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School of Computing

KH5041CMD

The Internet and Web Technologies

[Project Name]

[Student Name] / [TKH ID] / [Coventry ID]

Ethical Hacking and Cybersecurity

School of Computing

Coventry University – The Knowledge Hub Universities

[Submission Date]

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Required Components

Frontend GitHub Link:

https://github.com/yassin202300080/Internet-and-web-technologies-frontend-Yassin-Elkholy-20230080-

Backend GitHub Link:

https://github.com/yassin202300080/Internet-and-web-technologies-CW-Yassin-Elkholy-20230080-

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1 Introduction

The proposed web application is a secure classroom management system named FlashEdu designed to manage the interaction between staff and students. The system will provide teachers to manage their classrooms, post assignments and grade student submissions.

Students will be able to join classes and submit their assignments this makes the system an organized educational platform. The system provides security and performance and uses node.js backend with an Sq lite database.

The features include role-based access control which help maintains the systems security and the secure session management only uses the Http Only cookies

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2 Background and Motivation

Many educational platforms depend on emails for communication, physical handing out assignments and various calendars applications for scheduling; that results in a slow workflow, many deadlines could be missed and having some communication gaps. Flash Edu a unified platform that brings these essential functions together in one secure, accessible location.

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3 Comparison with Similar Applications

Flashedu is designed for speed and security, but similar application like Moodle and google classroom runs on a lightweight Node.js flash edu does not require cloud storage and uses a structured SQL database for all data persistence.

4 Project Goals

4.1 User Goals

Table 1. User Application Goals.

Feature	Description
User Authentication	Students and staff can register and log in to access their dashboard.
Classroom Management	Staff can create classes and generate class codes so students can join.
Assignment	Staff can create assignments and add deadlines and students can view them.

Submission	Students can submit assignments and upload their text answers before the deadlines.
Grading	Staff can view student answers, grade them and give feedback.

4.2 Developer Goals

- Secure users' passwords using bcrypt hashing
- Prevent cross site scripting
- Prevent Session Hijacking
- Use http only and same site cookies
- Ensure data integrity using foreign key constraints in SQLite.

5 Application Modelling

5.1 Use Case Diagram

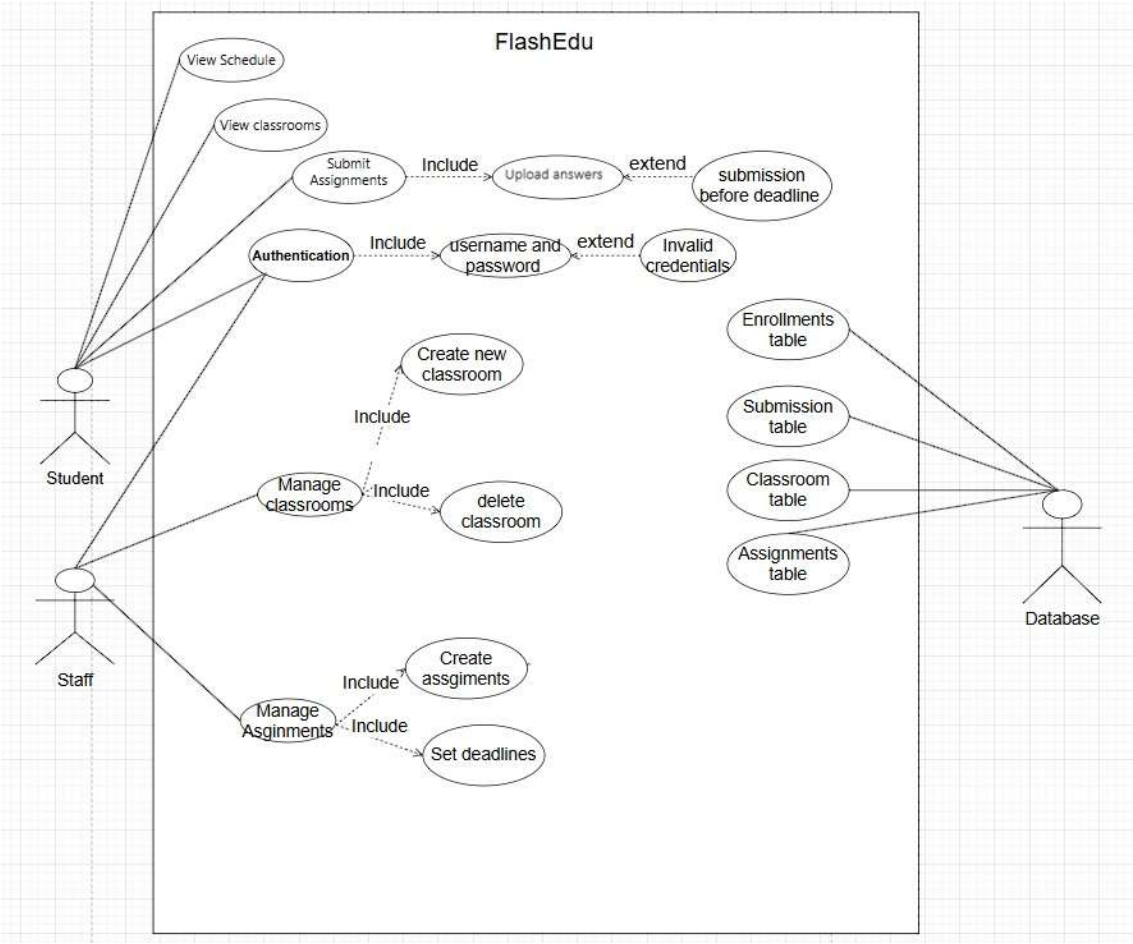


Figure 1. [use case diagram]

5.2 Use Case Scenarios

Table 2. Submitting assignments

Use Case #1: Submit assignments		
Goal in Context	Student submits text-based answers to assignments before the deadline.	
Scope & Level	Primary Task, System Level	
Preconditions	1. User is logged in as student 2. Assignment exists and deadline has not passed	
Success End Condition	Submission is saved to database with timestamp	
Failed End Condition	System rejects late submission	
Primary actor	Student	
Trigger	Student clicks Submit button on assignment page.	
Description	**Step**	**Action**
	1	Student navigates to the assignment page
	2	System retrieves assignment details
	3	Student enters their answer as text
	4	Student clicks submit
	5	System validates that the text is not empty
	6	System compares current time with due date
	7	System saves the submission to the database
Extensions	**Step**	**Branching Action**
	5a	If empty submission system returns request error
	6a	If deadline passed system returns deadline passed error
Sub-Variations	**List**	**Branching Action**
Resubmission		Can resubmit if deadline has not passed

