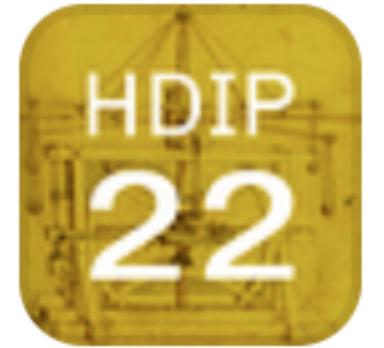




Waterford Institute of Technology

INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE



# Higher Diploma in Science in Computer Science

---

2022-2023



**Birney, Rosanne**  
Lecturer  
Tel:+353 0 51302647  
Email: RBIRNEY@wit.ie

*Database*



**Frisby, Richard**  
Lecturer in Computing  
Tel:+353 0 51302066  
Email: RFRISBY@wit.ie

*Developer Operations*



**Lyng, Mary**  
Lecturer  
Tel:+353 0 51302057  
Email: MLYNG@wit.ie

*Database*



**O'Connor ,  
Diarmuid**  
Lecturer  
Tel:+353 0 51-302760  
Email: Doconnor@wit.ie

*Full Stack Development 2*



**McGibney, Laura**  
Online Engagement Advisor  
Tel:+353 0 51 302856  
Email: lmcgibney@wit.ie



**Cahill, Caroline**  
Lecturer in Computing  
Tel:+353 0 51845529  
Email: CCAHILL@wit.ie

*Computer Systems & Networks*



**Drohan, David**  
Tel:+353 0 51302683  
Email: DDROHAN@wit.ie

*Mobile Application Development*



**McGibney, Jimmy**  
Lecturer  
Tel:+353 0 51302070  
Email: JMCGIBNEY@wit.ie

*Developer Operations  
Software Security*



**Windle, Peter**  
Lecturer  
Tel:+353 0 051 834119  
Email: PWINDLE@wit.ie

*Programming  
Web Development 1  
Computer Systems*



**Joan Mangan**  
Programme Coordinator  
Email: jmangan@wit.ie



**de Leastar, Eamonn**  
Lecturer  
Tel:+353 0 51302965  
Email: EDELEASTAR@wit.ie

*Programme Co-Director  
Web Development 1  
Web Development 2  
Full Stack Development 1*



**Dunphy, Colm**  
Lecturer  
Tel:+353 0 51302059  
Email: CDUNPHY@wit.ie

*Programme Co-Director  
Programming  
Project Coordinator*



**Walsh, Frank**  
Lecturer in Computing  
Tel:+353 0 51302089  
Email: FXWALSH@wit.ie

*Computer Systems & Networks*



Dave Hearne  
Lecturer  
Dave.Hearne@wit.ie

*Mobile Application Development*



# Workshop 1: Thursday January 13th, 2022

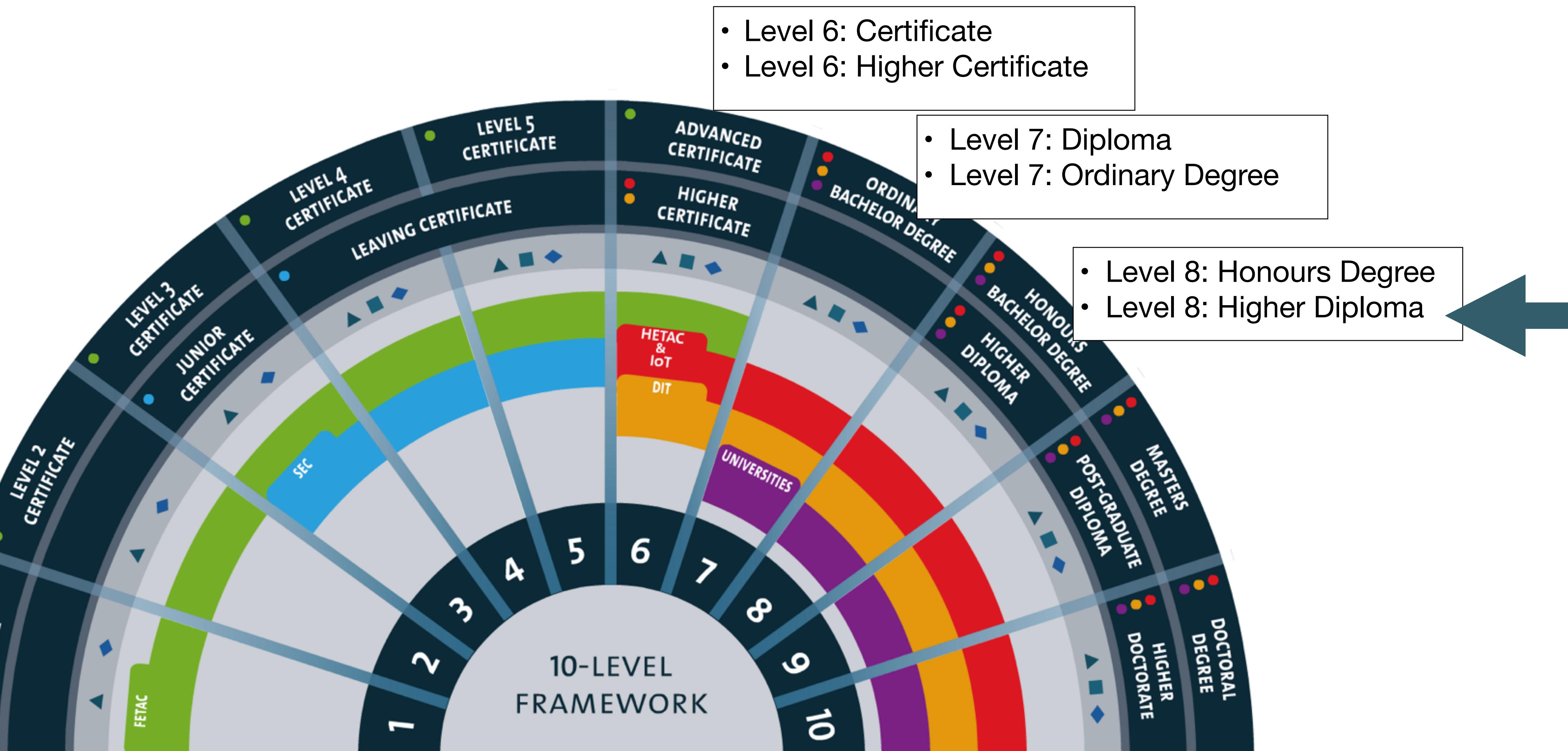
9:20	Join Room		
9:30	Agenda + Overview of Induction Day <i>Eamonn de Leastar, Colm Dunphy</i>		14:00 Semester 1 Module Overviews: <i>Web Development &amp; Programming</i> <i>Eamonn de Leastar, Colm Dunphy</i>
10:00	Online Learning Practices  Programme Structure, Assessment & Online Resources  <i>Eamonn de Leastar, Colm Dunphy</i>		14:30 Slack: Meeting Friends, Making Groups  <i>Colm Dunphy</i>
11:00	Coffee Break		
11:30	Online Learning Experience  Student expectations & community formation  <i>Laura McGibney</i>		15:30 Lab Clinics :  Bookable one-on-one slots for PC setup + Lab issues
12:30	Semester 2 Module Overviews: <i>Database &amp; Computer Systems</i> <i>Dr.Frank Wash, Caroline Cahill, Dr.Rosanne Birney, Mary Lyng</i>		15:30 <i>Programming</i>
1:00	Lunch		15:45
			16:00
			16:15
			16:45
			17:00
			17:15
			17:30
			17:45

# Agenda

- Context & Objectives
- Semesters & Modules
- Calendar, Timetable & Assessment Sequencing
- Module Summaries

# Context & Objectives

# Qualification/Programme Levels....



# Key Programme Features

- Immersion
- Specialisation
- Industry Partnership

# Immersion in Computing Knowledge



*“The participants will be graduates who have already obtained significant transferable skills by comparison with other undergraduate students...”*

*“Semester 1 participants will undertake a broad immersive set of modules in the fundamentals of computing...”*

*“The pace of delivery will have to be significantly higher than for normal undergraduate programmes...”*

## Deepening and Specialisation



*“In semester 2 ... a specialisation which reflects their own strengths as demonstrated on the programme to date...”*

*“.. a focused set of modules and project-work designed to bring candidates quickly to the industry entry standard ...”*

*“Participants will be expected to select their specialisation based on their achievement in semester 1 and their own ambitions...”*

## Industry experience and professional development

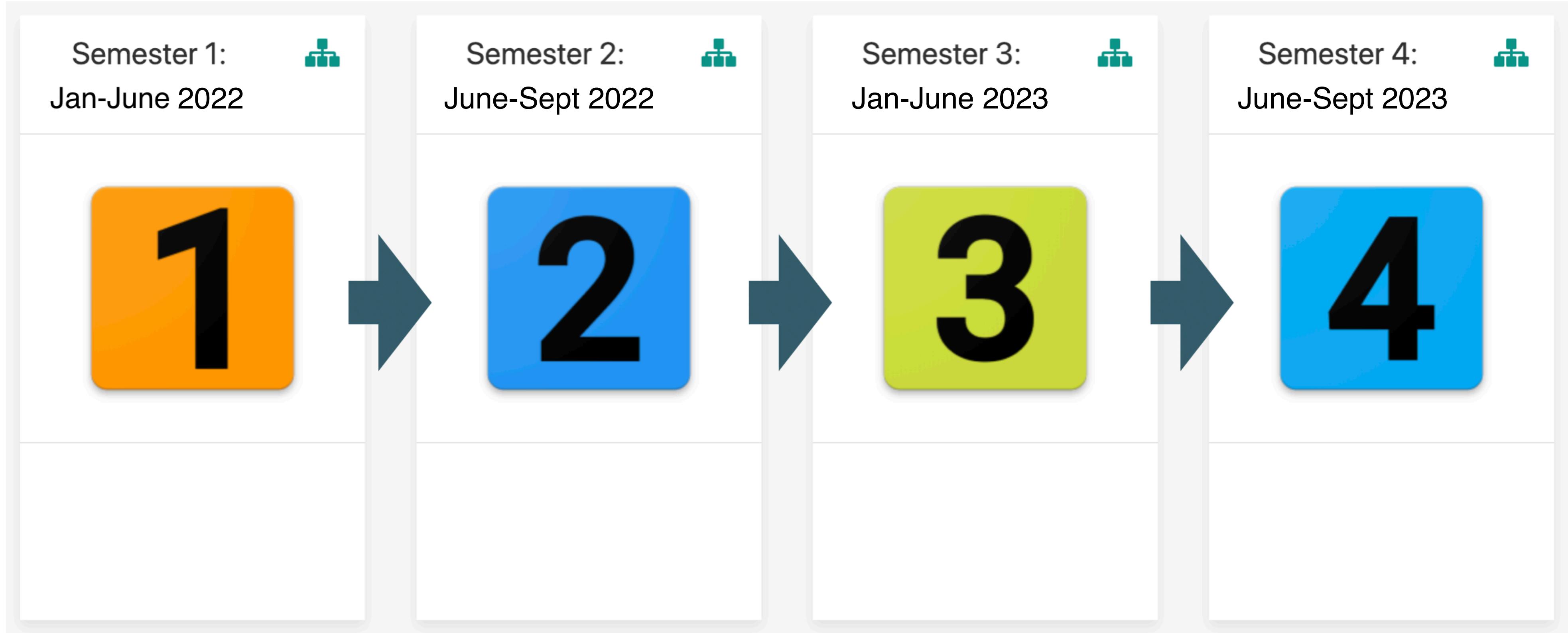


*“Internships or work placements are seen as crucial to providing graduates with the context and confidence in their new knowledge...”*

*“Outputs expected from the work placement would include a work placement report, a project ideally conducted in the work placement organisation...”*

*“...academic and industry partners will cooperate in the provision of appropriate academic supervision resources for the duration of this work placement activity...”*

