
type((1,)) # => <class 'tuple'>
```

```
type(())  # => <class 'tuple'>
```

# You can do most of the list operations on tuples too

```
len(tup)    # => 3
```

```
tup + (4, 5, 6) # => (1, 2, 3, 4, 5, 6)
```

```
tup[:2]     # => (1, 2)
```

```
2 in tup    # => True
```

# You can unpack tuples (or lists) into variables

```
a, b, c = (1, 2, 3) # a is now 1, b is now 2 and c is now 3
```

# You can also do extended unpacking

```
a, *b, c = (1, 2, 3, 4) # a is now 1, b is now [2, 3] and c is now 4
```

# Tuples are created by default if you leave out the parentheses

```
d, e, f = 4, 5, 6 # tuple 4, 5, 6 is unpacked into variables d, e and f
```

# respectively such that d = 4, e = 5 and f = 6

# Now look how easy it is to swap two values

```
e, d = d, e # d is now 5 and e is now 4
```

# Dictionaries store mappings from keys to values

```
empty_dict = { }
```

# Here is a prefilled dictionary

```
filled_dict = { "one": 1, "two": 2, "three": 3 }
```

# Note keys for dictionaries have to be immutable types. This is to ensure that

# the key can be converted to a constant hash value for quick look-ups.

# Immutable types include ints, floats, strings, tuples.

```
invalid_dict = {[1,2,3]: "123"} # => Raises a TypeError: unhashable type: 'list'
```

```
valid_dict = {(1,2,3):[1,2,3]} # Values can be of any type, however.
```

# Look up values with [ ]

```
filled_dict["one"] # => 1
```



```
# Get all keys as an iterable with "keys()". We need to wrap the call in list()
# to turn it into a list. We'll talk about those later. Note - for Python
# versions <3.7, dictionary key ordering is not guaranteed. Your results might
# not match the example below exactly. However, as of Python 3.7, dictionary
# items maintain the order at which they are inserted into the dictionary.
list(filled_dict.keys()) # => ["three", "two", "one"] in Python <3.7
list(filled_dict.keys()) # => ["one", "two", "three"] in Python 3.7+
```

```
# Get all values as an iterable with "values()". Once again we need to wrap it
# in list() to get it out of the iterable. Note - Same as above regarding key
# ordering.
list(filled_dict.values()) # => [3, 2, 1] in Python <3.7
list(filled_dict.values()) # => [1, 2, 3] in Python 3.7+
```

```
# Check for existence of keys in a dictionary with "in"
"one" in filled_dict # => True
1 in filled_dict     # => False
```

```
# Looking up a non-existing key is a KeyError
filled_dict["four"] # KeyError
```

```
# Use "get()" method to avoid the KeyError
filled_dict.get("one")    # => 1
filled_dict.get("four")   # => None
# The get method supports a default argument when the value is missing
filled_dict.get("one", 4) # => 1
filled_dict.get("four", 4) # => 4
```

```
# "setdefault()" inserts into a dictionary only if the given key isn't present
filled_dict.setdefault("five", 5) # filled_dict["five"] is set to 5
filled_dict.setdefault("five", 6) # filled_dict["five"] is still 5
```

```
# Adding to a dictionary
filled_dict.update({"four":4}) # => {"one": 1, "two": 2, "three": 3, "four": 4}
filled_dict["four"] = 4       # another way to add to dict
```

```
# Remove keys from a dictionary with del
del filled_dict["one"] # Removes the key "one" from filled dict
```

```
# From Python 3.5 you can also use the additional unpacking options
{'a': 1, **{'b': 2}} # => {'a': 1, 'b': 2}
```

```
{'a': 1, **{'a': 2}} # => {'a': 2}
```

```
# Sets store ... well sets
```

```
empty_set = set()
```

```
# Initialize a set with a bunch of values. Yeah, it looks a bit like a dict. Sorry.
```

```
some_set = {1, 1, 2, 2, 3, 4} # some_set is now {1, 2, 3, 4}
```

```
# Similar to keys of a dictionary, elements of a set have to be immutable.
```

```
invalid_set = {[1], 1} # => Raises a TypeError: unhashable type: 'list'
```

```
valid_set = {(1,), 1}
```

```
# Add one more item to the set
```

```
filled_set = some_set
```

```
filled_set.add(5) # filled_set is now {1, 2, 3, 4, 5}
```

```
# Sets do not have duplicate elements
```

```
filled_set.add(5) # it remains as before {1, 2, 3, 4, 5}
```

```
# Do set intersection with &
```

```
other_set = {3, 4, 5, 6}
```

```
filled_set & other_set # => {3, 4, 5}
```

```
# Do set union with |
```

```
filled_set | other_set # => {1, 2, 3, 4, 5, 6}
```

```
# Do set difference with -
```

```
{1, 2, 3, 4} - {2, 3, 5} # => {1, 4}
```

```
# Do set symmetric difference with ^
```

```
{1, 2, 3, 4} ^ {2, 3, 5} # => {1, 4, 5}
```

```
# Check if set on the left is a superset of set on the right
```

```
{1, 2} >= {1, 2, 3} # => False
```

```
# Check if set on the left is a subset of set on the right
```

```
{1, 2} <= {1, 2, 3} # => True
```

```
# Check for existence in a set with in
```

```
2 in filled_set # => True
```

```
10 in filled_set # => False
```

```
# Make a one layer deep copy
filled_set = some_set.copy() # filled_set is {1, 2, 3, 4, 5}
filled_set is some_set      # => False
```

```
#####
## 3. Control Flow and Iterables
#####
```

```
# Let's just make a variable
some_var = 5
```

```
# Here is an if statement. Indentation is significant in Python!
# Convention is to use four spaces, not tabs.
# This prints "some_var is smaller than 10"
if some_var > 10:
    print("some_var is totally bigger than 10.")
elif some_var < 10: # This elif clause is optional.
    print("some_var is smaller than 10.")
else: # This is optional too.
    print("some_var is indeed 10.")
```

```
"""
```

```
For loops iterate over lists
```

```
prints:
```

```
    dog is a mammal
    cat is a mammal
    mouse is a mammal
```

```
"""
```

```
for animal in ["dog", "cat", "mouse"]:
    # You can use format() to interpolate formatted strings
    print("{} is a mammal".format(animal))
```

```
"""
```

```
"range(number)" returns an iterable of numbers
from zero to the given number
```

```
prints:
```

```
0
1
2
3
```

```
"""
```

```
for i in range(4):
    print(i)
```

```
"""
```

"range(lower, upper)" returns an iterable of numbers from the lower number to the upper number

prints:

```
4
5
6
7
```

```
"""
```

```
for i in range(4, 8):
    print(i)
```

```
"""
```

"range(lower, upper, step)" returns an iterable of numbers from the lower number to the upper number, while incrementing by step. If step is not indicated, the default value is 1.

prints:

```
4
6
```

```
"""
```

```
for i in range(4, 8, 2):
    print(i)
```

```
"""
```

To loop over a list, and retrieve both the index and the value of each item in the list

prints:

```
0 dog
1 cat
2 mouse
```

```
"""
```

```
animals = ["dog", "cat", "mouse"]
for i, value in enumerate(animals):
    print(i, value)
```

```
"""
```

While loops go until a condition is no longer met.

prints:

```
0
```

```

1
2
3
"""
x = 0
while x < 4:
    print(x)
    x += 1 # Shorthand for x = x + 1

# Handle exceptions with a try/except block
try:
    # Use "raise" to raise an error
    raise IndexError("This is an index error")
except IndexError as e:
    pass # Pass is just a no-op. Usually you would do recovery here.
except (TypeError, NameError):
    pass # Multiple exceptions can be handled together, if required.
else:
    # Optional clause to the try/except block. Must follow all except blocks
    print("All good!") # Runs only if the code in try raises no exceptions
finally:
    # Execute under all circumstances
    print("We can clean up resources here")

# Instead of try/finally to cleanup resources you can use a with statement
with open("myfile.txt") as f:
    for line in f:
        print(line)

# Writing to a file
contents = {"aa": 12, "bb": 21}
with open("myfile1.txt", "w+") as file:
    file.write(str(contents)) # writes a string to a file

with open("myfile2.txt", "w+") as file:
    file.write(json.dumps(contents)) # writes an object to a file

# Reading from a file
with open('myfile1.txt', "r+") as file:
    contents = file.read() # reads a string from a file
print(contents)
# print: {"aa": 12, "bb": 21}

with open('myfile2.txt', "r+") as file:

```

```

    contents = json.load(file)    # reads a json object from a file
print(contents)
# print: {"aa": 12, "bb": 21}

```

# Python offers a fundamental abstraction called the Iterable.  
 # An iterable is an object that can be treated as a sequence.  
 # The object returned by the range function, is an iterable.

```

filled_dict = {"one": 1, "two": 2, "three": 3}
our_iterable = filled_dict.keys()
print(our_iterable) # => dict_keys(['one', 'two', 'three']). This is an object that implements
our Iterable interface.

```

```

# We can loop over it.
for i in our_iterable:
    print(i) # Prints one, two, three

```

```

# However we cannot address elements by index.
our_iterable[1] # Raises a TypeError

```

```

# An iterable is an object that knows how to create an iterator.
our_iterator = iter(our_iterable)

```

```

# Our iterator is an object that can remember the state as we traverse through it.
# We get the next object with "next()".
next(our_iterator) # => "one"

```

```

# It maintains state as we iterate.
next(our_iterator) # => "two"
next(our_iterator) # => "three"

```

```

# After the iterator has returned all of its data, it raises a StopIteration exception
next(our_iterator) # Raises StopIteration

```

```

# We can also loop over it, in fact, "for" does this implicitly!
our_iterator = iter(our_iterable)
for i in our_iterator:
    print(i) # Prints one, two, three

```

```

# You can grab all the elements of an iterable or iterator by calling list() on it.
list(our_iterable) # => Returns ["one", "two", "three"]

```

```
list(our_iterator) # => Returns [] because state is saved
```

# The indentation of each line controls whether it is within a loop, if statement, etc. -- there are no { } to define blocks of code. This use of indentation in Python is unusual, but it's logical and you get used to it.

```
#####
## 4. Functions
#####
```

# Use "def" to create new functions

```
def add(x, y):
    print("x is {} and y is {}".format(x, y))
    return x + y # Return values with a return statement
```

# Calling functions with parameters

```
add(5, 6) # => prints out "x is 5 and y is 6" and returns 11
```

# Another way to call functions is with keyword arguments

```
add(y=6, x=5) # Keyword arguments can arrive in any order.
```

# You can define functions that take a variable number of

# positional arguments

```
def varargs(*args):
    return args
```

```
varargs(1, 2, 3) # => (1, 2, 3)
```

# You can define functions that take a variable number of

# keyword arguments, as well

```
def keyword_args(**kwargs):
    return kwargs
```

# Let's call it to see what happens

```
keyword_args(big="foot", loch="ness") # => {"big": "foot", "loch": "ness"}
```

# You can do both at once, if you like

```
def all_the_args(*args, **kwargs):
    print(args)
    print(kwargs)
"""
```

all\_the\_args(1, 2, a=3, b=4) prints:

```
(1, 2)
{"a": 3, "b": 4}
"""
```

# When calling functions, you can do the opposite of args/kwargs!

# Use \* to expand tuples and use \*\* to expand kwargs.