Table 3. Manage Classrooms

Use Case #2: Manage Classrooms		
Goal in Context	Staff create a new digital classroom to organize students and assignments.	
Scope & Level	Primary Task, System Level	
Preconditions	1. User is logged in. 2. User has role as a staff	
Success End Condition	Classroom is created, saved to the database, and a unique Class Code is generated.	
Failed End Condition	Fails to create a classroom	
Primary actor	Staff	
Trigger	Click create classroom button	
Description	**Step**	**Action**
	1	Staff navigates to the classroom dashboard
	2	Staff creates new classroom
	3	enter the Classroom Name and description.
	4	System validates classroom not empty
	5	System generates
	6	System creates a Class Code
	7	New classroom saved to the database with status active
Extensions	**Step**	**Branching Action**
	5a	**Missing name gives a request error and prompts user to add class name**
	7b	**If system cannot save the data system returns server error**
Sub-Variations	**List**	**Branching Action**
Archiving Classrooms		Staff can update classroom status to be archived

6 Technology Stack Selection

Frontend uses HTML, CSS and JavaScript Backend uses Node.js and Express.js

SQL manages manage data for supporting optimized queries while express will handle secure authentication and session management.

Database uses sql lite and security implemented uses bcryptjs for hashing, jsontoken for authentication and cookie parser for session management.

7 Project Architecture

The model view controller MVC used

1. Models: Handles database interaction uses sql queries.
2. Controllers: systems logic
3. Routes: the API endpoints.
4. Middleware: verifies the authentication tokens before they reach controllers

8 Implementation

8.1 API Endpoints

8.1.1 Authentication Endpoints

Description	Endpoint	http method	Request	Response
Register new user	api/auth/register	Post	1. Email 2. Password 3. First name 4. Last name 5. role	201 Create: 1. JSON: User info & Token 2. Header: Set-Cookie (HttpOnly)
User login	api/auth/login	Post	Email and password	200 Successful login 1. JSON: User info & Token 2. Header: Set-Cookie (HttpOnly)
User logout	api/auth/logout	Post	No request	Header: Clear-Cookie

8.1.2 User Management Endpoints

Description	Endpoint	http method	Access	parameters
current user profile	api/users/me	Get	Authenticated	No parameters
Update profile details	api/users/me	Put	Authenticated	1. First name 2. Last name

8.1.3 Core Features Endpoints

8.2 Classroom Management

Description	Endpoint	HTTP Method	Access	parameters
List user's classrooms	api/classrooms	Get	authenticated	Uses User ID from Token
Create new classroom	api/classrooms	Post	Saff	1. Name 2. Description 3. Schedule
Join Classroom	/classrooms/join	Post	Student	Class code
Get classroom details	/classrooms/id	Get	Both	Id path
Update classroom	/classrooms/id	Put	Staff	1. Name 2. Description 3. Schedule
Archive Classroom	/classrooms/id /Archive	Patch	Staff	Archived
Delete classroom	/classrooms/id	Delete	Staff	Id path

8.3 Assignments & Submissions

Description	Endpoint	HTTP Method	Access	parameters
Create assignment	api/assignments	Post	staff	1. Classroom Id 2. Title 3. Description 4. Due Date 5. max points
List assignments	api/classrooms/id /assignments	Get	both	Id path
Get assignment details	/assignments/id	Get	both	Id path
Update assignment	/assignments/id	Put	staff	1. title 2. description 3. due Date
Submit assignment	/assignments/id /Submit	Post	student	Text submission
View submissions	/assignments/id/ submissions	Get	Staff	Id path
Grade submission	/submissions/id/ grade	Put	Staff	Garde feed back

8.4 Database Schema Design

8.4.1 Tables/Collections Design

8.5 Users

Name	Key type	Description	Constraints
User id	Primary	Unique user identifier	Auto Increment
email		User email address	Unique not null
Role		Student or student	not null
First name		User's first name	not null
Last name		User's last name	not null
Time created		Account creation time	Default current

8.6 Classroom

name	Key type	Description	Constraints
Classroom id	Primary	Unique classroom identifier	Auto Increment
Teacher id	Foreign	Reference user from user id	Not null
Name		Classroom name	Not null
Description		Brief description	
Class code		Code for students to join	Unique Not null
Schedule		schedule data	

Status		Active or archived	Default active
Time created		Creation timestamp	Default current

8.7 Enrolments

Name	Key Type	Description	constraints
Enrolment id	primary	Unique enrolment ID	Auto Increment
Classroom id	Foreign	References classrooms	Not null
Student id	Foreign	References users	Not null
Enrolled time		Time of enrolment	Default current
Combined key	Unique	Prevents duplicate students in one class	Unique Classroom id and student id

8.8 Assignment table

Name	Key Type	Description	constraints
Assignment id	Primary	Unique assignment ID	Auto increment
Classroom id	Foreign	References classrooms	Not null
Title		Assignment title	Not null
description		Assignment instructions	
Due date		Submission deadline	Not null
Max points		Maximum possible points	Default 100 points
Created at		Creation timestamp	Default current

8.9 Submission table

Name	Key Type	Description	constraints
Submission id	Primary	Unique submissions id	Not null
Assignment id	Foreign	References assignments	Not null
Student id	Foreign	References users	Not null
Submission text		Student's text answer	
status		Submitted or graded	Default submitted
Grade		Points awarded	
feedback		Teacher feedback comments	
Submitted at		Submission timestamp	Default current

8.9.1 Relationships and constraints

- The Staff and Classroom: It's a one-to-many relationship because a single staff member will create and manage multiple classrooms.
- Students and classrooms: it's a many to many relationships that is implemented by the enrolments table to allow students join multiple classes and the classrooms will have multiple students.
- Classroom and assignments: one to many relationship classroom can have multiple assignments, but an assignment belongs to one classroom.
- Assignments and submissions: every classroom has a one-to-many relationship with assignments. Each assignment is connected to submission is one to many.

9 Security Features Implementation

9.1 Secure Session Management

To prevent Cross Site Scripting attacks uses secure HTTP cookies and doesn't store web tokens. Hhttp only flag ensures cookie is not accessed by the client side.