# Semesters & Modules



1

2

3

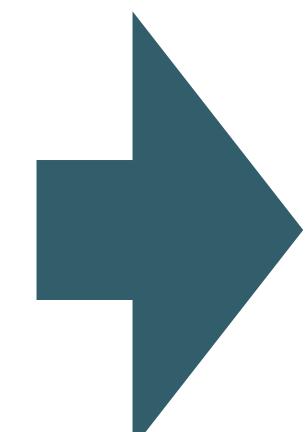
4

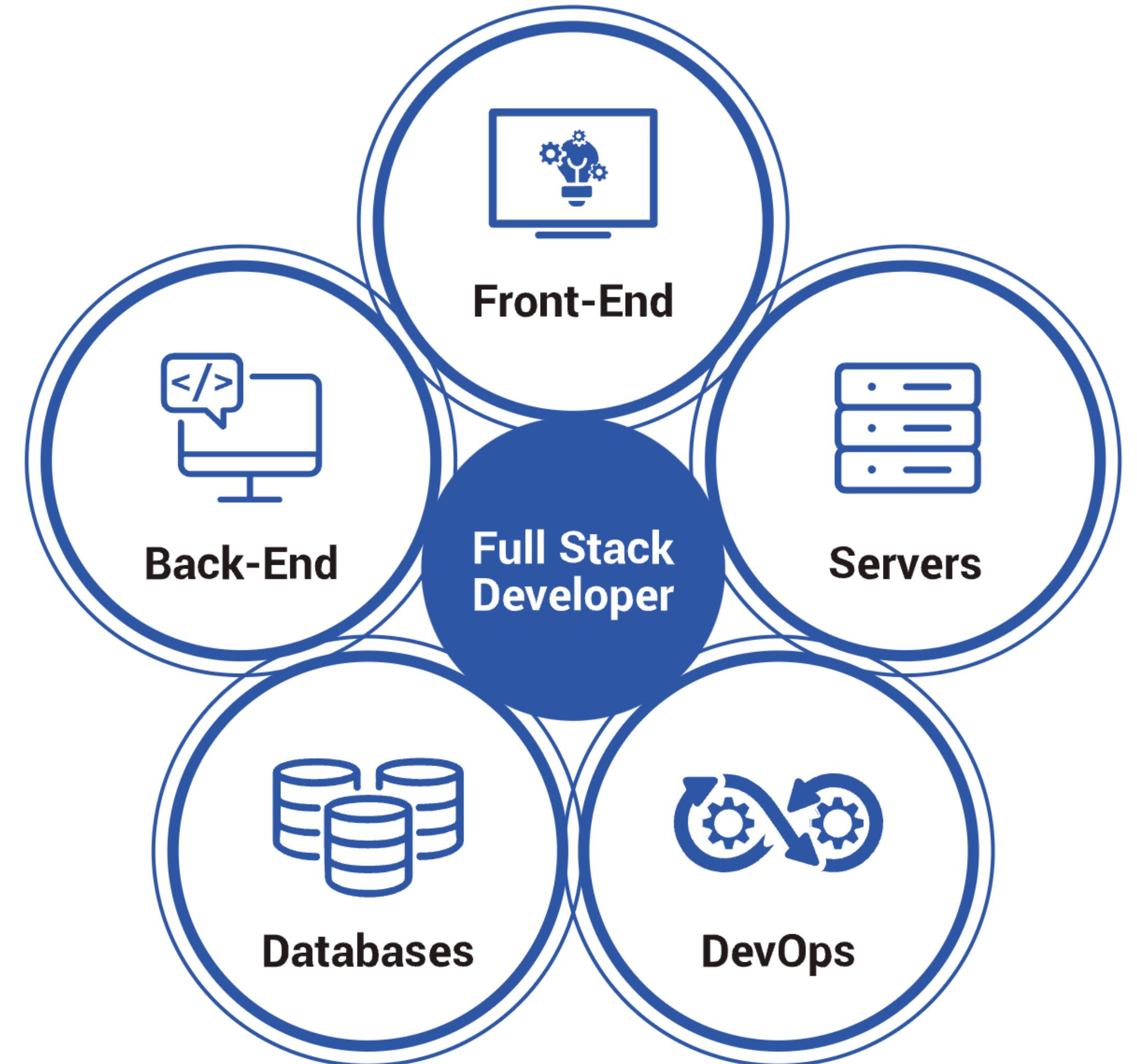
June 2023 - May 2024

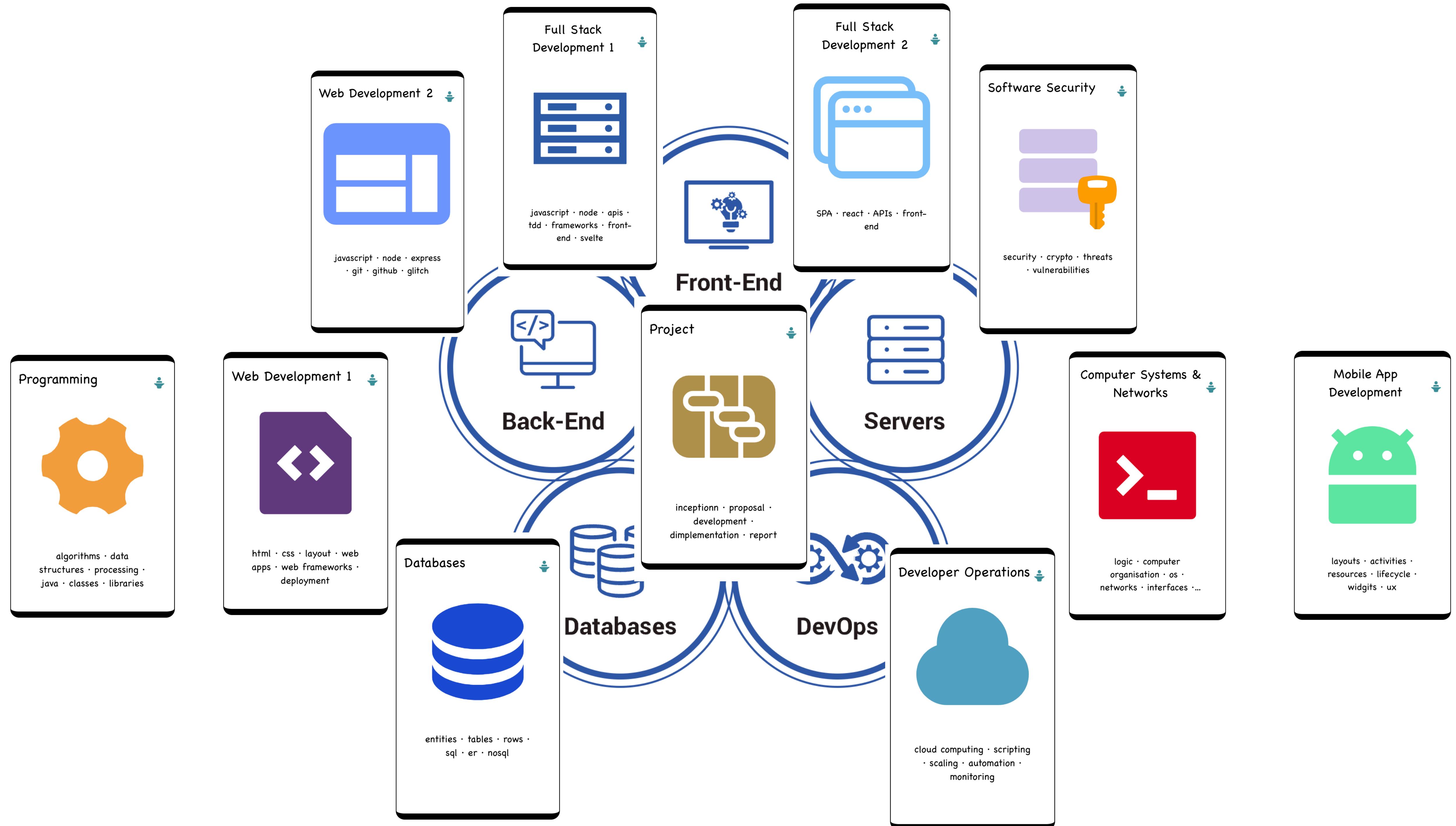


Project/Work Placement

(Work Placement 4-6 months)







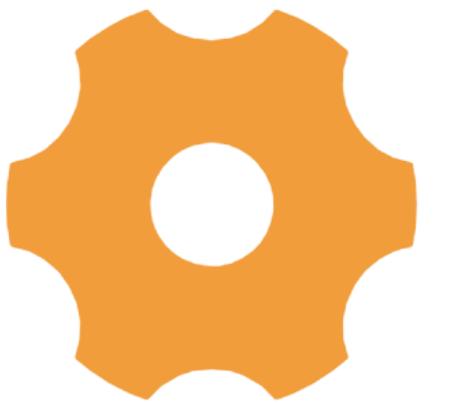
# 10 Modules

Web Development 1



html · css · layout · web apps · web frameworks · deployment

Programming



algorithms · data structures · processing · java · classes · libraries

Web Development 2



javascript · node · express · git · github · glitch

Computer Systems & Networks



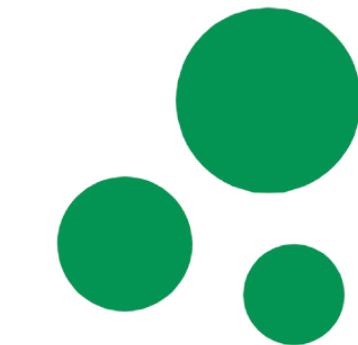
logic · computer organisation · os · networks · interfaces · ...

Databases



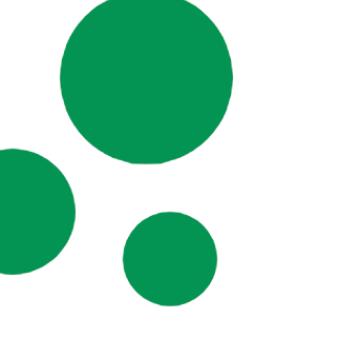
entities · tables · rows · sql · er · nosql

Workshop One



induction · structure · schedules · handbook

Workshop Two



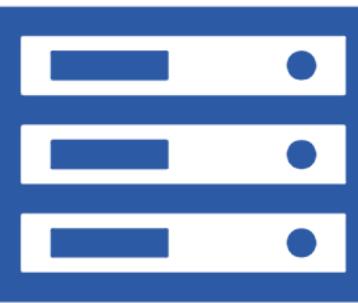
student perspectives · project & placement · introducing semester 2