```
args = (1, 2, 3, 4)
```

```
kwargs = {"a": 3, "b": 4}
```

```
all_the_args(*args)      # equivalent to all_the_args(1, 2, 3, 4)
```

```
all_the_args(**kwargs)   # equivalent to all_the_args(a=3, b=4)
```

```
all_the_args(*args, **kwargs) # equivalent to all_the_args(1, 2, 3, 4, a=3, b=4)
```

# Returning multiple values (with tuple assignments)

```
def swap(x, y):
```

```
    return y, x # Return multiple values as a tuple without the parenthesis.
```

```
    # (Note: parenthesis have been excluded but can be included)
```

```
x = 1
```

```
y = 2
```

```
x, y = swap(x, y) # => x = 2, y = 1
```

```
# (x, y) = swap(x,y) # Again parenthesis have been excluded but can be included.
```

# Function Scope

```
x = 5
```

```
def set_x(num):
```

```
    # Local var x not the same as global variable x
```

```
    x = num # => 43
```

```
    print(x) # => 43
```

```
def set_global_x(num):
```

```
    global x
```

```
    print(x) # => 5
```

```
    x = num # global var x is now set to 6
```

```
    print(x) # => 6
```

```
set_x(43)
```

```
set_global_x(6)
```

# Python has first class functions



```
def create_adder(x):
    def adder(y):
        return x + y
    return adder
```

```
add_10 = create_adder(10)
add_10(3) # => 13
```

```
# There are also anonymous functions
(lambda x: x > 2)(3) # => True
(lambda x, y: x ** 2 + y ** 2)(2, 1) # => 5
```

```
# There are built-in higher order functions
list(map(add_10, [1, 2, 3])) # => [11, 12, 13]
list(map(max, [1, 2, 3], [4, 2, 1])) # => [4, 2, 3]
```

```
list(filter(lambda x: x > 5, [3, 4, 5, 6, 7])) # => [6, 7]
```

```
# We can use list comprehensions for nice maps and filters
# List comprehension stores the output as a list which can itself be a nested list
[add_10(i) for i in [1, 2, 3]] # => [11, 12, 13]
[x for x in [3, 4, 5, 6, 7] if x > 5] # => [6, 7]
```

```
# You can construct set and dict comprehensions as well.
{x for x in 'abcddeef' if x not in 'abc'} # => {'d', 'e', 'f'}
{x: x**2 for x in range(5)} # => {0: 0, 1: 1, 2: 4, 3: 9, 4: 16}
```

```
#####
## 5. Modules
#####
```

```
# You can import modules
import math
print(math.sqrt(16)) # => 4.0
```

```
# You can get specific functions from a module
from math import ceil, floor
print(ceil(3.7)) # => 4.0
print(floor(3.7)) # => 3.0
```

```
# You can import all functions from a module.
```

```
# Warning: this is not recommended
from math import *
```

```
# You can shorten module names
import math as m
math.sqrt(16) == m.sqrt(16) # => True
```

```
# Python modules are just ordinary Python files. You
# can write your own, and import them. The name of the
# module is the same as the name of the file.
```

```
# You can find out which functions and attributes
# are defined in a module.
import math
dir(math)
```

```
# If you have a Python script named math.py in the same
# folder as your current script, the file math.py will
# be loaded instead of the built-in Python module.
# This happens because the local folder has priority
# over Python's built-in libraries.
```

Example:

Write a python program to display content of a file.

```
#!/usr/bin/python -tt
```

```
"""
```

```
-tt flag above detects space/tab indent problems
"""
```

```
# sys is one of many available modules of library code, import to use.
# sys.argv is the list of command line arguments.
import sys
```

```
# defines a global variable
a = 123
```

```
# defines a 'cat' function which takes a filename
def cat(filename):
    """Given filename, print its text contents."""
```

```

print filename, '====='
f = open(filename, 'r')
for line in f: # goes through a text file line by line
    print line, # trailing comma inhibits the ending print-newline
# alternative, read the whole file into a single string:
# text = f.read()
f.close()

def main():
    # sys.argv contains command line arguments.
    # This assigns a list of all but the first arg into a local 'args' var.
    args = sys.argv[1:]

    # important syntax -- loop of variable 'filename' over the args list.
    for filename in args:
        # detect scary filenames: if/else and/or/not
        if filename == 'voldemort' or filename == 'vader':
            print 'this file is very worrying'
            cat(filename, 123, bad_variable)
            # important point: errors in above line only caught if it is run
        else:
            # regular case
            cat(filename)
    print 'all done' # this print is outside the loop, due to its indentation

# Standard boilerplate at end of file to call main() function.
if __name__ == '__main__':
    main()

```

#### Exercises:

1. Write a python program to implement simple calculator which perform addition, subtraction, multiplication, and division.
2. Write a python program to reverse a content a file and store it in another file.
3. Write a python program to implement binary search with recursion.
4. Write a python program to sort words in alphabetical order.

#### Additional exercises

1. Write a python program to select smallest element from a list in an expected linear time.

2. Write a python program to implement bubble sort.
3. Write a python program to multiply two matrices

Lab No :4

Date:

## Python Objects and Classes

### Objectives:

In this lab, student will be able to

1. Understand the python classes
2. Learn how to use class objects and methods

Python is an object oriented programming language. Unlike procedure oriented programming, where the main emphasis is on functions, object oriented programming stresses on objects.

An object is simply a collection of data (variables) and methods (functions) that act on those data. Similarly, a class is a blueprint for that object.

We can think of class as a sketch (prototype) of a house. It contains all the details about the floors, doors, windows etc. Based on these descriptions we build the house. House is the object.

As many houses can be made from a house's blueprint, we can create many objects from a class. An object is also called an instance of a class and the process of creating this object is called **instantiation**.

### Defining a Class in Python

Like function definitions begin with the [def](#) keyword in Python, class definitions begin with a [class](#) keyword.

The first string inside the class is called docstring and has a brief description about the class. Although not mandatory, this is highly recommended.

Here is a simple class definition.

```
class MyNewClass:
    """This is a docstring. I have created a new class"""
    pass
```

A class creates a new local [namespace](#) where all its attributes are defined. Attributes may be data or functions.

There are also special attributes in it that begins with double underscores `__`. For example, `__doc__` gives us the docstring of that class.

As soon as we define a class, a new class object is created with the same name. This class object allows us to access the different attributes as well as to instantiate new objects of that class.

```
class Person:
    """This is a person class"""
    age = 10

    def greet(self):
        print('Hello')

# Output: 10
print(Person.age)

# Output: <function Person.greet>
print(Person.greet)
```

```
# Output: 'This is my second class'  
print(Person.__doc__)
```

## Output

```
10  
<function Person.greet at 0x7fc78c6e8160>  
This is a person class
```

## Creating an Object in Python

We saw that the class object could be used to access different attributes.

It can also be used to create new object instances (instantiation) of that class. The procedure to create an object is similar to a [function](#) call.

```
>>> harry = Person()
```

This will create a new object instance named `harry`. We can access the attributes of objects using the object name prefix.

Attributes may be data or method. Methods of an object are corresponding functions of that class.

This means to say, since `Person.greet` is a function object (attribute of class), `Person.greet` will be a method object.

```
class Person:
    "This is a person class"
    age = 10

    def greet(self):
        print('Hello')

# create a new object of Person class
harry = Person()

# Output: <function Person.greet>
print(Person.greet)

# Output: <bound method Person.greet of <__main__.Person object>>
print(harry.greet)

# Calling object's greet() method
# Output: Hello
harry.greet()
```

## Output

```
<function Person.greet at 0x7fd288e4e160>
<bound method Person.greet of <__main__.Person object at 0x7fd288e9fa30>>
Hello
```

You may have noticed the `self` parameter in function definition inside the class but we called the method simply as `harry.greet()` without any [arguments](#). It still worked. This is because, whenever an object calls its method, the object itself is passed as the first argument. So, `harry.greet()` translates into `Person.greet(harry)`.



In general, calling a method with a list of n arguments is equivalent to calling the corresponding function with an argument list that is created by inserting the method's object before the first argument.

For these reasons, the first argument of the function in class must be the object itself. This is conventionally called `self`. It can be named otherwise but highly recommend to follow the convention.

Another Example:

# We use the "class" statement to create a class

**class Human:**

# A class attribute. It is shared by all instances of this class

species = "H. sapiens"

# Basic initializer, this is called when this class is instantiated.

# Note that the double leading and trailing underscores denote objects

# or attributes that are used by Python but that live in user-controlled

# namespaces. Methods(or objects or attributes) like: `__init__`, `__str__`,

# `__repr__` etc. are called special methods (or sometimes called dunder methods)

# You should not invent such names on your own.

**def \_\_init\_\_(self, name):**

# Assign the argument to the instance's name attribute

self.name = name

```
# Initialize property

self._age = 0


# An instance method. All methods take "self" as the first argument
def say(self, msg):

    print("{name}: {message}".format(name=self.name, message=msg))


# Another instance method
def sing(self):

    return 'yo... yo... microphone check... one two... one two...'


# A class method is shared among all instances
# They are called with the calling class as the first argument
@classmethod
def get_species(cls):

    return cls.species


# A static method is called without a class or instance reference
@staticmethod
def grunt():

    return "*grunt*"
```

```
# A property is just like a getter.
```

```
# It turns the method age() into an read-only attribute of the same name.
```

```
# There's no need to write trivial getters and setters in Python, though.
```

```
@property
```

```
def age(self):
```

```
    return self._age
```

```
# This allows the property to be set
```

```
@age.setter
```

```
def age(self, age):
```

```
    self._age = age
```

```
# This allows the property to be deleted
```

```
@age.deleter
```

```
def age(self):
```

```
    del self._age
```

```
# When a Python interpreter reads a source file it executes all its code.
```

```
# This __name__ check makes sure this code block is only executed when this
```

```
# module is the main program.
```

```
if __name__ == '__main__':
```

```
    # Instantiate a class
```

```
i = Human(name="Ian")

i.say("hi")          # "Ian: hi"

j = Human("Joel")

j.say("hello")       # "Joel: hello"
```

# i and j are instances of type Human, or in other words: they are Human objects

# Call our class method

```
i.say(i.get_species())    # "Ian: H. sapiens"
```

# Change the shared attribute

```
Human.species = "H. neanderthalensis"
```

```
i.say(i.get_species())    # => "Ian: H. neanderthalensis"
```

```
j.say(j.get_species())    # => "Joel: H. neanderthalensis"
```

# Call the static method

```
print(Human.grunt())      # => "*grunt*"
```

# Cannot call static method with instance of object

# because i.grunt() will automatically put "self" (the object i) as an argument

```
print(i.grunt())          # => TypeError: grunt() takes 0 positional arguments but 1
was given
```

# Update the property for this instance

```
i.age = 42
```

```
# Get the property

i.say(i.age)          # => "Ian: 42"

j.say(j.age)          # => "Joel: 0"

# Delete the property

del i.age

# i.age                # => this would raise an AttributeError
```

Example: Write a Python program to convert an integer to a roman numeral.

