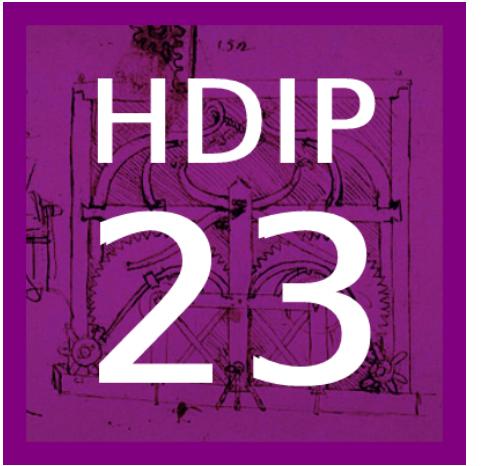


Higher Diploma in Science in Computer Science

2024-2026





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Programming

Agenda

1. Context & Objectives

2. Programme Structure

3. Semesters & Modules

4. Calendar, Timetable & Assessment Sequencing

5. Module Summaries

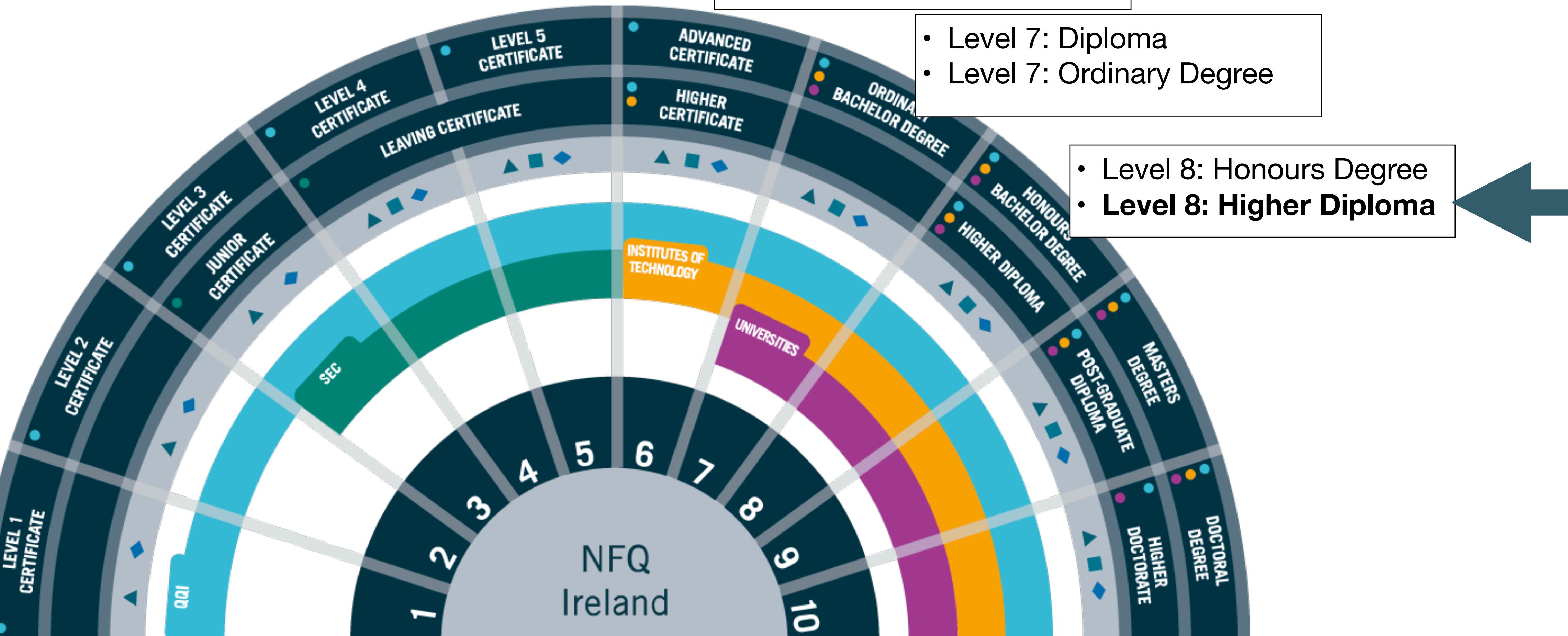
1. Context & Objectives

National Framework of Qualifications / Levels

- Level 6: Certificate
- Level 6: Higher Certificate

- Level 7: Diploma
- Level 7: Ordinary Degree

- Level 8: Honours Degree
- **Level 8: Higher Diploma**



<https://nfq.qqi.ie/>

5

ADVANCED CERTIFICATE	ORDINARY BACHELOR DEGREE	HONOURS BACHELOR DEGREE	MASTERS DEGREE	DOCTORAL DEGREE
HIGHER CERTIFICATE		HIGHER DIPLOMA	POST-GRADUATE DIPLOMA	HIGHER DOCTORATE

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...”*

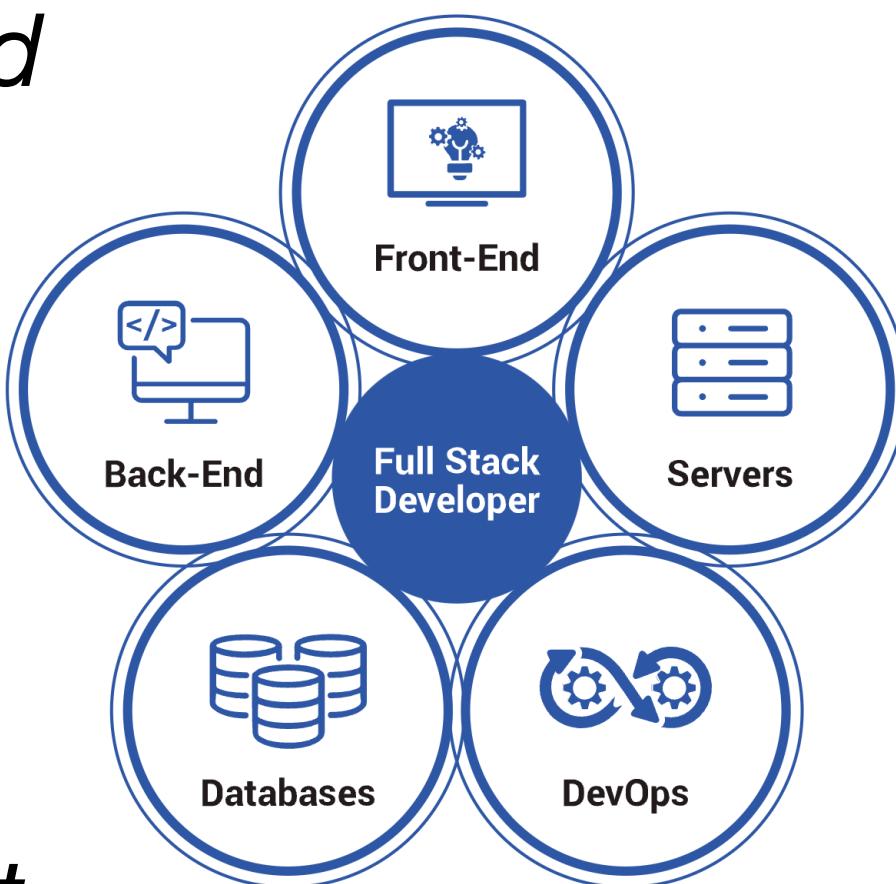
Deepening and Specialisation



*“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 ...” **Junior Software Developer (Full Stack Oriented)***