Workshop Three



agile methods · cv preparation · introducing semester 3

Full Stack Development 1



javascript · node · apis · tdd · frameworks · front-end · svelte

Software Security



security · crypto · threats · vulnerabilities

Developer Operations



cloud computing · scripting · scaling · automation · monitoring

Full Stack Development 2



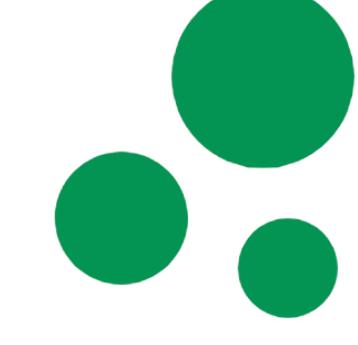
SPA · react · APIs · front-end

Mobile App Development



layouts · activities · resources · lifecycle · widgets · ux

Workshop Four



project structure · project showcase · introducing semester 4

Life Etc

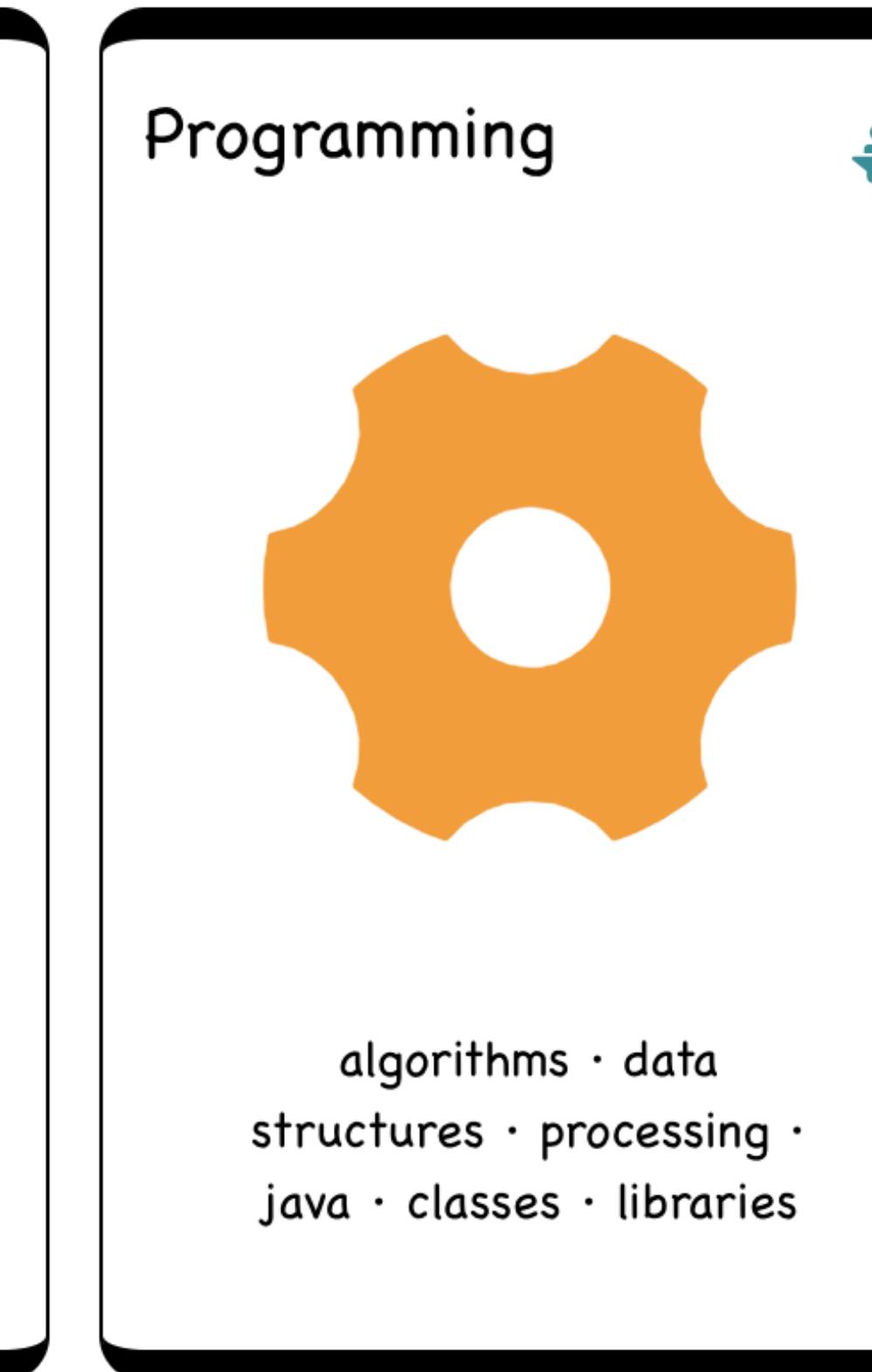
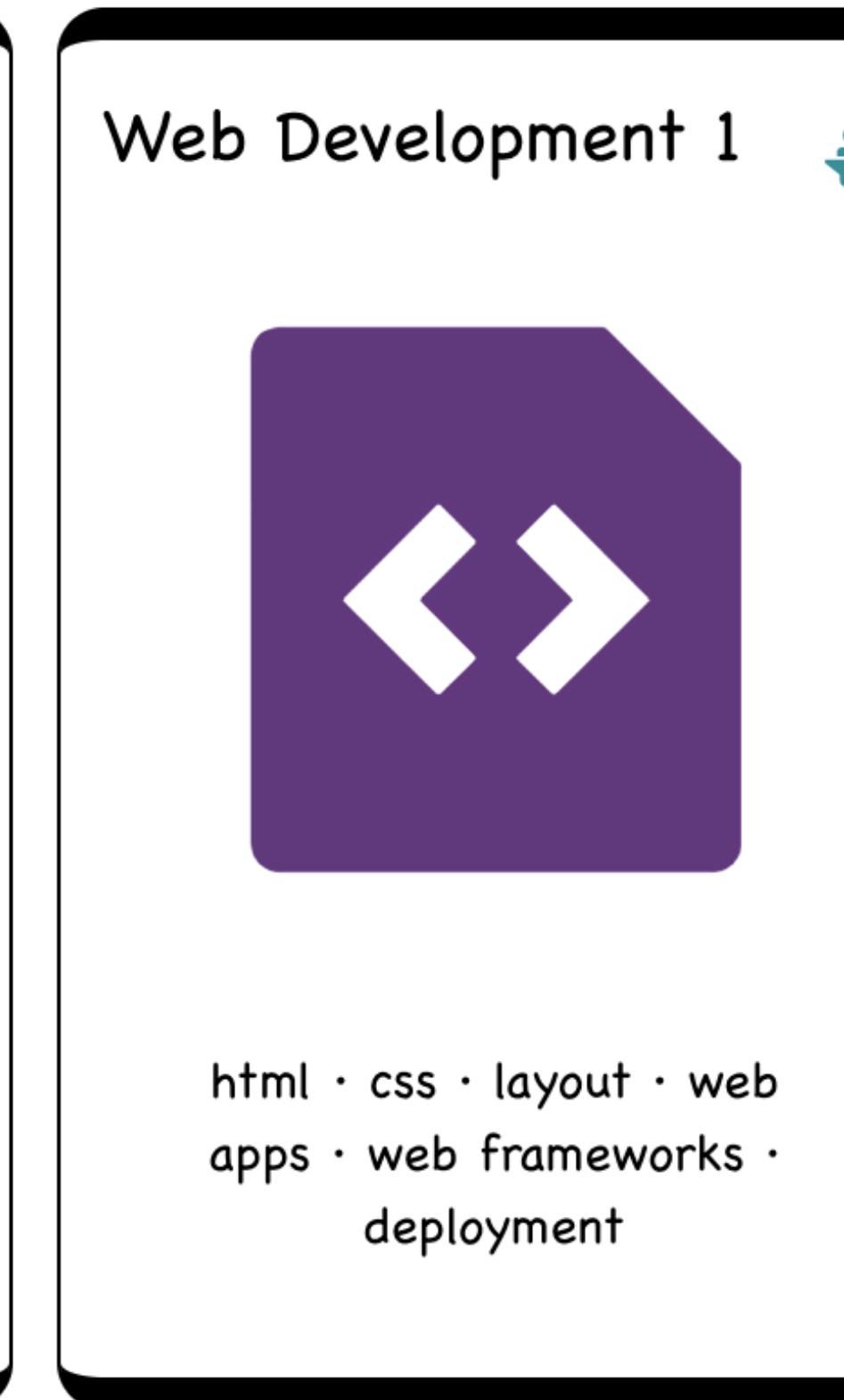
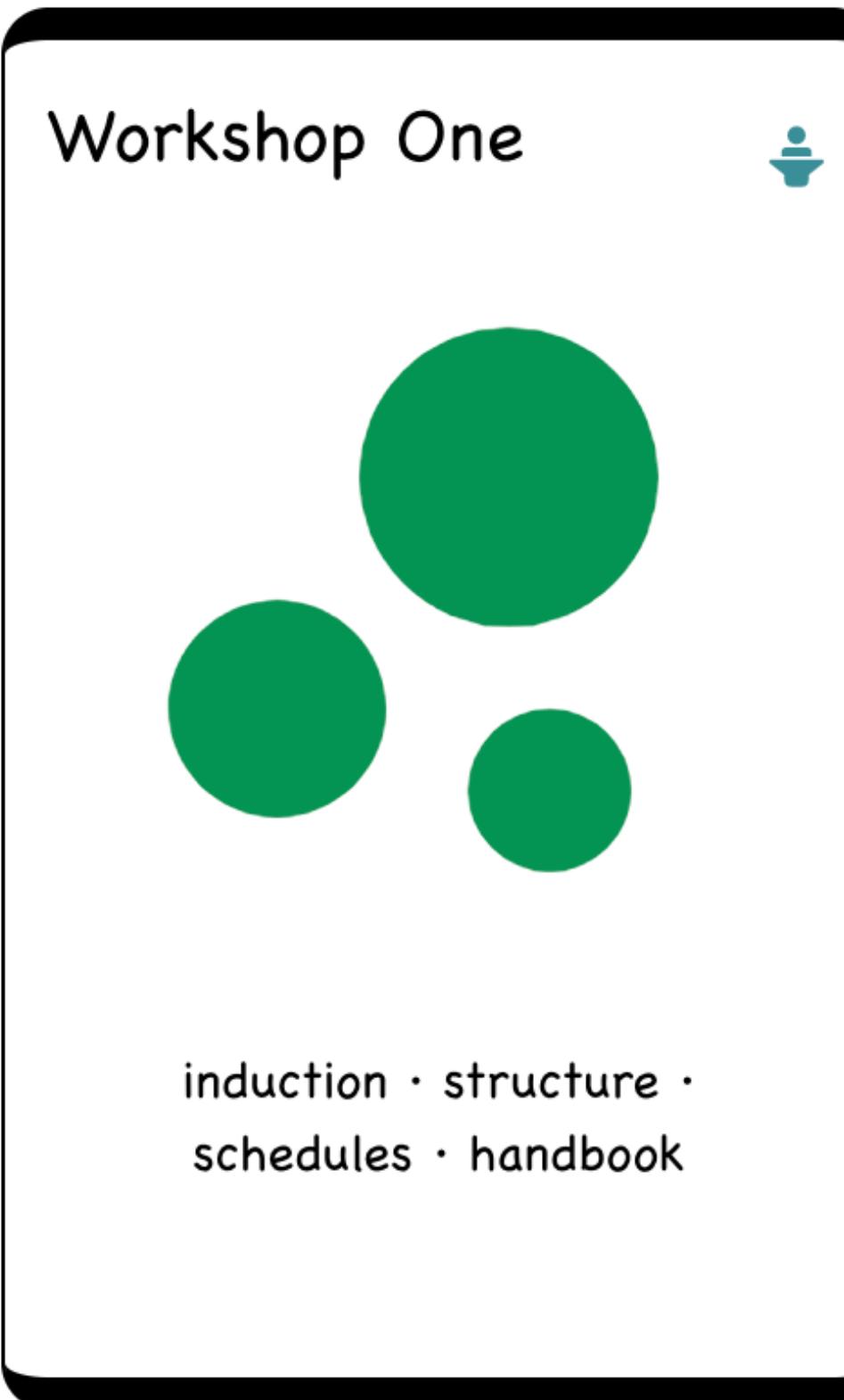


time · space · balance · experiences · tips · techniques

Web Development 1	Programming	Web Development 2	Computer Systems & Networks	Databases
5	10	2.5	10	5
Full Stack Development 1	Software Security	Developer Operations	Full Stack Development 2	Mobile App Development
7.5	2.5	5	2.5	10

Module Credits

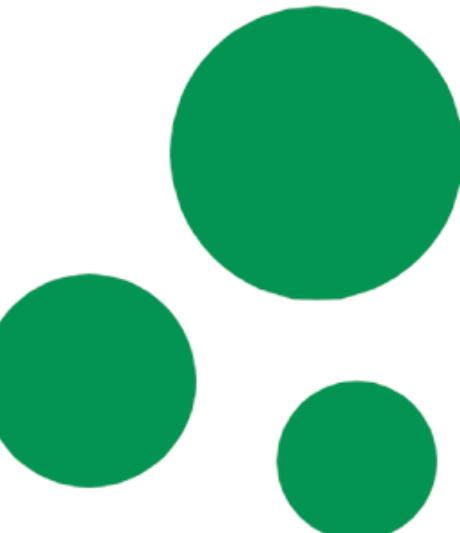
Semester 1: January - June 2022



*“..a broad immersive set of modules in the fundamentals of computing covering **software development, systems analysis & testing, databases, architecture, OS & networking, web design / user-experience..”***