```
class py_solution:
    def int_to_Roman(self, num):
        val = [
            1000, 900, 500, 400,
            100, 90, 50, 40,
            10, 9, 5, 4,
            1
        ]
        syb = [
            "M", "CM", "D", "CD",
            "C", "XC", "L", "XL",
            "X", "IX", "V", "IV",
            "I"
        ]
        roman_num = ""
        i = 0
        while num > 0:
            for _ in range(num // val[i]):
                roman_num += syb[i]
                num -= val[i]
            i += 1
        return roman_num

print(py_solution().int_to_Roman(1))
print(py_solution().int_to_Roman(4000))
```

Exercises:

1. Write a Python class to get all possible unique subsets from a set of distinct integers  
 Input:[4,5,6]  
 Output : [[], [6], [5], [5, 6], [4], [4, 6], [4, 5], [4, 5, 6]]
2. Write a Python class to find a pair of elements (indices of the two numbers) from a given array whose sum equals a specific target number.  
 Input:                numbers=                [10,20,10,40,50,60,70],                target=50  
 Output: 3, 4
3. Write a Python class to implement pow(x, n).
4. Write a Python class which has two methods get\_String and print\_String. get\_String accept a string from the user and print\_String print the string in upper case.

#### Additional Exercises:

1. Write a Python class to find validity of a string of parentheses, '(', ')', '{', '}', '[' and ']'. These brackets must be close in the correct order, for example "()" and "()[]{}" are valid but "[)", "({[})", and "{{{{" are invalid.
2. Write a Python class to reverse a string word by word.
3. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

Lab No:5

Date:

## Developing Web Application using Django

### Objectives:

In this lab, student will be able to

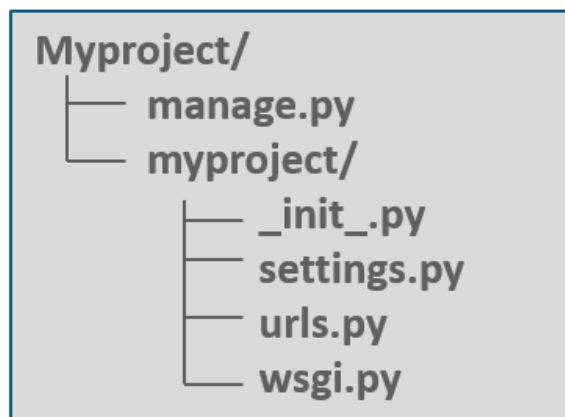
1. Understand the fundamentals of web forms creation
2. Learn to create views and templates
3. Design Django web applications using views and templates

### 1. Build Your First Web Application in Django

For creating a web application, first create a directory, say *PythonProject* where you would like to share your code, and then run the following command from the created directory using Windows Powershell:

```
django-admin startproject myproject
```

*Myproject* is the name of the project created. The following list of files are created inside the directory.



**manage.py** – It is a command-line utility that allows to interact with the Django project in various ways.

**myproject/** – It is the actual Python package for the project. It is used to import anything, say – `myproject.urls`.

**init.py** – Init just tells the python that this is to be treated like a python package.

**settings.py** – This file manages all the settings of the project.

**urls.py** – This is the main controller which maps it to the website.

**wsgi.py** – It serves as an entry point for WSGI compatible web servers.

Now to create the application, type the below command in Powershell from the created project folder (i.e., *myproject*).

```
python manage.py startapp webapp
```

Now the '*webapp*' directory will have some extra things from the original *myproject*. It includes model, test which are related to the backend databases.

It is important to import your application manually inside the project settings. For that, open *myproject/settings.py* and add your app manually:

```
INSTALLED_APPS = (
    'webapp',
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
)
```

Now to create a view, open *webapp/views.py* and put the below code in it:

```
from django.shortcuts import render
from django.http import HttpResponse
def index(request):
    return HttpResponse("<H2>HEY! Welcome to Edureka! </H2>")
```

The above code creates a view which returns HttpResponse. Now this view is to be mapped to a URL. So create a new python file "*urls.py*" inside the *webapp* folder. In *webapp/urls.py* include the following code:

```
from django.conf.urls import url
```



```
from . import views
urlpatterns = [
    url(r'^$', views.index, name='index'),
]
```

In the above code, a view is referenced which will return index (defined in views.py file). The url pattern is in regular expression format where ^ stands for beginning of the string and \$ stands for the end.

The next step is to point the root URLconf at the webapp.urls module. Open myproject/urls.py file and write the below code:

```
from django.conf.urls import include, url
from django.contrib import admin
urlpatterns = [
    url(r'^admin/', admin.site.urls),
    url(r'^webapp/', include('webapp.urls')),
]
```

In the above code, *webapp* and the *webapp.urls* are included. Now import *django.conf.urls.include* and insert an *include()* in the urlpatterns list. The *include()* function allows referencing other URLconfs.

Note that the regular expression doesn't have a '\$' but rather a trailing slash, this means whenever Django encounters *include()*, it chops off whatever part of the URL matched up to that point and sends the remaining string to include URLconf for further processing.

To start the server, type the below command:

```
E:\MyFolder\myproject> python manage.py runserver
```

After running the server, go to **http://localhost:8000/webapp/** in your browser, and you should see the text “*HEY! Welcome to Edureka!*”, which is defined in the index view(Fig 5.1).

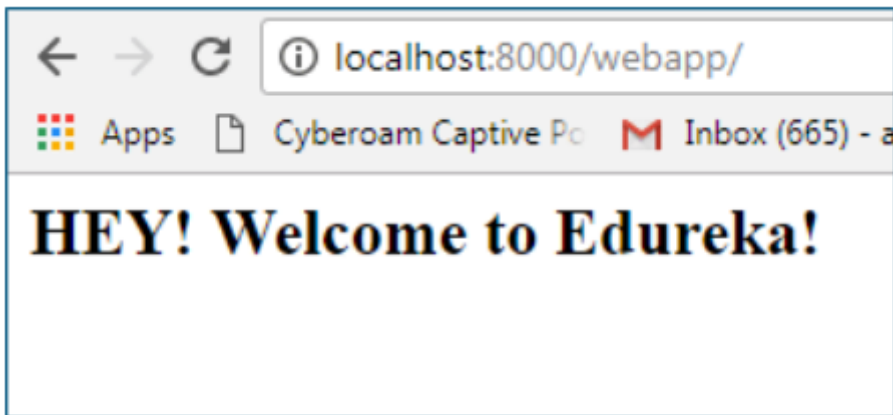


Fig 5.1

## 2. Creating a View

Django's views are the information brokers of a Django application. A view sources data from your database (or an external data source or service) and delivers it to a template. The view makes decisions on what data gets delivered to the template—either by acting on input from the user, or in response to other business logic and internal processes. Each Django view performs a specific function and has an associated template.

Modify `webapp/views.py` and put the below code in it:

```
# \webapp\views.py

1 from django.shortcuts import render
2 from django.http import HttpResponse
3 from datetime import date
4 import calendar
5 from calendar import HTMLCalendar
6
```

```

7
8 def index(request,year,month):
9     year = int(year)
10    month = int(month)
11    if year < 1900 or year > 2099: year = date.today().year
12    month_name = calendar.month_name[month]
13    title = "MyClub Event Calendar - %s %s" % (month_name,year)
14    cal = HTMLCalendar().formatmonth(year, month)
15    return HttpResponse("<h1>%s</h1><p>%s</p>" % (title, cal))

```

Modify webapp/urls.py and put the below code in it

```
# \webapp\urls.py
```

```

1 from django.urls import path, re_path
2 from . import views
3
4 urlpatterns = [
5     path(' ', views.index, name='index'),
6     re_path(r'^(?P<year>[0-9]{4})/(?P<month>0?[1-9]|1[0-2])/', views.index,
7     name='index'),

```

After running the server, go to `http://localhost:8000/2019/03` in your browser, and the screen appears as shown in Fig 5.2.

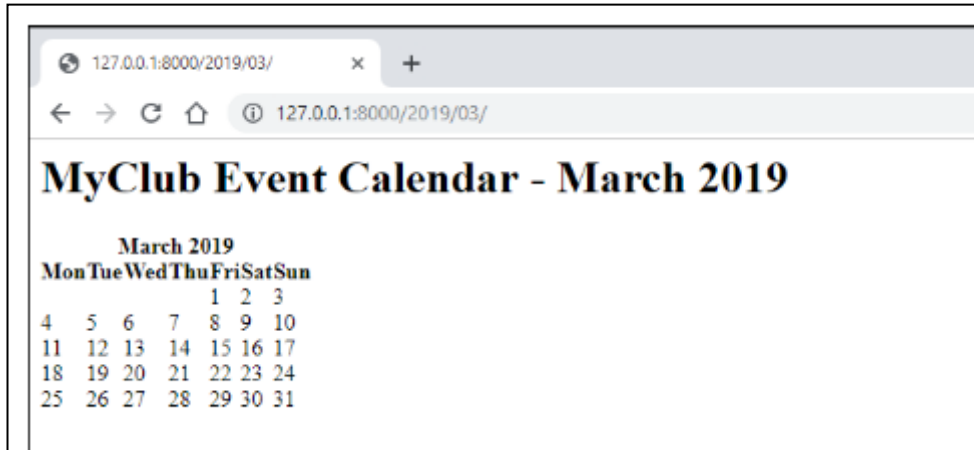


Fig 5.2

## Creating a Site Template

All modern websites have a site template; a common look or branding that is duplicated across every page on the website.

The most common place for storing site template files in Django is in the website app that Django created automatically when *startproject* command is executed. Django didn't create the templates folder, so go ahead and create that folder. The folder structure should look like this:

```
\webapp
    \templates
        __init__.py
    ...
```

As the website app is not in `INSTALLED_APPS`, Django won't automatically look for templates in the `\webapp\templates` folder. So tell Django where to look by adding a path to the `DIRS` setting. Modify `settings.py` (changes in bold):

```
TEMPLATES = [{
    'BACKEND': 'django.template.backends.django.DjangoTemplates',
    'DIRS': [os.path.join(BASE_DIR, 'webapp/templates')],
```

```
'APP_DIRS': True,
# ...
```

This looks complicated, but is easy to understand—`os.path.join` is a Python command to create a file path by joining strings together (concatenating). In this example, `webapp/templates` is joined to the project directory to create the full path to the templates directory, i.e., `<project path>/myproject/webapp/templates`.

Now that the template folder is created and the folder path is listed, Django can find the site template. Now to create a simple template, create a html file `base.html`:

```
# \webapp\templates\base.html

1 <!doctype html>
2 <html>
3   <head>
4     <meta charset="utf-8">
5     <title>Basic Site Template</title>
6   </head>
7
8   <body>
9     <h1>{{ title }}</h1>
10    <p>{{ cal }}</p>
11  </body>
12 </html>
```

### 3. Displaying a Template

Now that the template is created, tell Django to use the new base template when displaying content on the site. This is done in `views.py` file. Make the following changes to the index view (changes in bold):

```
# \webapp\views.py

1 from django.shortcuts import render
2 # from django.http import HttpResponse
3 from datetime import date
4 import calendar
5 from calendar import HTMLCalendar
6
7
8 def index(request, year=date.today().year, month=date.today().month):
```