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



Industry experience and professional development

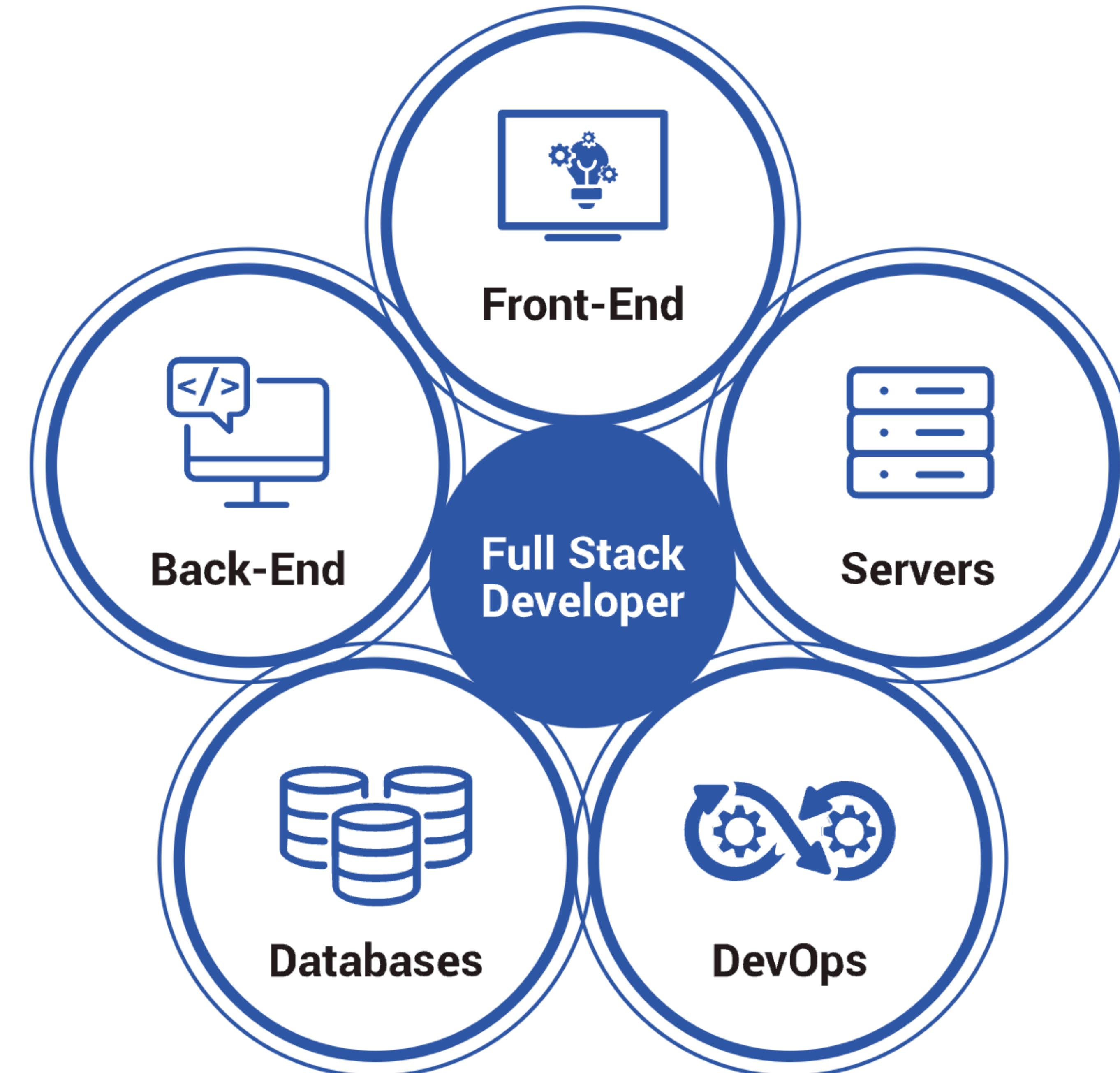


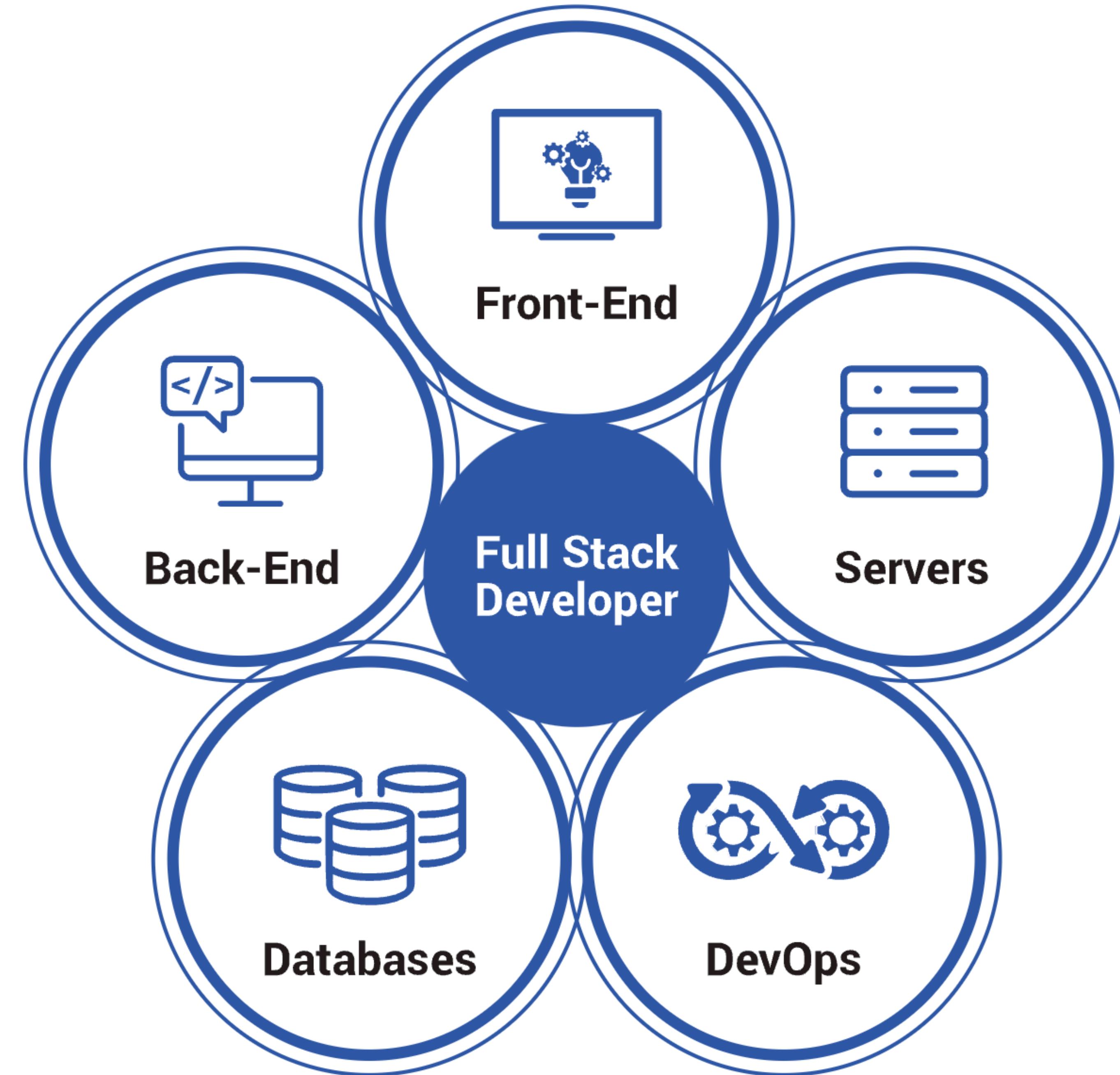
“Internships or work placements are seen as crucial to providing graduates with the context and confidence in their new knowledge...”