Samesite prevents requests attacks and the cookie is only sent for requests from the same website.

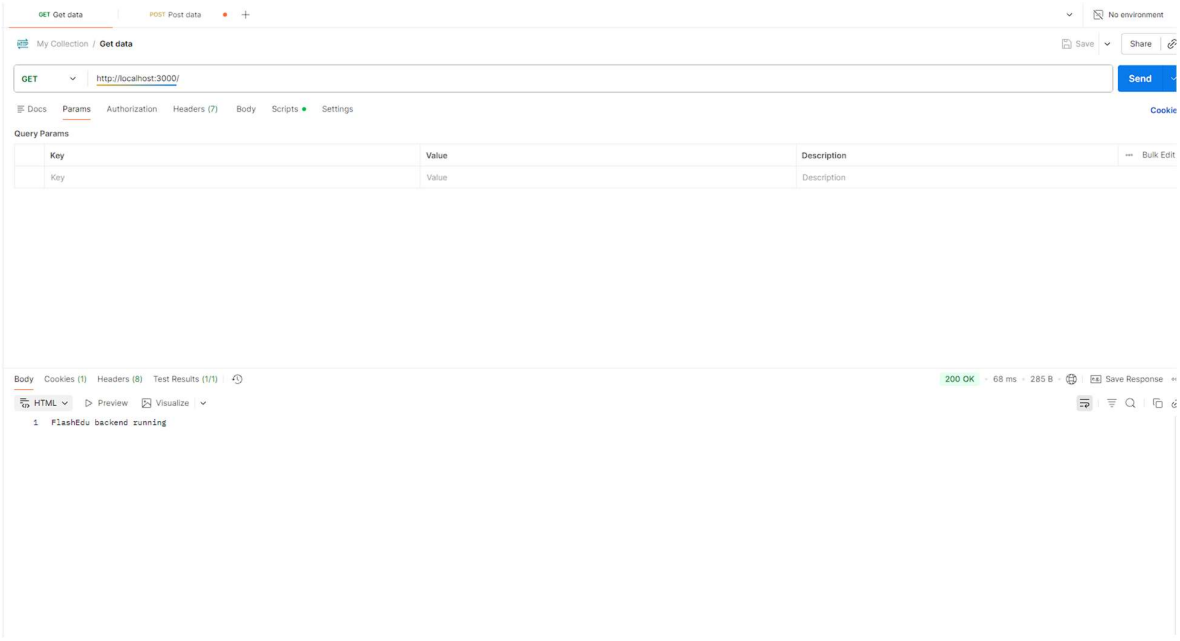
```
            // set cookie
            res.cookie('token', token, {
    httpOnly: true,
    secure: process.env.NODE_ENV === 'production',
    sameSite: 'strict',
    maxAge: 24 * 60 * 60 * 1000
});
```

9.2 Password hashing

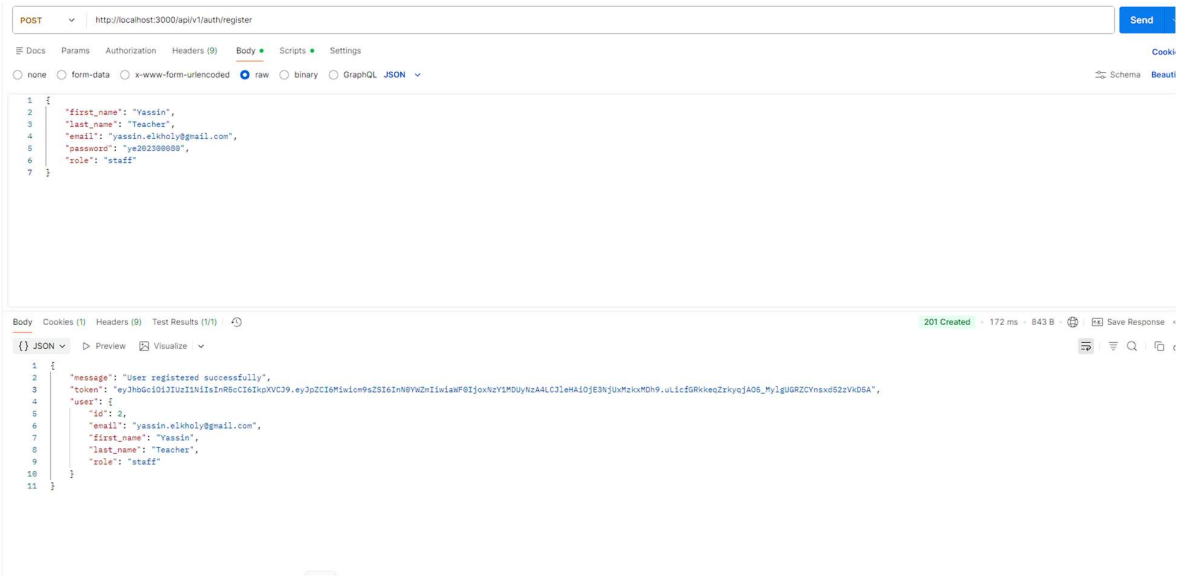
```
bcrypt.hash(password, 10, (err, hash) => {
    if (err) {
        return res.status(500).json({ error: "Error hashing password" });
    }
```

