



CX002-3-3 INTRODUCTION TO WEB PROGRAMMING

Assessment Mode: INDIVIDUAL

Instructions:

- The project is to be carried out individually
- Complete this cover sheet and attach it to your project

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Student ID	: TP040869
Intake	: UCFEFREI1603
Lecturer Name	: MOHAMAD FIRDAUS CHE ABDUL RANI
Hand in date	: March 28, 2016
Hand out date	: May 23, 2016

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Gantt chart

The whole development took seven weeks to complete.

Task / Week	28/03	04/04	11/04	18/04	25/04	02/05	09/05
Choose a subject							
Define functionalities							
Select a template							
Create database and queries							
Authentication system							
Students CRUD							
Responsibles CRUD							
Professors CRUD							
Intakes CRUD							
Modules CRUD							
Grades CRUD							
Profile							
Change password							
Permission system							
Report card							
Polishing interface							
Security							

Introduction and objectives

When the individual Web Programming Individual Assessment was first introduced, I knew that I wanted to create a website that could be useful and reused. My first idea was a blogging and news platform, but eventually I found that WordPress and many content management systems such as Dotclear or Joomla! already did this so well that I could not even start to create something that would be matching their standards.

Then I have been thinking about the extranet used both at Efrei and APU: Moodle. I realized that nobody really enjoyed using it because of its heaviness and poor user interface, hence my idea to create a simple and light platform to manage a university, APU in this case.

Let me be clear: I do not have the pretention to do better than Moodle in a few weeks, I simply wanted to see if I could code a website having some of its features without being so much heavy.

Now that it is finished (although a website is never “finished”), I can say that I am quite pleased with the result.

Three roles are defined: the Administrator is allowed to do everything. He can add Students and Professors, who can login after their creation. Each user can change its password and basic information about himself such as contact details. A student can review his report card while a professor can add grades for the students following his classes.

Intakes are defined to group students following the same classes, designed are “modules”. Only the administrator can create, update and delete intakes and modules.


If you want to take a look at the code, you can visit the GitHub repository where I have uploaded the code:

<https://github.com/AdrienPoupa/apu-webspace>

System design

Storyboards

Login page:

APU WebSpace 3	
	Login
Role dropdown	
Username or TP number	
Password	
<input type="button" value="Login"/>	

Admin index:

APU WebSpace 3	
Home	Welcome Admin
Students	Announcements
Responsibles	
Professors	
Intakes	
Modules	
Grades	
Logout	

Student list:

APU WebSpace 3																				
Home	Welcome Admin																			
Students	Student List																			
List	<div> <div>Show 10 entries</div> <div>Search</div> </div> <table border="1"> <thead> <tr> <th>Name</th> <th>Birthdate</th> <th>Reg</th> <th>Previous</th> <th>Address</th> <th>Phone</th> <th>Res</th> </tr> </thead> <tbody> <tr> <td>Adrien Poupa</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <div> <div>Previous</div> <div>1</div> <div>Next</div> </div>						Name	Birthdate	Reg	Previous	Address	Phone	Res	Adrien Poupa						
Name							Birthdate	Reg	Previous	Address	Phone	Res								
Adrien Poupa																				
Add																				
Responsibles																				
Professors																				
Intakes																				
Modules																				
Grades																				
Logout																				

Add a student:

APU WebSpace 3	
Home	Welcome Admin
Students	Add a student
List	<div> <div>Last name</div> <div></div> </div> <div> <div>First name</div> <div></div> </div> <div> <div>Birthdate</div> <div>AAAA-MM-JJ</div> </div> <div> <div>Gender</div> <div>M/F</div> </div> <div>...</div>
Add	
Responsibles	
Professors	
Intakes	
Modules	
Grades	
Logout	

The form continues with the other fields to be filled.

The other pages are similar (tables and forms) and do not need a specific storyboard.