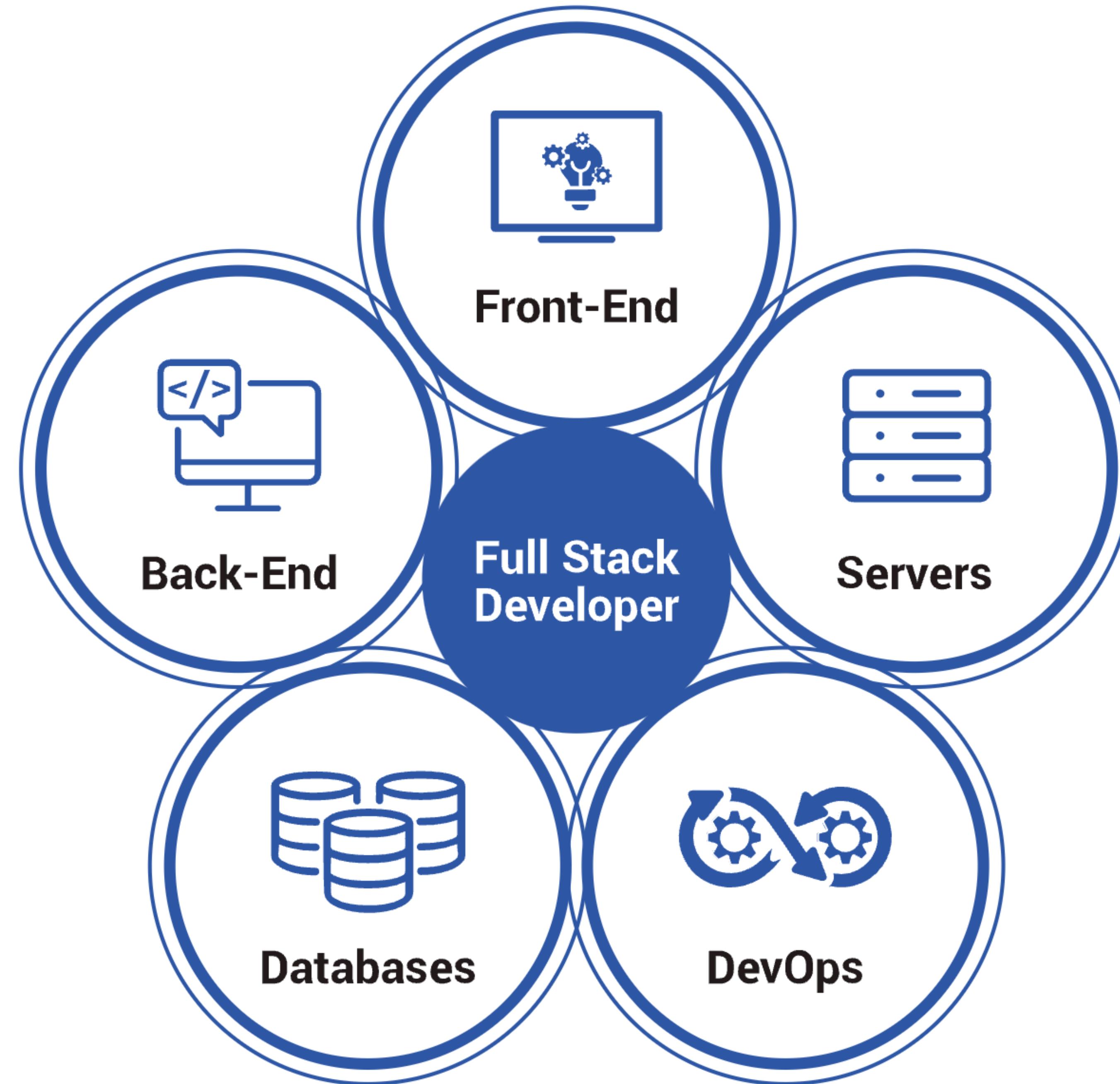
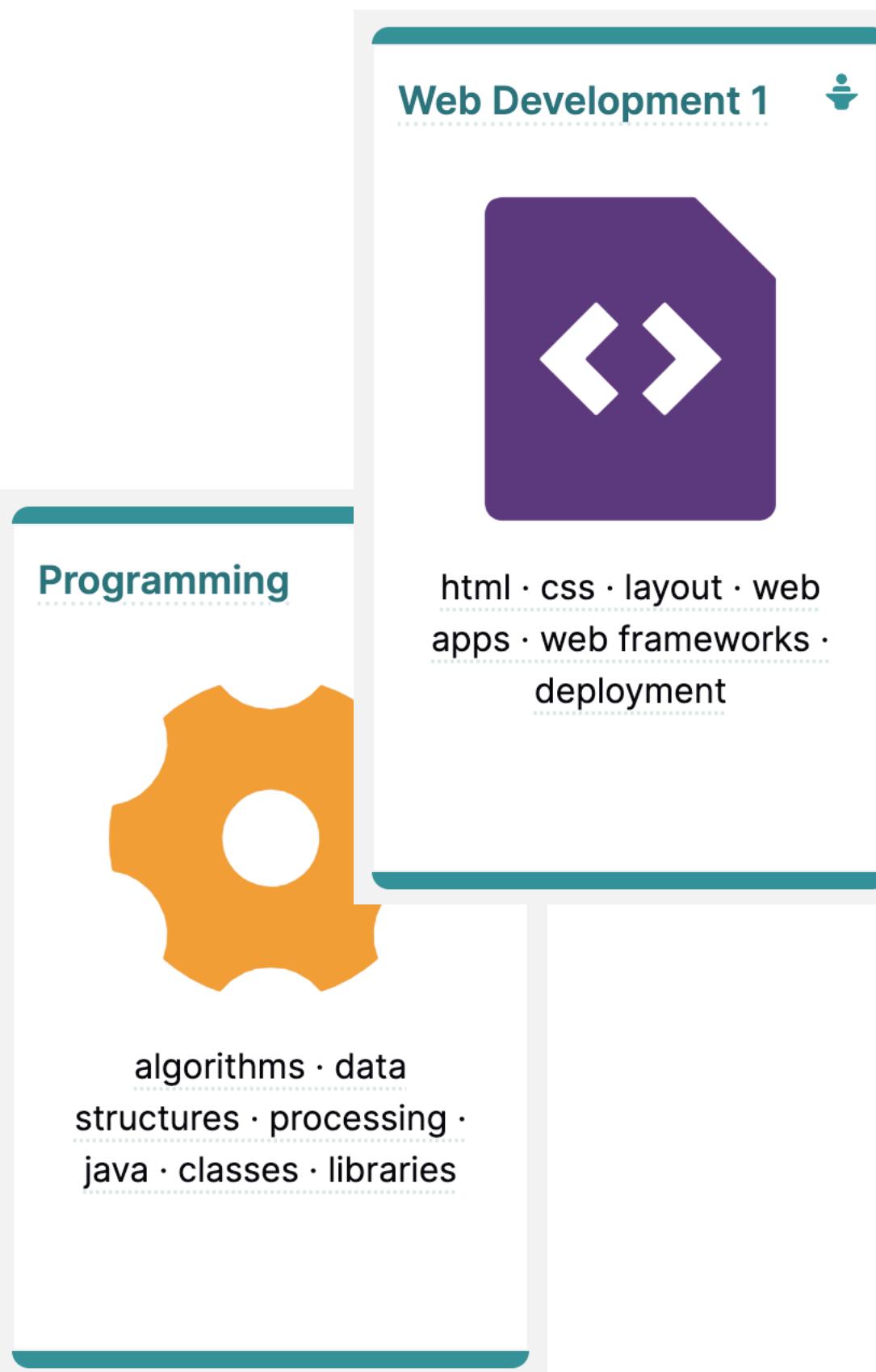
“Outputs expected from the work placement would include a work placement report, a project ideally conducted in the work placement organisation...”

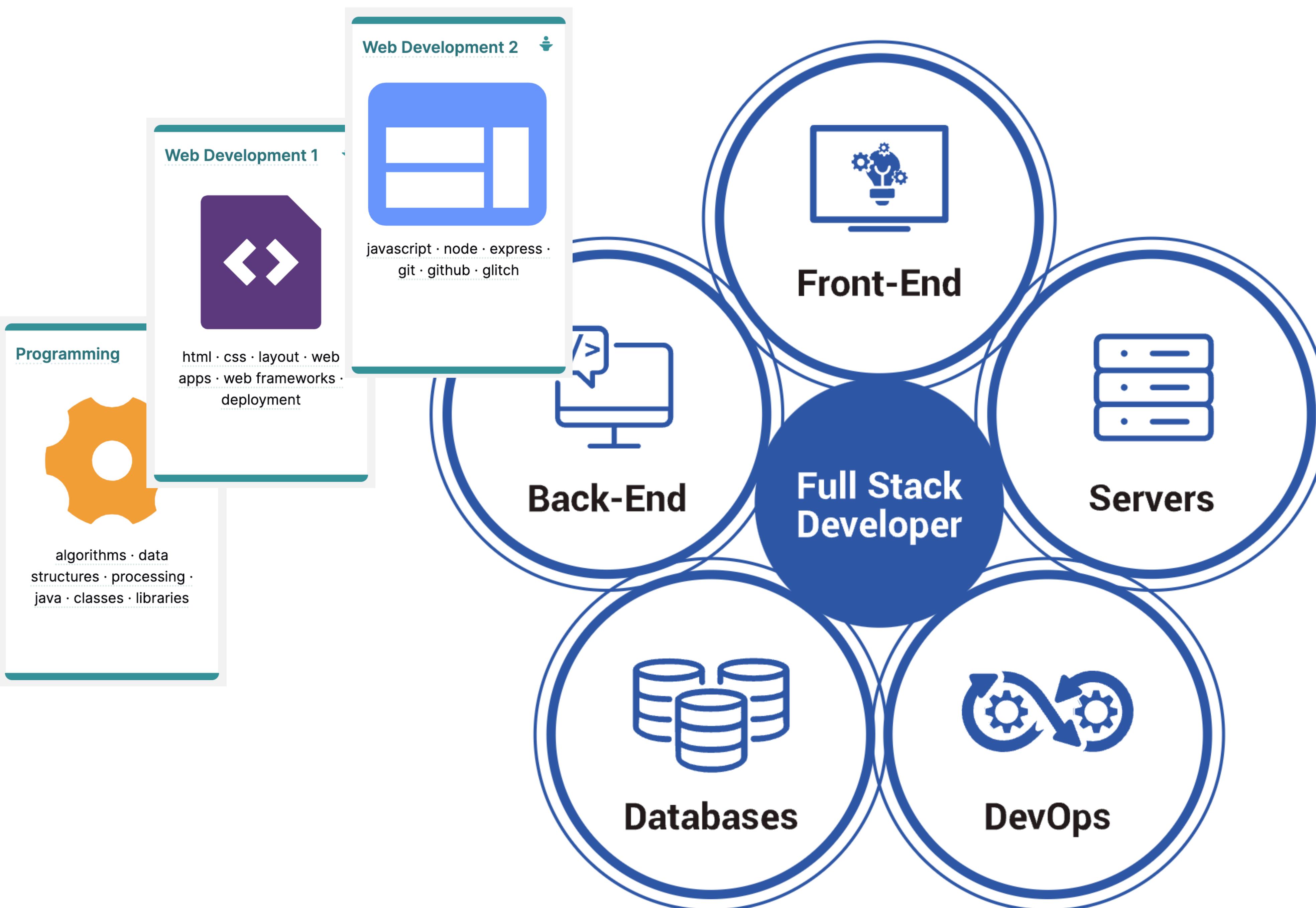
“...academic and industry partners will cooperate in the provision of appropriate academic supervision resources for the duration of this work placement activity...”