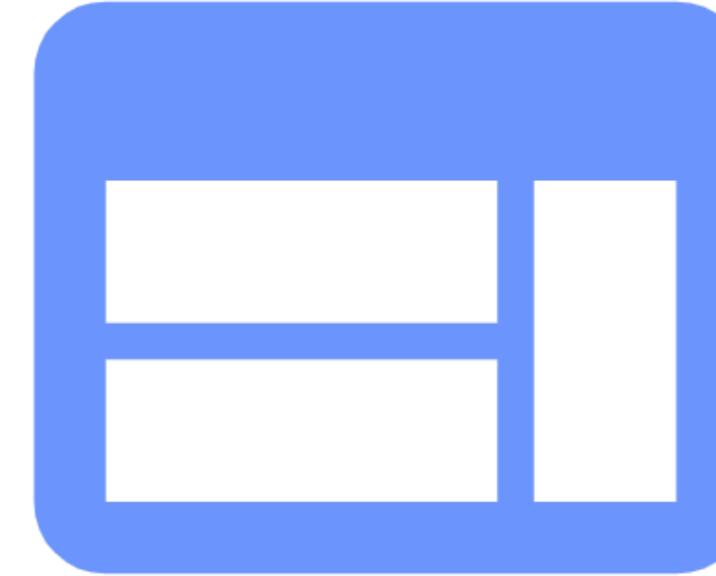
Semester 1: June - December 2021

Workshop Two



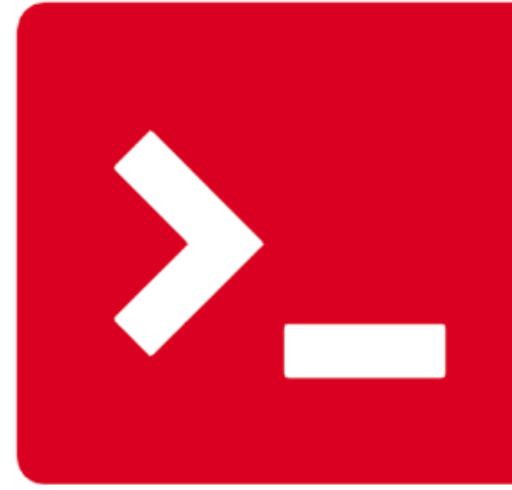
student perspectives ·  
project & placement ·  
introducing semester 2

Web Development 2



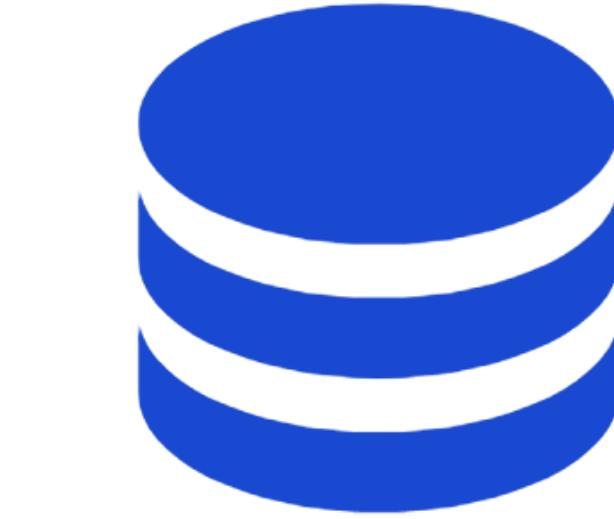
javascript · node · express  
· git · github · glitch

Computer Systems &  
Networks



logic · computer  
organisation · os ·  
networks · interfaces ...

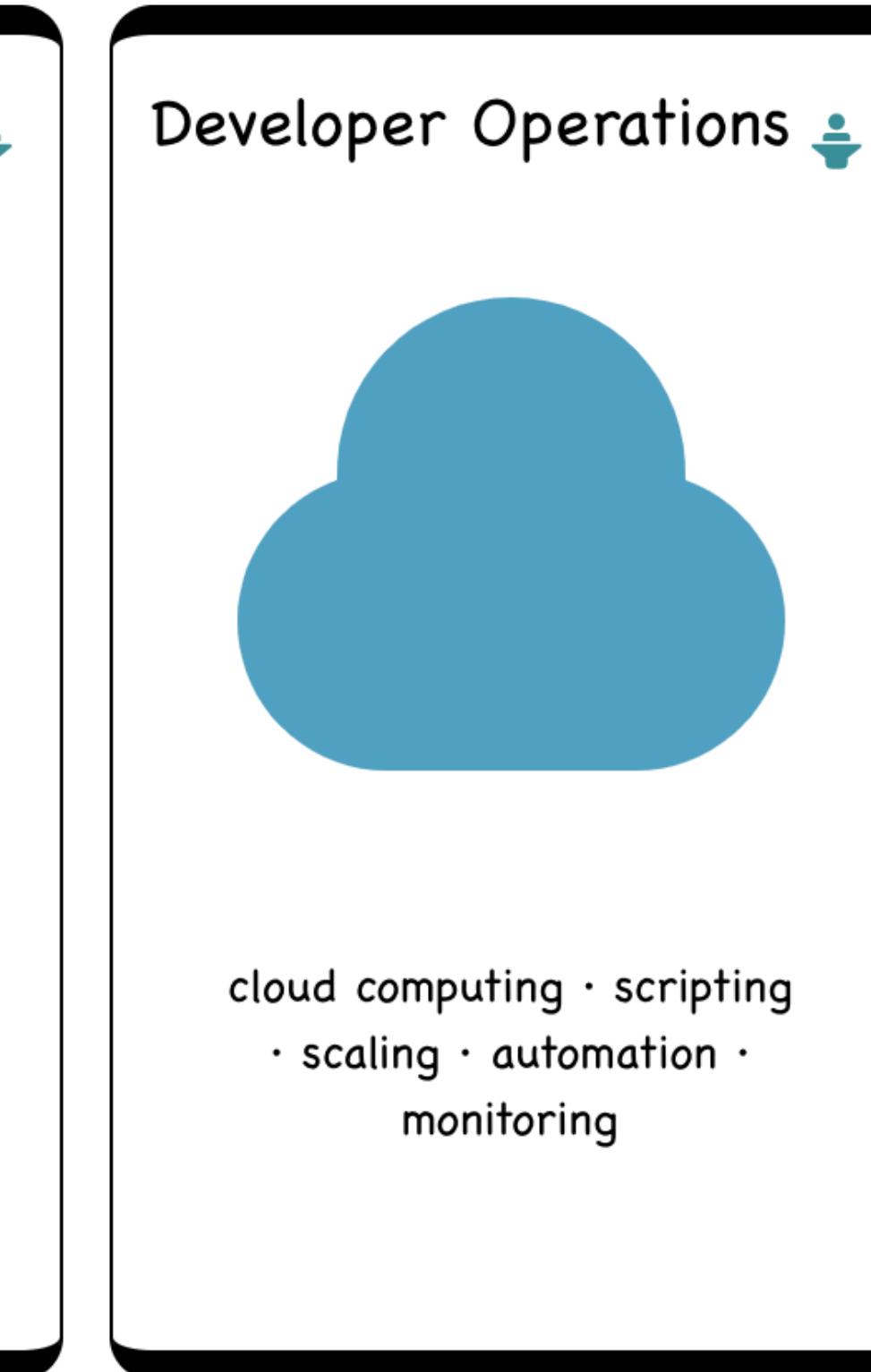
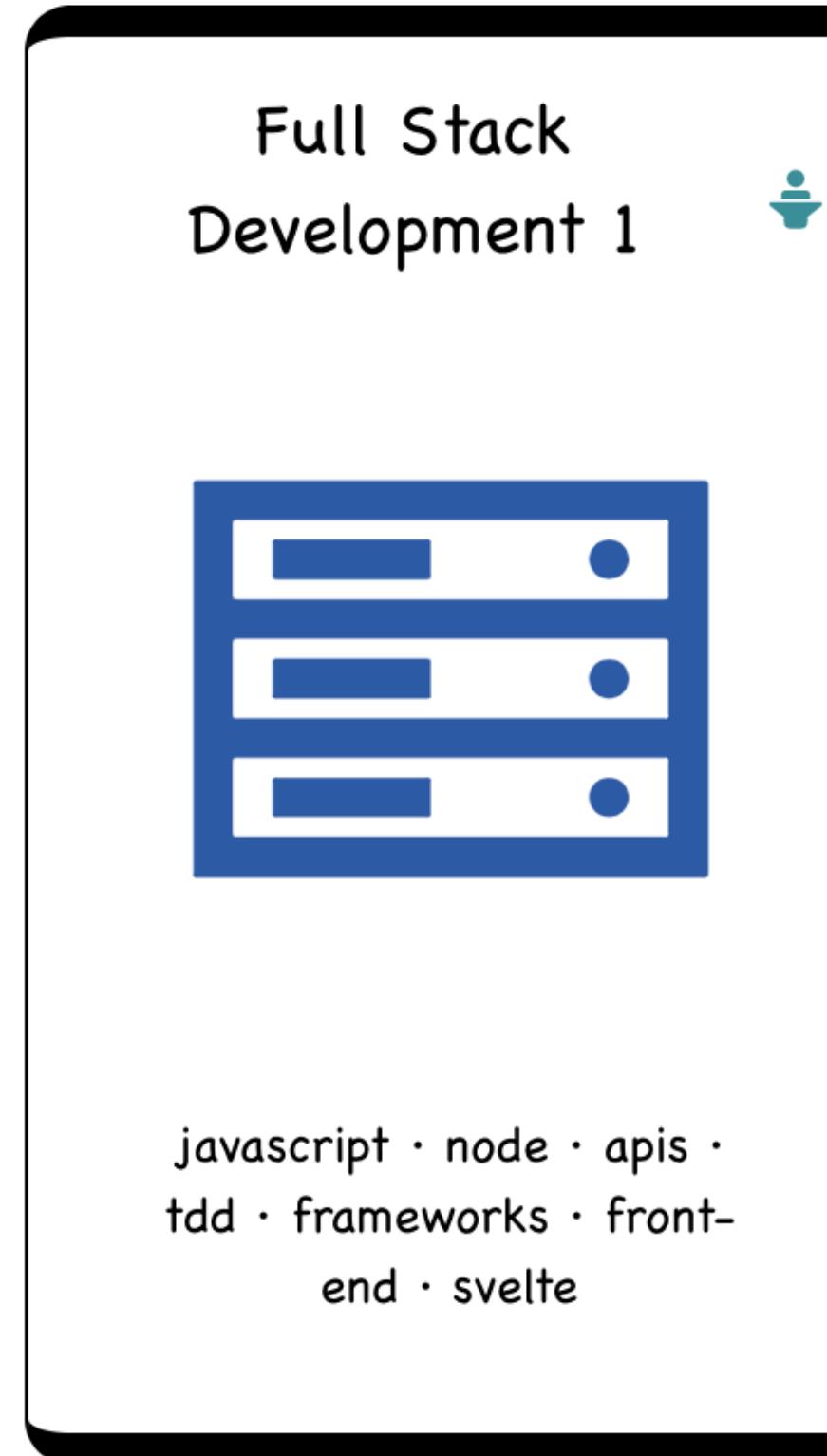
Databases