Student index:

APU WebSpace 3	
Home	Welcome Student name
Report card	Announcements
Profile	
Change password	
Logout	

Report card:

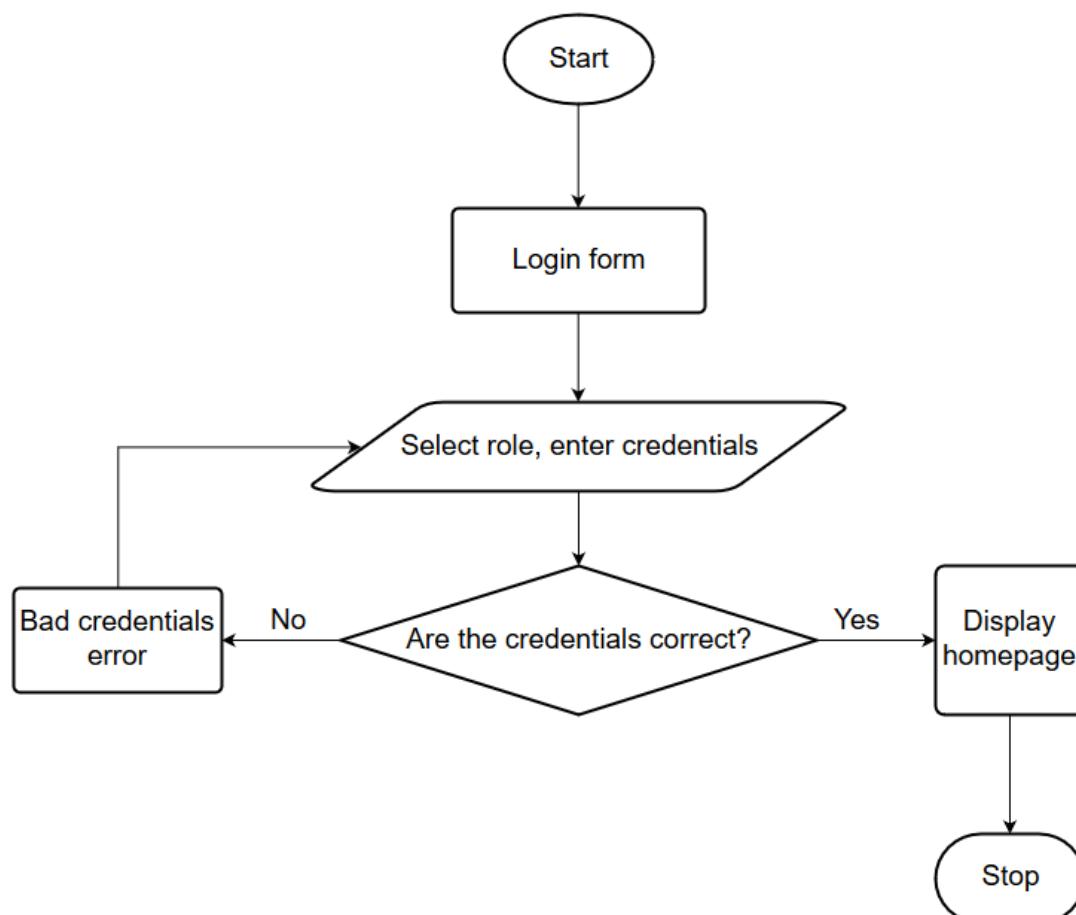
APU WebSpace 3								
Home	Welcome Student name							
Report card	Report card							
Profile	<div>Show 10 entries</div> <div>Search</div> <table><tr><th>Module</th><th>Professor(s)</th><th>Coefficients</th></tr><tr><td>Web Programming</td><td>Mohamad Firdaus</td><td>LEC (0.5) : 80 LAB (0.5) : 84 Module average : 82 Pass: A</td></tr></table> <div><div>Previous</div><div>1</div><div>Next</div></div>		Module	Professor(s)	Coefficients	Web Programming	Mohamad Firdaus	LEC (0.5) : 80 LAB (0.5) : 84 Module average : 82 Pass: A
Module			Professor(s)	Coefficients				
Web Programming			Mohamad Firdaus	LEC (0.5) : 80 LAB (0.5) : 84 Module average : 82 Pass: A				
Change password								
Logout								

Professor index:

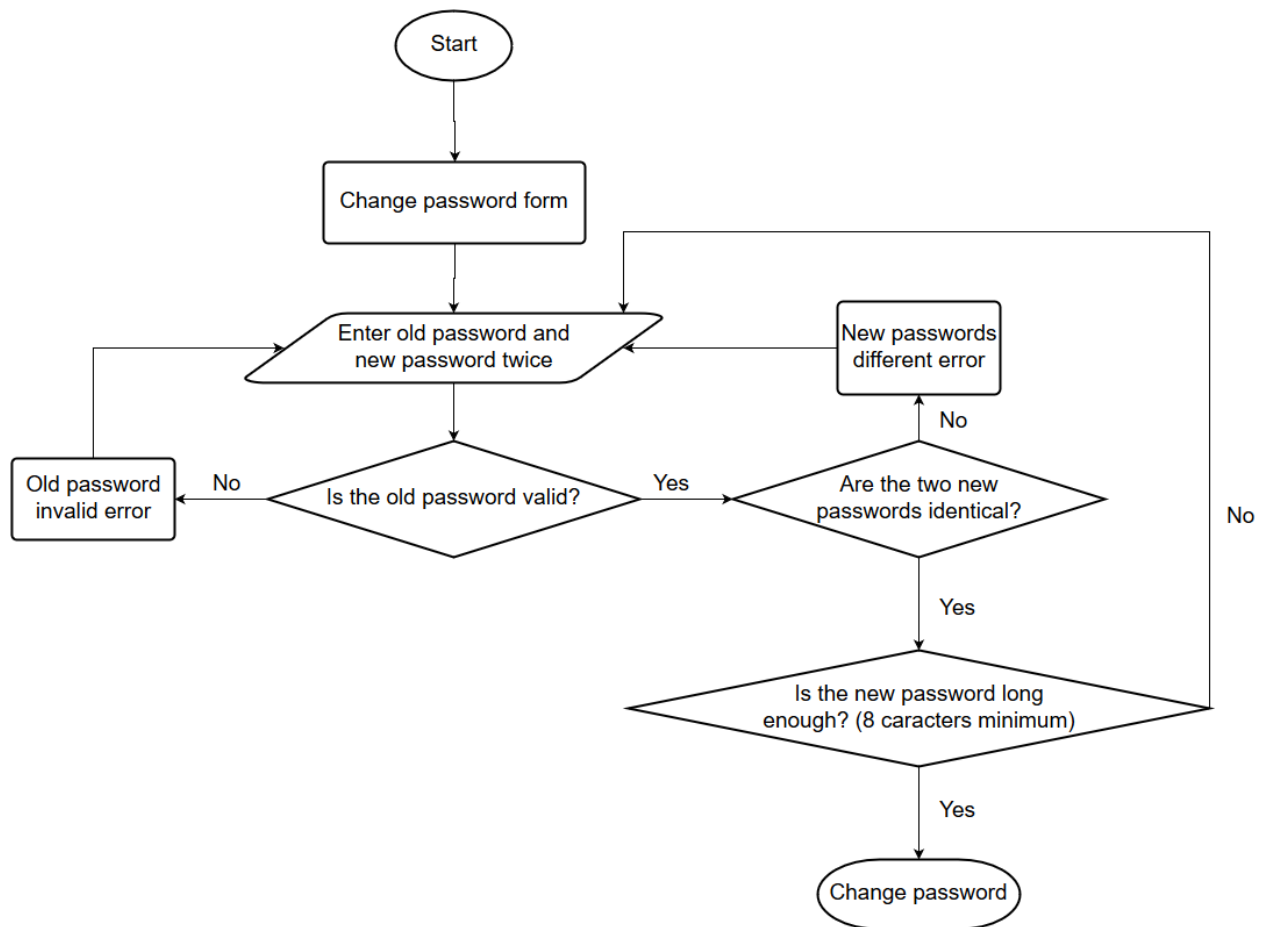
APU WebSpace 3	
Home	Welcome Professor name
Change password	Announcements
Grades	
Students	
Responsibles	
Intakes	
Modules	
Logout	

