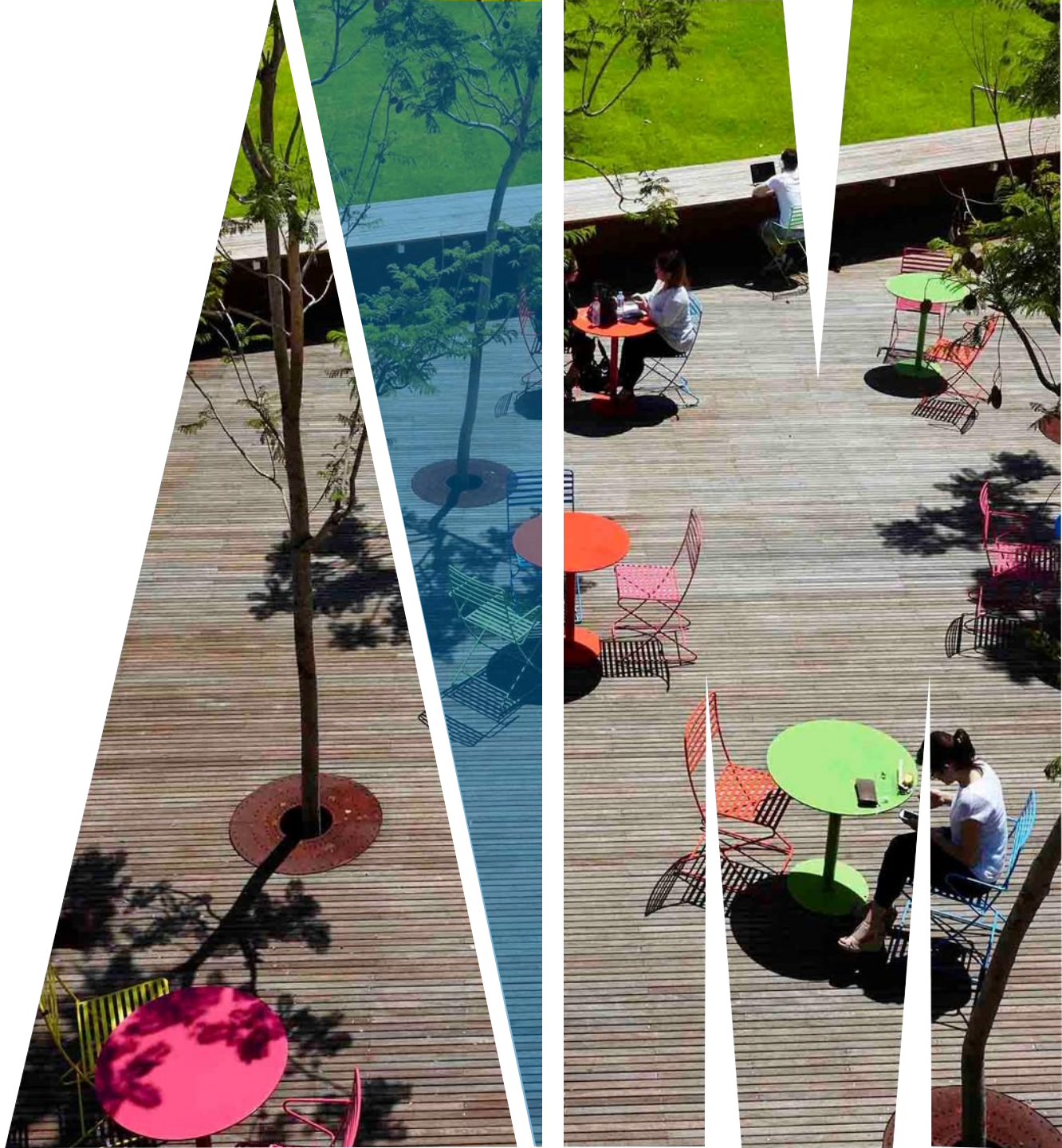
MONASH University

FIT2099 Object-Oriented Design and Implementation

The Final Assessment



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WHAT IS ABSTRACTION?

According to dictionary.com,

> *"the act of considering something as **a general quality or characteristic**, apart from concrete realities, specific objects, or actual instances."*

To a software developer, this means deciding

- **what information** do we need in order to represent some item or concept?
- **what should we expose to the rest of the code** (i.e. make public) so that we will be able to use this part easily?

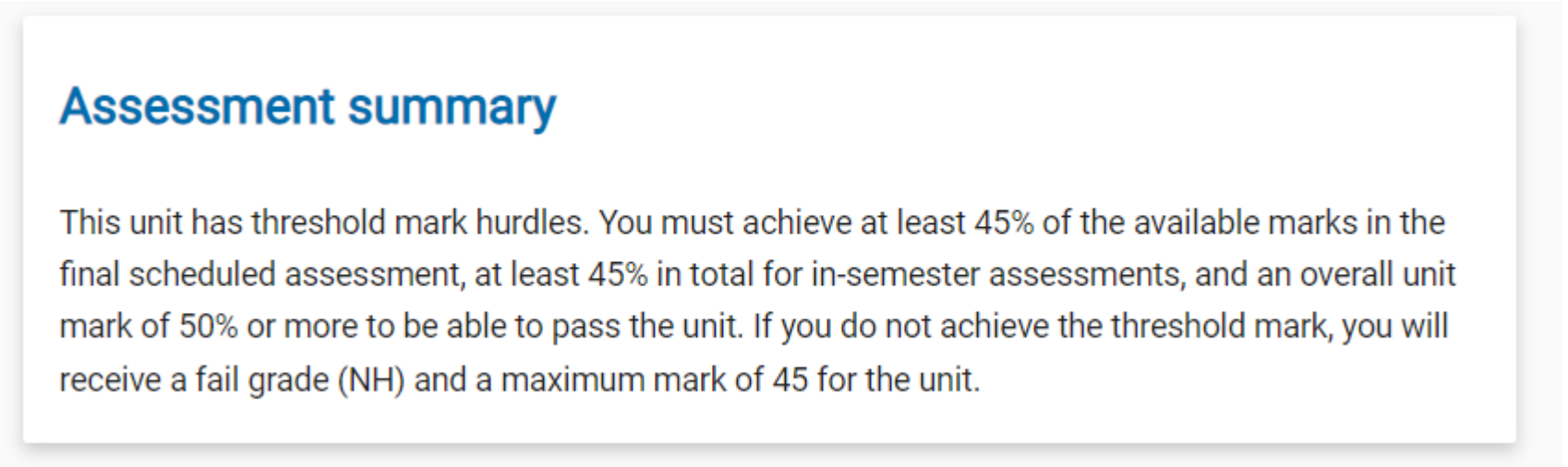
Outline

Review of FIT2099 final assessment

IS THERE AN EXAM?