```

9   year = int(year)
10  month = int(month)
11  if year < 1900 or year > 2099: year = date.today().year
12  month_name = calendar.month_name[month]
13  title = "MyClub Event Calendar - %s %s" % (month_name, year)
14  cal = HTMLCalendar().formatmonth(year, month)
15  # return HttpResponse("<h1>%s</h1><p>%s</p>" % (title, cal))
16  return render(request, 'base.html', {'title': title, 'cal': cal})

```

For the new view, replace the call to `HttpResponse()` with a call to `render()`. `render()` is a special Django helper function that creates a shortcut for communicating with a web browser. When Django receives a request from a browser, it finds the right view and the view returns a response to the browser.

When we wish to use a template, Django first must load the template, create a context—which is basically a dictionary of variables and associated data that is passed back to the browser—and then return a `HttpResponse`. Django's `render()` function provides a shortcut that provides all three steps in a single function.

When the original request, the template and a context is supplied directly to `render()`, it returns the appropriately formatted response without having to code the intermediate steps.

In the modified `views.py`, the original request object is returned from the browser, the name of the site template and a dictionary (the context) containing the title and cal variables from the view.

Once `views.py` file is modified, save it and fire up the development server. Navigate to `http://127.0.0.1:8000/`, to see your simple new site template.

The calendar will be rendered as plain text, not as HTML. To get Django to render the HTML correctly, turn off autoescape for the calendar code. As this is a common task, the Django developers created the autoescape tag to make life easier. Make the following changes to the `base.html` file (changes in bold):

```
# \webapp\templates\base.html
```

```

1  <!doctype html>
2  <html>
3    <head>
4      <meta charset="utf-8">
5      <title>Basic Site Template</title>

```

```

6  </head>
7
8  <body>
9    <h1>{{ title }}</h1>
10   <p>{% autoescape off %}{{ cal }} {% endautoescape %}</p>
11 </body>
12 </html>

```

Now, when you refresh your browser, the site homepage should look like Fig 5.3.

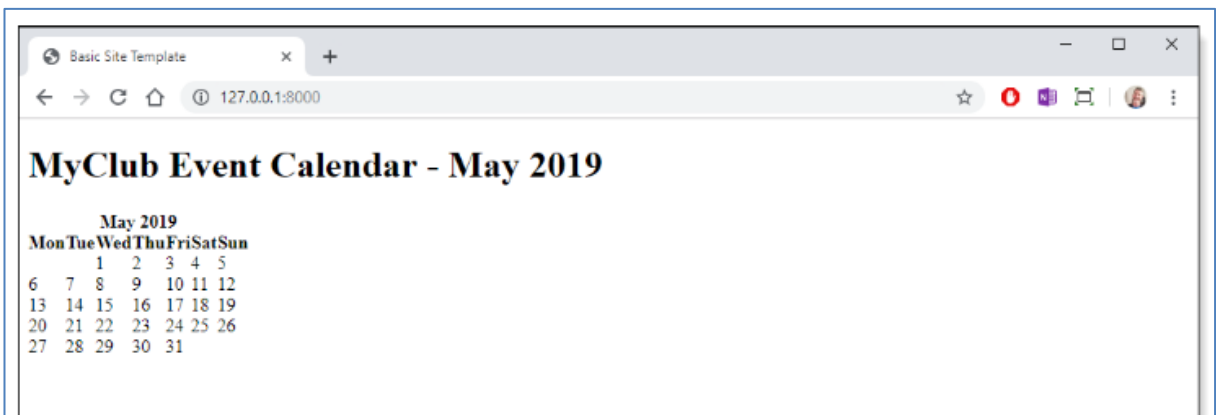


Fig 5.3

### **Solved Exercise:**

Develop a simple Django web application to accept two numbers from user and add them up.

A new project named MyForm is created which has the manage.py file. Inside MyForm a new app named formapp is created which contains all the application related files.

#### **# MyForm/settings.py**

```

INSTALLED_APPS = [
    'formapp',
    'django.contrib.admin',
    'django.contrib.auth',
]
TEMPLATES = [

```

```
{
    'BACKEND': 'django.template.backends.django.DjangoTemplates',
    'DIRS': [os.path.join(BASE_DIR, 'formapp/templates')],
    'APP_DIRS': True,
},
]
```

### # MyForm/urls.py

```
from django.contrib import admin
from django.urls import path
from django.conf.urls import include, url
```

```
urlpatterns = [
    path(r'^admin/', admin.site.urls),
    url("", include('formapp.urls')),
]
```

### # formapp/urls.py

```
from django.conf.urls import url
from . import views
```

```
urlpatterns = [
    url(' ', views.index, name='index'),
]
```

### # formapp/views.py

```
from django.shortcuts import render
# Create your views here.
def index(request):
    return render(request, 'basic.html')
```

### # formapp/templates/basic.html

```
<!doctype html>
<html>
    <head>
        <meta charset="utf-8">
```



```

<title>App to add two Nos</title>

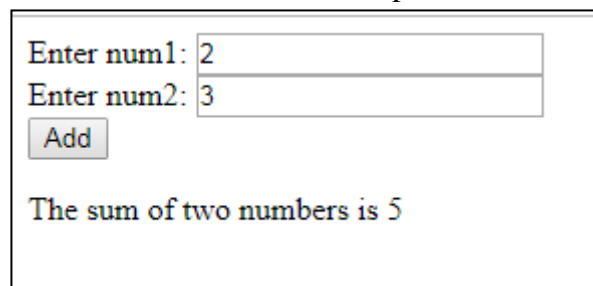
</head>
<body>
  <script type="text/javascript">
    function myfunc(){
      var n1= document.getElementById("num1").value;
      var n2= document.getElementById("num2").value;
      var n3=parseInt(n1)+parseInt(n2);
      document.getElementById("para1").innerHTML="The sum of two numbers is
"+n3;
    }
  </script>
  Enter num1: <input type="text" id="num1"><br>
  Enter num2: <input type="text" id="num2"><br>
  <button onclick="myfunc()">Add</button><br>
  <p id="para1"></p>
</body>
</html>

```

After editing all the above files save them and fire up the development server as shown below

E:\newdir\MyForm> python manage.py runserver

Navigate to <http://127.0.0.1:8000/>, and find the output as shown in Fig 5.4.



Enter num1: 2

Enter num2: 3

Add

The sum of two numbers is 5

Fig 5.4

## LAB EXERCISES:

- 1) Create a web form which allows the teacher to enter the student details like name, date of birth, address, contact number, email id and marks of English, Physics and Chemistry. After filling all the information and on clicking submit button, details

should be added to a textarea displayed on the same page. Display the total percentage of marks obtained in a label.

- 2) Create a web form with employee ids in dropdown list. Use a textbox for accepting date of joining. Add a button named “Am I Eligible for Promotion”. On clicking the button, if he has more than 5 years of experience, then display “YES” else “NO” in the label control.
- 3) Develop a simple web page to perform basic arithmetic operations. Take two integer inputs from the user, select the operation to be performed using a dropdown. Include a button “Calculate” to perform the selected operation, and then display the result in the same web page.
- 4) Develop a simple web form that generates the front cover for a magazine. The form should provide the options for selecting the image, background color, changing font size, color etc. Input messages must be taken from the user so as to display it on the front cover with legible font family and font size. The front cover developed should be proportionate to the web page size. Place the css files inside static folder.

### **ADDITIONAL EXERCISES:**

- 1) Develop a simple web page to reproduce the given Captcha. Upon match, suitable message has to be displayed. If there is a mismatch for more than 3 times, TextBox has to be disabled.
- 2) Design a simple web application to provide information about a book. The home page of the application should display the cover page of the book along with three hyperlinks: Metadata, Reviews, Publisher info. Give provision to revert to home page from any other page.

Lab No:6

Date:

## Form Processing using Django

### Objectives:

In this lab, student will be able to

1. Develop web forms using Form class in Django
2. Learn to use Form Widgets to enhance the web forms
3. Design Django web applications using session management techniques

### Django Forms:

When one creates a **Form** class, the most important part is defining the fields of the form. Each field has custom validation logic. Forms are basically used for taking input from the user in some manner and using that information for logical operations on databases. For example, registering a user by taking input as his name, email, password, etc.

Django maps the fields defined in Django forms into HTML input fields. Django handles three distinct parts of the work involved in forms:

- preparing and restructuring data to make it ready for rendering
- creating HTML forms for the data
- receiving and processing submitted forms and data from the client

### Syntax:

Django Fields have the following syntax:

```
field_name = forms.FieldType(**options)
```

### Built in Django Form fields:

The **forms** library comes with a set of **Field** classes that represent common validation needs.

For each field, we describe the default widget used. We also specify the value returned when you provide an empty value.

## BooleanField

*class* **BooleanField**(\*\*kwargs)

- Default widget: **CheckboxInput**
- Empty value: **False**
- Normalizes to: A Python **True** or **False** value.

## CharField

*class* **CharField**(\*\*kwargs)

- Default widget: **TextInput**
- Empty value: Whatever you've given as **empty\_value**.
- Normalizes to: A string.
- Uses arguments **max\_length** or **min\_length** (integer values), to ensure that the string is at most or at least the given length.

## ChoiceField

*class* **ChoiceField**(\*\*kwargs)

- Default widget: **Select**
- Empty value: "" (an empty string)
- Normalizes to: A string.
- Validates that the given value exists in the list of choices.

## DateField

*class* **DateField**(\*\*kwargs)

- Default widget: **DateInput**
- Empty value: **None**
- Normalizes to: A Python **datetime.date** object.
- Validates that the given value is either a **datetime.date**, **datetime.datetime** or string formatted in a particular date format.

## EmailField

*class* **EmailField**(\*\*kwargs)

- Default widget: **EmailInput**
- Empty value: "" (an empty string)
- Normalizes to: A string.
- Uses **EmailValidator** to validate that the given value is a valid email address, using a moderately complex regular expression.

## FileField

*class* **FileField**(\*\*kwargs)

- Default widget: **ClearableFileInput**
- Empty value: **None**
- Normalizes to: An **UploadedFile** object that wraps the file content and file name into a single object.

## IntegerField

*class* **IntegerField**(\*\*kwargs)

- Default widget: **NumberInput** when **Field.localize** is **False**, else **TextInput**.
- Empty value: **None**
- Normalizes to: A Python integer.

Takes two optional arguments for validation:

- **max\_value**
- **min\_value**

These control the range of values permitted in the field.

## URLField

*class* **URLField**(\*\*kwargs)

- Default widget: **URLInput**

FIELD OPTIONS	DESCRIPTION
<u>required</u>	By default, each Field class assumes the value is required, so to make it not required you need to set <code>required=False</code>
<u>label</u>	The label argument lets you specify the “human-friendly” label for this field. This is used when the Field is displayed in a Form.
<u>label_suffix</u>	The label_suffix argument lets you override the form’s <u>label_suffix</u> on a per-field basis.
<u>widget</u>	The widget argument lets you specify a Widget class to use when rendering this Field. See <u>Widgets</u> for more information.
<u>help_text</u>	The help_text argument lets you specify descriptive text for this Field. If you provide help_text, it will be displayed next to the Field when the Field is rendered by one of the convenience Form methods.
<u>error_messages</u>	The error_messages argument lets you override the default messages that the field will raise. Pass in a dictionary with keys matching the error messages you want to override.

<u>validators</u>	The validators argument lets you provide a list of validation functions for this field.
<u>localize</u>	The localize argument enables the localization of form data input, as well as the rendered output.
<u>disabled.</u>	The disabled boolean argument, when set to True, disables a form field using the disabled HTML attribute so that it won't be editable by users.

- Empty value: "" (an empty string)
- Normalizes to: A string.

Takes the following optional arguments:

- **max\_length**
- **min\_length**

These are the same as **CharField.max\_length** and **CharField.min\_length**.

Core Field Arguments:

Core Field arguments are the arguments given to each field for applying some constraint or imparting a particular characteristic to a particular Field. For example, adding an argument `required = False` to `CharField` will enable it to be left blank by the user.

## Creating a Django Form:

To use Django Forms, create a project and an app inside it. After you start an app, create a form in `app/forms.py`.

For creating a form in Django we have to specify what fields would exist in the form and of what type.

Let us create a form with CharField, IntegerField and BooleanField as follows:

**# app/forms.py**