entities · tables · rows ·  
sql · er · nosql

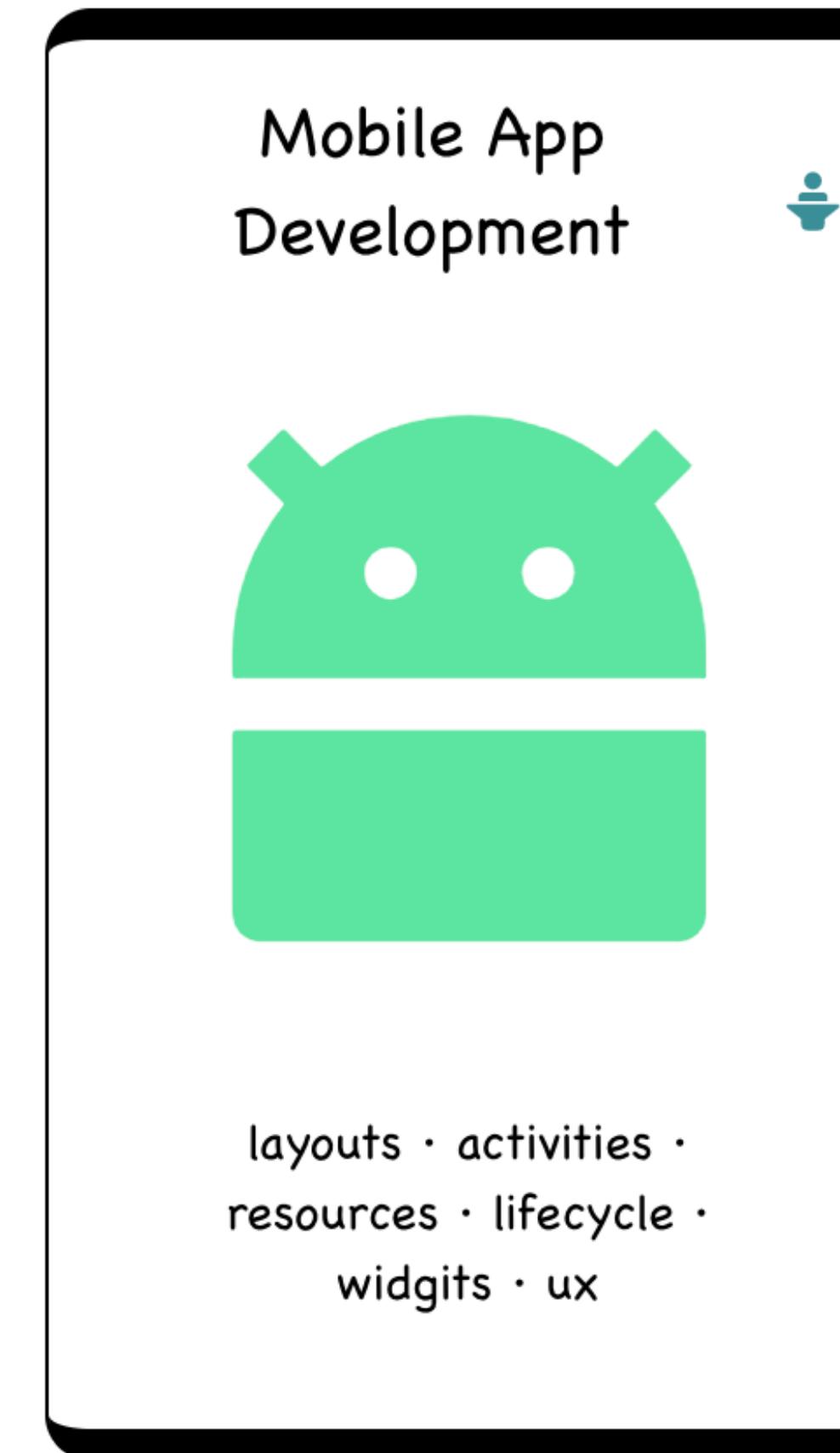
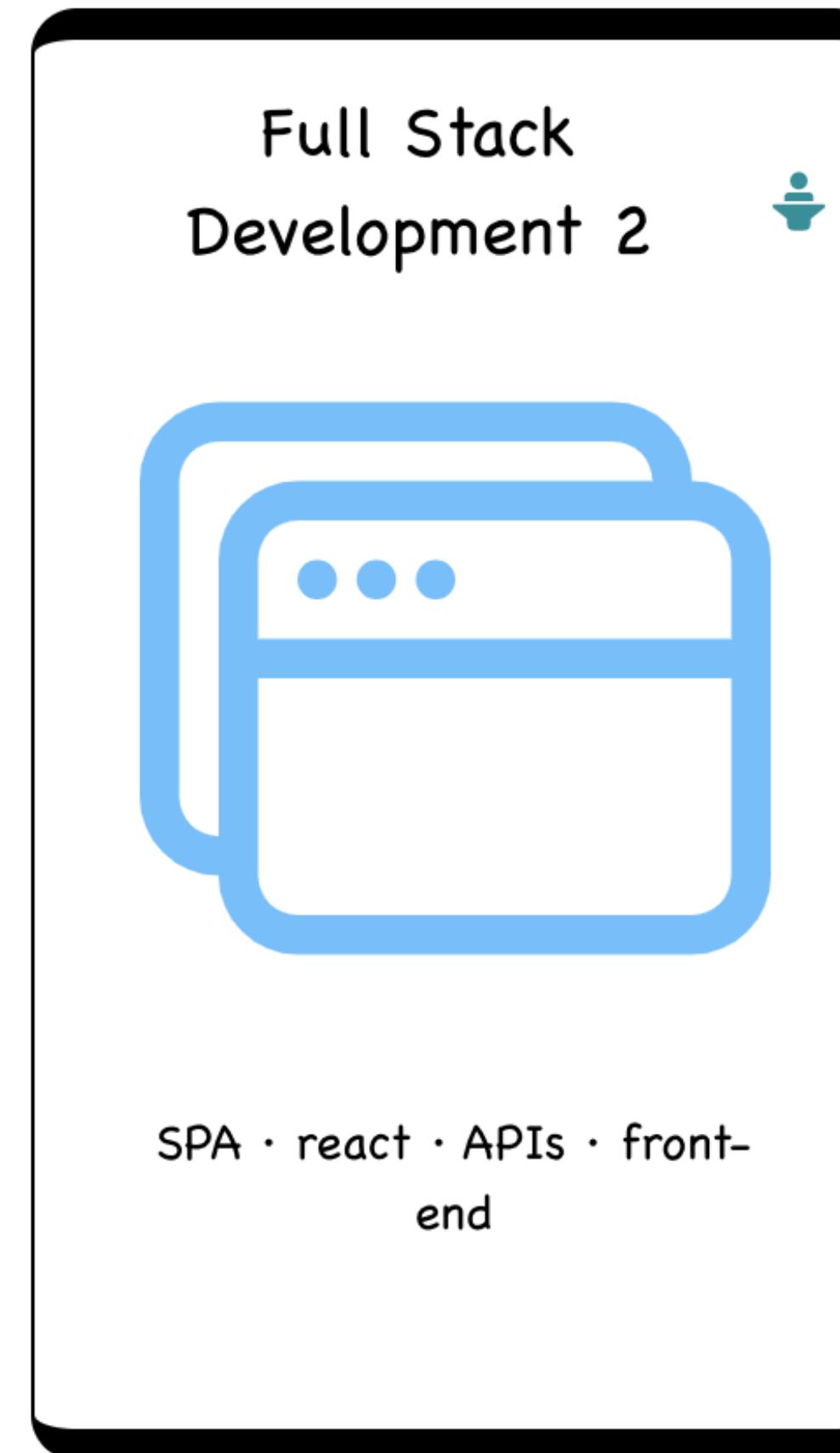
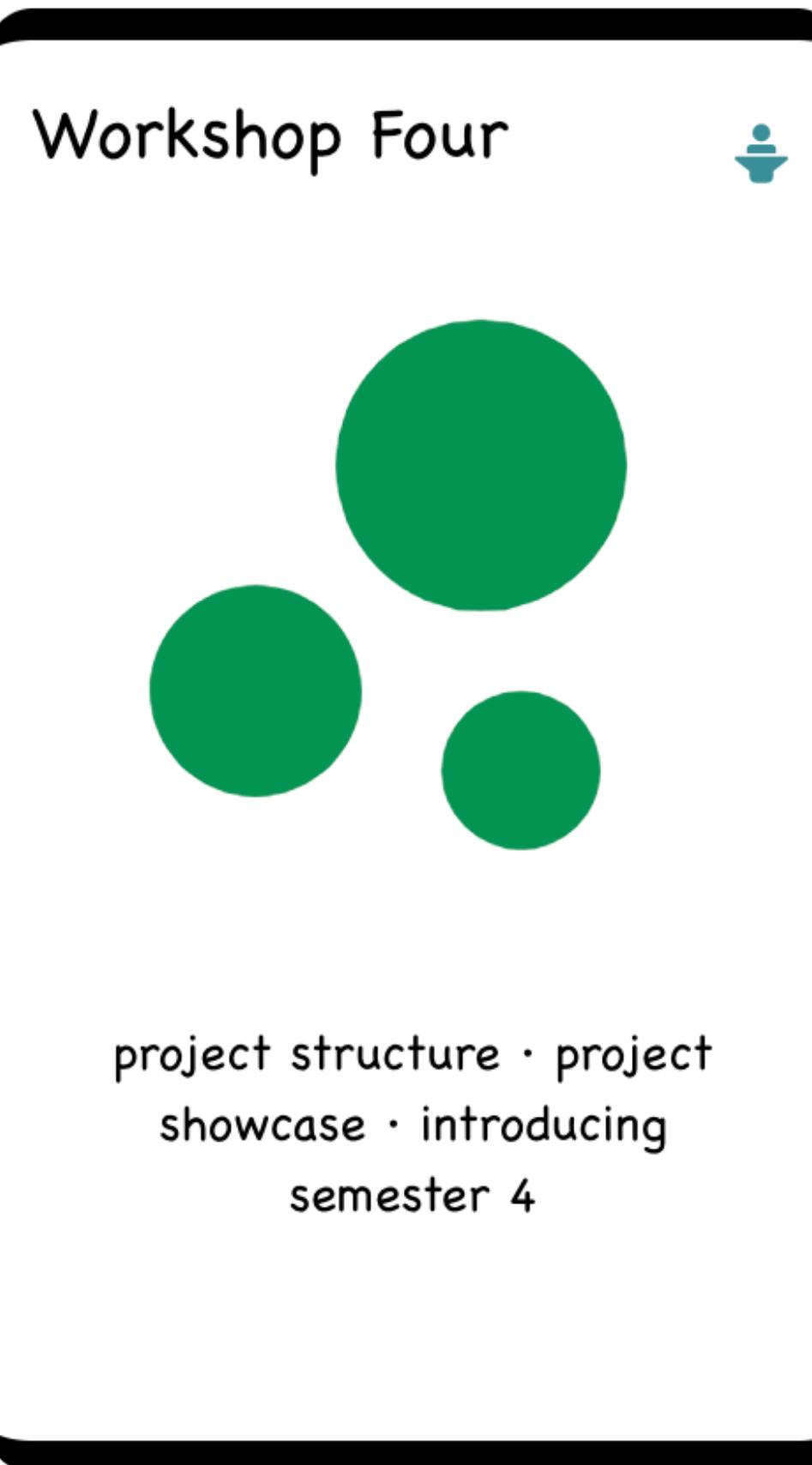
*“..a broad immersive set of modules in the **fundamentals of computing** covering software development, systems analysis & testing, **databases, architecture, OS & networking**, web design / user-experience..”*