Yes, it is worth 30% of your total mark

- there is a 45% hurdle (i.e. you need to get at least 45% in the exam in order to pass FIT2099)
- it will be an eExam



Source: FIT2099 Monash Handbook

WHAT IS NOT INCLUDED IN THE EXAM?

Trivia quiz type questions

Program language syntax

- markers are specifically directed to ignore minor syntax errors

Writing large slabs of Java

- there's a bit, but it's simple
- we're trying to assess your design skills
- we assessed your coding skills in the assignments!

WHAT IS EXAMINABLE?

Everything you studied in this unit, including:

- Lecture content
- Compulsory readings
- Bootcamp exercises
- Assignment-related material

WHAT CAN I BRING TO THE EXAM?

You can bring/use up 5 double sided pages with notes (printed or handwritten)

We recommend you consider the following material :

- UML syntax reference
  - class and sequence diagrams
- Java reference (if you want)
  - consider a quick reference sheet with very basic syntax
- Some notes on KEY lecture slides (e.g. design principles)

EXAM
STRUCTURE

2 Hours 10 minutes

- includes “reading time”, which is not a separate thing with eExams

Written answers (no multiple choice)

EXAM
STRUCTURE

There are 30 marks available in this exam.

It is 6-8 pages long and contains 6-8 items (some with multiple **parts**).

WHAT IS COMMONLY ASKED IN THE EXAM?

Things we might ask you to do:

- come up with a design based on requirements
  - document that design
  - justify that design
- critique an existing design/implementation
- analyze connections between design and implementation in Java
- explain OO and Java concepts seen in lectures/assignments/readings IN YOUR OWN WORDS

EXAM STRUCTURE
IN DETAIL

Section A: Code revisions.

Section B: Code critiques.

Section C: Design critiques.

Section D: Design.

SECTION A

CODE REVISIONS

You are provided with some code and you are requested to modify the existing code or extend the code. You may also be asked to briefly justify your decisions.

What you are provided with:

Some code

What you are asked to do:

Write some **revised code** based on the code above
AND/OR
Write some **explanation** using/mentioning FIT2099 concepts and principles

SECTION B

CODE CRITIQUES

You are provided with some code and **contextual information**. You are then asked to respond to questions about such code and/or suggest ways to improve the underlying design. You do not need to code anything in this case.

What you are provided with:

Some code

Some contextual information
such as a fictional challenge or a hint
about a problem with this code

What you are asked to do:

Write some **explanation** using/mentioning FIT2099 concepts and principles

Describe how you would **improve the code** based on design principles (you may be asked to fix the code provided)

SECTION C

DESIGN CRITIQUES

You are provided with a design diagram and then you are asked to highlight any design issue in it and/or recommend improvements. Responses are in written format.

What you are provided with:

A diagram

Some contextual information such as **requirements**

What you are asked to do:

Identify and describe **design deficiencies**

Suggest potential **design improvements** based on FIT2099 design concepts / principles

SECTION D
DESIGN

You are provided with design specifications and maybe a partial design (a diagram).
You are then asked to explain how you would complete the design.

What you are provided with:

A list of specifications

Some contextual information
in the form of system requirements

Maybe some partial design

It is **suggested** to create a UML diagram (static/dynamic depending on the question).
You are not required to upload this.

What you are asked to do:

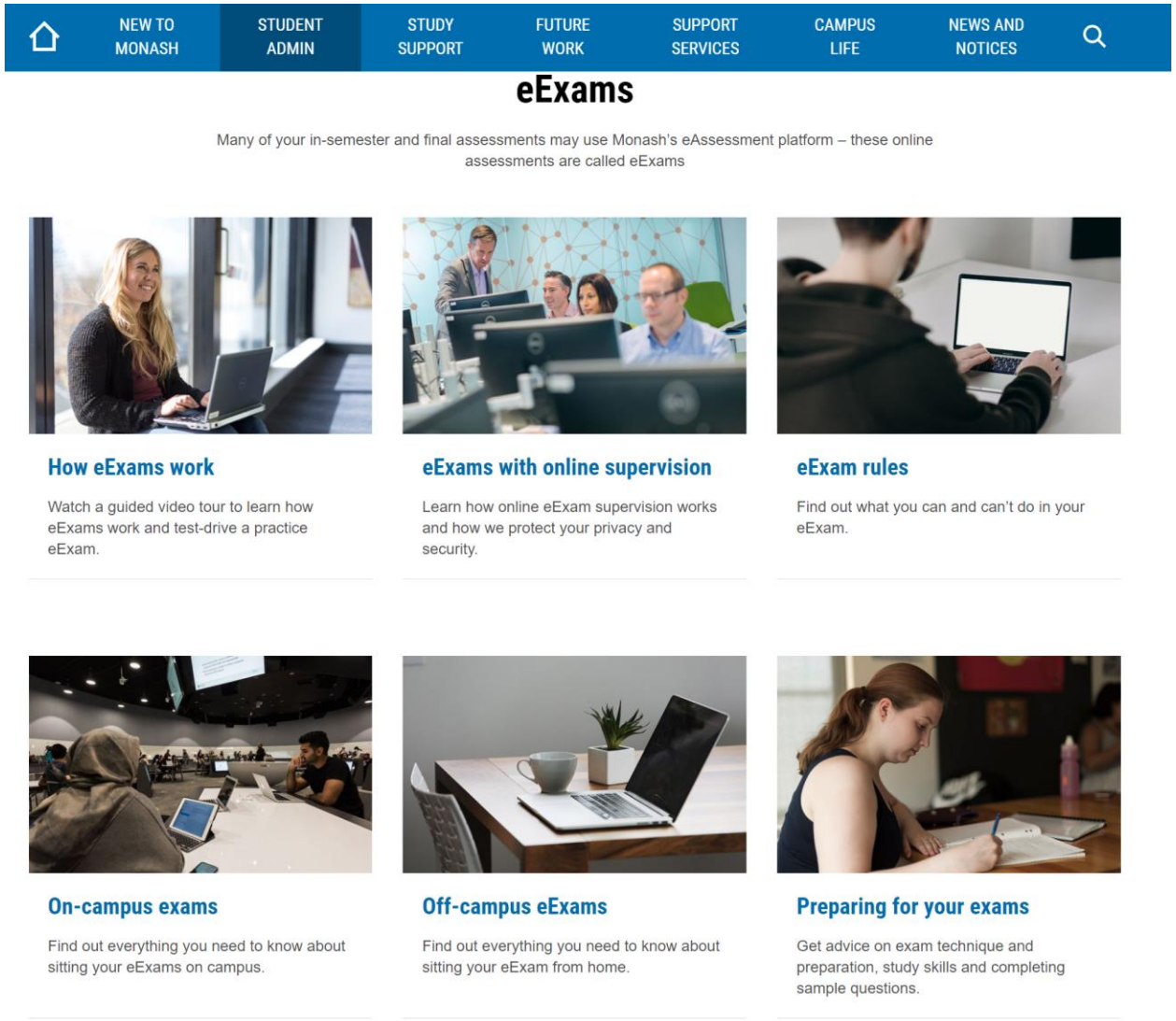
Describe different features and elements of a design, for example, the classes that should be present in the design, connection types, attributes, methods.