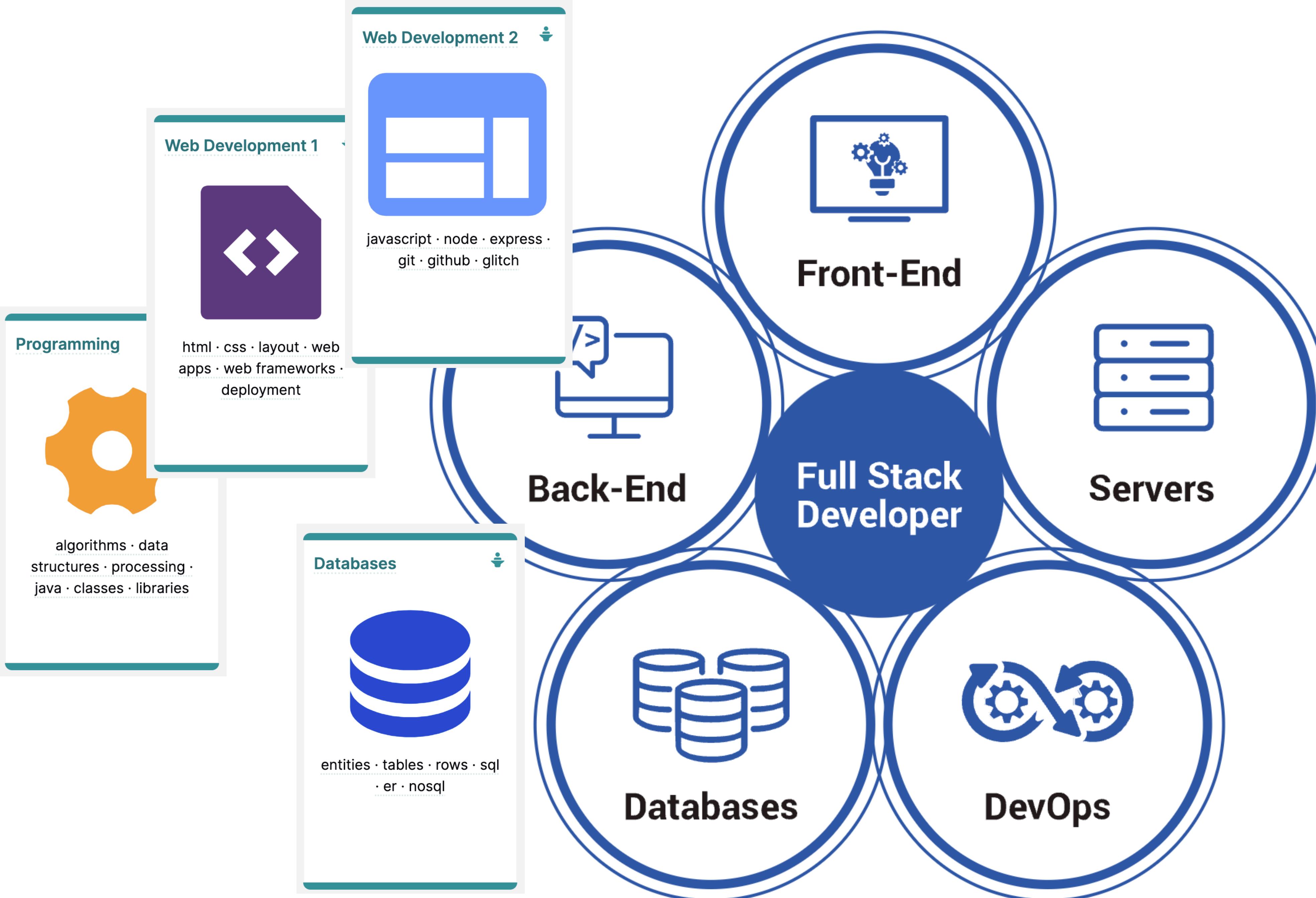
2. Programme Structure

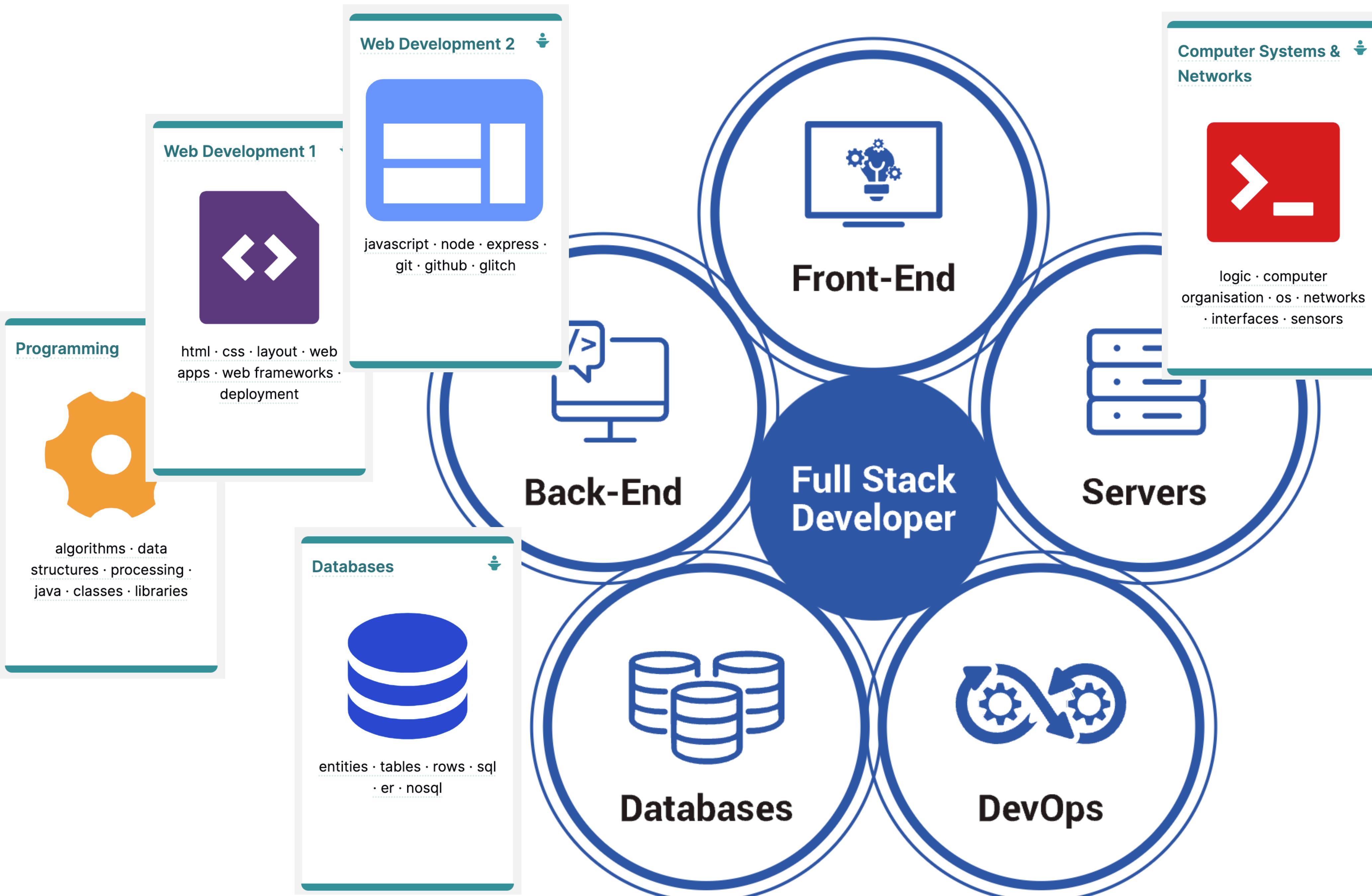