```
from django import forms

class RegForm(forms.Form):
    title = forms.CharField()
    description = forms.CharField()
    views = forms.IntegerField()

    available = forms.BooleanField()
```

### Rendering Django Forms:

Django form fields have several built-in methods to ease the work of the developer but sometimes one needs to implement things manually for customizing User Interface(UI). A form comes with 3 in-built methods that can be used to render Django form fields.

- `{{ form.as_table }}` will render them as table cells wrapped in `<tr>` tags
- `{{ form.as_p }}` will render them wrapped in `<p>` tags
- `{{ form.as_ul }}` will render them wrapped in `<li>` tags

**# app/views.py**

```
from django.shortcuts import render

from .forms import RegForm

# creating a home view
def home_view(request):
    context = {}

    form = RegForm(request.POST or None)

    context['form'] = form

    return render(request, "home.html", context)
```

**#app/ templates/home.html**



```
<html>
<body>
<form action="" method="POST">
    {{ form.as_p }}
    <input type="submit" value="Submit">
</form>
</body>
</html>
```

Use the command ‘python manage.py runserver’ to see the following output in the web page (Fig 6.1):

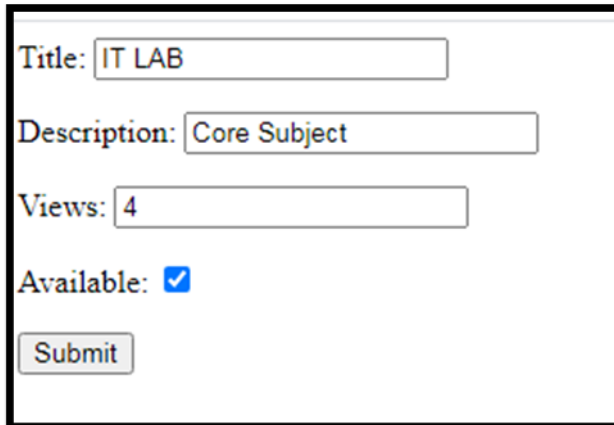
A screenshot of a web browser displaying a Django form. The form is titled "Title: IT LAB". It contains three input fields: "Description: Core Subject", "Views: 4", and "Available: [checked checkbox]". At the bottom of the form is a "Submit" button. The entire form is enclosed in a black rectangular border.

Fig 6.1

### Widgets used in Django Forms:

A widget is Django’s representation of an HTML input element. The widget handles the rendering of the HTML, and the extraction of data from a GET/POST dictionary that corresponds to the widget.

Whenever you specify a field on a form, Django will use a default widget that is appropriate to the type of data that is to be displayed.

However, if you want to use a different widget for a field, you can use the **widget** argument on the field definition. For example:

```

from django import forms

class CommentForm(forms.Form):

    name = forms.CharField()

    url = forms.URLField()

    comment = forms.CharField(widget=forms.Textarea)

```

This would specify a form with a comment that uses a larger **Textarea** widget, rather than the default **TextInput** widget.

Widgets handling input of text

These widgets make use of the HTML elements **input** and **textarea**.

*TextInput*

*class* **TextInput**

- **input\_type:** 'text'
- **template\_name:** 'django/forms/widgets/text.html'
- Renders as: <input type="text" ...>

*NumberInput*

*class* **NumberInput**

- **input\_type:** 'number'
- **template\_name:** 'django/forms/widgets/number.html'
- Renders as: <input type="number" ...>

*EmailInput*

*class* **EmailInput**

- **input\_type:** 'email'
- **template\_name:** 'django/forms/widgets/email.html'
- Renders as: <input type="email" ...>

*PasswordInput**class* **PasswordInput**

- **input\_type:** 'password'
- **template\_name:** 'django/forms/widgets/password.html'
- Renders as: <input type="password" ...>

*HiddenInput**class* **HiddenInput**

- **input\_type:** 'hidden'
- **template\_name:** 'django/forms/widgets/hidden.html'
- Renders as: <input type="hidden" ...>

*DateInput**class* **DateInput**

- **input\_type:** 'text'
- **template\_name:** 'django/forms/widgets/date.html'
- Renders as: <input type="text" ...>

*Textarea**class* **Textarea**

- **template\_name:** 'django/forms/widgets/textarea.html'
- Renders as: <textarea>...</textarea>

*CheckboxInput**class* **CheckboxInput**

- **input\_type:** 'checkbox'
- **template\_name:** 'django/forms/widgets/checkbox.html'
- Renders as: <input type="checkbox" ...>

*Select**class* **Select**

- **template\_name:** 'django/forms/widgets/select.html'
- **option\_template\_name:** 'django/forms/widgets/select\_option.html'
- Renders as: <select><option ...>...</select>

**Sample code:**

```
CHOICES= (('1','Choice1'), ('2','Choice2'), ('3','Choice3'),)
```

```
select = forms.ChoiceField(widget=forms.Select, choices=CHOICES)
```

*RadioSelect**class* **RadioSelect**

- **template\_name:** 'django/forms/widgets/radio.html'
- **option\_template\_name:** 'django/forms/widgets/radio\_option.html'

Similar to **Select**, but rendered as a list of radio buttons within <li> tags:

```
<ul>
<li><input type="radio" name="..."></li>
</ul>
```

**Sample Code:**

```
YES_SMARTPHONE = 'Yes'
NO_SMARTPHONE = 'No'
SMART_PHONE_OWNERSHIP = ((YES_SMARTPHONE, 'Yes'),
(NO_SMARTPHONE, 'No'),)
smart_phone_ownership=forms.ChoiceField(widget=forms.RadioSelect(),
choices=SMART_PHONE_OWNERSHIP, initial= "", label='Do you own a
Smartphone?', required = False)
```

**Custom Django Form field widgets:**

We can override the default widget of each field for various purposes. To do so we need to explicitly define the widget we want to assign to a field.  
**Make following changes to app/forms.py**

```
from django import forms
```

```
class GeeksForm(forms.Form):
    title = forms.CharField(widget = forms.Textarea)
    description = forms.CharField(widget = forms.CheckboxInput)
    views = forms.IntegerField(widget = forms.TextInput)
    available = forms.BooleanField(widget = forms.Textarea)
```

**The output obtained will be as follows (Fig 6.2):**

The screenshot shows a web browser window with the address bar displaying '127.0.0.1:8000'. The browser content displays a Django form. The form consists of the following elements:

- A large text area for the 'Title' field.
- A 'Description' field represented by a checkbox.
- A text input field for 'Views'.
- A text area for the 'Available' field.
- A 'Submit' button located at the bottom left of the form.

Fig 6.2

### **Solved Exercise:**

A Sample program to demonstrate passage of multiple parameters from one page to another.

**#loginapp/ forms.py**

```
from django import forms
class LoginForm(forms.Form):
```

```
username = forms.CharField(max_length = 100)
contact_num = forms.IntegerField()
```

### #loginapp/views.py

```
from django.shortcuts import render
from loginapp.forms import LoginForm
def login(request):
    username = "not logged in"
    cn="not found"
    if request.method == "POST":
        #Get the posted form
        MyLoginForm = LoginForm(request.POST)
        if MyLoginForm.is_valid():
            username = MyLoginForm.cleaned_data['username']
            cn= MyLoginForm.cleaned_data['contact_num']

    else:
        MyLoginForm = LoginForm()

    context = {'username': username,'contact_num':cn}

    return render(request, 'loggedin.html',context)
```

### #loginapp/templates/login.html

```
<html>
<body>

<form name = "form" action = "{% url 'login' %}"
method = "POST" >{% csrf_token %}

<div style = "max-width:470px;">
    <center>
        <input type = "text" style = "margin-left:20%;"
        placeholder = "Identifiant" name = "username" />
    </center>
</div>

<br>

<div style = "max-width:470px;">
    <center>
```

```

        <input type = "number" style = "margin-left:20%;"
        placeholder = "contact_number" name = "contact_num" />    </center>
    </div>

    <br>

    <div style = "max-width:470px;">
        <center>

            <button style = "border:0px; background-color:#4285F4; margin-top:8%;
            height:35px; width:80%;margin-left:19%;" type = "submit"
            value = "Login" >
                <strong>Login</strong>
            </button>

        </center>
    </div>

</form>

</body>
</html>

```

### #loginapp/templates/loggedin.html

```

<html>
    <body>
        You are : <strong>{{username}}</strong>
        Your number is : <strong>{{contact_num}}</strong>
    </body>
</html>

```

### Output (Fig 6.3):

**Command to be used:** E:\MyFolder\FormProject > python manage.py runserver



Fig 6.3

## Django Sessions:

Sessions are used to abstract the receiving and sending of cookies, data is saved on server side (like in database), and the client side cookie just has a session ID for identification. Sessions are also useful to avoid cases where the user browser is set to ‘not accept’ cookie

### Setting Up Sessions

In Django, enabling session is done in your project **settings.py**, by adding some lines to the **MIDDLEWARE\_CLASSES** and the **INSTALLED\_APPS** options. This should be done while creating the project, so **MIDDLEWARE\_CLASSES** should have –

**'django.contrib.sessions.middleware.SessionMiddleware'**

And **INSTALLED\_APPS** should have –

**'django.contrib.sessions'**

By default, Django saves session information in database (django\_session table or collection), but we can configure the engine to store information using other ways like: in **file** or in **cache**.

When session is enabled, every request (first argument of any view in Django) has a session (dict) attribute.



**Solved Exercise:****#sessapp/forms.py**

```

from django import forms
class LoginForm(forms.Form):
    username = forms.CharField(max_length = 100)
    password= forms.CharField(widget= forms.PasswordInput())

```

**#Sessapp/views.py**

```

from django.shortcuts import render
from sessapp.forms import LoginForm
def login(request):
    username = 'not logged in'
    if request.method == 'POST':
        MyLoginForm = LoginForm(request.POST)
        if MyLoginForm.is_valid():
            username = MyLoginForm.cleaned_data['username']
            request.session['username'] = username
        else:
            MyLoginForm = LoginForm()
    return render(request, 'loggedin.html', {"username" : username})

def formView(request):
    if request.session.has_key('username'):
        username = request.session['username']
        return render(request, 'loggedin.html', {"username" : username})
    else:
        return render(request, 'login.html', { })

def logout(request):
    try:
        del request.session['username']
    except:
        pass
    return HttpResponse("<strong>You are logged out.</strong>")

```

**#sessapp/templates/login.html**

```

<html>
<body>

<form name = "form" action = "{% url 'login' %}"
method = "POST" >{% csrf_token %}

    <div style = "max-width:470px;">
        <center>
            <input type = "text" style = "margin-left:20%;"
                placeholder = "Identifiant" name = "username" />
        </center>
    </div>

    <br>

    <div style = "max-width:470px;">
        <center>
            <input type = "password" style = "margin-left:20%;"
                placeholder = "password" name = "password" />
        </center>
    </div>