A design rationale.

HOW DO eEXAMS WORK?

Plenty of resources online

A good place to start is
https://www.monash.edu/exams/electronic-exams



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WILL THERE BE
A SAMPLE EXAM?

There're *already* sample exams

Go look under Exams on Moodle!

There is also a sample marking scheme.

- You have plenty of time for you to read it and go to consultation

EXAM STRATEGIES

ROTE LEARNING WON'T HELP

Repeat – no trivia quiz questions

Learning the vocabulary will help

We will test your ability to analyze, apply, explain, not memorising

- so practice those skills

READ
THE WHOLE QUESTION

Common mistakes:

- read half the question, assume the rest
- read a key phrase in the question, brain dump of everything you have memorized relating to that phrase

We are not interested in your ability to recall/copy slabs of text

TMTOWTDI

There's More Than One Way To Do It

- motto of the Perl community

Also true of design

- there will be *multiple* answers to design questions that are acceptable

Marking schemes for exam design questions will be like miniature versions of assignment ones

- e.g. a design would be marked on:
  - use of correct notation
  - implementability
  - clarity
  - adherence to design principles (DRY, minimizing dependencies, maximizing cohesion etc.)
  - avoidance of code/design smells

Answers that are “a little bit wrong” will still get most of the marks

- even answers that are a *lot* wrong will usually get something…

EXPLAIN IN YOU OWN WORDS

Questions may ask you to explain your reasoning

Don't ignore this!

- explanation is often as important or more important (marks-wise) as the “right” answer
- sometimes, both answers can be “right”, based on your explanation

For many of these questions, you're making an **argument**

- *An argument is a connected series of statements intended to establish a proposition* http://www.montypython.net/scripts/argument.php

Your “statements” should ideally be based on:

- facts
- principles as discussed in the course

QUESTION EXAMPLES

Section A: Code revision example.

Here is an interface that is part of a visual design software:

```
public interface Shape {
    public void draw();
    public double getArea();
}
```

You have been asked to write the code to calculate the area of two shapes: Circle and Triangle. Please, create two classes using the Shape interface and following the next requirements:

- The area of a Circle is pi times the radius squared (hint: use Math.PI to get the value of PI).
- The area of a Triangle is the product of the height and width of the triangle divided by 2.
- You don’t have to code the logic for drawing the shapes, you can simply print a message using System.out.println("some text");

(8 marks)

Section A: Code revision example.

Partial Solution:

```
public class Triangle implements Shape {
    private double width;
    private double height;
    @Override
    public void draw() {
        System.out.println("Drawing Triangle");
    }

    @Override
    public double getArea() {
        return this.height*this.width / 2;
    }
}

public class Circle implements Shape {
…
…
.
.
```

Section A: Code revision example.

Marking criteria:

There are 8 marks available if they complete the following
Implements
+1 mark for correct use of the keyword Implements in both classes
Override draw
+1 mark if they implemented draw() method even if it is just to write to the console.

The Triangle class:
+2 marks for correct getArea() implementation (see example above) – deduct 1 mark if they implementation is somehow similar with some small error. They have to add the two attributes (they could use other names).

The Circle class
+2 marks for correct getArea() implementation (see example above) – deduct 1 mark if they implementation is somehow similar with some small error. They have to add the radius attributes.

Attributes
+2 mark if they correctly made the three attributes for Triangle and Circle private. Deduct one mark if they did not include the directive private or have something else

Section B: Code critique example

Here are three classes that are part of an Australian wildlife simulator:

```
public abstract class Bird{
        public void fly();
}
public class Cockatoo extends Bird{…}
public class Emu extends Bird{…}
```

You realise there is something wrong with this design since Emus cannot fly.

1- What solid principle would be violated if the design is left as is and why? Explain briefly in one or two lines using your own words. (1 mark)

2- Briefly suggest a solution to comply with such a principle (use 2-3 lines maximum). (1 mark)

