



COMSATS University Islamabad (CUI), Lahore Campus
Department of Electrical & Computer Engineering

CSC336 – Web Technologies

Lab Manual v 1.0.1

Lab Resource Person

Muhammad Babar Ali

Theory Resource Person

Muhammad Babar Ali

FALL 2024

Name:

Registration No:

Program:

Batch:

Semester:

Laboratory 04b

To organize and reutilize web components to bootstrap an application using UI Framework

BOOTSTRAPPING A WEB APPLICATION WITH UI FRAMEWORK

1 Objective

The purpose of the lab is to introduce students to the most famous front-end web development framework, called [Bootstrap](#). Students will learn how to introduce bootstrap in their project. They will also learn about Content Delivery Network (CDN) links, node package manager, bootstrap layout mechanism, bootstrap classes, responsive webpages, bootstrap-icons, and bootstrap forms.

2 Introduction to Bootstrap

2.1 Why use frameworks?

In the previous laboratory activities, you have learned Hypertext Markup Language ([HTML](#)) and Cascaded Style Sheets ([CSS](#)). The development of production grade websites with these tools is quite time-consuming. Usually, web application developers need a prototype for their web project which they discuss with their client so that they can discuss their initial proposal and they can give the first impression of the final product. However, if the prototype is not ready in due time, the client might get offended or even lost.

The frameworks play an important role in this regard. They are a collection of basic tools, procedures, and components. They help programmers to develop production grade websites quickly and efficiently. Lots of frameworks are available in the development industry. These frameworks are divided into two categories: frontend frameworks and backend frameworks. The purpose of the lab is to introduce students to one of the most powerful front-end tools, namely Bootstrap. Currently, Bootstrap 5.3 is available.

2.2 Introducing Bootstrap in a project

Bootstrap can be introduced to basic HTML/CSS based web applications. It can also be included in more advanced front-end frameworks such as React.js and Angular. This lab will focus on introducing Bootstrap in basic HTML/CSS applications. Three ways of introducing Bootstrap to web application are:

1. Use CDN links to add Bootstrap's CSS and JS files.
2. Download the Bootstrap's CSS, Bootstrap's JS, and related JS files from the internet and introduce them into the web application.
3. Download and install Node.js which brings node package manager (NPM) into your local computer. Using NPM, you can now install bootstrap into your project.

2.2.1 Bootstrap from CDN

Visit bootstrap website, <https://getbootstrap.com/>, where you can find the CDN links for your bootstrap's CSS and JS files. The <link> tag with CDN link for the recent version v5.3 of bootstrap.min.css is given in Figure 2.1:

```
<link
  href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.2/dist/css/bootstrap.min.css"
  rel="stylesheet"
  integrity="sha384-T3c6CoIi6uLrA9TneNEoa7RxnatzjcDSCmG1MXxSR1GAsXEV/Dwwykc2MPK8M2HN"
  crossorigin="anonymous">
```

Figure 2.1: Introducing Bootstrap's CSS in web application

The <script> tags with CDN link for the recent version v5.3 of bootstrap.min.js is given in Figure 2.2:

```
<!-- ----- -->
<!-- Popper.js to position drop-downs, tooltips and poppers -->
<script
  src="https://cdn.jsdelivr.net/npm/@popperjs/core@2.11.8/dist/umd/popper.min.js"
  integrity="sha384-I7E8VVD/ismYTF4hNIPjVp/Zjvgyo16VFvRkX/vR+Vc4jQkC+hVqc2pM80Dewa9r"
  crossorigin="anonymous"
></script>

<!-- Bootstrap's JS File -->
<script
  src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.2/dist/js/bootstrap.min.js"
  integrity="sha384-BBt1+eGJRgqQAUMxJ7pMwbEyER411g+015P+16Ep7Q9Q+zqX6gSbd85u4mG4QzX+"
  crossorigin="anonymous"
></script>
```

Figure 2.2: Introducing Bootstrap's JS and Popper's JS in web application

Introduce the above HTML tags in web application. The <link> tag (Bootstrap's CSS file/s) must be added inside the content of <head> HTML element and before any of your own CSS file such as style.css etc. The <script> tag (Bootstrap's JS and other supporting JS file/s) can be added in the content of <head> element. However, it is recommended that the JS