Flowcharts

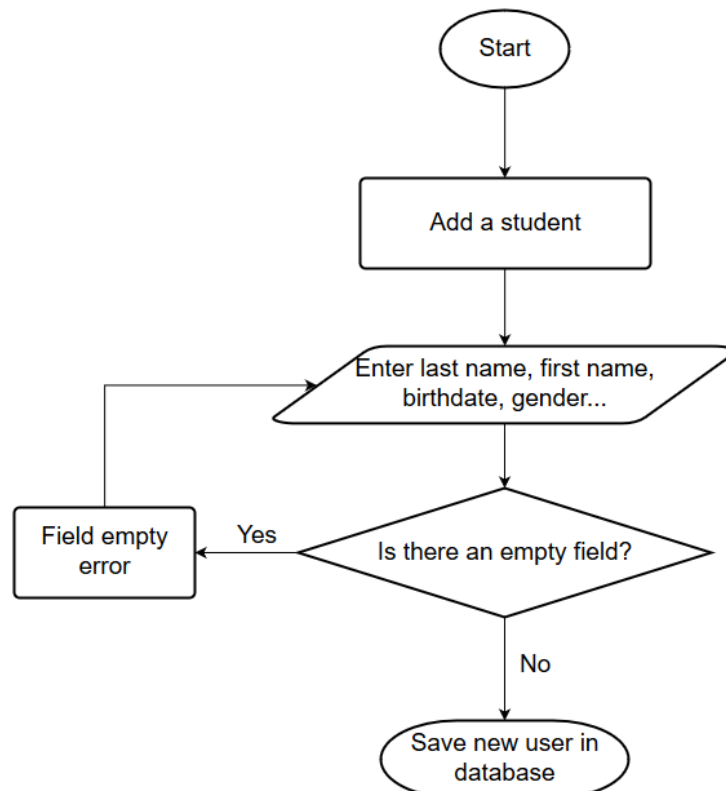
Login



Change password



Add new student (same goes for professor, intake, modules, responsables, grades)











Implementation

I have chosen a very simple and clean **design**, which makes the website easy to understand and use. It is based on Bootstrap 3, making it easy to modify and responsive for a proper display on cellphones and tablets. Since the audience targeted is mostly students keen on technology, the website had to be modern and responsive, if the students wanted to check their grades using their cellphones for example. The color scheme had to be neutral like Facebook, Twitter or LinkedIn in order to be pleasant and comfortable: professors and administrators would use it for a long period when entering grades into the database.

For the header, I chose to use APU's logo followed by the mention "WebSpace 3" as "WebSpace 2" is the version currently used. I used the logo available in the current WebSpace and edited it with The Gimp.

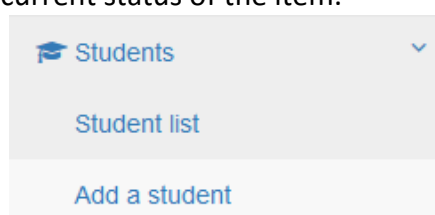


Each item of the menu has an icon, provided by the CSS framework FontAwesome.

 Home	<	The index had to be represented by a house in my opinion.
 Students	<	The student list figures a graduation cap, which is the goal every student aims at.
 Responsibles	<	Responsibles and professors share a common icon, multiple users.
 Professors	<	
 Intakes	<	Intakes have an icon representing two tags, since an intake is a way to label a group of modules.
 Modules	<	Modules are represented with a building that figures a university, since modules and their content are the main reason why students go to the university.
 Grades		
 Logout		Grades have an icon representing a bar-chart, since a grade is a way to measure students' performances.

Finally, logout is represented with a simple arrow out a square, picturing the action of leaving.

The menu is an accordion menu, which makes it more compact and user-friendly at the same time. An arrow indicates the current status of the item.



Since it is a requirement of the assessment, **PHP** has been used as primary scripting language. The project has been developed using PHP version 5.5.12 but it should work on any version of the 5.5 branch up to the PHP 7.0 branch.

MySQL has been chosen as the database used for this project, because of its free availability and its popularity among databases systems for websites. The project has been developed using MySQL version 5.6.17 but it should work on any version above 5.5.

The database structure is as following:

student	
student_id	int(8)
name	varchar(255)
surname	varchar(255)
birthdate	date
gender	varchar(1)
registered	date
previous_school	varchar(255)
photo	blob
street	varchar(255)
cp	int(5)
city	varchar(255)
mobile	varchar(10)
tp_number	varchar(8)
password	text

responsible	
id	int(10)
name_responsible	varchar(255)
surname_responsible	varchar(255)
mobile_responsible	int(10)
email_responsible	varchar(255)
street_responsible	varchar(255)
cp_responsible	bigint(5)
city_responsible	varchar(255)
student_id	int(10)

coefficient	
id_grade_module	int(10)
grade_type	varchar(3)
id_module3	int(10)
coefficient	float

professor	
id_professor	int(10)
name_professor	varchar(255)
surname_professor	varchar(255)
password	text

grade	
id	int(10)
student_id	int(10)
grade_id	int(10)
grade	float

module	
id_module	bigint(10)
name_module	varchar(255)
id_group2	int(10)

intake_student	
id_student4	int(8)
id_groupe	int(10)

intake	
id	int(10)
name	varchar(255)

teaches_module	
id_professor	int(10)
id_module	bigint(10)

Powered by yFiles

To connect to the database using PHP, the **PDO driver** has been chosen over the deprecated `mysql_*` and `mysqli_*` extensions, providing a better security and an object-oriented interface to create queries with named parameters.