10 Postman Collections

10.1 Starting server

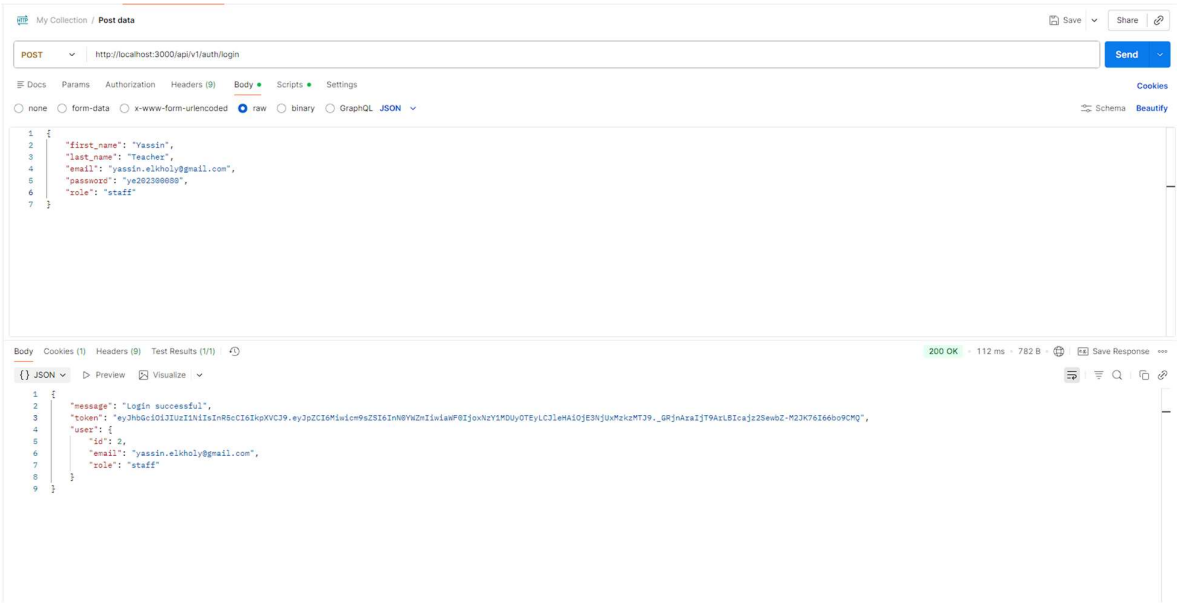


10.2 Authentication

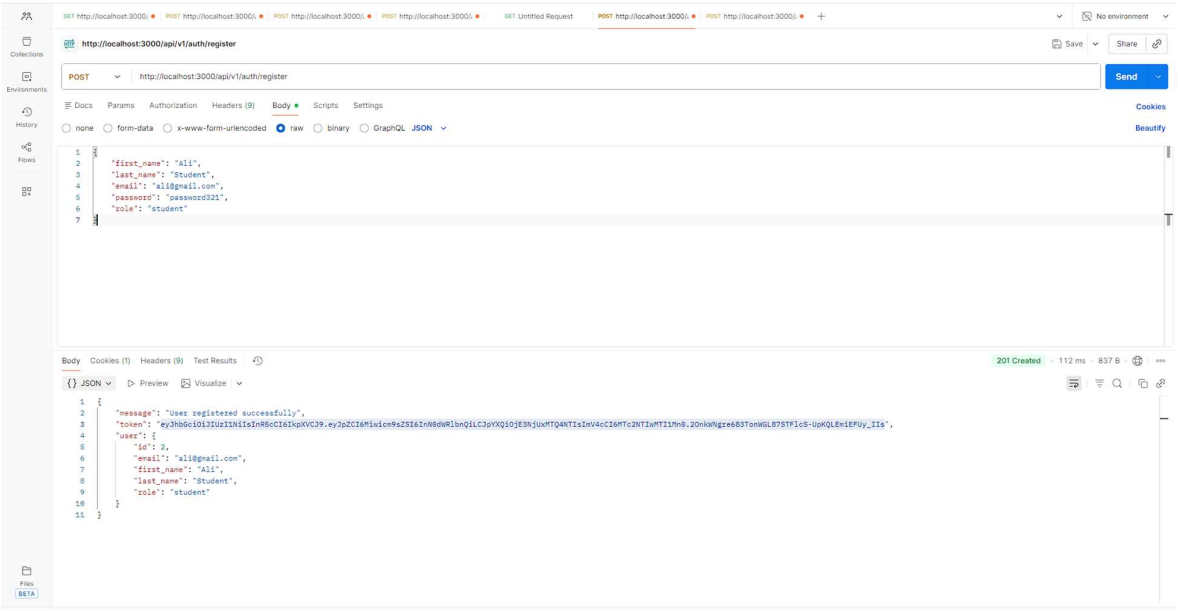


10.3 User Authentication

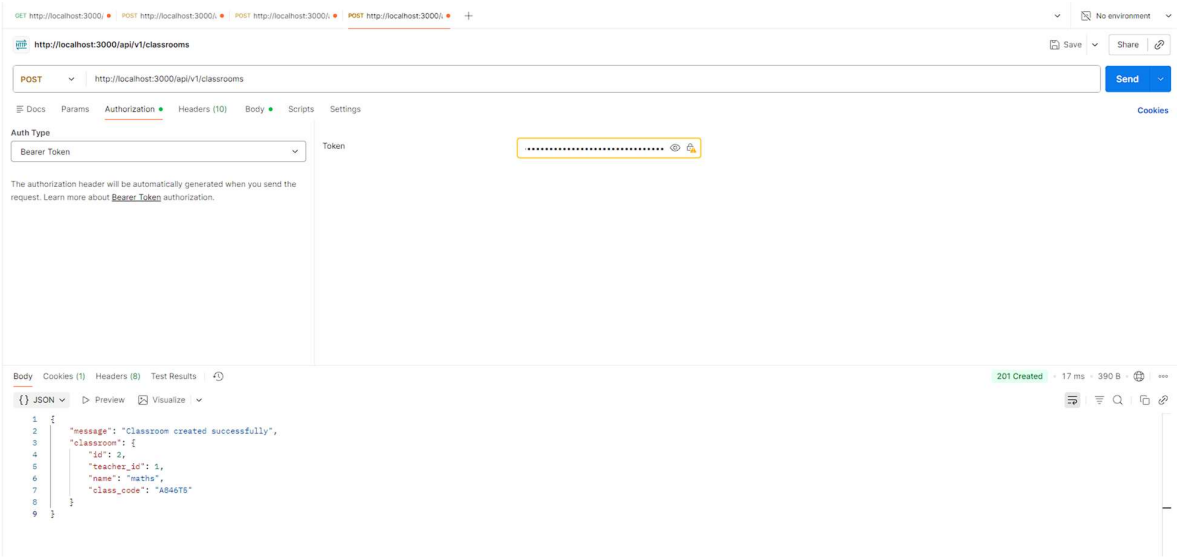
Staff:



Student:

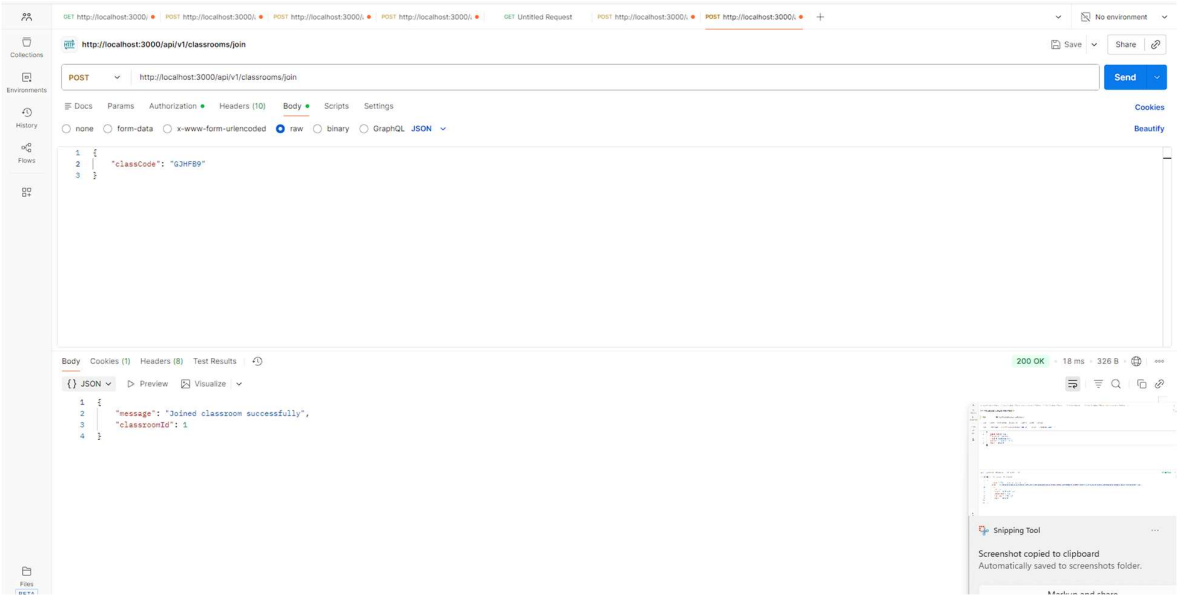


10.4 Classroom Creation

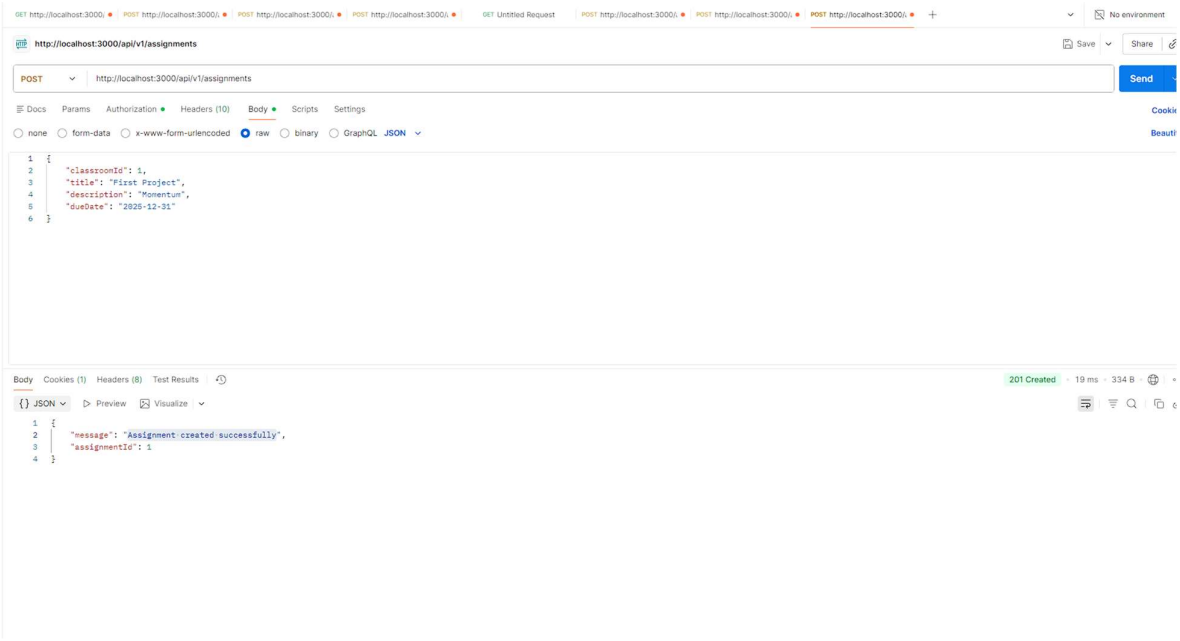


10.5 Student Joining Classroom

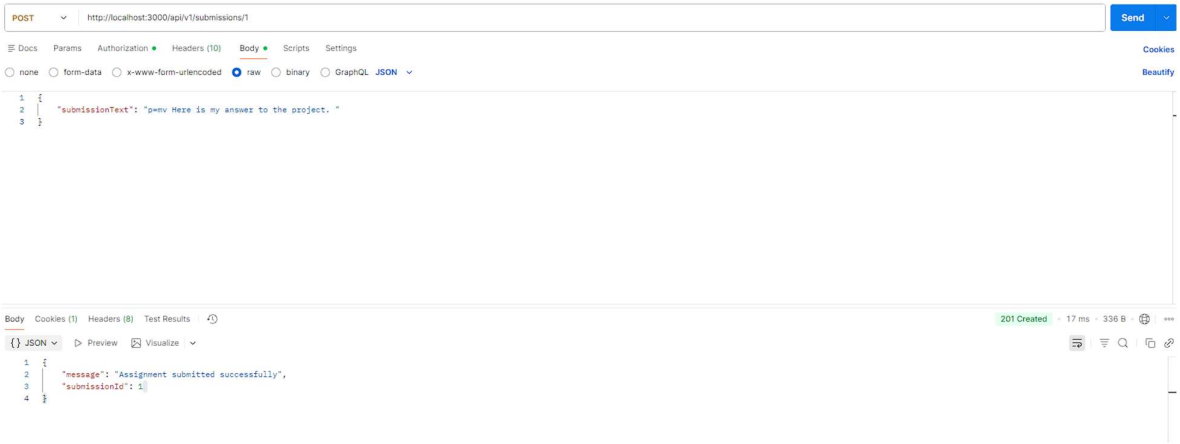
Many to many relationship



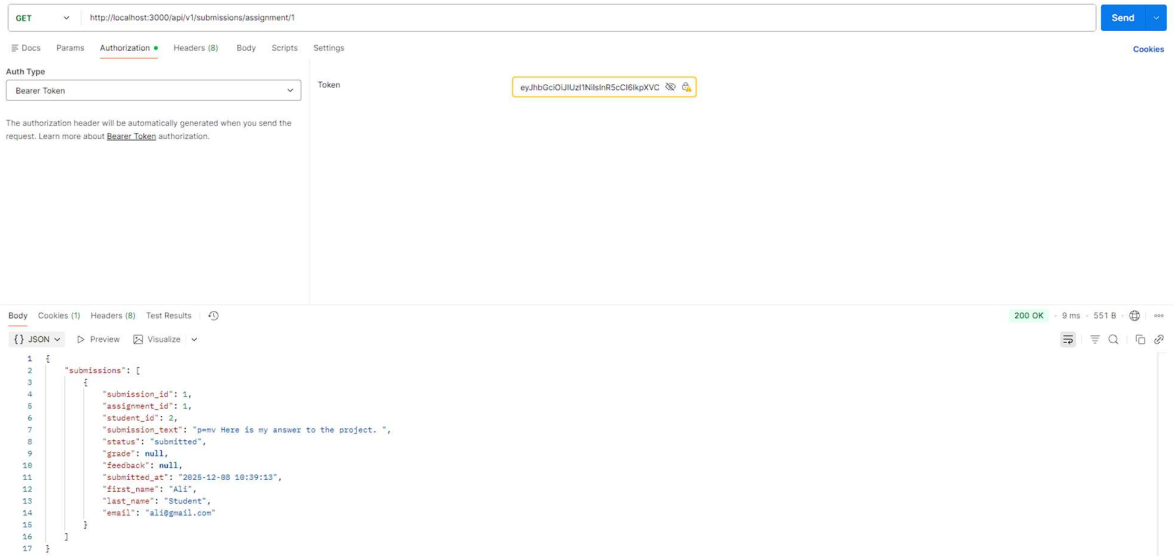
10.6 Create assignments



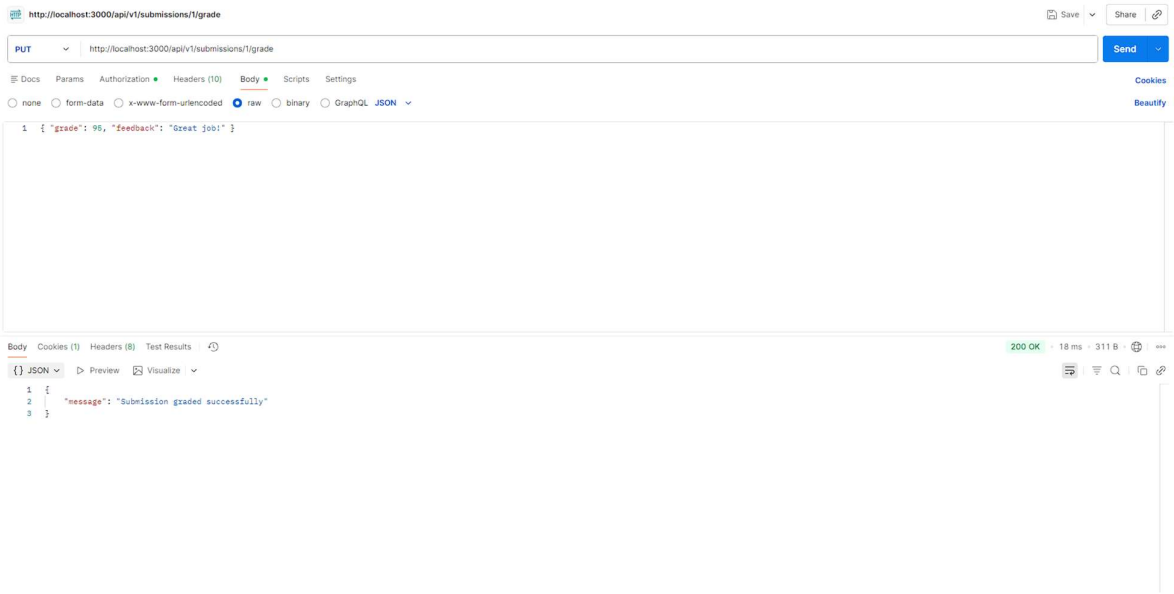
10.7 Submissions



10.8 View submissions

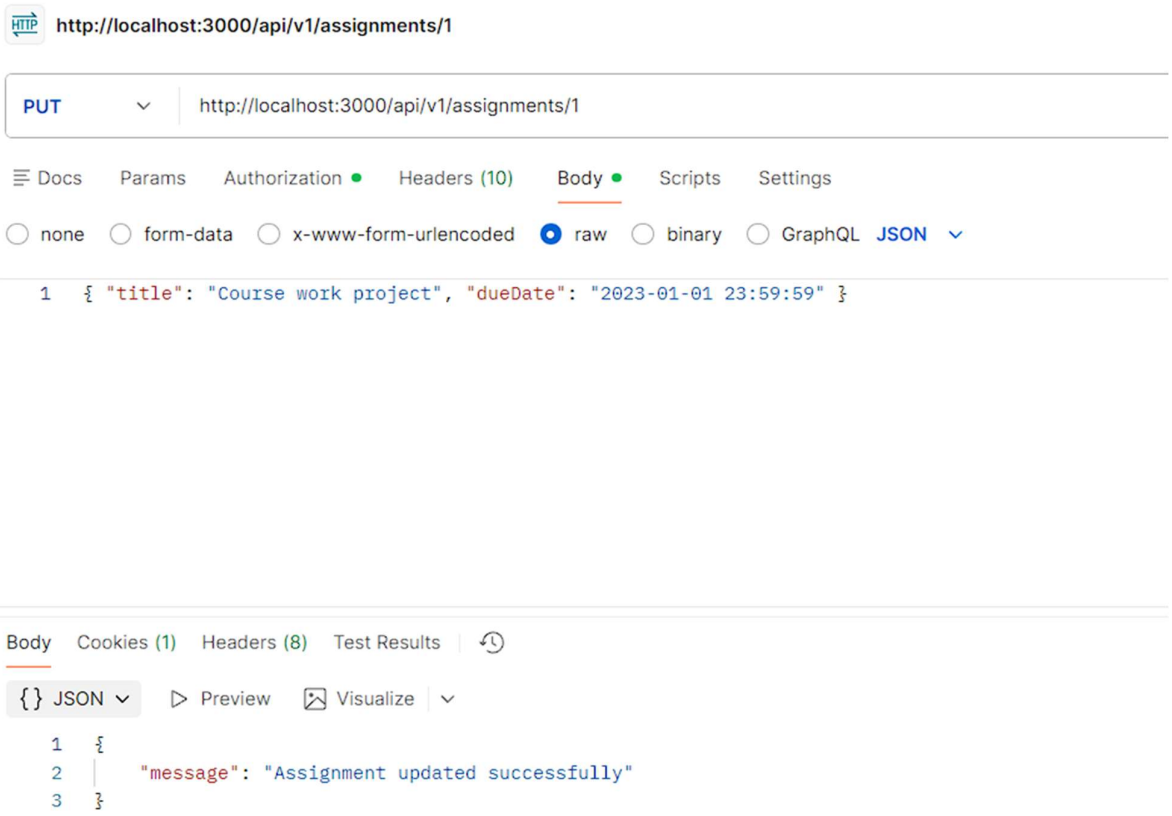