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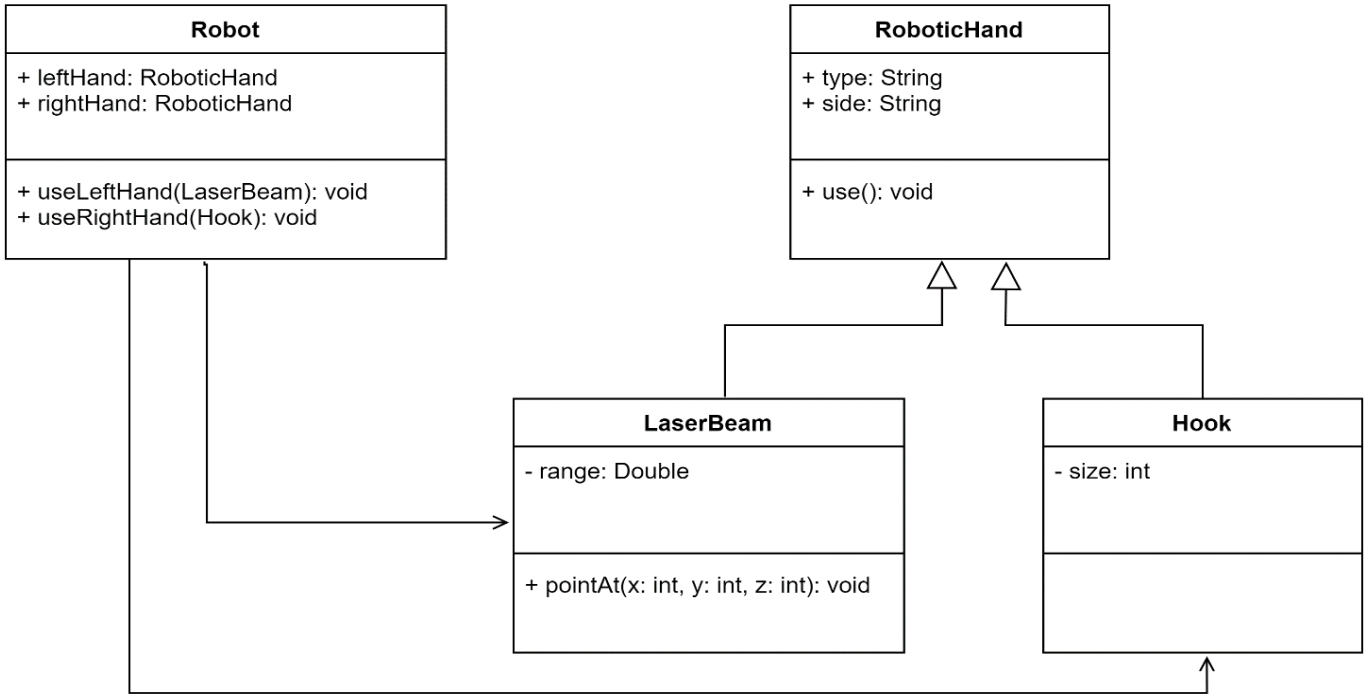
Section C: Design critique example

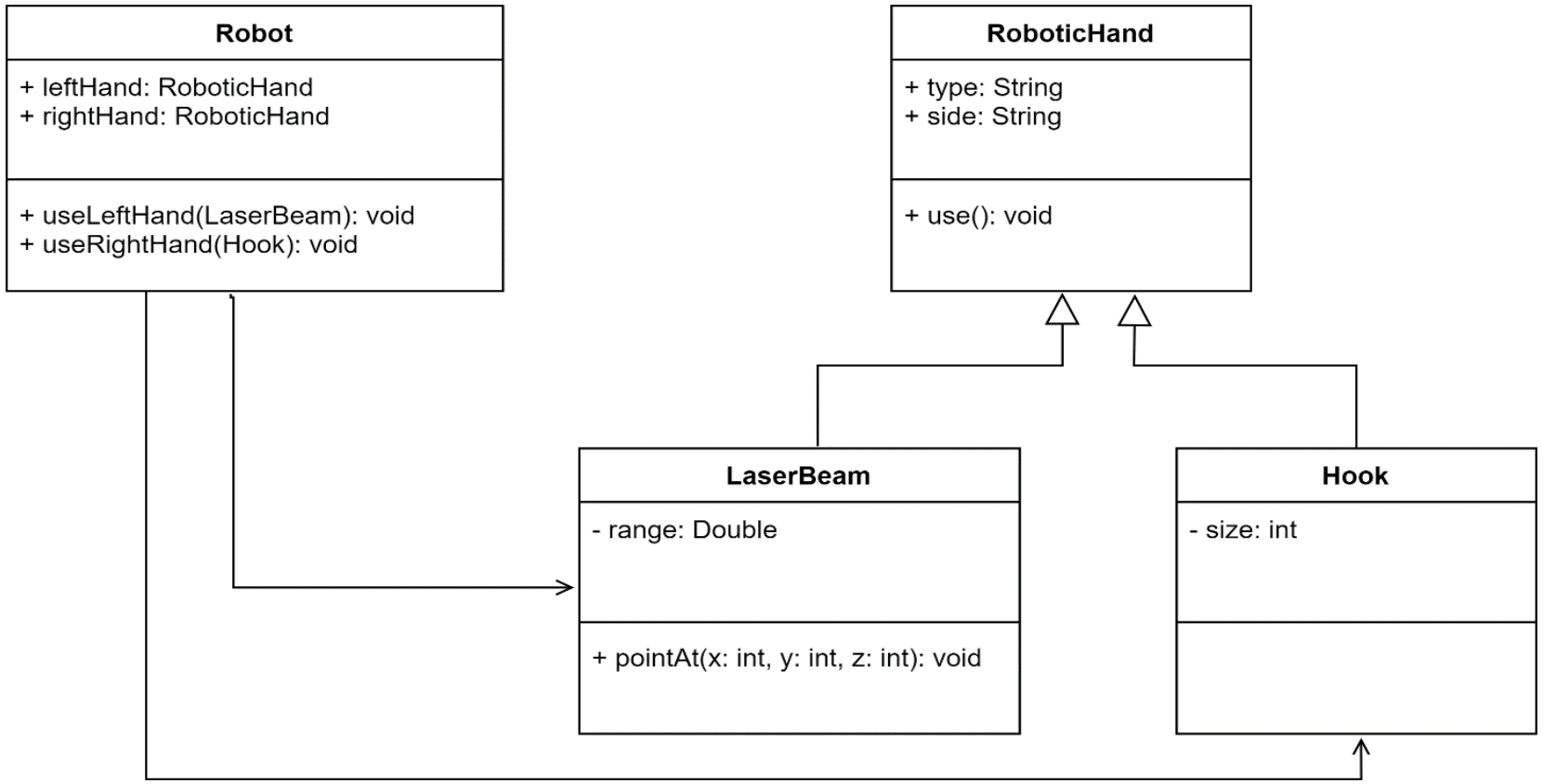
You are creating a text-based game based on robots with the following characteristics:

- The **hands** of the robots can be interchangeable with **tools and "weapons"**.
- There are currently two types of RoboticHands: a laser beam and a hook. A laser beam has a range and can be pointed to certain 3D coordinates. The hook is just a hook of varied sizes.