To prevent MySQL injections, the statements are prepared as following:

```
$query = $db->prepare("SELECT id_student4 FROM intake_student WHERE  
id_groupe=:id");  
$query->bindParam(':id', $_GET['id']);  
$query->execute();
```

Using the `bindParam` method and the `id` named parameter, we can safely use the superglobal `$_GET` within the query without minding if `$_GET['id']` is a valid ID or a bad character such as a quote, which would result in a failed query and a vulnerability.

Transactions are also used in order to revert any modifications done to the database, should the query fail. A try/catch block is used to do this: if any error is detected during the execution of the code located within the try block, the catch block is executed right after.

```
try {  
    $db->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);  
  
    $db->beginTransaction();  
    $query = $db->prepare('INSERT INTO intake (name) VALUES (:name)');  
    $query->bindParam(':name', $_POST['name']);  
    $query->execute(); // Add the query to the queue  
  
    $db->commit(); // Execute to the queue  
} catch (Exception $e) {  
    $db->rollBack(); // Revert any modifications done to the database  
}
```

The design has been splitted in three different files within the “include” folder:

- head.php contains the HTML headers
- navigation.php contains the main menu
- footer.php closes all the balises opened above

Each publicly accessible PHP file of the project includes the three files named above as well as the `functions.php` file located in the same folder. It contains all the functions used throughout the project, such as the database connection, the redirection to another page, the validation of a form or the redirection to the login page if the page requested is not available for the current user.

This file includes `config.php` located in the same folder, which contains an array defining the required information to connect to the database: host (usually `localhost`), database name, database user and its password, making it easy to migrate on a different installation. Moreover, it contains the administrator’s password.

The **authentication** system is built with sessions. They have been chosen over cookies because of their reliability: sessions are safer than cookies because the actual values are hidden from the client.

The sessions are started in the functions.php file, just after the database connection. As a result, they are started in every page of the application since functions.php is included in every PHP file:

```
// Connect to DB
$db = connection();

// Start a session, needed for authentication
session_start();
```

Once the sessions are started, the authentication can be checked using the `$_SESSION` superglobal. This superglobal behaves like an array shared by all the documents of the website. It is initially filled right after the login, and the application uses three elements:

- "student_id" or "id_prof" to register the unique ID of a student or a professor
- "user", string to be displayed in the "Welcome XXX" message
- "role", string used to specify the role played by the user in the application: admin, student and prof are the possible values

The login process is quite simple: first, we make sure all the fields are correctly filled (ie: there is no empty field), then we check which role the user is trying to login to. Once it is done, we query the proper database (student or professor) to get the password and the ID of the user the guest wants to login to.

In order to protect users' data, their password is encrypted in database using the BCrypt algorithm. It creates a unique and one-way hash, making it very safe to use to encrypt passwords.

As a result, we have to check the validity of the password entered by the guest using `password_verify`. It takes two parameters: the hash stored in the database and the clear password entered by the guest.

```
// Return true if the password entered matches the hashed one (2nd arg)
password_verify($_POST['password'], $student['password'])
```

If the functions return true, we can finally fill the `$_SESSION` array with the proper data extracted from the database above and redirect the user to the homepage.

```
$_SESSION['id_prof'] = $prof['id_professor'];
$_SESSION['user'] = $prof['surname_professor'].' '.$prof['name_professor'];
$_SESSION['role'] = 'prof';
redirect('index');
```

All lists (students, responsables, professors, intakes, modules and grades) are displayed in a **table**. It seemed to be the most efficient way to fit a lot of information in the minimal amount of space possible.

In order to provide a better user experience, the javascript plugin for jQuery DataTables has been added. It adds a search form, pagination, column ordering and a filter, without reloading the page thanks to JavaScript. A few lines are enough to transform a table:

```
<script src="js/datatables/media/js/jquery.dataTables.min.js"></script>
<script>
    $(document).ready(function() {
        $('#jsTable').DataTable({
            responsive: true
        });
    });
</script>
```

Of course, the tables must have the ID specified above (jsTable, see below).

All the pages to add an entity (students, responsables, professors, intakes, modules and grades) are similar and prefixed with “add-”. They consist of inputs and dropdowns, that have to be field. The validation is taken care of by the checkForm function, taking an array of input’s name in argument:

```
// Required field names
$required = array('student', 'grade');
$error = checkForm($required);
```

The function itself return an array, empty or not depending of the content of the fields:

```
function checkForm($required) {
    if (isset($_POST['form_sent'])) {
        foreach($required as $field) {
            if (!isset($_POST[$field]) || empty($_POST[$field])) {
                $error[] = 'Please fill all the fields';
                return $error;
            }
        }
    }
}
```

Finally, the database transactions are done if \$error is empty only.