Semester 3: January - June 2023



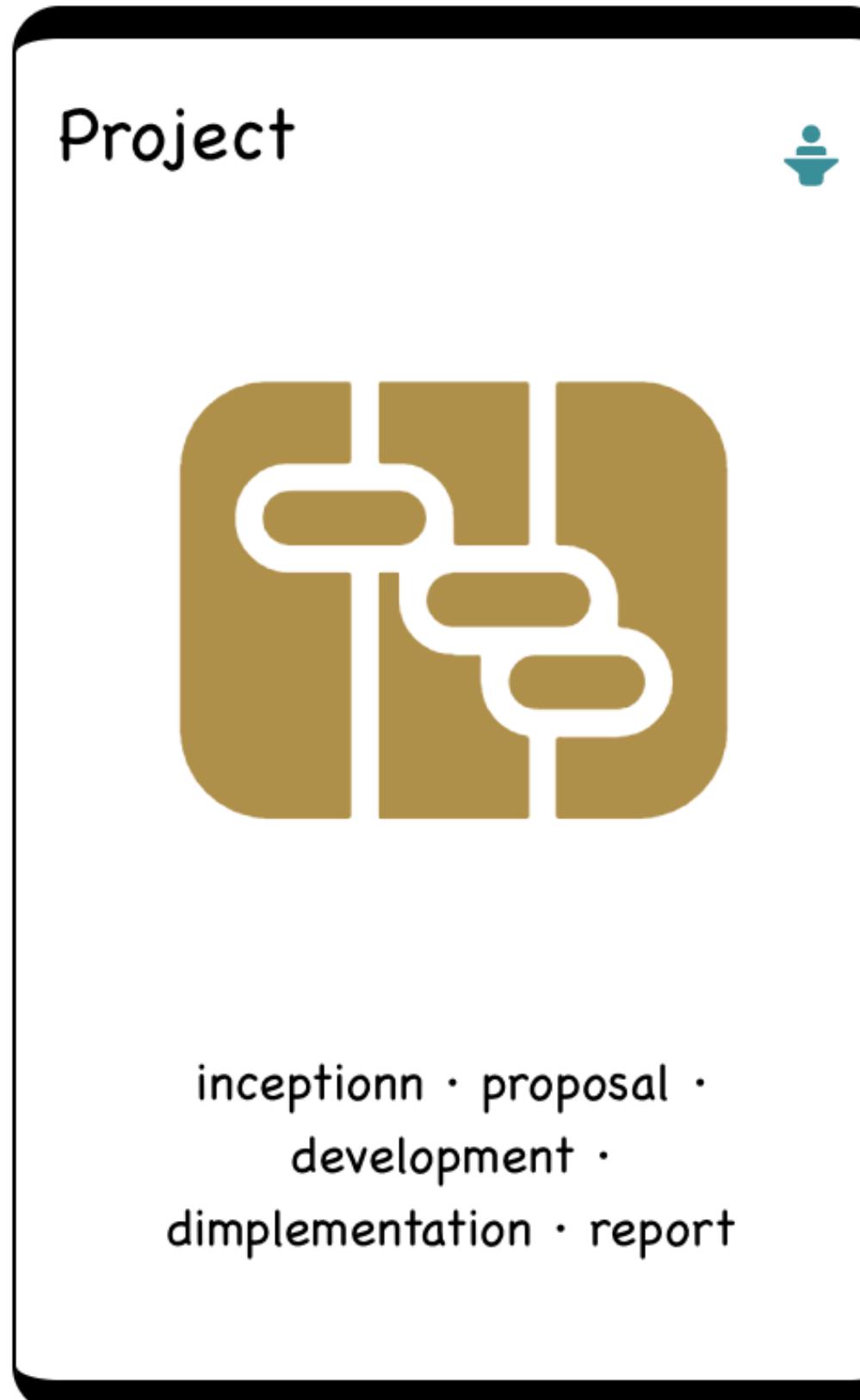
*“... students are expected to take a specialisation which reflects their own strengths as demonstrated on the programme to date...”*

Semester 4: June - December 2023



*“... students are expected to take a specialisation which reflects their own strengths as demonstrated on the programme to date...”*

Semester 4: September 2022 - May 2023

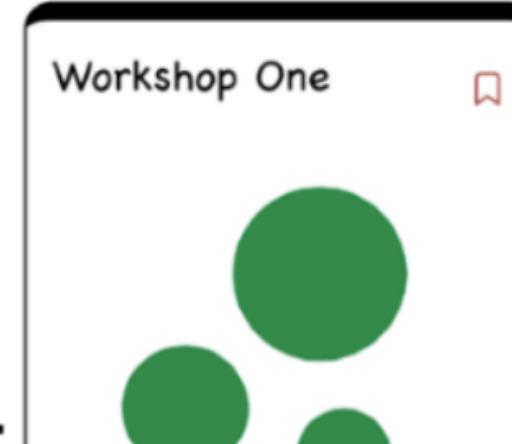


*“Internships or work placements are seen as crucial to providing graduates with the context and confidence in their new knowledge...”*

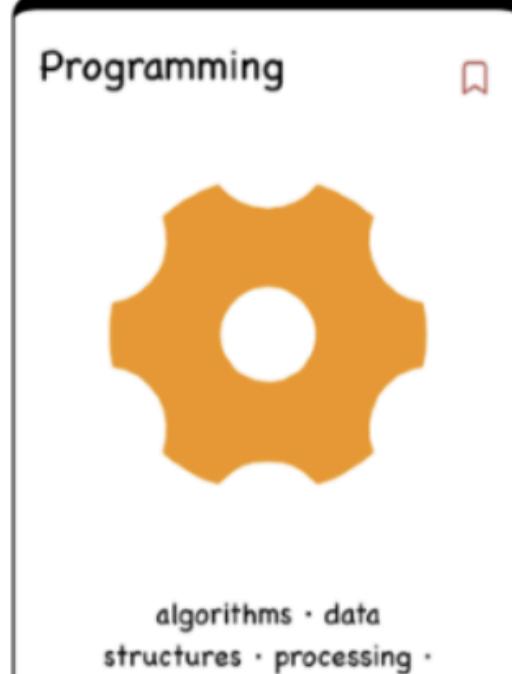
# Calendar, Timetable & Assessment Sequencing

# Calendar

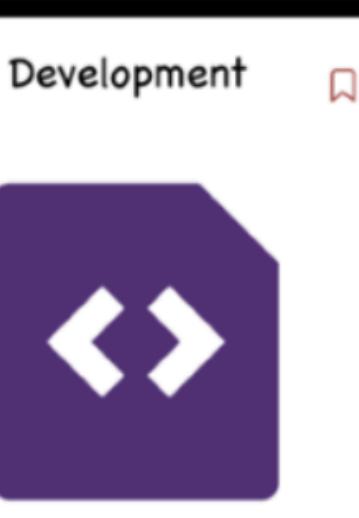
	S	M	T	W	T	F	S	Modules
Week	2	3	4	5	6	7	8	
January	<i>Induction</i>	9	10	11	12	13	14	15
	0	16	17	18	19	20	21	22
	1	23	24	25	26	27	28	programming & web dev
	2	30	31	1	2	3	4	5 programming & web dev
February	<i>reading-week</i>	6	7	8	9	10	11	12 programming & web dev
	5	20	21	22	23	24	25	26 programming & web dev
	6	27	28	1	2	3	4	5 programming & web dev
March	<i>reading-week</i>	6	7	8	9	10	11	12 programming & web dev
	13	14	15	16	17	18	19	
	7	20	21	22	23	24	25	26 programming & web dev
	8	27	28	28	30	31	1	2 programming & web dev
April	<i>Reading week</i>	3	4	5	6	7	8	9 programming & web dev
	10	11	12	13	14	15	16	
	<i>Reading week (Easter)</i>	17	18	19	20	21	22	23
	10	24	25	26	27	28	29	30 programming & web dev
May	11	1	2	3	4	5	6	7 programming & web dev
	12	8	9	10	11	12	13	14 programming & web dev
	<i>reading-week</i>	15	16	17	18	19	20	21
	<i>reading-week</i>	22	23	24	25	26	27	28
	13	29	30	31	1	2	3	4
June	14	5	6	7	8	9	10	11 ICT Skills One
	14	12	13	14	15	16	17	18 ICT Skills One
	16	19	20	21	22	23	24	25 ICT Skills One
	17	26	27	28	29	30	1	2 ICT Skills One
July	18	3	4	5	6	7	8	9 ICT Skills One



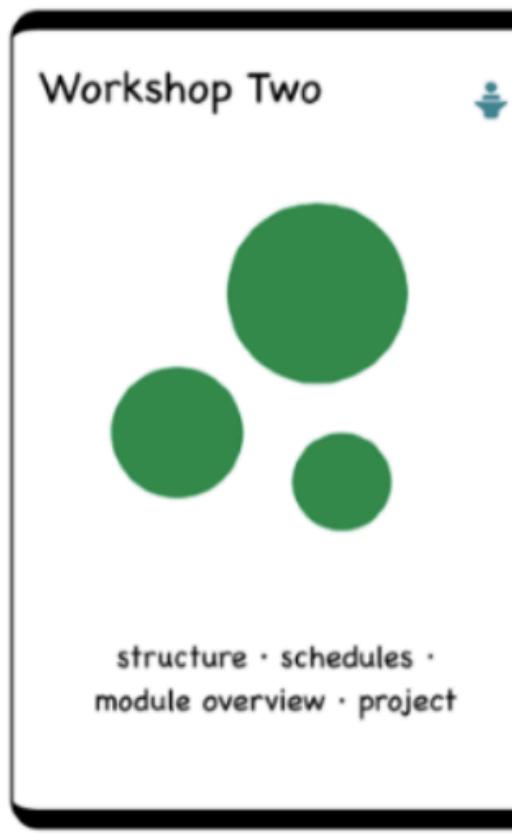
induction · structure · schedules · handbook



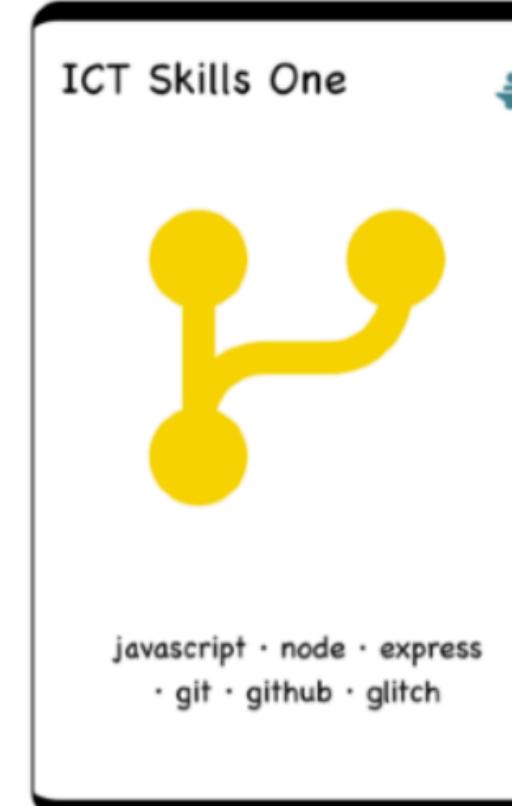
algorithms · data structures · processing · java · classes · libraries



html · css · layout · web apps · web frameworks · deployment



structure · schedules · module overview · project



javascript · node · express · git · github · glitch

# Weekly Webinar Schedule

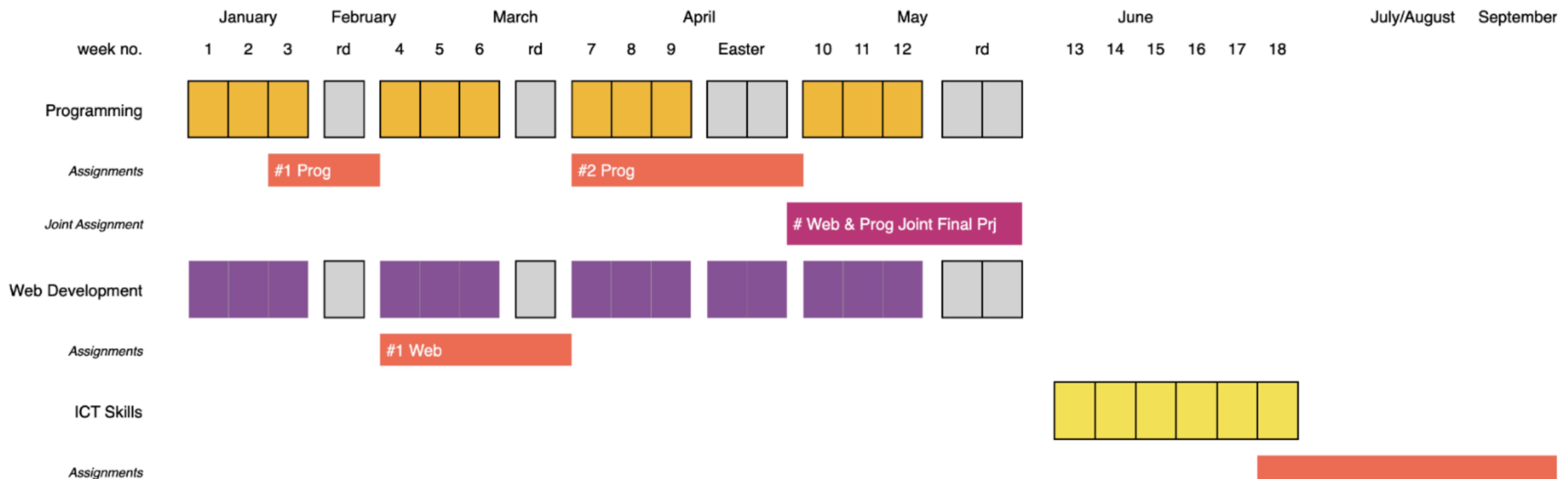
## Timetable

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
10:45				10:45
12:15	Programming <i>Webinar</i> 12:15-2:00	Programming <i>Webinar</i> 12:15-2:00	Web Development <i>Webinar</i> 12:15-2:00	12:15
2:00				13:45
15:15				15:15