Some colleagues have proposed a design for the Robotic Hand system. They have produced the following class diagram:

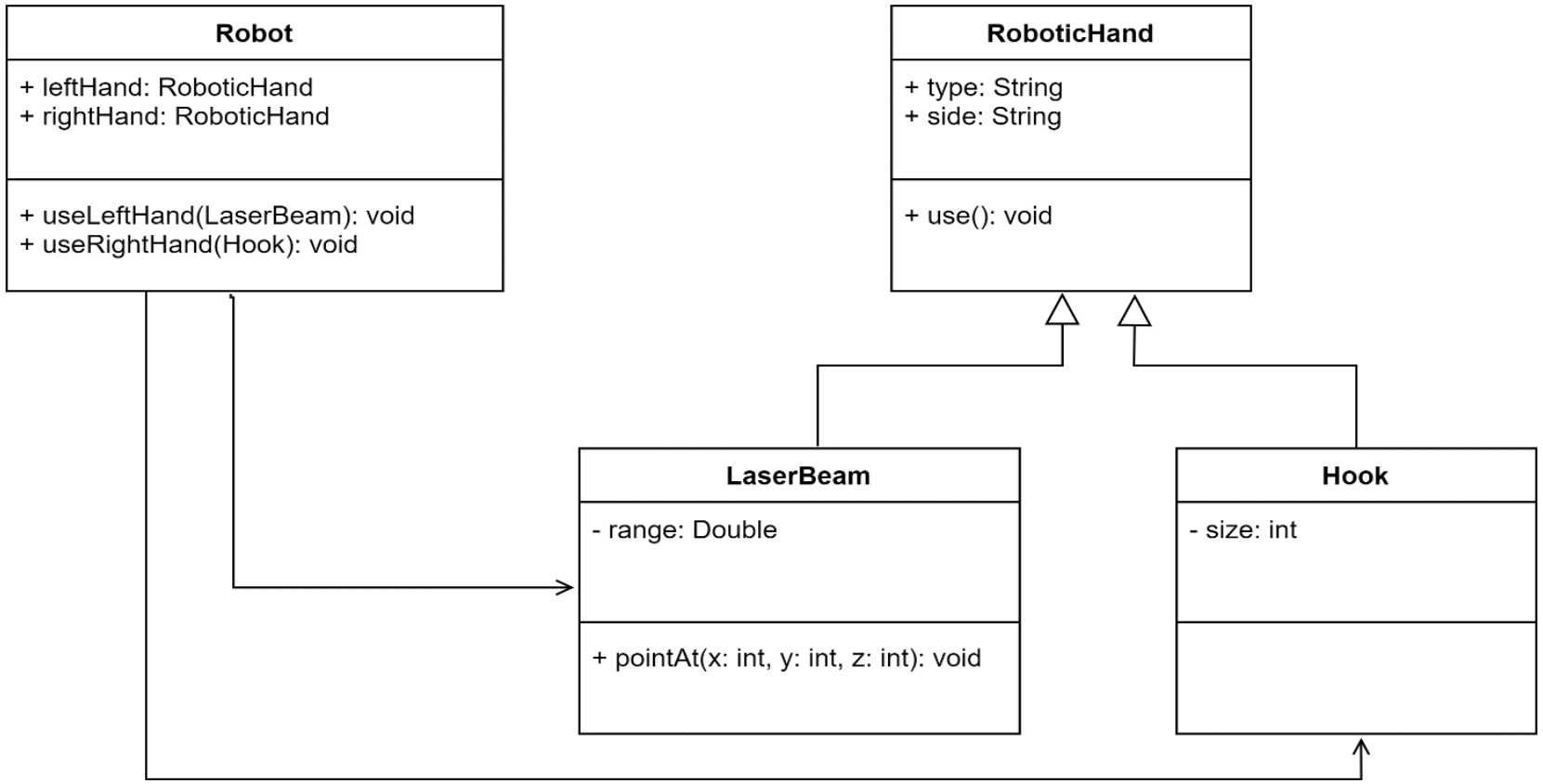


Section C: Design critique example



1) There is a new requirement to create 5 new types of hands. You realise that the current design may not be adequate. Your task is to find the flaws in this design (if any). **What are the main problems with this design?** Briefly explain in no more of 8 lines. (3 marks)

Section C: Design critique example



2) Briefly explain **how the design should be improved**. What is the main change that needs to be applied on this design so multiple hand types can be attached to both of the Robot's arms. Write a brief response of no more than 8 lines. (3 marks)

Section D: Design example

You have been assigned to design a booking system for a small yoga studio with two rooms.

The studio has 2 rooms and classes can be run in any of them by different yoga teachers.

When students want to join a class they have to login in through the web system. They would be able to look at a list of yoga classes in this way:

Date: Monday April 26, 2021
Time: 6.30 am
Duration: 75 mins class
Room: A
Class type: Yoga flow
Staff: Alex