10.9 Grade submissions

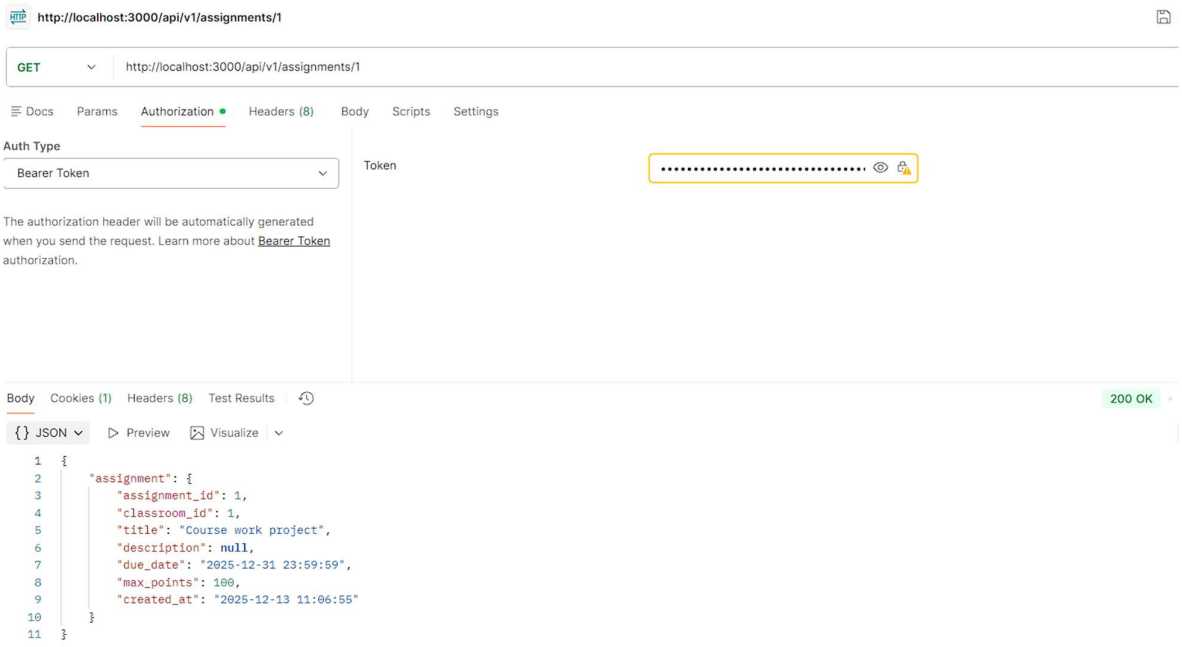


10.10 verify Deadlines

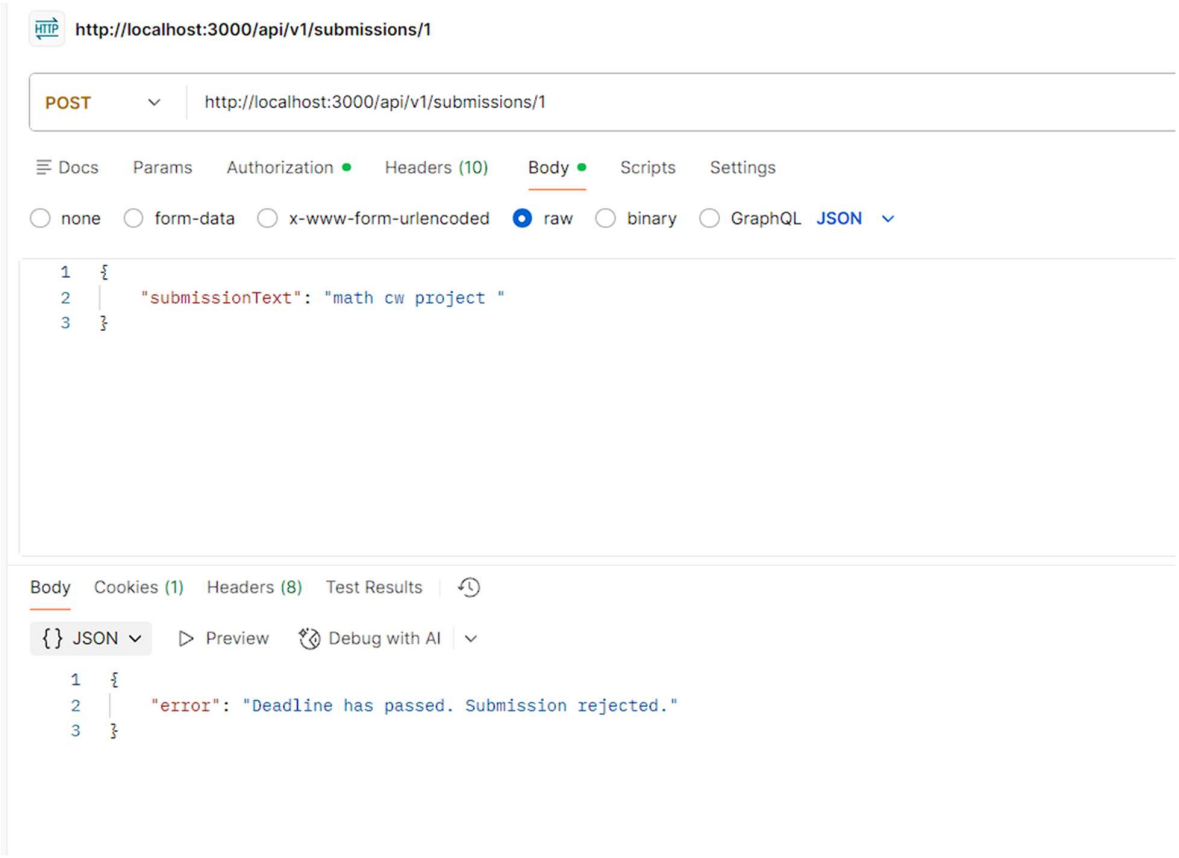
Update an Assignment



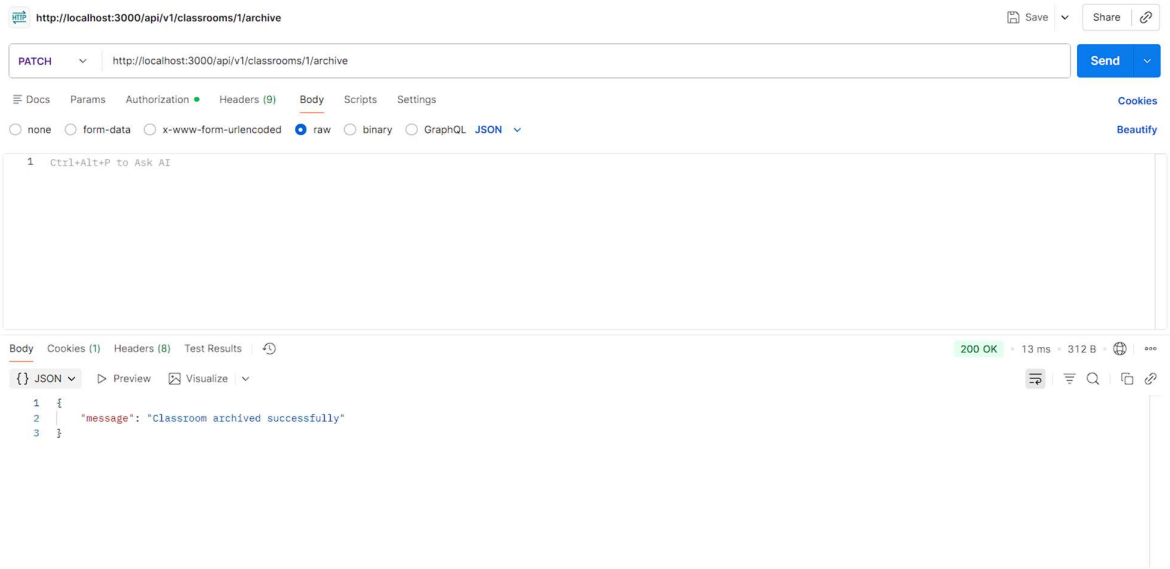
View :


http://localhost:3000/api/v1/assignments/1
GET
http://localhost:3000/api/v1/assignments/1
Docs
Params
Authorization
Headers (8)
Body
Scripts
Settings
Auth Type
Bearer Token
Token