The edition of an existing entity works almost exactly the same way, the only differences being the filename prefixed by “edit-”, the inputs pre-filled with existing data and an UPDATE query instead of an INSERT INTO.

Finally, the deletion happens in the edit files described above. If the argument delete is passed along with the ID to delete, a DELETE FROM query is run in order to delete the entity.

The **permissions** are checked with helpers functions such as `checkAdmin`, `checkStudent` or `checkProfessor`. Depending on the superglobal `$_SESSION['role']` filled after login, they redirect to the login page if the page requested is not available for the current user. For example, the function to check if the current user is an administrator of the application is the following:

```
function checkAdmin() {  
    if ($_SESSION['role'] != 'admin') {  
        redirect('login');  
    }  
}
```

The `redirect` function is nothing else but a syntactic sugar for `header('Location... :`

```
function redirect($page) {  
    header("Location: ".(string)$page.".php");  
}
```

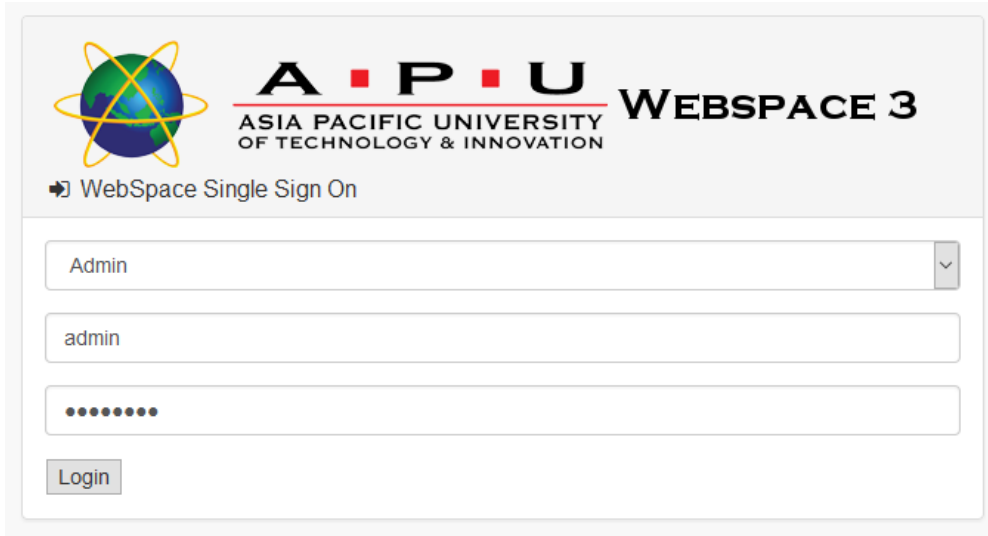
Finally, in order to protect users from XSS injections and provide a better security, the function `htmlspecialchars` has to be applied everytime a data we do not control is displayed; data entered by the user and stored in the database for example:

```
Welcome <?php echo htmlspecialchars($_SESSION['user']) ?>
```

If this was not done, the website would be prone to cross-site scripting, allowing attackers to include third-party content to the website with dramatic consequences such as stealing credentials in cookies or even change a page of the website.

Main section

First of all, the user has to login using his credentials. He must select his role as well. The default username and password for the admin user are “admin” and “password”. This can be changed in the include/config.php file.



Once this is done, the administrator is redirected on the index.



Then, he can access the student list, which is displayed using DataTables (see above).

APU WEBSPACE 3
ASIA PACIFIC UNIVERSITY OF TECHNOLOGY & INNOVATION

Home
Students
Student list
Add a student
Reponsibles
Professors
Intakes
Modules
Grades
Logout

Welcome admin

Student list (click on a name to edit the student)

Show 10 entries Search:

Name	Birthdate	Reg	Previous	Address	Phones	Res
Barbot Timothée TP046218 Report card						
Buob Edgar						

It is also possible to add a student using the following form:

APU WEBSPACE 3
ASIA PACIFIC UNIVERSITY OF TECHNOLOGY & INNOVATION

Home
Students
Student list
Add a student
Reponsibles
Professors
Intakes
Modules
Grades
Logout

Welcome admin

Add a student

Last name

First name

Birthdate

Gender

Registration date

Previous school

Responsible

A student can be modified by clicking its name on the table described above. He can be deleted using the link provided in the header of the form.