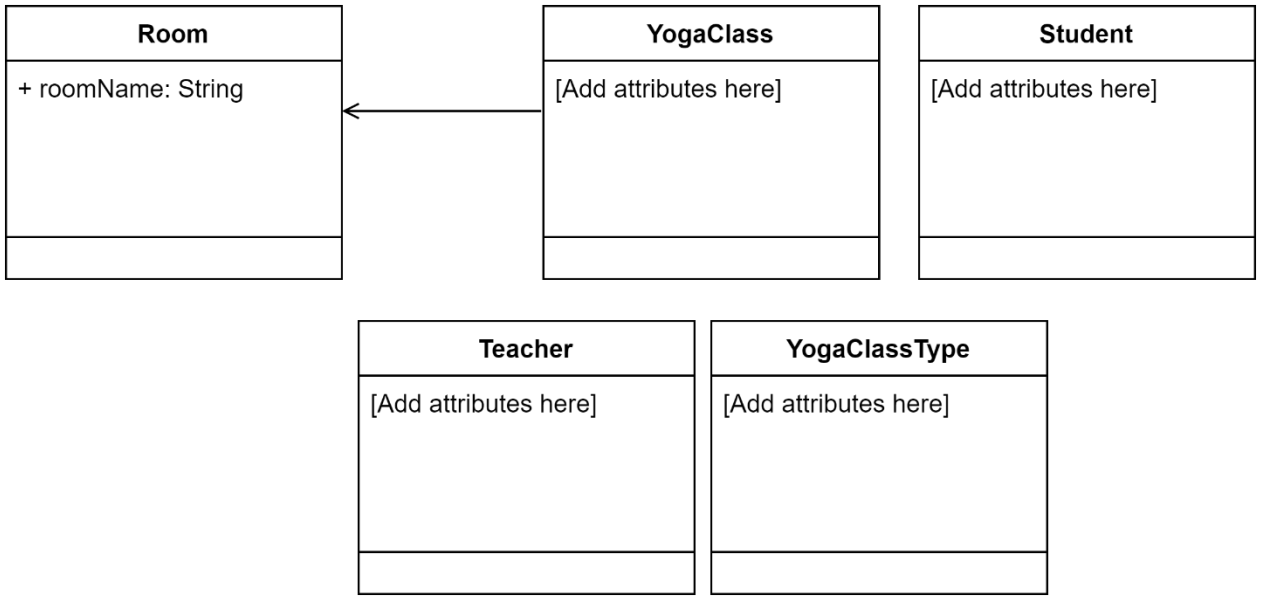
Date: Monday April 26, 2021
Time: 6 pm
Duration: 60 mins class
Room: B
Class type: Yin
Staff: Amela

Section D: Design example

To help scope the initial design, here are two functional requirements for the system:

- Create a report containing human-readable description of all the classes delivered by each yoga instructor in the last week.
- Create a system to enable a student to book a yoga class. When the student books a class the **registration time** should be captured along with a any **message** that the student may submit as text for the instructor to see (e.g. “This is my first class”).

A colleague started a design but only identified some key classes as follows:



Section D: Design example

Question 1: Are the classes identified in the UML draft enough to model the booking system? (YES/NO), if not, what extra classes are needed and why? Please, write Yes or Not. If not, list the missing class(es) and in one line explain why this is needed (1 mark)

Question 2: What attributes do need to be added to each class? Please, use the follow notation:

[Room]
roomName: String
[Teacher]
attributeName: type
anotherAttributeName: type
[AnotherClass]

(2 marks)

Section D: Design example

Question 3: What interactions between classes need to exist and of which type (consider inheritance, dependency or association?

Please list all the interactions between classes as follows:
[Class] -> [AnotherClass] type of relationship

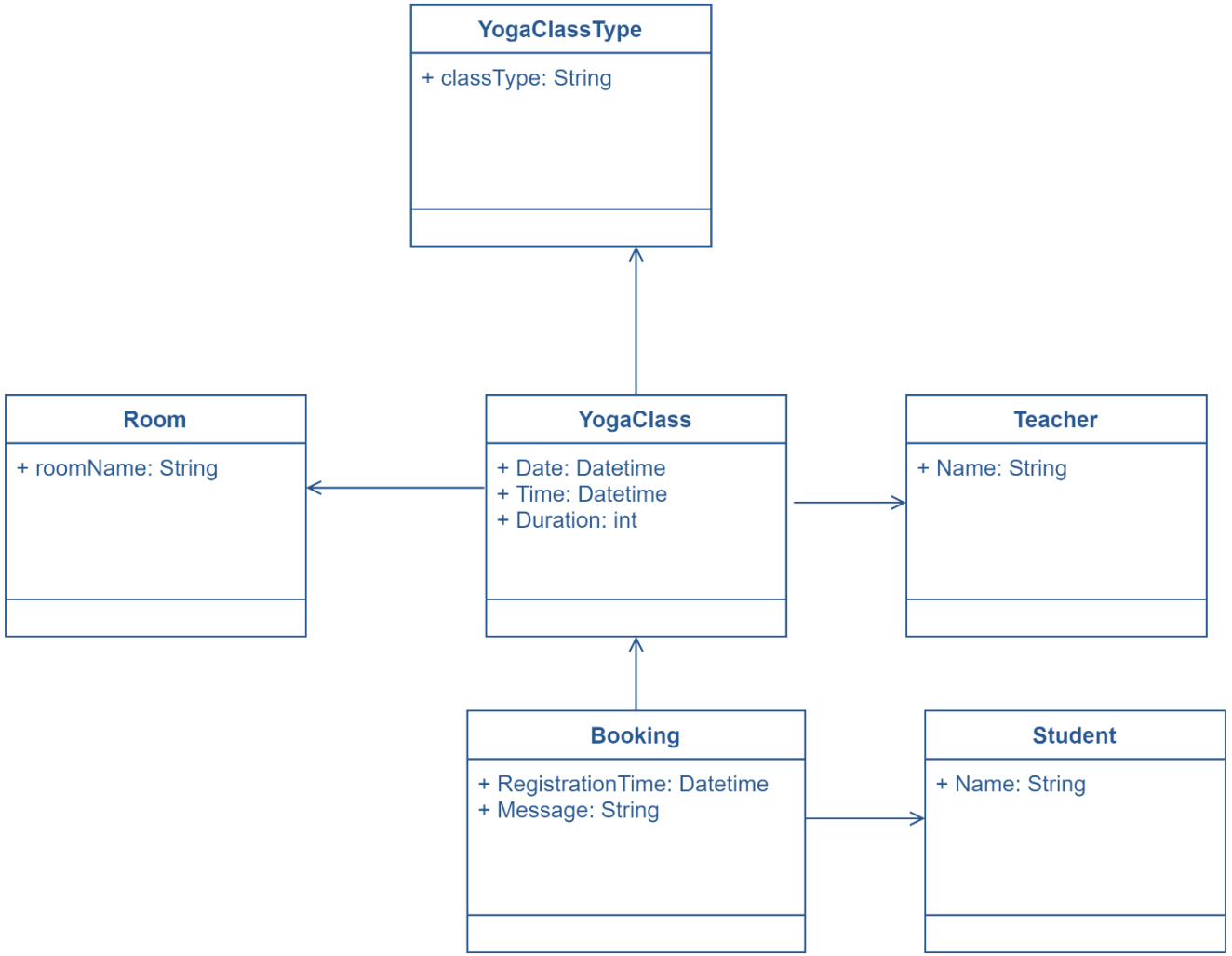
For example, there is already an association between YogaClass and Room. This would be coded as [YogaClass] -> [Room] association

Please, list all the remaining interactions using the similar notation, below.
(3 marks)

Question 4: Write a rationale explaining why you chose to model the classes and their interactions in this way, **making references to design principles** introduced in FIT2099. Write up to 15 lines. **(3 marks)**

Section D: Design example

Potential solution BUT you don't need to upload this to the eExam system!