    <br>

    <div style = "max-width:470px;">
        <center>

            <button style = "border:0px; background-color:#4285F4; margin-top:8%;
                height:35px; width:80%;margin-left:19%;" type = "submit"
                value = "Login" >
                <strong>Login</strong>
            </button>

        </center>
    </div>

</form>

</body>
</html>

```

**#sessapp/templates/loggedin.html**

```
<html>

<body>
  You are : <strong>{{ username }}</strong>
</body>

</html>
```

### #sessapp/urls.py

```
from django.conf.urls import url
from . import views

urlpatterns = [
    url(r'^connection/', views.formView, name = 'formView'),
    url(r'^login/', views.login, name = 'login'),
    url(r'^logout/', views.logout, name = 'logout'),
]
```

### Output (Fig 6.4):

Commands to be used:

E:\MyFolder\SessProject> python manage.py migrate

E:\MyFolder\SessProject> python manage.py runserver



Fig 6.4

## LAB EXERCISES:

- 1) Develop a web application using Django framework to demonstrate the transfer of multiple parameters between web pages. User should be presented with a dropdown list containing car manufacturers, a text box which takes model name of the manufacturer and a submit button. On submitting the web page, the user is forwarded to a new page. This new page should display the selected car manufacturer name and the model name.
- 2) Create a page firstPage.html with two TextBoxes [Name, Roll], DropDownList [Subjects], and a button. Create another page secondPage.html with a label and a button. When the user clicks the button in first Page, he should be sent to the second page and display the contents passed from first page in the label. The button in second page should navigate the user back to firstPage. Use Django sessions to transfer information.
- 3) Create a Register page and Success page with the following requirements:
  - i. Register page should contain four input TextBoxes for UserName, Password, Email id and Contact Number and also a button to submit. Make the username as compulsory field and other fields as optional.
  - ii. On button click, Success page is displayed with message "Welcome {UserName}" and also his Email and Contact Number has to be displayed.
  - iii. Use secure technique to send details to the Success page (Hint: use csrftoken)
- 4) Design a website with two pages.  
 First page contains:  
 RadioButton with HP, Nokia, Samsung, Motorola, Apple as options.  
 CheckBox with Mobile and Laptop as items.  
 TextBox to enter quantity.  
 There is a button with text as "Produce Bill".  
 On Clicking Produce Bill button, item should be displayed with total amount on another page.

## ADDITIONAL EXERCISES:

- 1) Develop a Web Application for Grocery Checklist Generation as shown in the figure below. It must have **checkboxes** which must be populated on page load listing grocery items. On clicking the **Add Item** button the selected Items and their prices have to be displayed in a Table. Set the borderstyle and border width for the table and its cells.

Select Item:

- ☒ Wheat  
☐ Jaggery  
☒ Dal

Item Name	Item Price
Wheat	40
Dal	80

- 2) Create a website with two pages. Page 1 has two TextBoxes (name and total marks) and one 'Calculate' Button as shown in the figure. On clicking the 'Calculate' Button, CGPA (total marks/50) along with the name should be displayed in the Page 2. Use Django sessions to store the information.

<p>Name: <input type="text" value="Alex"/></p> <p>Total Marks: <input type="text" value="450"/></p> <p><input type="button" value="Calculate"/> Page 1</p>	<p><b>Welcome Alex</b> <b>Your CGPA is = 9</b></p> <p>Page 2</p>
--	--

Lab No:7

Date:

## **Mini-project-phase-I**

### **Objectives:**

In this lab, student will be able to

1. Identify an idea to implement a mini project using ASP.NET concepts.
2. Formulate the synopsis for a mini project.
3. Perform the requirement gathering and design phases of the project.

### **INSTRUCTIONS TO STUDENTS TO CARRY OUT MINI PROJECT:**

- Students are supposed to come up with an idea regarding a website.
- Students have to give the name of the project at the end of the 7th week of the regular lab session.
- Students can work in batch containing a maximum of two students.
- The project must cover most of the topics that are worked on during the previous and upcoming lab sessions.
- The project must be completed during the duration between Lab 7 to Lab 12.
- At the end of the last week of regular lab, the report has to be submitted, and the project must be demonstrated to the instructor.

### **Project Synopsis format**

1. Synopsis should contain the following
  - a. Project title.
  - b. Abstract.
  - c. Team members name, Section and roll number.

The mini project carries 20 marks.

Lab No:8

Date:

## Databases

### Objectives:

In this lab, student will be able to

1. Understand the MTV architecture
2. Create an App in Django and establish a connection with SQLite database
3. Set different privileges to different types of users.
4. Set the Django administrator account.

Django supports following databases

1. MySql
2. PostgreSQL
3. Oracle
4. Sqlite

With the help of 3<sup>rd</sup> party backend Django supports following databases

1. SAP SQL Anywhere
2. IBM DB2
3. Microsoft SQL Server
4. Firebird
5. ODBC
6. ADSDB

Django abstracts the details of underlying database. One only need to specify the (models.py) python functions which will be converted into underlying database statements. Django supports CRUD operations. There are two way one can control the data on the website. First way is to use the admin interface second way is to use the forms.

### Solved Exercise

Model is the name given to data abstraction part. To create the model you must first create an app. To create an app right click on the project → Add → DjangoApp

Let us name the app as “blog”

Step1: In settings.py add the app name (blog) under Installed\_Apps as follows:

```
INSTALLED_APPS = [  
    # Add your apps here to enable them  
    'django.contrib.admin',  
    'django.contrib.auth',  
    'django.contrib.contenttypes',  
    'django.contrib.sessions',  
    'django.contrib.messages',  
    'django.contrib.staticfiles',  
    'blog'  
]
```

Under Templates provide the path of the template directory as follows

```
TEMPLATES = [  
    {  
        'BACKEND': 'django.template.backends.django.DjangoTemplates',  
        'DIRS': [os.path.join(BASE_DIR, 'blog/templates/blog')],  
        'APP_DIRS': True,  
        'OPTIONS': {  
            'context_processors': [  
                'django.template.context_processors.debug',  
                'django.template.context_processors.request',  
                'django.contrib.auth.context_processors.auth',
```



```

        'django.contrib.messages.context_processors.messages',

    ],

},

},

]

```

If you are using sqlite leave the default setting for database which will look as follows

```

DATABASES = {

    'default': {

        'ENGINE': 'django.db.backends.sqlite3',

        'NAME': os.path.join(BASE_DIR, 'db.sqlite3'),

    }

}

```

If you are using MySQL in that case modify the database entry as follows

```

DATABASES = {

    'default': {

        'ENGINE': 'django.db.backends.mysql',

        'OPTIONS': {'read_default_file': '/path/to/my.cnf'},

    }

}

```

```
}
```

```
}
```

My.cnf file is as follows:

```
# my.cnf
```

```
[client]
```

```
database = NAME
```

```
user = USER
```

```
password = PASSWORD
```

```
default-character-set = utf8
```

Step2: Modify the Projects urls.py as given below

```
from django.conf.urls import include, url
```

```
# Uncomment the next two lines to enable the admin:
```

```
from django.contrib import admin
```

```
admin.autodiscover()
```

```
urlpatterns = [
```

```
    # Examples:
```

```
    # url(r'^$', MyBlog.views.archive, name='archive'),
```

```
    #url(r'^MyBlog/', include('MyBlog.MyBlog.urls')),
```

```
# Uncomment the admin/doc line below to enable admin documentation:
```

```
# url(r'^admin/doc/', include('django.contrib.admindocs.urls')),
```

# Uncomment the next line to enable the admin:

```
# (r'^$', 'django.views.generic.simple.redirect_to',
# {'url': '/blog/'}),
url(r'^blog/', include('blog.urls')),
url(r'^admin/', include(admin.site.urls)),

]
```

Step3: Under blog app create a file named urls.py and type the following

```
from django.conf.urls import include,url
from blog.views import archive,create_blogpost
urlpatterns = [
    url(r'^$', archive, name='archive'),
    url(r'^create/', create_blogpost, name='create_blogpost'),
]
```

Step4: Under models.py type the following

```
from django.db import models
```

```
# Create your models here.
```

```
from django import forms
```

```

class BlogPost(models.Model):
    title = models.CharField(max_length=150)
    body = models.TextField()
    timestamp = models.DateTimeField()

    class Meta:
        ordering = ('-timestamp',)

class BlogPostForm(forms.ModelForm):
    class Meta:
        model = BlogPost
        exclude = ('timestamp',)

```

It contains the details of table and Model form uses the model already created to create the form. This approach avoids duplication of code and goes with python philosophy Do not Repeat Yourself.

Step5: Registering your app in the admin: To register your app type the following into admin.py

```

from django.contrib import admin

import site

from blog.models import BlogPost

# Register your models here.

from blog import models

class BlogPostAdmin(admin.ModelAdmin):
    list_display = ('title', 'timestamp')

admin.site.register(models.BlogPost,BlogPostAdmin)

```

Step6: Type the following into views.py

```
from django.shortcuts import render

# Create your views here.

from datetime import datetime

from django.http import HttpResponseRedirect

from django.shortcuts import render

from blog.models import BlogPost, BlogPostForm

def archive(request):

    posts = BlogPost.objects.all()[:10]

    return render(request, 'archive.html',

                  {'posts': posts, 'form': BlogPostForm()})

def create_blogpost(request):

    if request.method == 'POST':

        form = BlogPostForm(request.POST)

        if form.is_valid():

            post = form.save(commit=False)

            post.timestamp=datetime.now()

            post.save()

        return HttpResponseRedirect('/blog/')

It is displaying the 10 most recent blogs posted by users/admin.
```

Step7: Type the following lines into archive.html