Edit a student - [Delete this student](#)

Last name

First name

Birthdate

Gender

The responsible features work in a similar way:

Responsible list (click on a name to edit it)

Show entries

Search:

Last name	First name	Phone	Email	Address	Student
Barbot	Hervé	92872728	herve@barbot.fr	34 avenue de la Joie 34000 Montpellier	Timothée Barbot
Buob	Laurent	627165382	laurent@buob.fr	32 Boulevard Raspail 75014 Paris	Edgar Buob

Welcome admin

Add a responsible

Last name

First name

Student

Welcome admin

Edit a responsible - [Delete this responsible](#)

Last name

First name

Student

Same goes for the professors.

Reponsibles

Professors

Professor list

Add a professor

Intakes

Modules

Professor list (click on a name to edit it)

Show 10 entries Search:

Last name	First name
Barbot	Hervé
Dhason	Padmakumar

As all DataTables, the search form works without reloading the page:

Professor list (click on a name to edit it)

Show 10 entries Search: dh

Last name	First name
Dhason	Padmakumar

Showing 1 to 1 of 1 entries (filtered from 7 total entries)

Previous 1 Next

Add a professor

Last name

First name

Password

Envoyer

Edit a professor - Delete this professor

Last name

First name

Envoyer

Intakes work in a similar way. Each intake is displayed with the list of its students, or a mention “None” if there is no student (yet) for an intake.

- Professors
- Intakes**
 - Intake and student list
 - Add an intake
- Modules
- Grades
- Logout

Intake list and their students (click on an intake to edit it)

Show entries Search:

Intake	Last name	First name
AFCF1604AS	None	None
UC1F1509ACS	None	None
UCFEFREI1603	Poupa	Adrien
UCFEFREI1603	Buob	Edgar
UCFEFREI1603	Barbot	Timothée

To add an intake, the administrator only need to enter its name. He can add or delete students using the edit form.

Add an intake

Name

Envoyer

Edit an intake - [Delete this intake](#)

Name

Student to add

Student to delete

Envoyer

Modules and their properties are displayed within a table. It shows modules’ names, intakes, professor (one or more) and the grades expected for this module and their coefficient. To add a grade, the administrator or the professor has to click the link within the coefficient column.

Show	<input type="text" value="10"/>	entries	Search: <input type="text"/>
Module	Intake	Professor(s)	Coefficients
C++	UCFEFREI1603	Nicolas Sicard	LEC : 0.5 LAB : 0.5
Communication	UCFEFREI1603	Jean Soma	LEC : 1
Databases	UCFEFREI1603	Safia Ouerdane Karim Lahlou	LEC : 0.5 LAB : 0.25 PRJ : 0.25

To add a module, the administrator has to specify its name, its professors and the grades expected. Each grade must have a coefficient and be one of the following type:

- LEC for lecture
- LAB for work in lab
- PRJ if it is a project

Of course, the sum of all coefficients must be equal to 1. Each module can have up to 5 professors and 5 grades.

Add a module

Name

UML & Object Oriented Programming

Intake

UCFEFREI1603

Professor 1

Padmakumar Dhason

Professor 2

None

Professor 3

None

Professor 4

None

Professor 5

None

Grade 1

LAB

Coefficient grade 1

0.5

Grade 2

PRJ

Coefficient grade 2

0.5

Grade 3

None

Coefficient grade 3

Grade 4

None

Coefficient grade 4

Grade 5

None

Coefficient grade 5

Envoyer

All the grades are displayed in a table showing the student, the module and the coefficient of the grade.

List of grades (click on a grade to change it)

Show entries Search:

Module	Last name	First name	Examination	Grade
C++	Poupa	Adrien	LEC : 0.5	80
C++	Poupa	Adrien	LAB : 0.5	84
C++	Buob	Edgar	LAB : 0.5	50
Databases	Poupa	Adrien	LEC : 0.5	100
Databases	Buob	Edgar	LEC : 0.5	100
Network	Poupa	Adrien	LEC : 0.5	85

The addition and deletion of a grade is similar to all the other features:

Add a grade

Module
UCFEFREI1603 > C++

Grade
LEC : 0.5

Student
Adrien Poupa

Grade
82

Envoyer

Add a grade - [Delete this grade](#)