Section D: Design example

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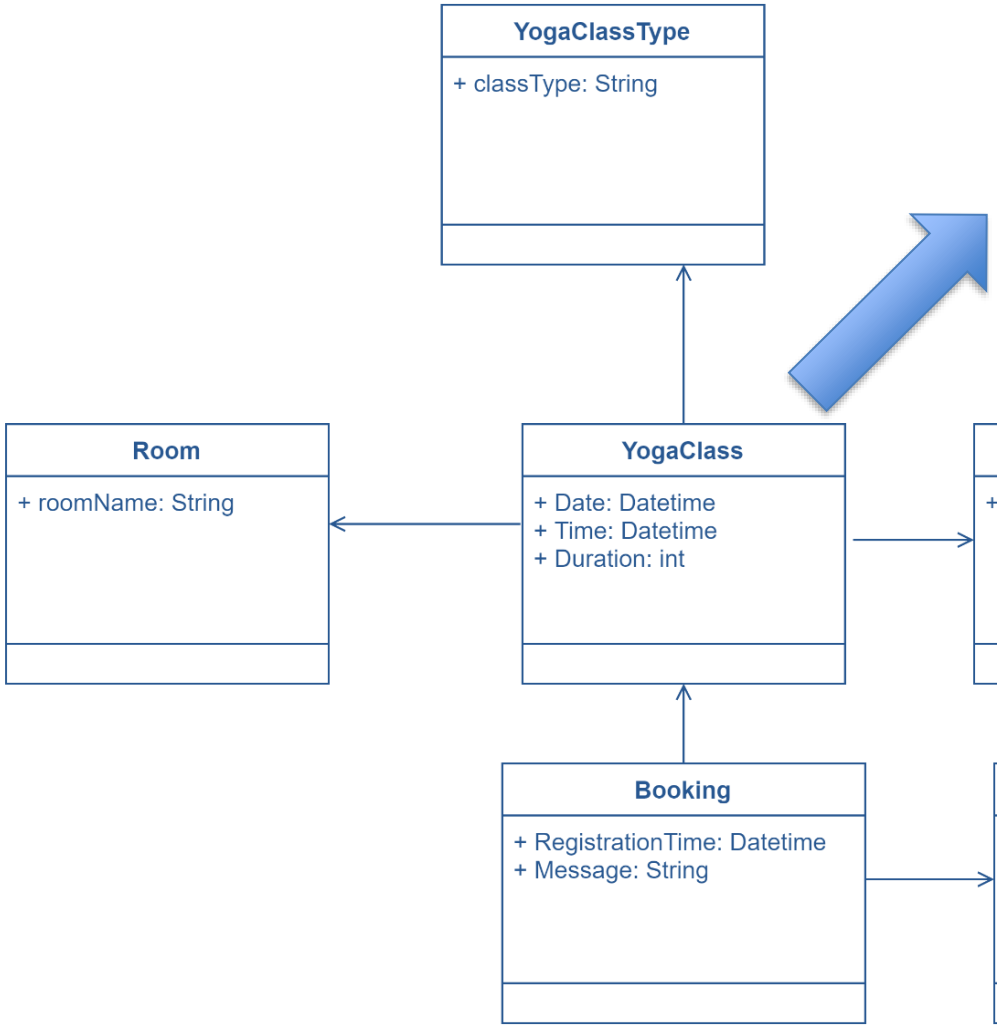
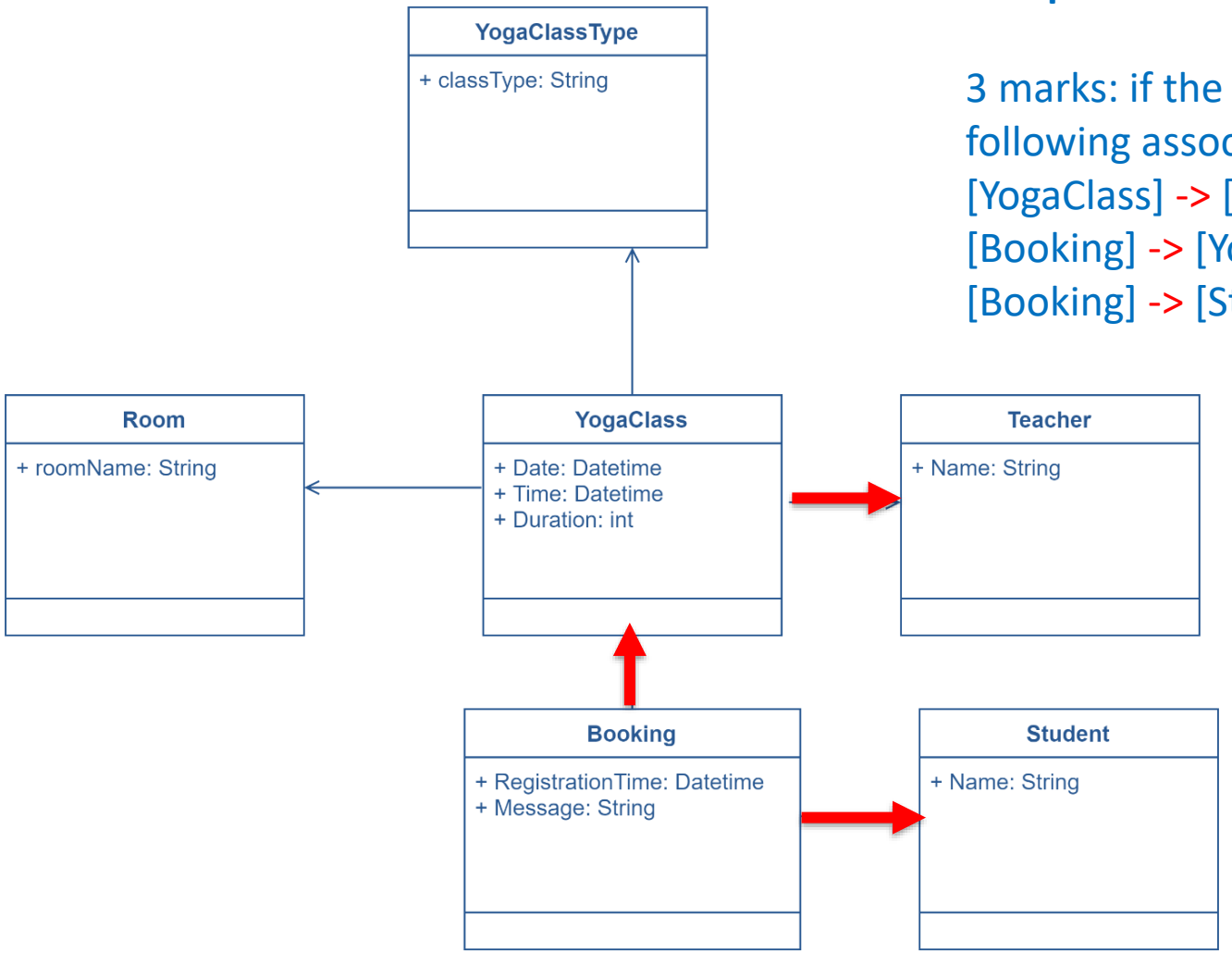