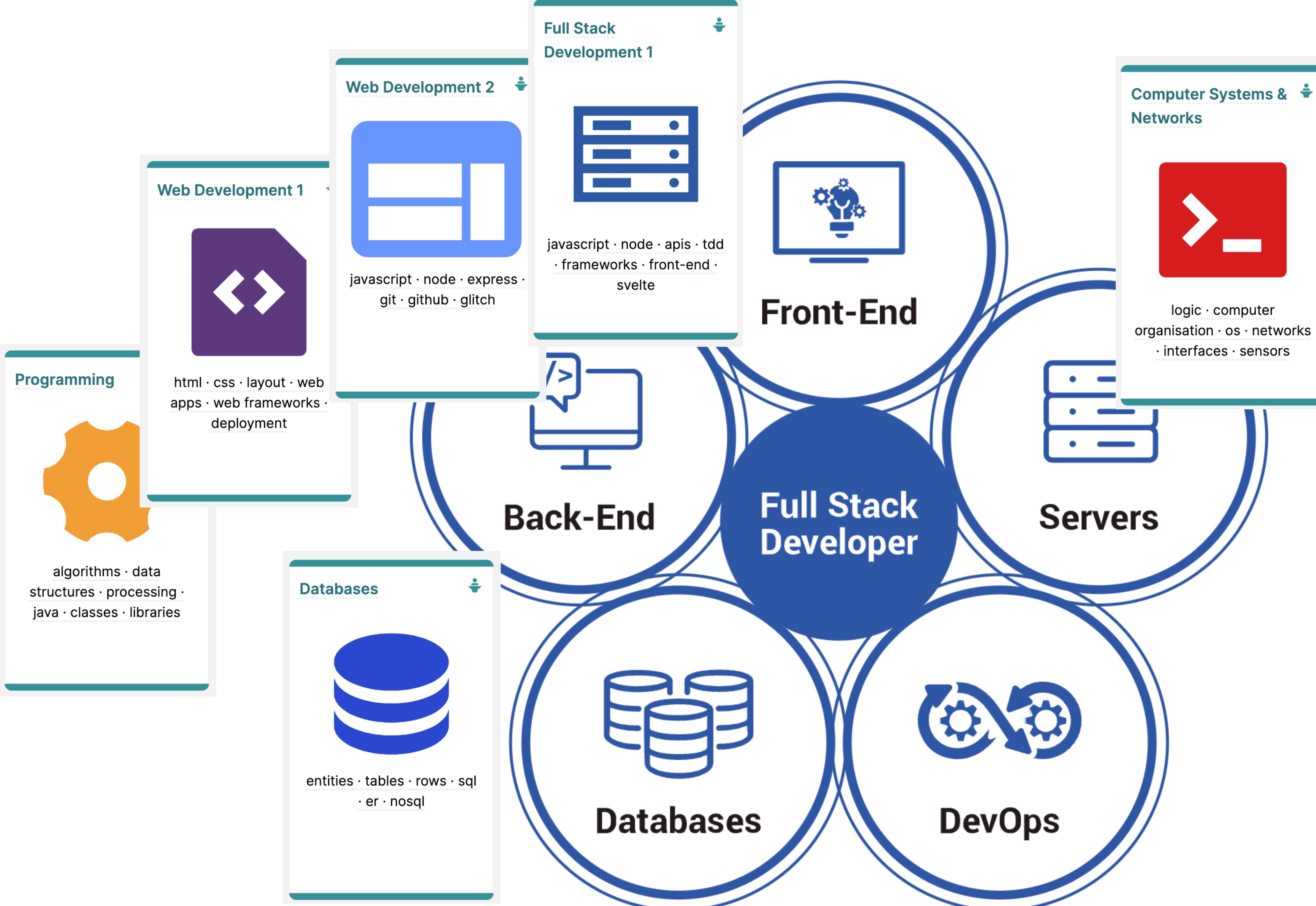


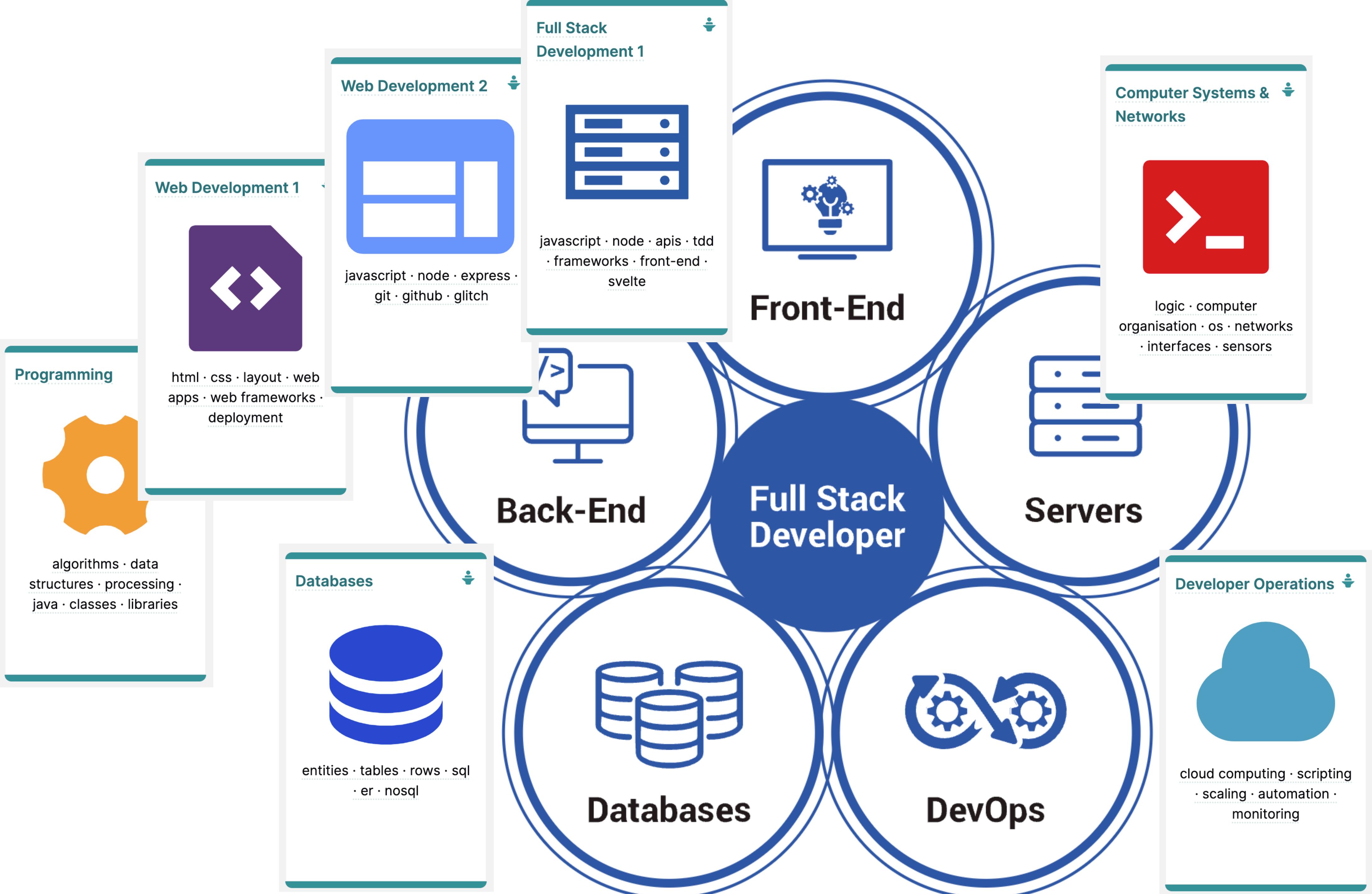