The authorization header will be automatically generated when you send the request. Learn more about Bearer Token authorization.
Body
Cookies (1)
Headers (8)
Test Results
200 OK
JSON
Preview
Visualize
{
"assignment": {
"assignment_id": 1,
"classroom_id": 1,
"title": "Course work project",
"description": null,
"due_date": "2025-12-31 23:59:59",
"max_points": 100,
"created_at": "2025-12-13 11:06:55"
}
}

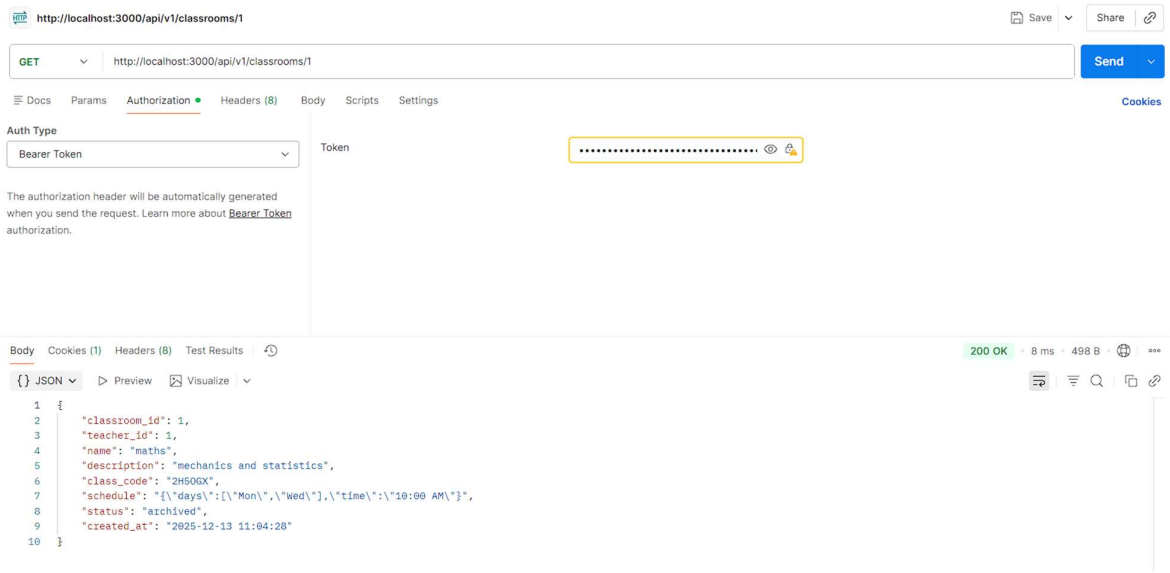
10.11 Submitting after Deadline:



10.12 Archiving



check classroom status:



References

Firer, A., Kopeikin, A., & Khramov, I. (2025). *Features of automation of the university schedule management process through the "Class Schedule WEB application"*. ITM Web of Conferences, 72, 02006.
DOI:
https://www.itm-conferences.org/articles/itmconf/pdf/2025/03/itmconf_hmmocs-III2024_02006.pdf