For question 2:

[YogaClass]
date: Datetime
time: Datetime //Date and Time can be one attribute
duration: int

Section D: Design example

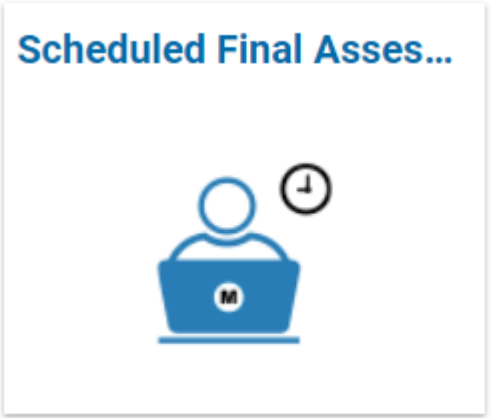
Potential solution BUT you don't need to upload this to the eExam system!



For **question 3:**

3 marks: if the student has at least the following associations
[YogaClass] -> [Teacher] association
[Booking] -> [YogaClass] association
[Booking] -> [Student] association

SAMPLE EXAMS
IN MOODLE



FIT2099 sample exam A 292.6KB PDF document

FIT2099 sample exam B 305.9KB PDF document

FIT2099 sample exam A (with sample solutions and rubric) 498.7KB PDF document

FIT2099 sample exam B (with sample solutions and rubric) 477.9KB PDF document

Solutions to be released after Week 12

BEST WISHES

Thanks so much for the learning journey!

All the best in your future endeavors and projects!

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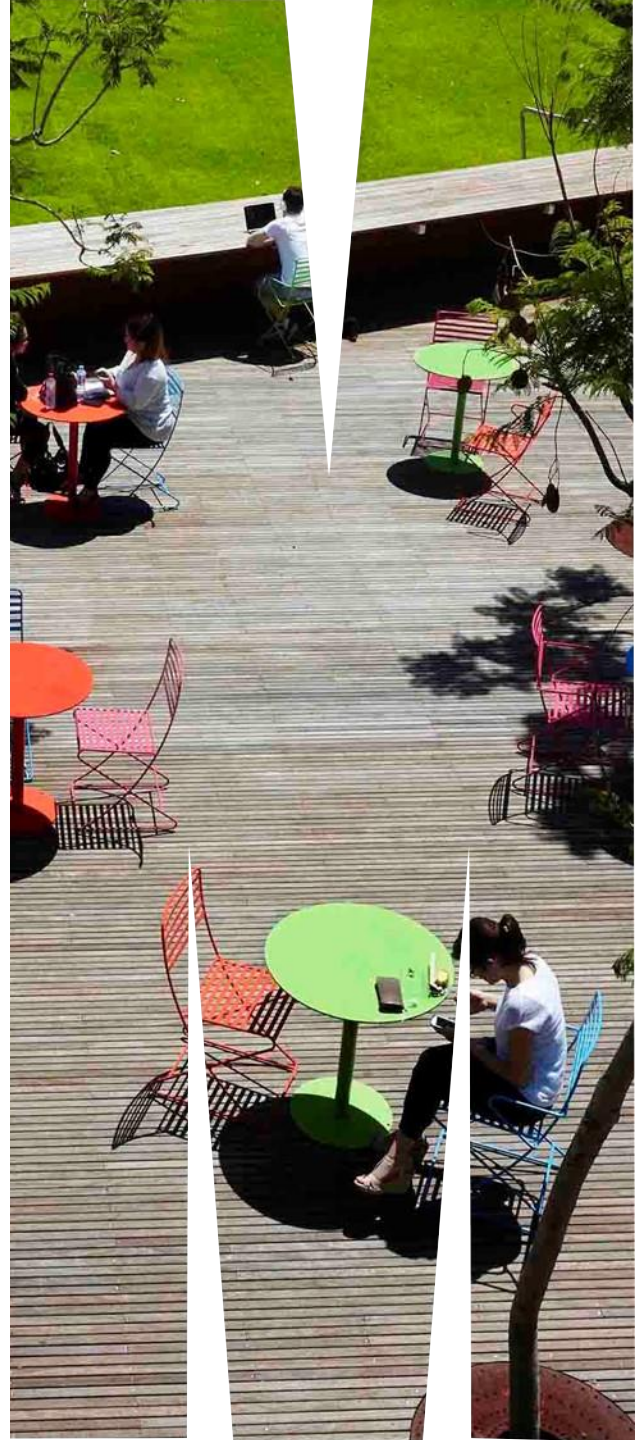
Thanks



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