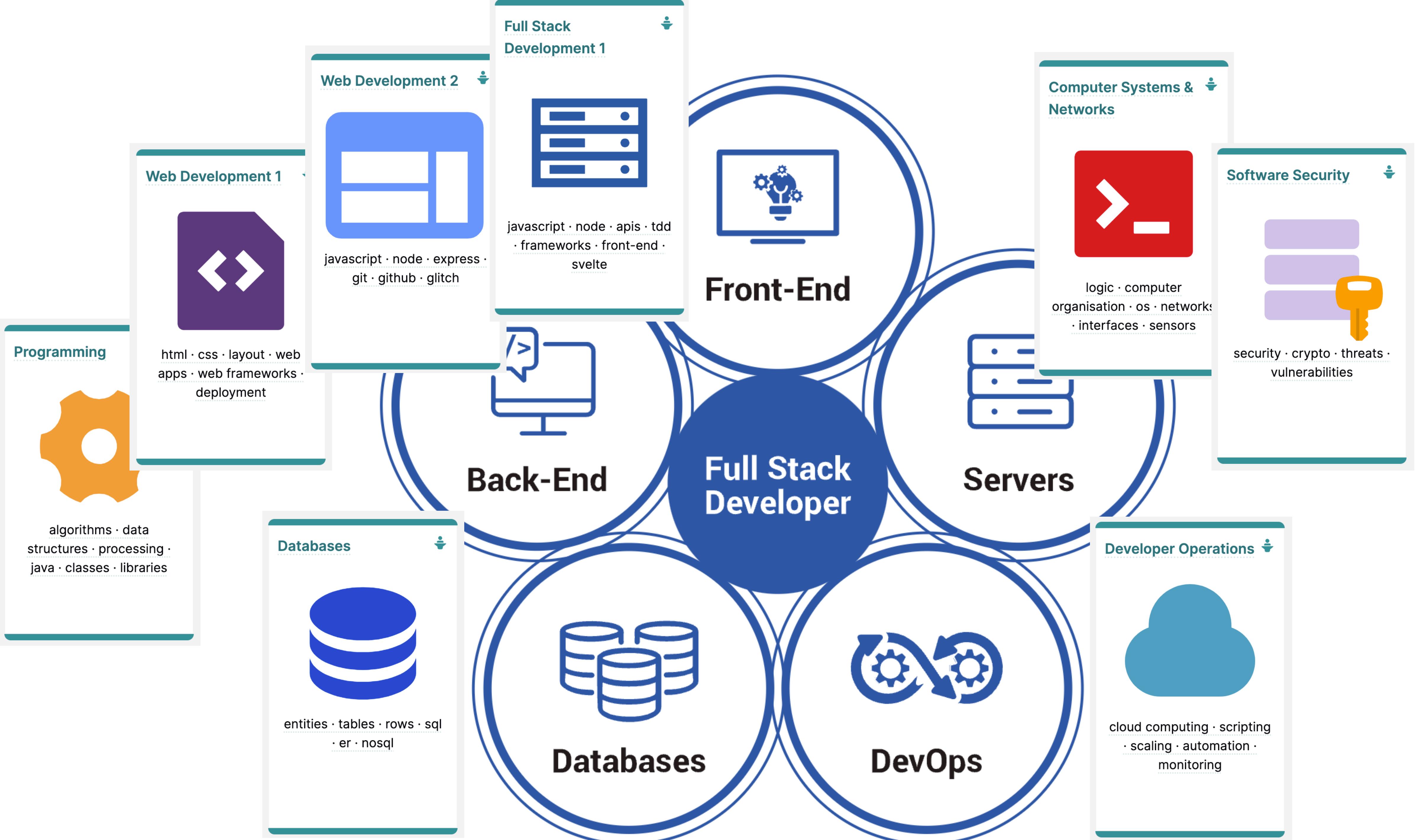


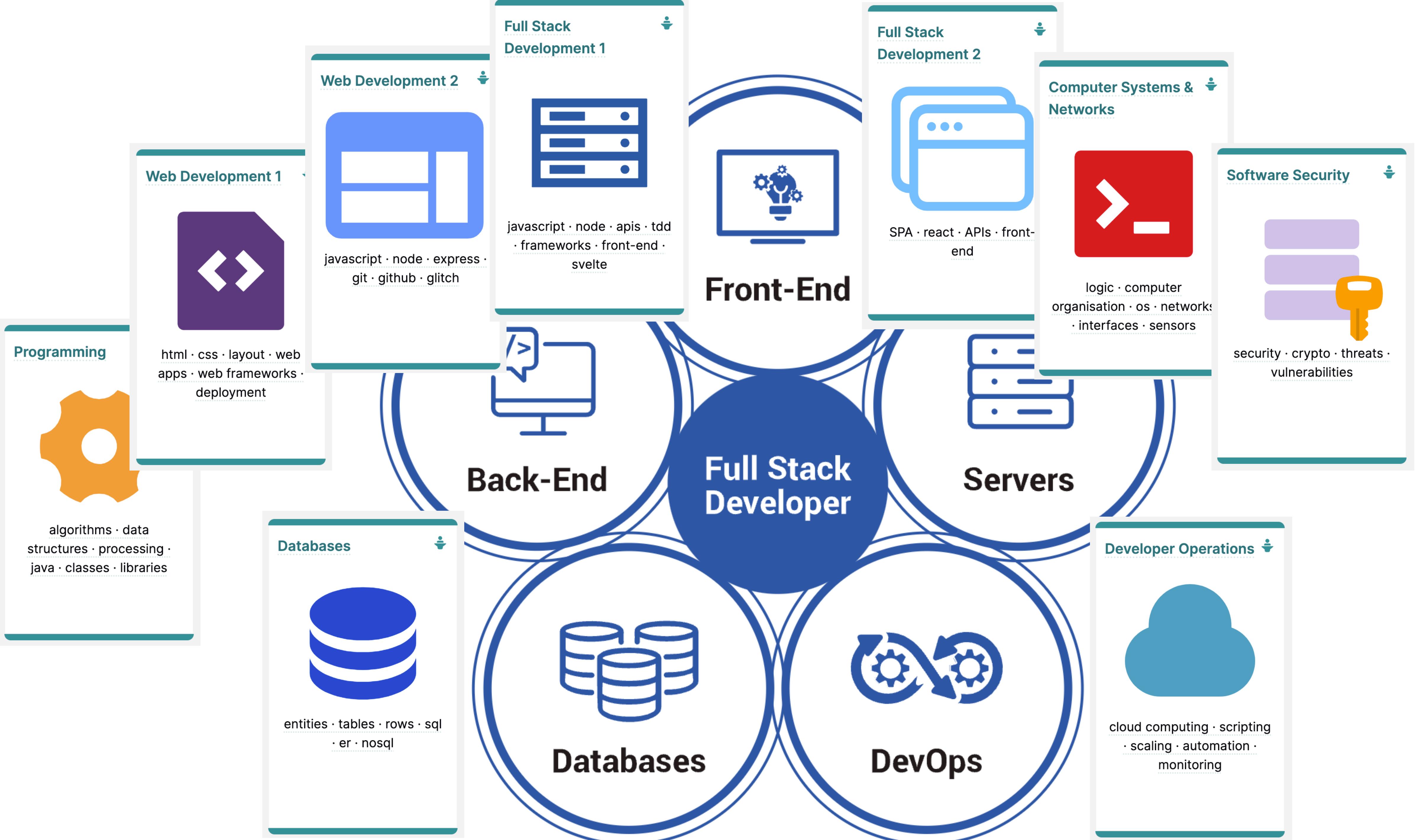