```

<!DOCTYPE html>

<html lang="en" xmlns="http://www.w3.org/1999/xhtml">
<head>
    <meta charset="utf-8" />
    <title></title>
</head>
<body>
<form action="/blog/create/" method=post>{% csrf_token %}
    <table>{{ form }}</table><br>
    <input type=submit>
</form>
<hr>
{% for post in posts %}
    <h2>{{ post.title }}</h2>
    <p>{{ post.timestamp }}</p>
    <p>{{ post.body }}</p>
    <hr>
{% endfor %}
</body>
</html>

```

This is the template which displays the blog posts that are separated by horizontal rule.

Once you have typed all of the above

- i. Go to Projects → Django Check

If it succeeds then

- ii. Goto Projects → Django Make Migrations

If it succeeds then

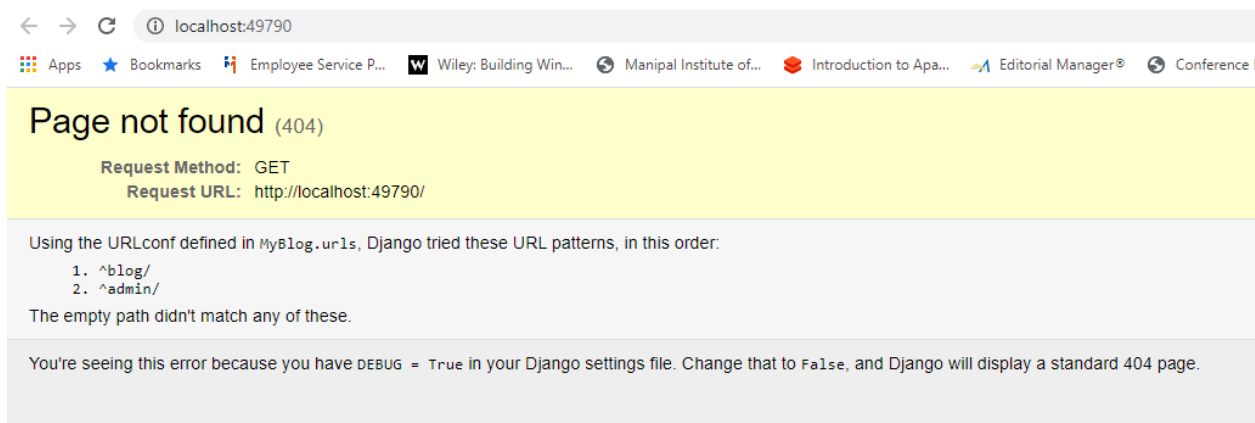
- iii. Goto Projects → Django Migrate

If it Succeeds then

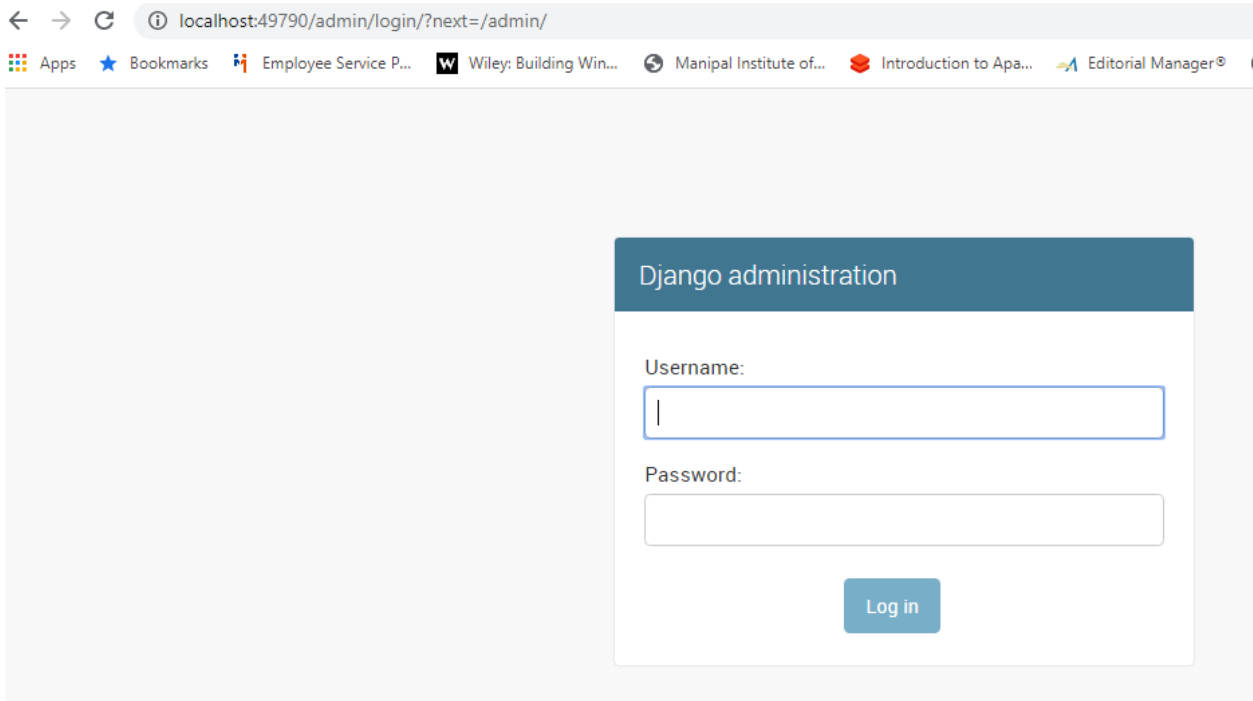
- iv. Goto Projects → Django Create Superuser

You have to repeat the above four steps whenever you modify the model or use different database.

Once you have created the superuser you can open the website. It looks as follows



append /admin to the host name you will get the following screen



← → ↻ ⓘ localhost:49790/admin/login/?next=/admin/

Apps ★ Bookmarks ⓘ Employee Service P... W Wiley: Building Win... ⓘ Manipal Institute of... ⓘ Introduction to Apa... ⓘ Editorial Manager®

### Django administration

Username:

Password:

Log in

Type the superuser name and password you will be taken to following admin page. In the admin page you can see entry for Blog Posts as you have registered it.



## Django administration

### Site administration

#### AUTHENTICATION AND AUTHORIZATION

##### Groups

[+ Add](#)[✎ Change](#)

##### Users

[+ Add](#)[✎ Change](#)

#### BLOG

##### Blog posts

[+ Add](#)[✎ Change](#)

#### Recent actions

##### My actions

None available

Add a blog post You will be taken to following screen you can observe only title and timestamp are visible as per our code

localhost:49790/admin/blog/blogpost/

Apps Bookmarks Employee Service P... Wiley: Building Win... Manipal Institute of... Introduction to Apa... Editorial Manag

## Django administration

Home » Blog » Blog posts

✓ The blog post "BlogPost object" was added successfully.

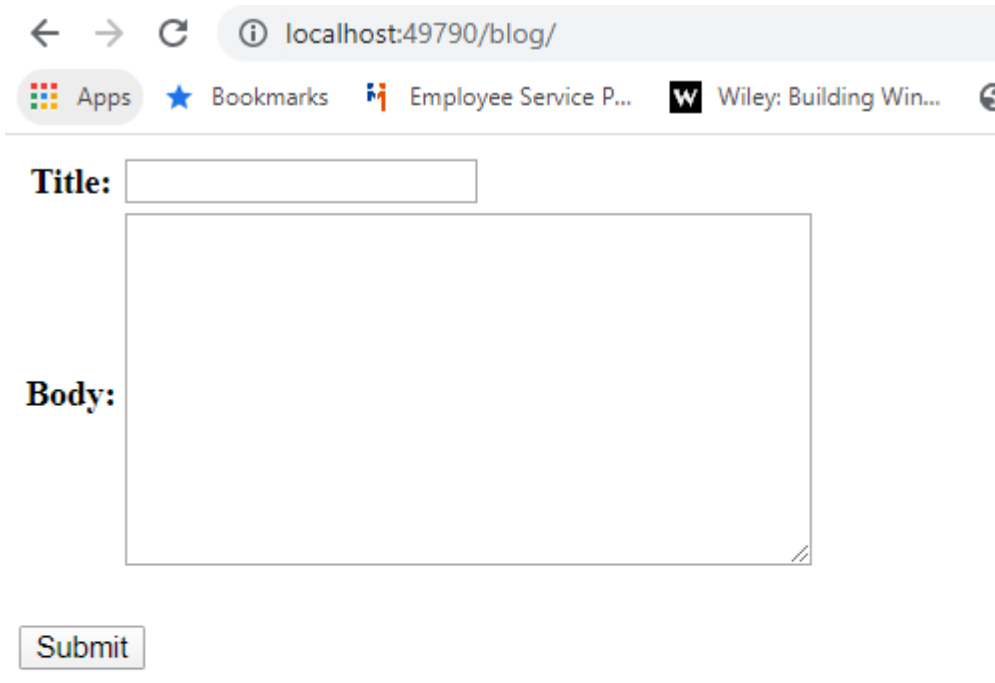



Select blog post to change






Action:   0 of 1 selected

<input type="checkbox"/>	TITLE	TIMESTAMP
<input type="checkbox"/>	<a href="#">Internet Technology Lab</a>	May 10, 2020, 10:50 a.m.

1 blog post

Now you append the blog to the address you will get the following output.

    localhost:49790/blog/

 Apps  Bookmarks  Employee Service P...  Wiley: Building Win... 

---

**Title:**

**Body:**

---

## Internet Technology Lab

May 10, 2020, 10:50 a.m.

Welcome to the Lab

---

As per our instructions users cannot edit the timestamp and current date and time will be taken for user entry. The blog entered by admin is also displayed. Once you enter the blog post details it will display it as under.

←

→

↺

localhost:49790/blog/

Apps

★

Bookmarks

Employee Service P...

W

Wiley: Building Win...

Manipal Institute

Title:

Body:

Submit

---

## Internet Technology Lab

May 10, 2020, 4:29 p.m.

Do the lab exercises

---

## Internet Technology Lab

May 10, 2020, 10:50 a.m.

Welcome to the Lab

## Lab Exercises

1. Design a web site using Django, which is a website directory – A site containing links to other websites. A web page has different categories.
  - A category table has a name, number of visits, and number of likes.
  - A page table refers to a category, has a title, URL, and many views.

Design a form that populates the above database and displays it.

2. Consider the following tables:  
 WORKS(person-name,Company-name,Salary)  
 LIVES(Person\_name, Street, City)  
 Assume Table data suitably. Design a Django webpage and include an option to insert data into WORKS table by accepting data from the user using TextBoxes. Also, include an option to retrieve the names of people who work for a particular company along with the cities they live in (particular company name must be accepted from the user).
3. There are three tables in the database an author table has a first name, a last name and an email address. A publisher table has a name, a street address, a city, a state/ province, a country, and a Web site. A book table has a title and a publication date. It also has one or more authors (a many-to-many relationship with authors) and a single publisher (a one-to-many relationship - aka foreign key - to publishers). Design a form which populates and retrieves the information from the above database using Django.
4. Create a Django Page for entry of a Product information (title, price and description) and save it into the db. Create the index page where you would view the product entries in an unordered list.

## Additional Exercises

1. Create a web page with DropDownList, Textboxes and Buttons. Assume the table 'Human' with First name, Last name, Phone, Address and City as fields.

When the page is loaded, only first names will be displayed in the drop-down list. On selecting the name, other details will be displayed in the respective TextBoxes. On clicking the update button, the table will be updated with new entries made in the text box. On clicking the delete button, the selected record will be deleted from the table, and the DropDownList is refreshed.

2. Assume a table “Institutes” with institute\_id, name, and no\_of\_courses are the fields. Create a web page that retrieves all the data from “Institutes” table displays only Institute names in the list box.

Lab No:9

Date:

## **Mini-project-Phase-II**

### **Objectives:**

In this lab, student will be able to

1. Implement database concepts into the mini-project.
2. Assign privileges to different users.
3. Administer the website

At the end of Phase-II of mini-project student must implement database concept into the mini-project and assign different roles and responsibilities to different users. Administration of website must be possible.

**Lab No 10:****Date:**

## **ReST API**

### **Objectives:**

In this lab, student will be able to

1. Understand the ReSTful architecture
2. Create a ReST API
3. Access ReST API from Django web application.

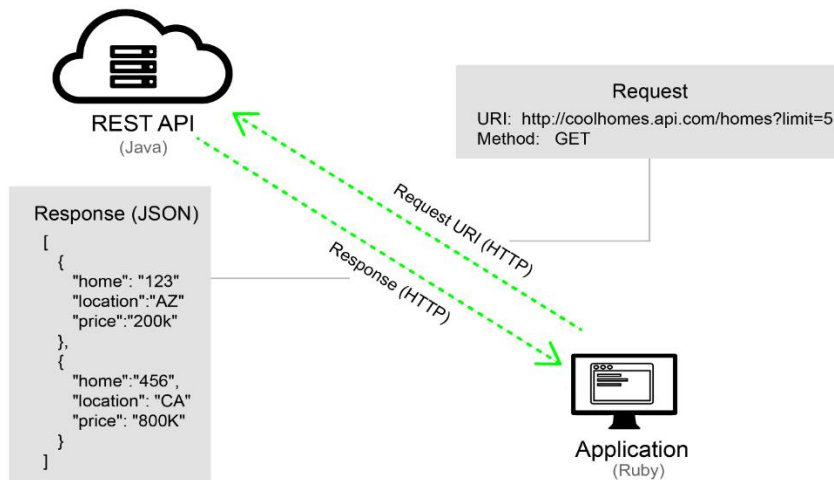
### **I. DESCRIPTION**

REST is acronym for REpresentational State Transfer. It is architectural style for distributed hypermedia systems and was first presented by Roy Fielding in 2000.

#### **Why ReST API?**

User owns a website and has all the code and database connections already set up and it is working fine. Now, he/she decides to develop a mobile application for his/her website. In such a case, it becomes extremely difficult and time-consuming to configure the same database connections separately around different mobile OSs. Instead of that, the user can build a REST API on top of the current WEB application and use that API to serve requests from the mobile application irrespective of the devices. As ReST API returns a JSON, which is a common format and not specific to any devices. So, it becomes easy for various devices to communicate with each other. Another key feature of REST API is that if the user has an API to perform certain operations then he/she does not have to rewrite that as part of the code and thereby it also reduces the size of the code.





### *ReST API Model*

The key abstraction of information in REST is a resource. Any information that can be named can be a resource: a document or image, a temporal service, a collection of other resources, a non-virtual object (e.g. a person), and so on. REST uses a resource identifier to identify the resource involved in an interaction between components.

Resources are represented by URIs. The clients send requests to these URIs using the methods defined by the HTTP protocol, and possibly because of that the state of the affected resource changes.

The state of the resource at any timestamp is known as resource representation. A representation consists of data, metadata describing the data and hypermedia links which can help the clients in transition to the next desired state.

HTTP Method	Action	Examples
GET	Obtain information about a resource	<a href="http://manipal.edu/api/v1/students">http://manipal.edu/api/v1/students</a> (retrieve student list)
GET	Obtain information about a resource	<a href="http://manipal.edu/api/v1/students/123">http://manipal.edu/api/v1/students/123</a> (retrieve student #123)
POST	Create a new resource	<a href="http://manipal.edu/api/v1/students">http://manipal.edu/api/v1/students</a> (create a new student, from data provided with the request)

PUT	Update a resource	<a href="http://manipal.edu/api/v1/students/123">http://manipal.edu/api/v1/students/123</a> (update student #123, from data provided with the request)
DELETE	Delete a resource	<a href="http://manipal.edu/api/v1/students/123">http://manipal.edu/api/v1/students/123</a> (delete student #123)

*HTTP Methods*

<b>Level 200 (Success)</b> 200 : OK 201 : Created 203 : Non-Authoritative Information 204 : No Content	<b>Level 400</b> 400 : Bad Request 401 : Unauthorized 403 : Forbidden 404 : Not Found 409 : Conflict	<b>Level 500</b> 500 : Internal Server Error 503 : Service Unavailable 501 : Not Implemented 504 : Gateway Timeout 599 : Network timeout 502 : Bad Gateway
--	---	--

*HTTP Status Codes*

For an API to be considered RESTful, it has to conform to these criteria:

- A client-server architecture made up of clients, servers, and resources, with requests managed through HTTP.
- Stateless client-server communication, meaning no client information is stored between get requests and each request is separate and unconnected.
- Cacheable data that streamlines client-server interactions.
- A uniform interface between components so that information is transferred in a standard form. This requires that:
  - resources requested are identifiable and separate from the representations sent to the client.
  - resources can be manipulated by the client via the representation they receive because the representation contains enough information to do so.
  - self-descriptive messages returned to the client have enough information to describe how the client should process it.
  - hypertext/hypermedia is available, meaning that after accessing a resource the client should be able to use hyperlinks to find all other currently available actions they can take.

- A layered system that organizes each type of server (those responsible for security, load-balancing, etc.) involved the retrieval of requested information into hierarchies, invisible to the client.
- Code-on-demand (optional): the ability to send executable code from the server to the client when requested, extending client functionality.

## REST API Design:

The starting point in selection of resources is to analyze your business domain and extract the nouns that are relevant to your business needs. More importantly, focus should be given to the needs of API consumers and how to make the API relevant and useful from the perspective of API consumer interactions. Once the nouns (resources) have been identified, then the interactions with the API can be modeled as HTTP verbs against these nouns. When they don't map nicely, we could approximate. For example, we can easily use the “nouns in the domain” approach and identify low level resources such as Post, Tag, Comment, etc. in a blogging domain. Similarly, we can identify the nouns Customer, Address, Account, Teller, etc. as resources in a banking domain.

If we take “Account” noun example, “open” (open an account), “close” (close an account), “deposit” (deposit money to an account), “withdraw” (withdraw money from an account), etc. are the verbs. These verbs can be nicely mapped to HTTP verbs. For example, API consumer can “open” an account by creating an instance of “Account” resource using HTTP POST method. Similarly, API consumer can “close” an account by using HTTP DELETE method. API consumer can “withdraw” or “deposit” money using HTTP “PUT” / “PATCH” / “POST” methods

## II. SOLVED EXERCISE:

First install the required module within a virtual environment:

```
pip install djangorestframework
```

To create a project we should move to the directory where we would like to store our code. For this go to command line and use cd command. Then trigger the startproject command.

```
django-admin startproject pollsapi
```

For database setup, go to pollsapi/settings.py and make sure it contains the following entry

```
DATABASES = {
    'default': {
        'ENGINE': 'django.db.backends.sqlite3',
```

```

        'NAME': os.path.join(BASE_DIR, 'db.sqlite3'),
    }
}

```

Now, use the migrate command which builds the needed database tables regarding the django\_pollsapi/settings.py file.

```
python manage.py migrate
```

To create pollsapi App, use

```
python manage.py startapp polls
```

For creating the polls api we are going to create a Poll model, a Choice model, and a Vote model. Once we are done with designing our models, the *models.py* file should look like this:

```

from django.db import models
from django.contrib.auth.models import User
class Poll(models.Model):
    question = models.CharField(max_length=100)
    created_by = models.ForeignKey(User, on_delete=models.CASCADE)
    pub_date = models.DateTimeField(auto_now=True)
    def __str__(self):
        return self.question

class Choice(models.Model):
    poll = models.ForeignKey(Poll, related_name='choices',
    on_delete=models.CASCADE)
    choice_text = models.CharField(max_length=100)
    def __str__(self):
        return self.choice_text

class Vote(models.Model):
    choice = models.ForeignKey(Choice, related_name='votes',
    on_delete=models.CASCADE)
    poll = models.ForeignKey(Poll, on_delete=models.CASCADE)
    voted_by = models.ForeignKey(User, on_delete=models.CASCADE)
    class Meta:
        unique_together = ("poll", "voted_by")

```

To create the database tables to our models, ‘rest\_framework’ and ‘polls’ app needs to be added to the “INSTALLED\_APPS” in the ‘django\_pollsapi/settings’ file.

```
INSTALLED_APPS = (
```

```
...
'rest_framework',
'polls',
)
```

Run the makemigrations command which will notify Django that new models have been created and those changes need to be applied to the migration. Run migrate command to do the actual migration.

```
python manage.py makemigrations polls
python manage.py migrate
```

Go to pollsapi/urls.py and include the polls urls.

```
from django.urls import include, re_path
urlpatterns = [
    re_path(r'^', include('polls.urls')),
]
```

To run the server use:

```
python manage.py runserver
```

Open any browser and hit the url <http://127.0.0.1:8000>

Register Poll and Choice in the admin using:

```
from django.contrib import admin
from .models import Poll, Choice
admin.site.register(Poll)
admin.site.register(Choice)
```

Create urls.py in polls app with the following code:

```
from django.urls import path
from .views import polls_list, polls_detail
urlpatterns = [
    path("polls/", polls_list, name="polls_list"),
    path("polls/<int:pk>/", polls_detail, name="polls_detail")
]
```

In views.py, add the following:

```
from django.shortcuts import render, get_object_or_404
from django.http import JsonResponse
from .models import Poll
def polls_list(request):
    MAX_OBJECTS = 20
    polls = Poll.objects.all()[:MAX_OBJECTS]
    data = {"results": list(polls.values("question", "created_by__username",
    "pub_date", "→"))}
```

```

        return JsonResponse(data)
def polls_detail(request, pk):
    poll = get_object_or_404(Poll, pk=pk)
    data = {"results": {
        "question": poll.question,
        "created_by": poll.created_by.username,
        "pub_date": poll.pub_date
    }}
    return JsonResponse(data)

```

The API can be tested using Postman using the following url and GET method:

*http://localhost:8000/polls/*

### III. LAB EXERCISE:

1. Create a ReST service for "ManipalBlog" with the following requirements:

- Users can register by providing email or phone number.
- Only registered users can create a new blog.
- Even anonymous users can comment on a blog.

Create HTTP methods for the following operations:

- User registration
- Update existing blog.
- Registered user adds comment.
- Anonymous user deletes comment

Test the service using POSTMAN.

2. Create a ReST service for Ola Cabs with the requirement given below:

The service should provide the following real time information about Ola rides available at a given user location (latitude and longitude).

- Estimated time of arrival (ETA)
- Fare details

Implement the CRUD operations for the resources identified and create a client to consume the service.

3. Design and implement a ReST service for Romato, which gives you access to the freshest and most exhaustive information for over 1 million restaurants across 1,000 cities globally. With the Romato APIs, one can search for restaurants by name, cuisine, or location. Identify any three resources and implement CRUD operations.

4. Design a ReST service for RodeSprinter, which is a one-stop solution for all local needs. Through the API, the website can request for any amenity from Fish, meat, groceries, vegetables, flowers, cakes, hotel food, home cooked food, medicines, bill payments, documents pickup and so much more. Basically, anything from anywhere. With the RodeSprinter APIs, one can search for amenities by name, or location. Identify any three Resources and implement CRUD operations.

**ADDITIONAL EXERCISES:**

1. Design a ReST service for an e-learning platform such as Coursera. Identify any three resources and implement CRUD operations.
2. Design a ReST service for bus ticket booking site. Identify any three resources and implement CRUD operations.

## **Mini Project**

### **Objective:**

1. Demonstrate the website developed as part of the mini project along with report and presentation.

### **Project Details**

1. Student must do a mini project in Django.
2. Student must submit the synopsis in 7<sup>th</sup> lab.
3. Complete the Django mini project and demonstrate by 12<sup>th</sup> lab.
4. Student must submit the report in 12<sup>th</sup> lab.

### **Project Report format for research projects**

1. Abstract
2. Motivation
3. Objectives
4. Introduction
5. Literature review
6. Methodology
7. Results
8. Limitations and Possible Improvements
9. Conclusion
10. References

Other type of projects can exclude literature review.



## References:

1. Mark Lutz, Learning Python, 5th Edition, O'Reilly, 2013
2. Nigel George, Mastering Django, Packt Publishing, 2016.
3. Leif Azzopardi and David Maxwell, Tango with Django 2, Apress, 2019