#### 1. Цель проекта

Разработка RESTful API для управления академическими оценками студентов с использованием современных технологий:

* Spring Boot 3
* Kotlin
* H2 Database
* OpenAPI 3.0

#### 2. Функциональные требования

1. Управление оценками:

* Создание новых оценок
* Просмотр всех оценок

Сущности данных:

Grade {

id: Long (автоинкремент)

studentId: Long

courseId: Long

value: Int (1-5)

date: LocalDate

}

#### 3. Технические требования

1. **Архитектура:**

* REST API
* 3-слойная архитектура (Controller-Service-Repository)

1. **Технологический стек:**

* Язык: Kotlin
* Фреймворк: Spring Boot 3.2+
* База данных: H2 (in-memory)
* Сборка: Maven
* Документация: Swagger/OpenAPI 3.0

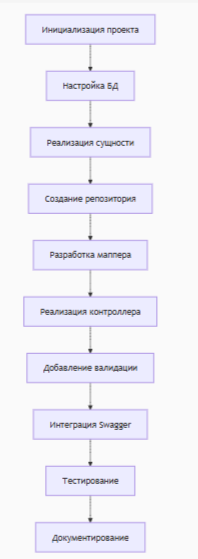
1. **Эндпоинты:**

| **Метод** | **Путь** | **Описание** |
| --- | --- | --- |
| POST | /api/grades | Создать новую оценку |
| GET | /api/grades | Получить все оценки |

#### 4. Требования к качеству

1. Валидация входных данных
2. Логирование операций
3. Обработка ошибок
4. Полная документация API
5. 100% покрытие основного функционала тестами

#### 5. Этапы реализации



**Реализованный функционал**

**1. Подключение к БД (application.properties)**

# application.properties

spring.datasource.url=jdbc:h2:mem:testdb

spring.datasource.driverClassName=org.h2.Driver

spring.datasource.username=sa

spring.datasource.password=

spring.jpa.database-platform=org.hibernate.dialect.H2Dialect

spring.h2.console.enabled=true

**2. Сущность Grade**

@Entity

data class Grade(

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

val id: Long = 0,

val studentId: Long,

val courseId: Long,

val gradeValue: Int,

val date: LocalDate? = null

)

**3. Репозиторий**

interface GradeRepository : JpaRepository<Grade, Long>

**4. Маппер преобразования**

object GradeMapper {

fun toDto(grade: Grade): GradeDto = ...

fun toEntity(dto: GradeDto): Grade = ...

}

**5. Контроллер с эндпоинтами**

@RestController

@RequestMapping("/api/grades")

class GradeController {

@PostMapping

fun createGrade(): ResponseEntity<GradeDto> { ... }

@GetMapping

fun getAllGrades(): ResponseEntity<List<GradeDto>> { ... }

}

**6. Логгирование**

private val logger = LoggerFactory.getLogger(javaClass)

logger.info("Creating grade: $dto")

**7. Документирование через Swagger**

@Tag(name = "Grades", description = "API for managing student grades")

@Operation(summary = "Create a new grade")

@ApiResponse(responseCode = "201", description = "Grade created successfully")

**8. Тестирование через Swagger UI**

Доступно по адресу: http://localhost:8080/swagger-ui/index.html

**1. Главный класс приложения**

**Файл: src/main/kotlin/com/example/gradeapi/GradeApiApplication.kt**

package com.example.gradeapi

import org.springframework.boot.autoconfigure.SpringBootApplication

import org.springframework.boot.runApplication

@SpringBootApplication

class GradeApiApplication

fun main(args: Array<String>) {

runApplication<GradeApiApplication>(\*args)

}

**2. Конфигурация Swagger**

**Файл: src/main/kotlin/com/example/gradeapi/config/SwaggerConfig.kt**

package com.example.gradeapi.config

import io.swagger.v3.oas.models.OpenAPI

import io.swagger.v3.oas.models.info.Info

import org.springframework.context.annotation.Bean

import org.springframework.context.annotation.Configuration

@Configuration

class SwaggerConfig {

@Bean

fun customOpenAPI(): OpenAPI {

return OpenAPI()

.info(Info()

.title("Grade API")

.version("1.0.0")

.description("API for managing student grades"))