# Semester 1 Assessment Schedule

## Assignments



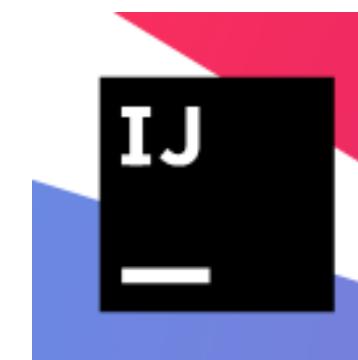
# Module Summaries

# Programming



algorithms • data  
structures • processing •  
java • classes • libraries

- Apply core problem solving approaches suitable to the programming discipline to build algorithms.
- Construct small applications using standard sequence, conditional and iterative control structures. Change and expand small applications.
- Construct small applications that use simple UI, computation and data structures.
- Apply techniques to effectively test, debug and document small applications.
- Defend and explain how the above applications work.
- Apply problem-solving strategies to various computing problems of increasing complexity.
- Plan, code, test and document applications using advanced programming constructs and data structures

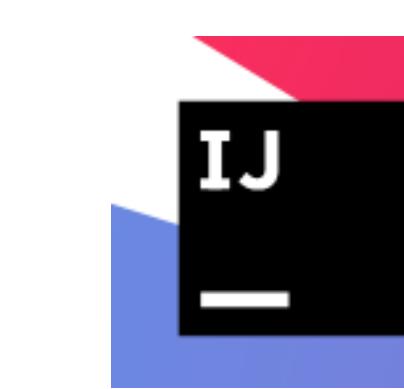


# Web Development 1

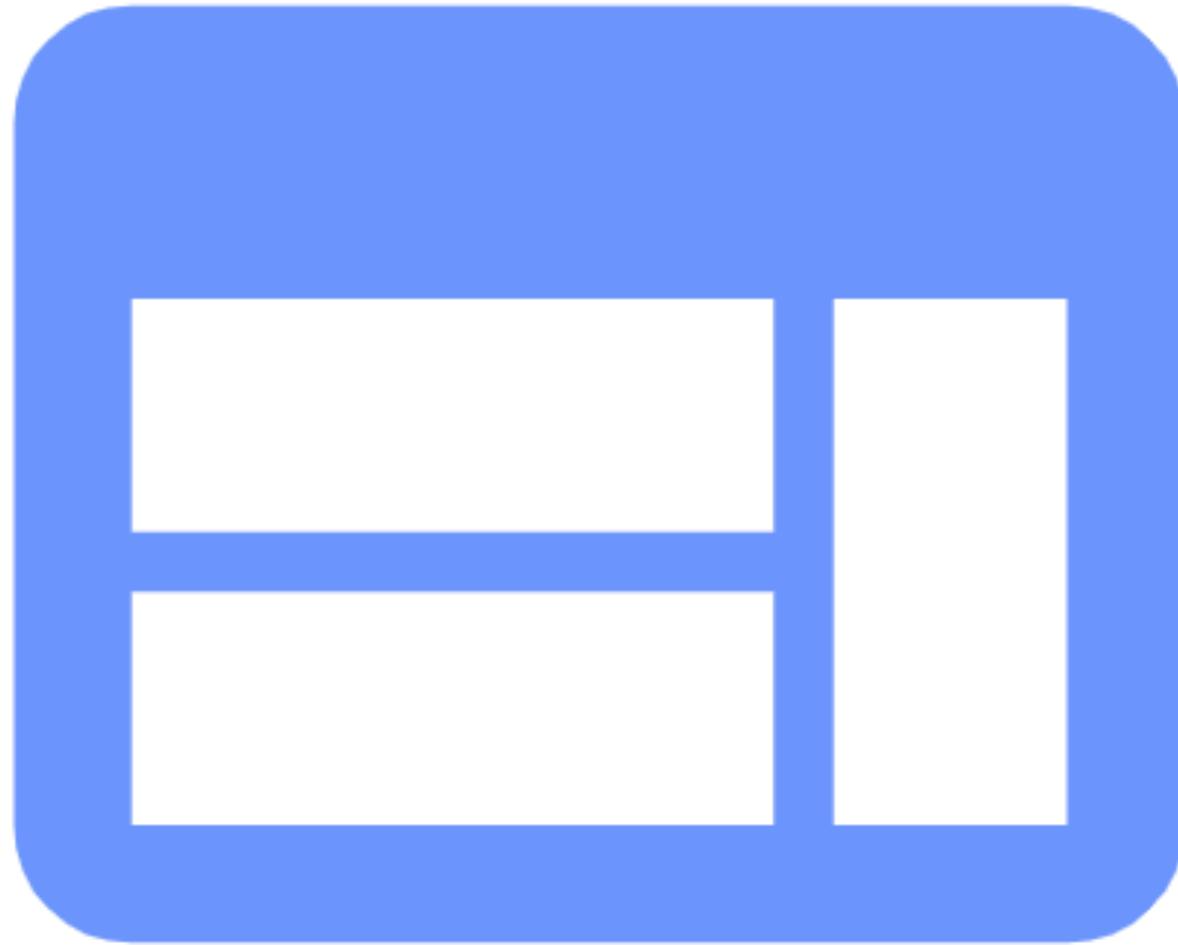


html · css · layout · web  
apps · web frameworks ·  
deployment

- Understand the fundamentals of the HTML markup language.
- Understand the role of Human Computer Interaction and manipulate CSS to present HTML content.
- Be able to integrate HTML, CSS and Java script to structure simple web sites.
- Understand how a dynamic web page is generated and be familiar with the role of html templating techniques
- Understand the difference between a web site and a web app. Be able to design and implement a simple web app.
- Implement a simple Model View Controller application pattern for a web app.

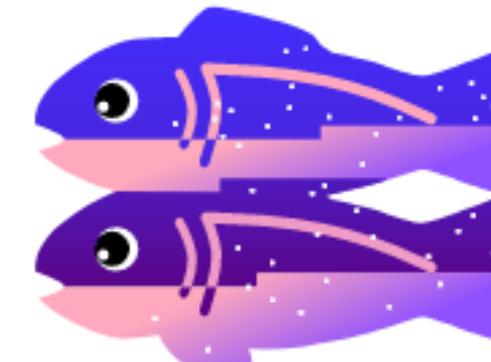


# Web Development 2



javascript · node · express  
· git · github · glitch

- Continue the journey into web application development
- Establish a competence in Javascript programming language
- Explore the basics of the Node.js framework
- Use a simple JSON persistent storage database
- Design, build and deploy a complete web application using these tools
- Understand the role of Agile methods in this context

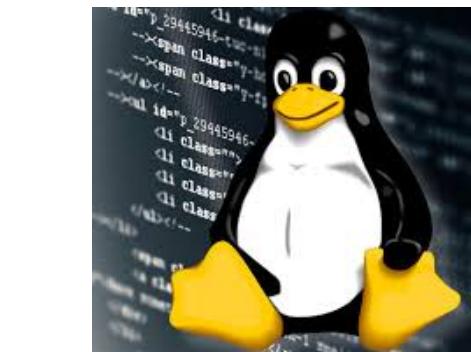
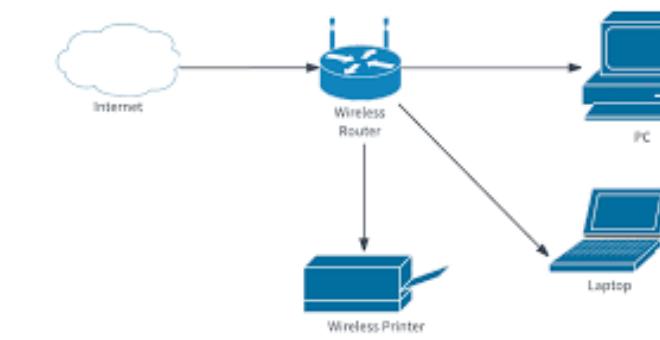


# Computer Systems & Networks



logic • computer  
organisation • os •  
networks • interfaces •...

- Identify and explain the role various hardware components play in a computer system.
  - Use an operating system on a chosen computer architecture.
  - Demonstrate an ability to configure systems using the command line.
  - Describe the memory management, process management and file management components of a modern operating system.
  - Explain basic concepts and theory of networked operating systems and virtualisation.
  - Configure a contemporary operating system (within a virtual machine environment)
  - Demonstrate competency in a limited set of utilities provided by a contemporary operating system.



```

1 #!/bin/bash
2
3 #!/bin/bash -x
4 cd /Volumes/Phi/Drive_05/TestDec7/arc_postprocess/
5
6
7 - paths.txt
8
9
10
11 echo "Debug level set for $DEBUG_LEVEL"
12 echo "Log read in xscripts directory"
13
14
15 cp $HIGHSNP_OUT ./;
16 cp $LONNSNP_OUT ./;
17 cp $SEIRNSNP_OUT ./;
18 # echo "$!<${SCRIPT_DIR}/run_somatic_mutation_analysis $(if [ ! -e $false_src ]"
19 if [ $DEBUG_LEVEL -gt 0 ]
20 then
21     echo "INFO: ${!<${SCRIPT_DIR}/run_somatic_mutation_analysis.sh $SAMPLE no_falso_src"
22     'assumes' $!<${SCRIPT_DIR}/'assumes' $(cp $HIGHSNP_OUT ./; cp $LONNSNP_OUT ./; cp $SEIRNSNP_OUT ./)
23     $!<${BAM_FILE} $!<${BAM_FILE}">>$(LOG)
24
25     fi
26 $!<${SCRIPT_DIR}/run_somatic_mutation_analysis.sh
27
28 echo "End of somatic mutation analysis">>> $LOG