code must be added at the end of the <body> HTML Element, right AFTER all markup code, as shown below:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>Document</title>
    <!-- Bootstrap's CSS File(s) -->
    <link
      href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.2/dist/css/bootstrap.min.css"
      rel="stylesheet"
      integrity="sha384-T3c6CoIi6uLrA9TneNEoa7RxnatzjcDSCmG1MXxSR1GAsXEV/Dwwykc2MPK8M2HN"
      crossorigin="anonymous"
    />
    <!-- Web Application's CSS File(s) -->
    <link rel="stylesheet" href="style.css">
  </head>
  <body>
    <!-- [HTML-Markup-START] HTML code starts here -->
    <div>HTML Markup</div>
    <div>HTML Markup</div>
    <div>HTML Markup</div>
    <div>HTML Markup</div>
    <div>HTML Markup</div>
    <!-- [HTML-Markup-END] HTML code ends here -->
    <!-- ----- -->
    <!-- Popper's JS to position drop-downs, tooltips and poppers -->
    <script
      src="https://cdn.jsdelivr.net/npm/@popperjs/core@2.11.8/dist/umd/popper.min.js"
      integrity="sha384-I7E8VVD/ismYTF4hNIPjVp/Zjvgyol6VFvRkX/vR+Vc4jQkC+hVqc2pM80Dewa9r"
      crossorigin="anonymous"
    ></script>
    <!-- Bootstrap's JS File -->
    <script
      src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.2/dist/js/bootstrap.min.js"
      integrity="sha384-BBt1+eGJRgqQAUMxJ7pMwbEyER411g+O15P+16Ep7Q9Q+zqX6gSbd85u4mG4QzX+"
      crossorigin="anonymous"
    ></script>
```

Figure 2.3: Recommended placement of external CSS and JS file(s)

2.2.2 Bootstrap from download files

Download the Bootstrap's CSS, Bootstrap's JS, and related JS files from the internet. Introduce these files into your web application by using `<link>` and `<script>` HTML element for CSS and JS files, respectively. The `<link>` tag must be added inside the content of `<head>` HTML element and before any of your own CSS file such as `style.css` etc., as shown in Figure 2.3. The JS files can also be added in the content of `<head>` element, using `<script>` tag. However, it is recommended that the JS code must be added at the end of the `<body>` HTML Element, right AFTER all markup code., as shown in Figure 2.3.

2.2.3 Bootstrap from NPM

You can introduce different libraries, modules or even frameworks to your web application. The most common tool for this purpose is Node Package Manager (NPM). For this purpose, you must proceed through the following steps:

1. Install the latest version of Node.js on the local machine which will be used for the development of web applications. [Node.js](#) comes with [NPM](#). No separate procedures required for NPM.
2. Initialize node package manager in web directory of the web application
3. Install all necessary packages such as bootstrap in current lab activity
4. Configure node package manager settings for the web application using its configuration file namely *package.json*, found in the project working directory
5. Run web application using scripts configured in previous step
6. Start coding, modifying and saving your application to see web view facilitated by the scripts configured and executed in step 4 and step 5 respectively

Step 1: Visit <https://nodejs.org/> and download (install as well) the latest long-term support (LTS) release version as shown in Figure 2.4.

Node.js® is an open-source, cross-platform JavaScript runtime environment.

Download for Windows (x64)



[Other Downloads](#) | [Changelog](#) | [API Docs](#) [Other Downloads](#) | [Changelog](#) | [API Docs](#)

For information about supported releases, see the [release schedule](#).

Figure 2.4: Target view of the <https://nodejs.org/>

After the installation is complete, verify it by entering following command in command prompt available in the operating system:

```
$ node --version
```

(The output of this command must show the version of node.js, installed on your computer)

Step 2: Navigate to your project's working directory (say, d:\lab04), in the command prompt using the following command:

```
$ cd d:\lab04
```

Now enter the command for initializing node package manager for your project, enter the following command (while command prompt is navigated in d:\lab04):

```
$ npm init
```

Provide all details asked in the prompt or you can skip to keep everything with the default value. The file named "*package.json*" will be created in the working directory i.e. d:\lab04\package.json. Make sure.

Step 3: Install necessary packages. For this lab, install lite server, bootstrap and bootstrap-icons using following 'npm' commands:

```
$ npm install bootstrap@5.3.2 --save
```

```
$ npm install lite-server --save-dev
```

```
$ npm install bootstrap-icons --save
```

You can install popper and jQuery which are optional right now for the current lab activity, so you can skip following commands for now:

```
$ npm install @popperjs/core --save
```

```
$ npm install jquery --save
```

Step 4: Add following script lines below `"test": "echo \"Error: no test specified\" && exit 1"` in *package.json* file :

```
"start": "npm run lite",
```

```
"lite": "lite-server"
```

Step 5: In the final step, execute the following command to run web application by running the "start" script configured in step 4, which runs 'lite-server'.

```
$ npm start
```

Alternatively, you can directly run 'lite-server' from "lite" script configured in step 4 by giving the following command:

```
$ npm run lite
```

Step 6: Start coding! Save changes to update the UI.

3 Lab Activity

3.1 Task 1

Use Bootstrap 5 to develop a web page namely “payment.html” for payment portal of an online store. The web page is responsive and uses a mobile-first approach. Desired user interface (UI) of the page:

- On medium or larger screens (≥ 768 pixels) is shown in Figure 3.1.
- On small screens (≥ 576 pixels) is shown in Figure 3.2.
- On extra small screens (< 576 pixels) is shown in Figure 3.3.

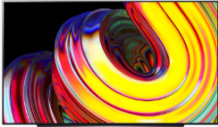
3.1.1 Instructions

Read the following points carefully and abide by the instructions:

1. The HTML markup will be provided to you in a separate file. Place this file into your project directory and rename it to index.html.
2. Use bootstrap only. Do not include external CSS file
3. Most of the work will be done with bootstrap classes. However, you might need inline style on 3 to 5 HTML Tags
4. The final website should be responsive on three breakpoint points for the website: xs, sm and md

Your Shopping Cart

Select delivery options



[change](#)

OLED TV 195 cm (77 Inch) [Model Year 2022]

Condition: Used Brand-new

Unit Price: € 2000/-

Quantity:

Order Summary

[Change delivery address](#)

Items Cost: € 6000
Delivery Insurance: € 35
Delivery Charges: Free for members

Total Purchase: € 6035
VAT: € 1146 [\(included\)](#)

Confirm payment details

Enter bank details:

BIC (Swift-Code):

IBAN:

Account Holder's Name:

☒ Save my bank details for future purchases?

Choose payment method

☐ Credit Card

☐ PayPal


☒ Personal Bank Account

☐ Bank Financing

Figure 3.1: Medium or larger viewport (1321 pixels wide view)

Your Shopping Cart

Select delivery options



[change](#)

OLED TV 195 cm (77 Inch) [Model Year 2022]

Condition:

Unit Price: € 2000/-

Quantity:

Order Summary

Items Cost:
€ 6000

Delivery Insurance:
€ 35

Delivery Charges:
Free for members

Total Purchase:
€ 6035

VAT: € 1146
[\(included\)](#)

Confirm payment details

Enter bank details:

BIC (Swift-Code):

IBAN:

Account Holder's Name:

☒ Save my bank details for future purchases?


Choose payment method

☐ Credit Card
 ☐ PayPal
 ☒ Personal Bank Account
 ☐ Bank Financing

Figure 3.2: Small viewports (767px pixels wide view)

Your Shopping Cart

Select delivery options



[change](#)
OLED TV 195 cm (77 Inch) [Model Year 2022]
 Condition:

Used

Brand-new

 Unit Price: € 2000/-
 Quantity:

3

Order Summary

Change delivery address

Items Cost:
 € 6000
 Delivery Insurance:
 € 35
 Delivery Charges:
 Free for members

Total Purchase:
€ 6035
 VAT: € 1146 ([included](#))

Confirm payment details

Enter bank details:

BIC (Swift-Code):

 IBAN:

 Account Holder's Name:

☒ Save my bank details for future purchases?

Choose payment method

☐ Credit Card

☐ PayPal

☒ Personal Bank Account

☐ Bank Financing

Figure 3.3: Extra-small Viewports (575px pixels wide view)

4 Rubric for Lab Assessment

The student performance for the assigned task during the lab session was:			
Excellent	The student completed assigned tasks without any help from the instructor and showed the results appropriately.	4	
Good	The student completed assigned tasks with minimal help from the instructor and showed the results appropriately.	3	
Average	The student could not complete all assigned tasks and showed partial results.	2	
Worst	The student did not complete assigned tasks.	1	

Instructor Signature: _____ Date: _____

5 Additional Resources

5.1 Initial markup file

index-markup.html

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Payment</title>
  </head>
  <body>
    <header>
      <span>Your Shopping Cart</span>
    </header>
    <main>
      <section>
        <article>
          <div>
            <h2>Select delivery options</h2>
            <div>
              <div>
                <div>
                  
                  <div>
                    <a href="#change">change</a>
                  </div>
                </div>
                <div>
                  <h4>OLED TV 195 cm (77 Inch) [Model Year 2022]</h4>
                  <span>Condition:</span>
                  <div>
                    <button>Used</button>
                    <button>Brand-new</button>
                  </div>
                </div>
              </div>
              <div>Unit Price: 2000/-</div>
            </div>
            <div>
              <label for="qty">
                >Quantity:
                <select name="quantity" id="qty">
```



```

<h2>Confirm payment details</h2>
<div>
  <h4>You bank details:</h4>
  <form action="abc">
    <div>
      <label for="bic">BIC (Swift-Code):</label>
      <input type="text" id="bic" /> <label for="iban">IBAN:</label>
      <input type="text" id="iban" />
      <label for="accholder">Account Holder's Name:</label>
      <input type="text" id="accholder" />
    </div>
    <div>
      <input type="checkbox" id="savechk" />
      <label for="savechk">
        >Save my bank details for future purchases?</label>
      </div>
    </div>
  </form>
</div>
<div>
  <h2>Choose payment method</h2>
  <div>
    <form action="xyz">
      <div>
        <label for="cc">
          <input name="paymentmethod" type="radio" id="cc" /> Credit
          Card</label>
        </div>
        <div>
          <label for="pp">
            <input name="paymentmethod" type="radio" id="pp" />
            PayPal
          </label>
        </div>
        <div>
          <label for="ba">
            <input name="paymentmethod" type="radio" id="ba" checked />
            <span> Personal Bank Account</span>
          </label>
        </div>
        <div>
          <label for="bf">
            <input name="paymentmethod" type="radio" id="bf" />
            Bank Financing
          </label>
        </div>
      </div>
    </form>
  </div>
</div>

```

```
    </article>
  </article></article>
</section>
</main>
</body>
</html>
```

5.2 Content image



TV_OLED.jpg