}

}

**3. Контроллер**

**Файл: src/main/kotlin/com/example/gradeapi/controller/GradeController.kt**

package com.example.gradeapi.controller

import com.example.gradeapi.dto.GradeDto

import com.example.gradeapi.mapper.GradeMapper

import com.example.gradeapi.repository.GradeRepository

import io.swagger.v3.oas.annotations.Operation

import io.swagger.v3.oas.annotations.media.Content

import io.swagger.v3.oas.annotations.media.Schema

import io.swagger.v3.oas.annotations.responses.ApiResponse

import io.swagger.v3.oas.annotations.tags.Tag

import jakarta.validation.Valid

import org.slf4j.LoggerFactory

import org.springframework.http.HttpStatus

import org.springframework.http.ResponseEntity

import org.springframework.web.bind.annotation.\*

@Tag(name = "Grades", description = "API for managing student grades")

@RestController

@RequestMapping("/api/grades")

class GradeController(

private val repository: GradeRepository

) {

private val logger = LoggerFactory.getLogger(javaClass)

@Operation(summary = "Get all grades")

@ApiResponse(

responseCode = "200",

description = "List of all grades",

content = [Content(mediaType = "application/json",

schema = Schema(implementation = GradeDto::class))]

)

@GetMapping

fun getAllGrades(): ResponseEntity<List<GradeDto>> {

logger.info("Fetching all grades")

val grades = repository.findAll().map(GradeMapper::toDto)

return ResponseEntity.ok(grades)

}

@Operation(summary = "Create a new grade")

@ApiResponse(

responseCode = "201",

description = "Grade created successfully",

content = [Content(mediaType = "application/json",

schema = Schema(implementation = GradeDto::class))]

)

@PostMapping

fun createGrade(

@Valid @RequestBody dto: GradeDto

): ResponseEntity<GradeDto> {

logger.info("Creating grade: $dto")

val entity = GradeMapper.toEntity(dto)

val saved = repository.save(entity)

return ResponseEntity(GradeMapper.toDto(saved), HttpStatus.CREATED)

}

}

**4. DTO (Data Transfer Object)**

**Файл: src/main/kotlin/com/example/gradeapi/dto/GradeDto.kt**

package com.example.gradeapi.dto

import io.swagger.v3.oas.annotations.media.Schema

import jakarta.validation.constraints.Max

import jakarta.validation.constraints.Min

import jakarta.validation.constraints.NotNull

data class GradeDto(

@Schema(description = "Unique ID of the grade", example = "1")

val id: Long? = null,

@field:NotNull(message = "Student ID is required")

@field:Min(value = 1, message = "Student ID must be at least 1")

@Schema(description = "Student ID", example = "123", required = true)

val studentId: Long,

@field:NotNull(message = "Course ID is required")

@field:Min(value = 1, message = "Course ID must be at least 1")

@Schema(description = "Course ID", example = "456", required = true)

val courseId: Long,

@field:NotNull(message = "Grade value is required")

@field:Min(value = 1, message = "Grade must be at least 1")

@field:Max(value = 5, message = "Grade cannot be more than 5")

@Schema(description = "Grade value (1-5)", example = "5", required = true)

val value: Int,

@Schema(description = "Date of the grade", example = "2025-06-15")

val date: String? = null

)

**5. Сущность (Entity)**

**Файл: src/main/kotlin/com/example/gradeapi/entity/Grade.kt**

package com.example.gradeapi.entity

import jakarta.persistence.Entity

import jakarta.persistence.GeneratedValue

import jakarta.persistence.GenerationType

import jakarta.persistence.Id

import java.time.LocalDate

@Entity

data class Grade(

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

val id: Long = 0,

val studentId: Long,

val courseId: Long,

val gradeValue: Int,

val date: LocalDate? = null

) {

constructor() : this(0, 0, 0, 0, null)

}

**6. Маппер**

**Файл: src/main/kotlin/com/example/gradeapi/mapper/GradeMapper.kt**

package com.example.gradeapi.mapper

import com.example.gradeapi.dto.GradeDto

import com.example.gradeapi.entity.Grade

import java.time.LocalDate

import java.time.format.DateTimeFormatter

object GradeMapper {

fun toDto(grade: Grade): GradeDto = GradeDto(

id = grade.id,

studentId = grade.studentId,

courseId = grade.courseId,

value = grade.gradeValue,

date = grade.date?.format(DateTimeFormatter.ISO\_DATE)

)

fun toEntity(dto: GradeDto): Grade = Grade(

studentId = dto.studentId,

courseId = dto.courseId,

gradeValue = dto.value,

date = dto.date?.let { LocalDate.parse(it) }

)