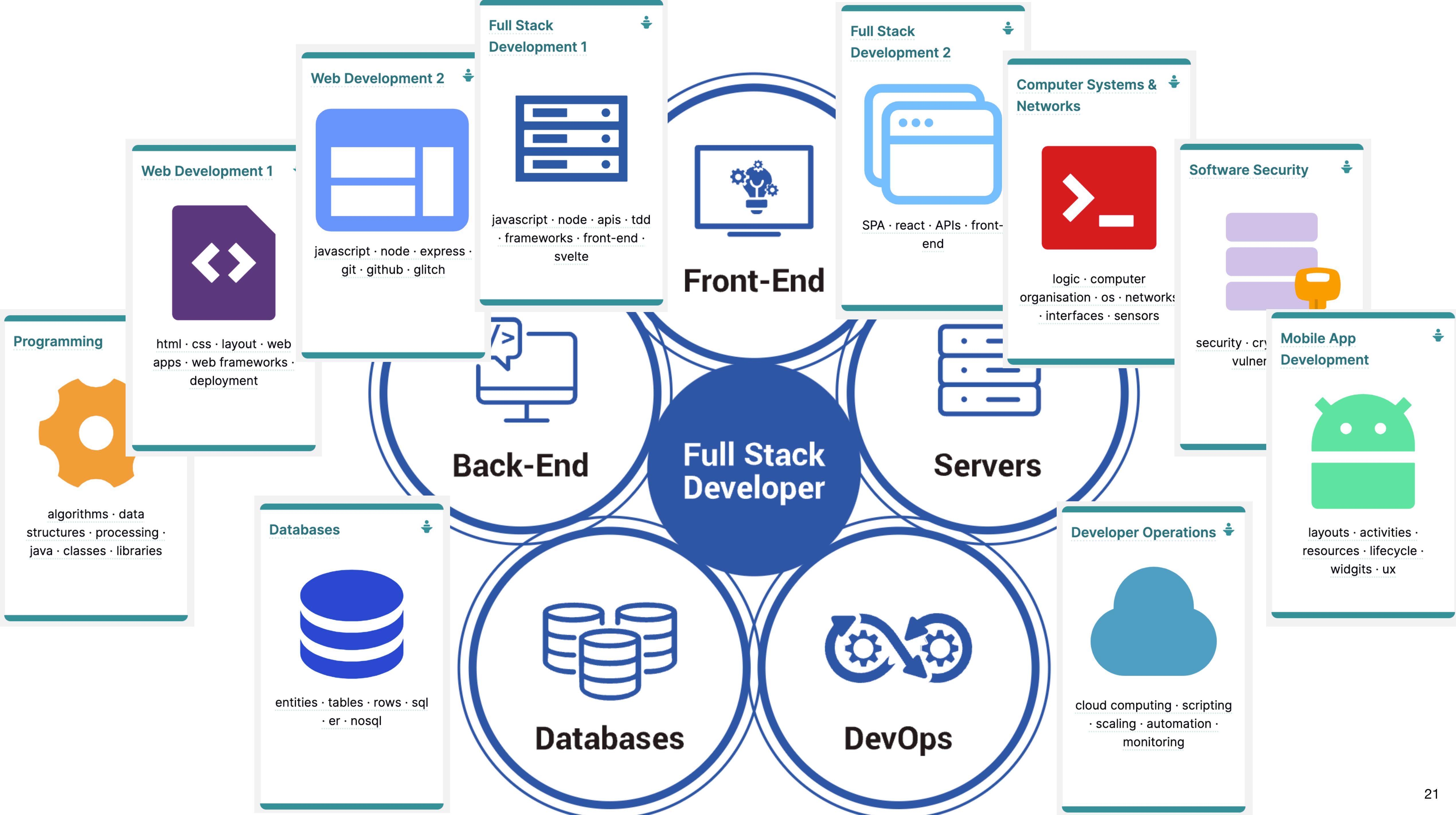


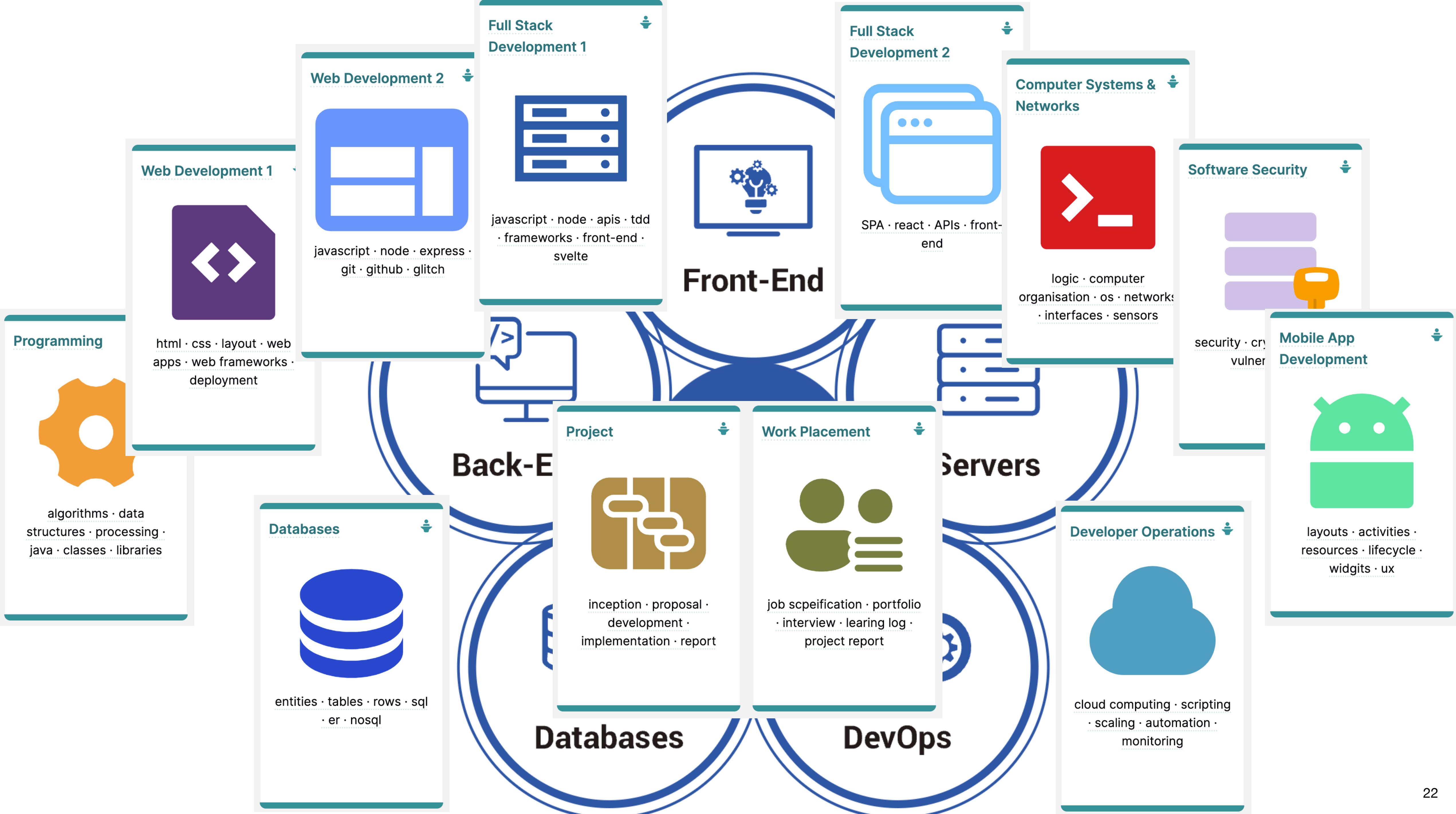


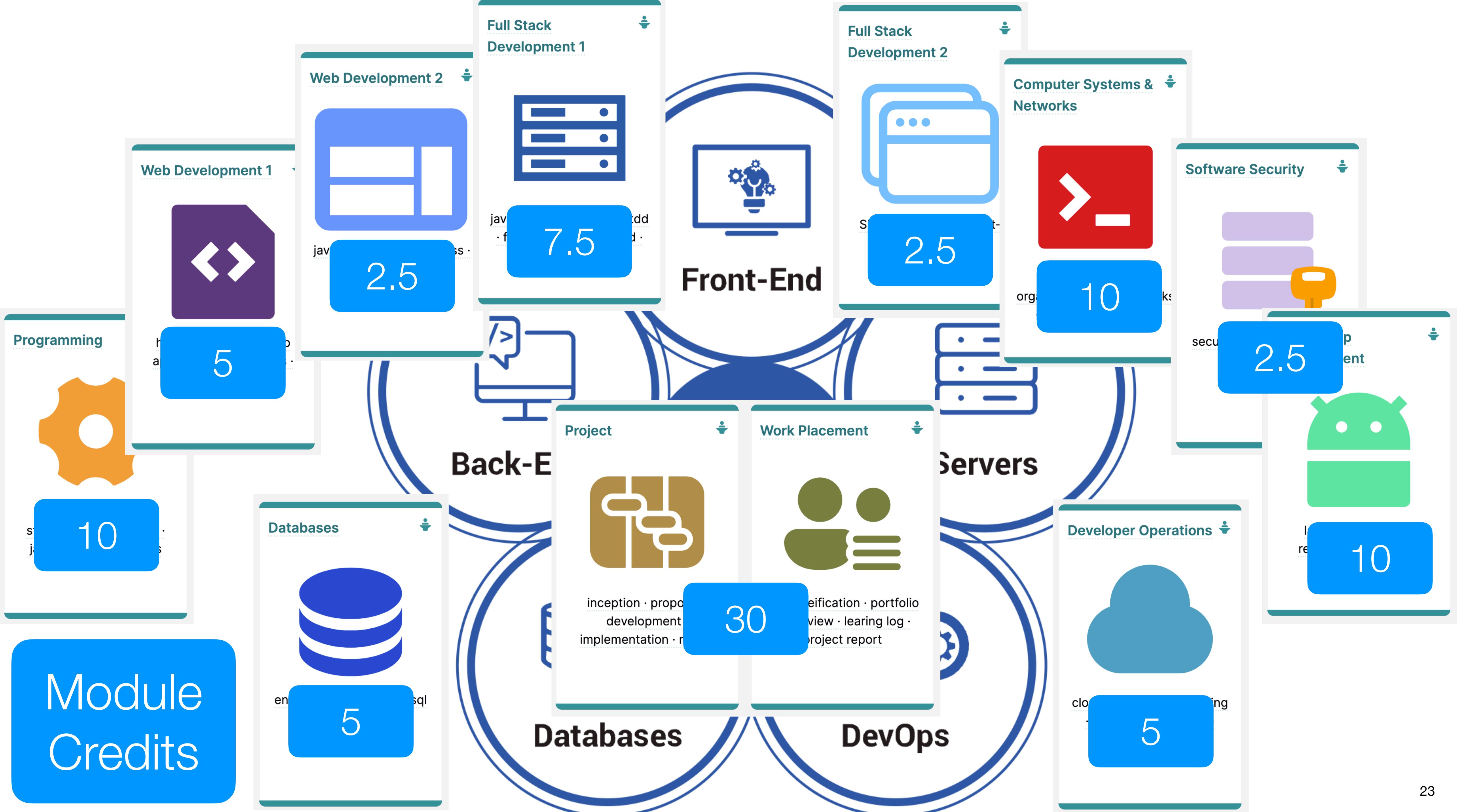