Module
UCFEFREI1603 > Network

Grade type and coefficient
LEC : 0.5

Student
Adrien Poupa

Grade
85

A professor account is similar to an administrator's. The only differences are the credentials he has to use to login (his name and his password) and the authorizations that he has. His index page looks like this:

Like a student, he can change his password with the following form:

Welcome Dhason Padmakumar

Change password

Old password

New password

Repeat new password

Envoyer

Finally, he only has access to the modules he teaches:

Welcome Dhason Padmakumar

List of modules, their professors and their groups			
Show 10 ▼ entries	Search: <input type="text"/>		
Module ▲	Intake ▲	Professor(s) ▲	Coefficients ▲
Operating Systems	UCFEFREI1603	Dhason Padmakumar	LEC : 0.5 PRJ : 0.5

A student logs in using his TP number and the password provided by the admin – or the password he changed in the interface. His index page looks like this:



The screenshot shows the APU Webspaces 3 interface. The header features the APU logo (Asia Pacific University of Technology & Innovation) and the text 'WEBSPACE 3'. A left sidebar contains navigation links: Home, Report card, Profile, Change password, and Logout. The main content area displays a welcome message 'Welcome TP040869 Adrien Poupa' and a section for 'Important Announcements for Students' with a placeholder image.

Unlike an administrator or a professor, he has access to his own profile where he can change his personal information:

Address

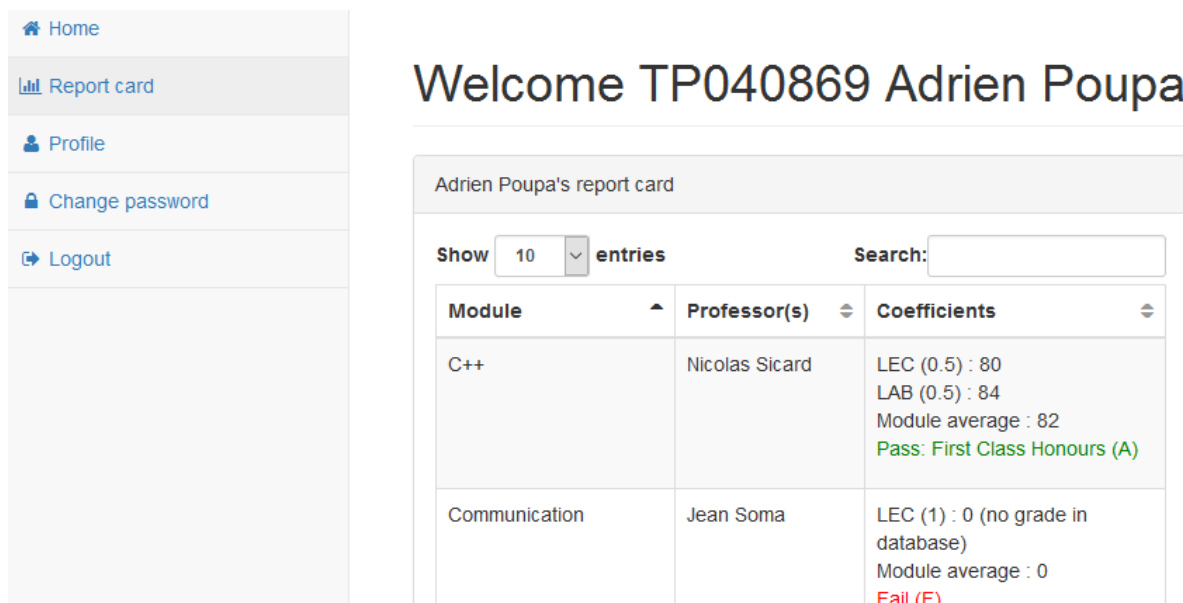
 Postal code

 City

 Phone

 Mobile phone

Finally, he can review his report card with the grades entered by his professor. A text indicates if he passed the module or not with the grade letter:



The screenshot shows the 'Adrien Poupa's report card' page. It includes a sidebar with navigation links: Home, Report card, Profile, Change password, and Logout. The main content area displays the report card with a table of modules and grades.

Module	Professor(s)	Coefficients
C++	Nicolas Sicard	LEC (0.5) : 80 LAB (0.5) : 84 Module average : 82 Pass: First Class Honours (A)
Communication	Jean Soma	LEC (1) : 0 (no grade in database) Module average : 0 Fail (F)

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