```

# Databases



entities · tables · rows ·  
sql · er · nosql

# MySQL™

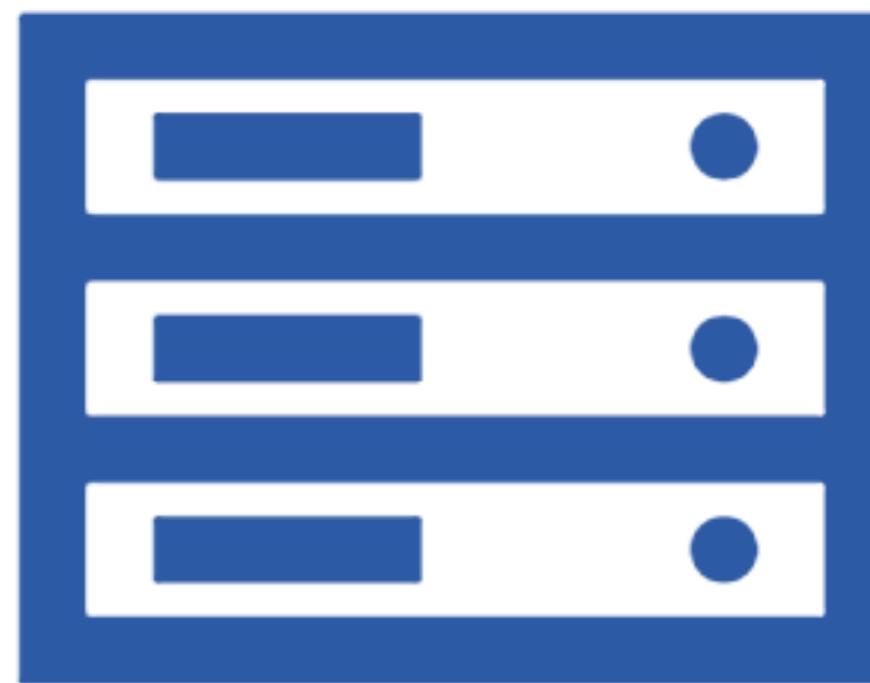
- Discuss the role of a database and its management system.
- Draw Entity Relationship (ER) diagram from an application problem and reproduce this diagram into a set of normalised relations, which are ready for database implementation.
- Design a NoSQL database suitable for a distributed environment with consideration of the CAP theorem.
- Gain an understanding of the physical database design process, its objectives and deliverables.
- Design and implement a database system



ORACLE®

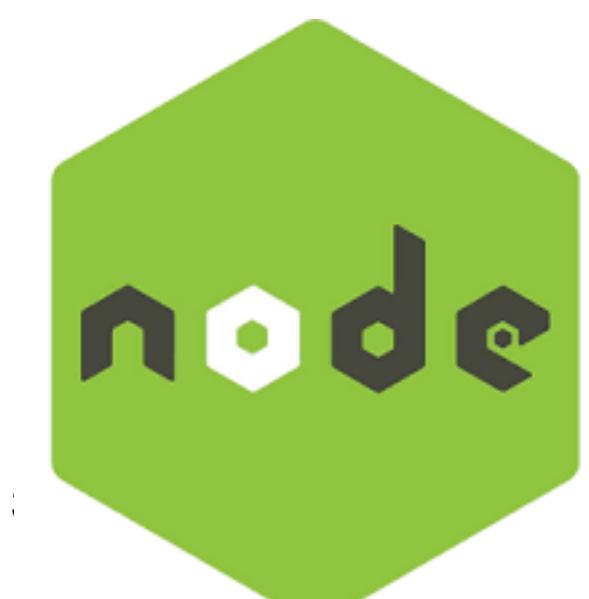
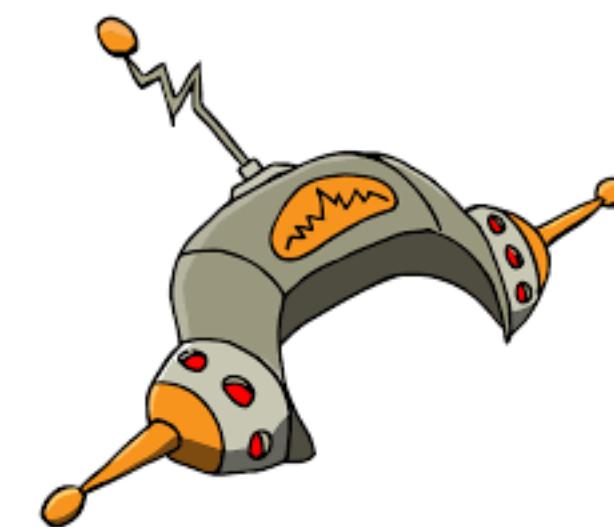
 mongoDB®

# Full Stack Development 1



javascript · node · apis ·  
tdd · frameworks · front-  
end · svelte

- Examine the key components of a server rendered web application and incorporate them into a running application.
- Use Model View Controller & related patterns in the implementation of a web project.
- Relate the request/response lifecycle, routing & session management in the context of a modern application framework.
- Model the user requirements and realize the model in a simple database.
- Apply best practice principles and patterns to the design and documentation of a web API.
- Apply best practice principles and patterns to the design of a medium-sized Single Page Web App.
- Develop an end-to-end web app that supports session management and persistence for a constrained functional requirement set.



# Software Security



security · crypto · threats  
· vulnerabilities



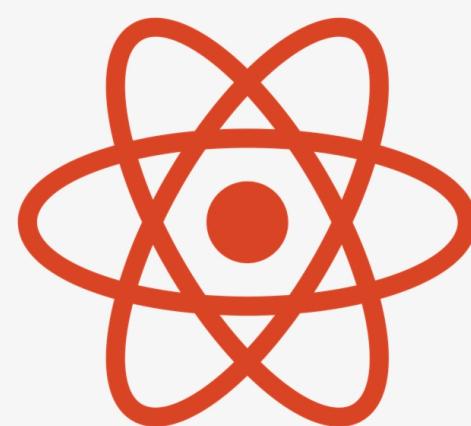
- Demonstrate specific security problems that can arise with web applications and how to address them.
- Compare and contrast alternative approaches to authentication in both enterprise and consumer-oriented web applications.
- Use a selection of best security practices in a web application.

# Full Stack Development 2



SPA · react · APIs · front-  
end

- Introduce React + Storybook
- Explore the React component model
- Understand component navigation, lifecycle & routing
- Review the react methodology
- Select appropriate state management strategies & components

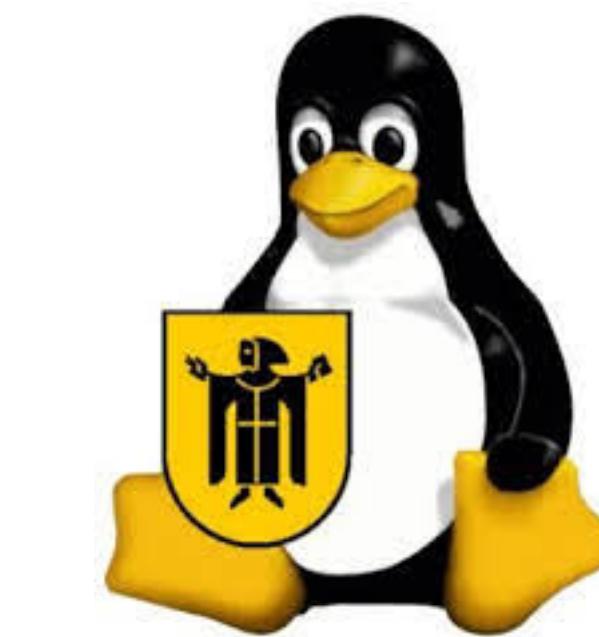


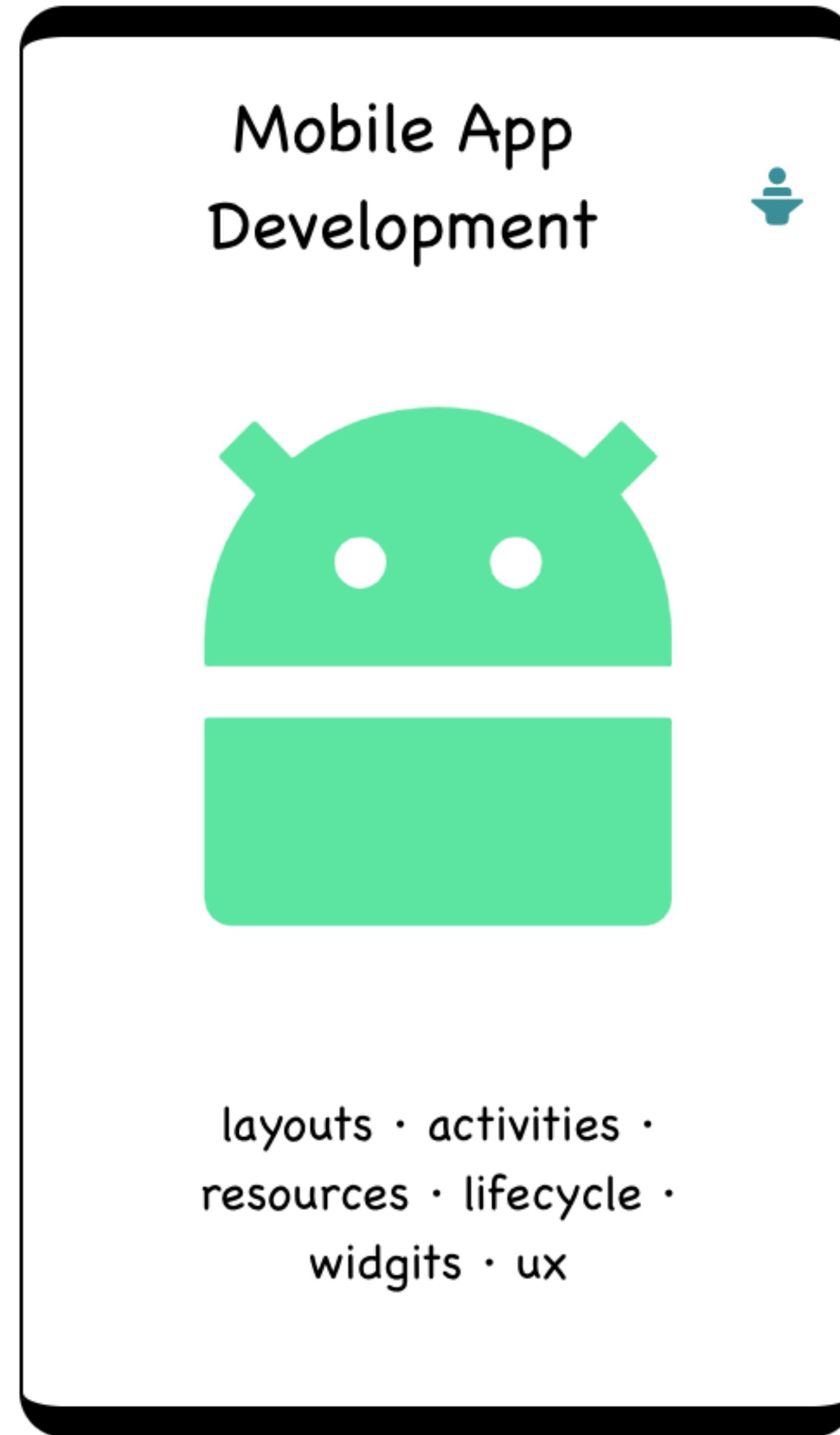
## Developer Operations



cloud computing · scripting  
· scaling · automation ·  
monitoring

- Build, configure and manage essential network infrastructure services.
- Build, configure and manage essential application services.
- Deploy a network monitoring solution.
- Develop scripts to assist in the management and automation of modern network services.
- Configure appropriate security mechanisms, including firewall rules, encrypted services, and authentication.





- Decompose an application into its constituent parts, including but not limited to: core application components, user experience resources, packaging.
- Design a coherent User Experience - using appropriate tools, practices and guidelines - for a moderately sized application. Produce a medium sized application, based on a limited set of design patterns.
- Manage the application lifecycle. Structure persistent storage on a device and reliably save and restore application state.
- Select the appropriate design patterns and tools in the development of complex mobile apps.
- Comment on the chosen mobile app framework and the underlying hardware components.
- Design and develop complex multi-screen mobile apps from concept through to completion using best practices and guidelines.
- Set up the interaction of an application with internal sensors and physical subsystems.
- Integrate a remote service API within an application, perhaps based on REST principles, to deliver aspects of its core features set.



# Opportunities for Further Study

- The development team are closely involved in the delivery of two potential follow-on graduate programmes:
  - MSc in Enterprise Software Systems
- These are mature courses, closely aligned with research at TSSG, with substantial enrolments in part-time mode from industry practitioners in the region.
- Successful candidates could continue their academic development in part-time or full-time capacity.