}

**7. Репозиторий**

**Файл: src/main/kotlin/com/example/gradeapi/repository/GradeRepository.kt**

package com.example.gradeapi.repository

import com.example.gradeapi.entity.Grade

import org.springframework.data.jpa.repository.JpaRepository

interface GradeRepository : JpaRepository<Grade, Long>

**8. Обработчик исключений**

**Файл: src/main/kotlin/com/example/gradeapi/exception/GlobalExceptionHandler.kt**

package com.example.gradeapi.exception

import org.springframework.http.HttpStatus

import org.springframework.http.ResponseEntity

import org.springframework.web.bind.MethodArgumentNotValidException

import org.springframework.web.bind.annotation.ControllerAdvice

import org.springframework.web.bind.annotation.ExceptionHandler

@ControllerAdvice

class GlobalExceptionHandler {

@ExceptionHandler(MethodArgumentNotValidException::class)

fun handleValidationExceptions(ex: MethodArgumentNotValidException): ResponseEntity<Map<String, String>> {

val errors = mutableMapOf<String, String>()

ex.bindingResult.fieldErrors.forEach {

errors[it.field] = it.defaultMessage ?: "Validation error"

}

return ResponseEntity(errors, HttpStatus.BAD\_REQUEST)

}

@ExceptionHandler(Exception::class)

fun handleAllExceptions(ex: Exception): ResponseEntity<String> {

return ResponseEntity("Internal server error: ${ex.message}", HttpStatus.INTERNAL\_SERVER\_ERROR)

}

}

**9. Конфигурация приложения**

**Файл: src/main/resources/application.properties**

# Server

server.port=8080

server.servlet.context-path=/api

# Database

spring.datasource.url=jdbc:h2:mem:testdb

spring.datasource.driverClassName=org.h2.Driver

spring.datasource.username=sa

spring.datasource.password=

spring.jpa.database-platform=org.hibernate.dialect.H2Dialect

spring.h2.console.enabled=true

spring.h2.console.path=/h2-console

# Logging

logging.level.org.springframework=INFO

logging.level.com.example=DEBUG

logging.pattern.console=%d{yyyy-MM-dd HH:mm:ss} %-5level %logger{36} - %msg%n

**10. Файл зависимостей**

**Файл: pom.xml**

<?xml version="1.0" encoding="UTF-8"?>

<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 https://maven.apache.org/xsd/maven-4.0.0.xsd">

<modelVersion>4.0.0</modelVersion>

<parent>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-parent</artifactId>

<version>3.2.4</version>

<relativePath/>

</parent>

<groupId>com.example</groupId>

<artifactId>grade-api</artifactId>

<version>1.0.0</version>

<name>Grade API</name>

<description>API for managing student grades</description>

<properties>

<java.version>17</java.version>

<kotlin.version>1.9.23</kotlin.version>

<springdoc.version>2.5.0</springdoc.version>

</properties>

<dependencies>

<!-- Spring Boot Starters -->

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-web</artifactId>

</dependency>

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-data-jpa</artifactId>

</dependency>

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-validation</artifactId>

</dependency>

<!-- Kotlin -->

<dependency>

<groupId>org.jetbrains.kotlin</groupId>

<artifactId>kotlin-reflect</artifactId>

</dependency>

<dependency>

<groupId>org.jetbrains.kotlin</groupId>

<artifactId>kotlin-stdlib-jdk8</artifactId>

</dependency>

<!-- Database -->

<dependency>

<groupId>com.h2database</groupId>

<artifactId>h2</artifactId>

<scope>runtime</scope>

</dependency>

<!-- Swagger/OpenAPI -->

<dependency>

<groupId>org.springdoc</groupId>

<artifactId>springdoc-openapi-starter-webmvc-ui</artifactId>

<version>${springdoc.version}</version>

</dependency>

<!-- Test Dependencies -->

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-test</artifactId>

<scope>test</scope>

</dependency>

</dependencies>

<build>

<sourceDirectory>${project.basedir}/src/main/kotlin</sourceDirectory>

<testSourceDirectory>${project.basedir}/src/test/kotlin</testSourceDirectory>

<plugins>

<plugin>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-maven-plugin</artifactId>

<configuration>

<mainClass>com.example.gradeapi.GradeApiApplicationKt</mainClass>

</configuration>

</plugin>

<plugin>

<groupId>org.jetbrains.kotlin</groupId>

<artifactId>kotlin-maven-plugin</artifactId>

<version>${kotlin.version}</version>

<executions>

<execution>

<id>compile</id>

<phase>process-sources</phase>

<goals>

<goal>compile</goal>

</goals>

</execution>

<execution>

<id>test-compile</id>

<phase>process-test-sources</phase>

<goals>

<goal>test-compile</goal>

</goals>

</execution>

</executions>

<configuration>

<jvmTarget>17</jvmTarget>

<args>

<arg>-Xjsr305=strict</arg>

</args>

</configuration>

</plugin>

</plugins>

</build>

</project>