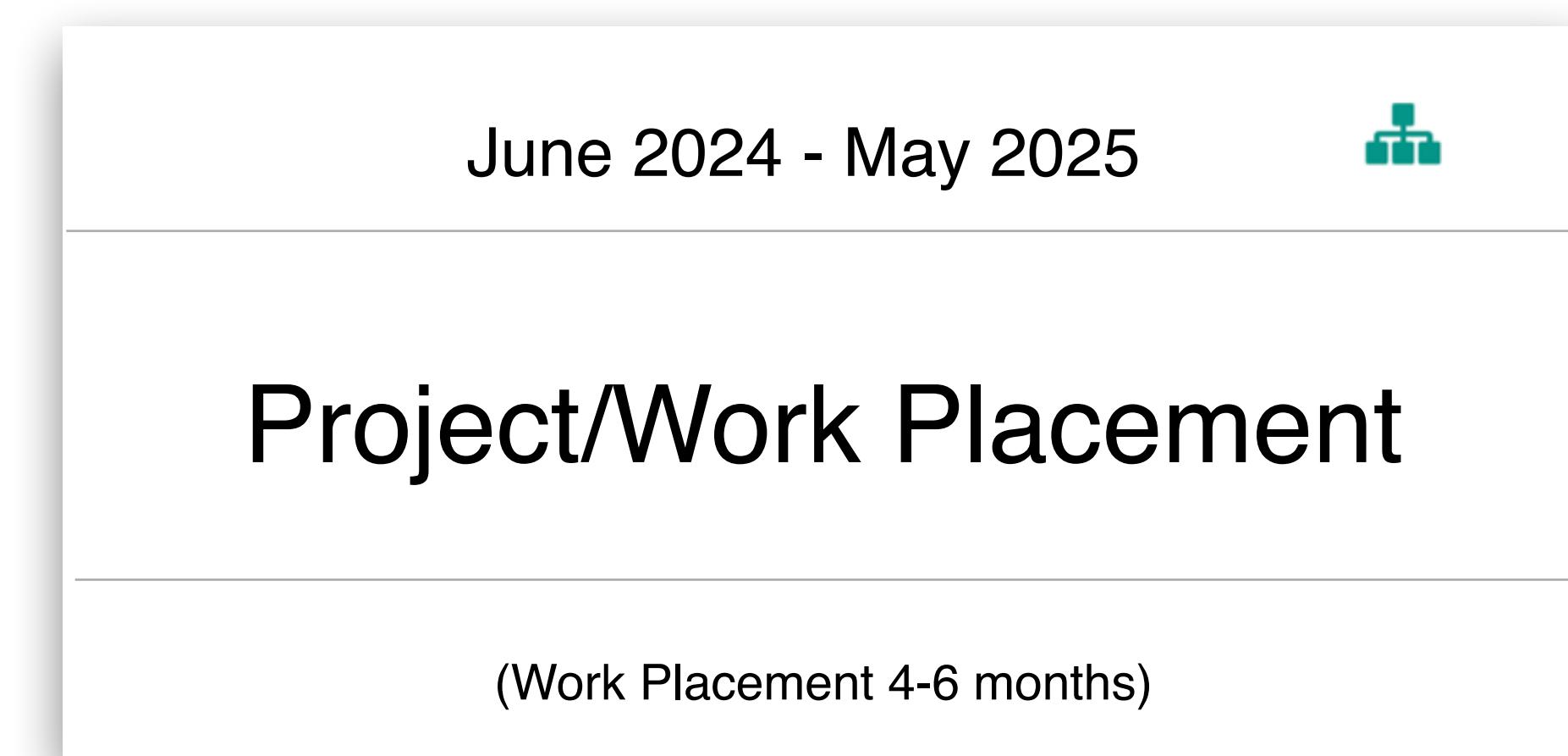
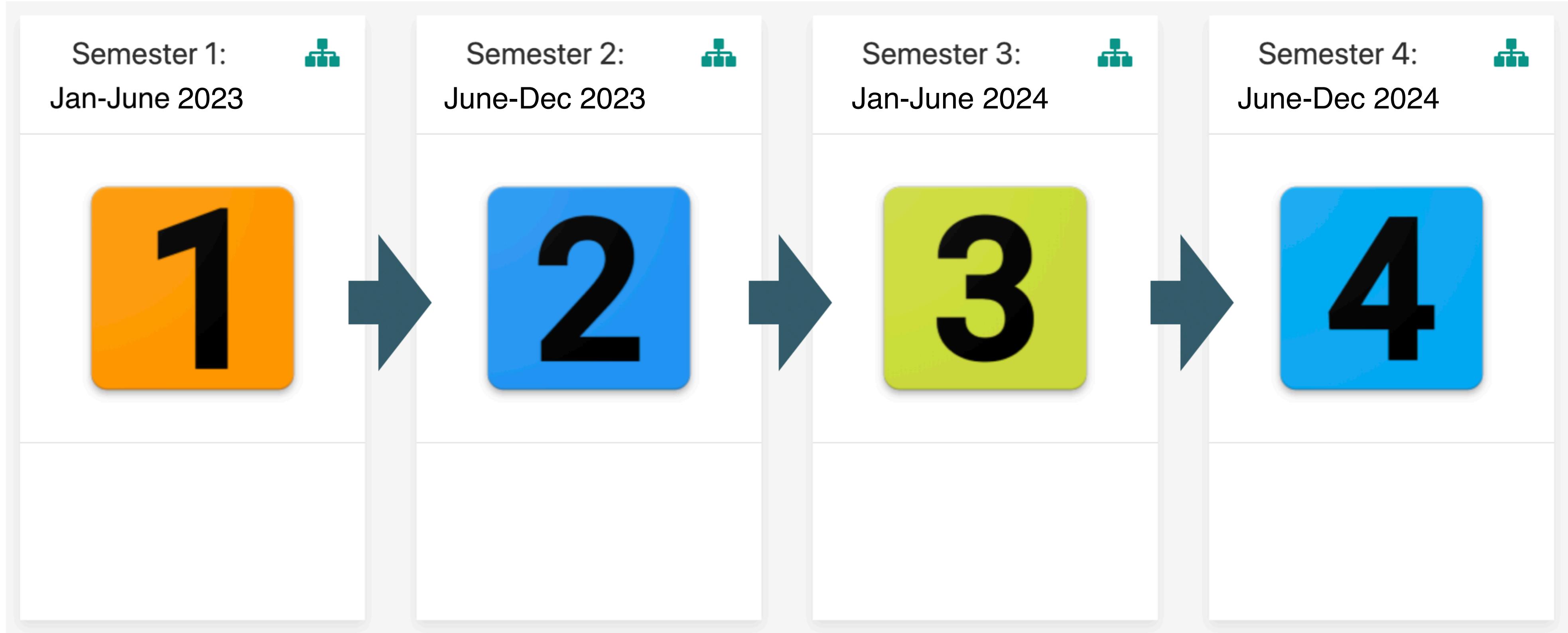




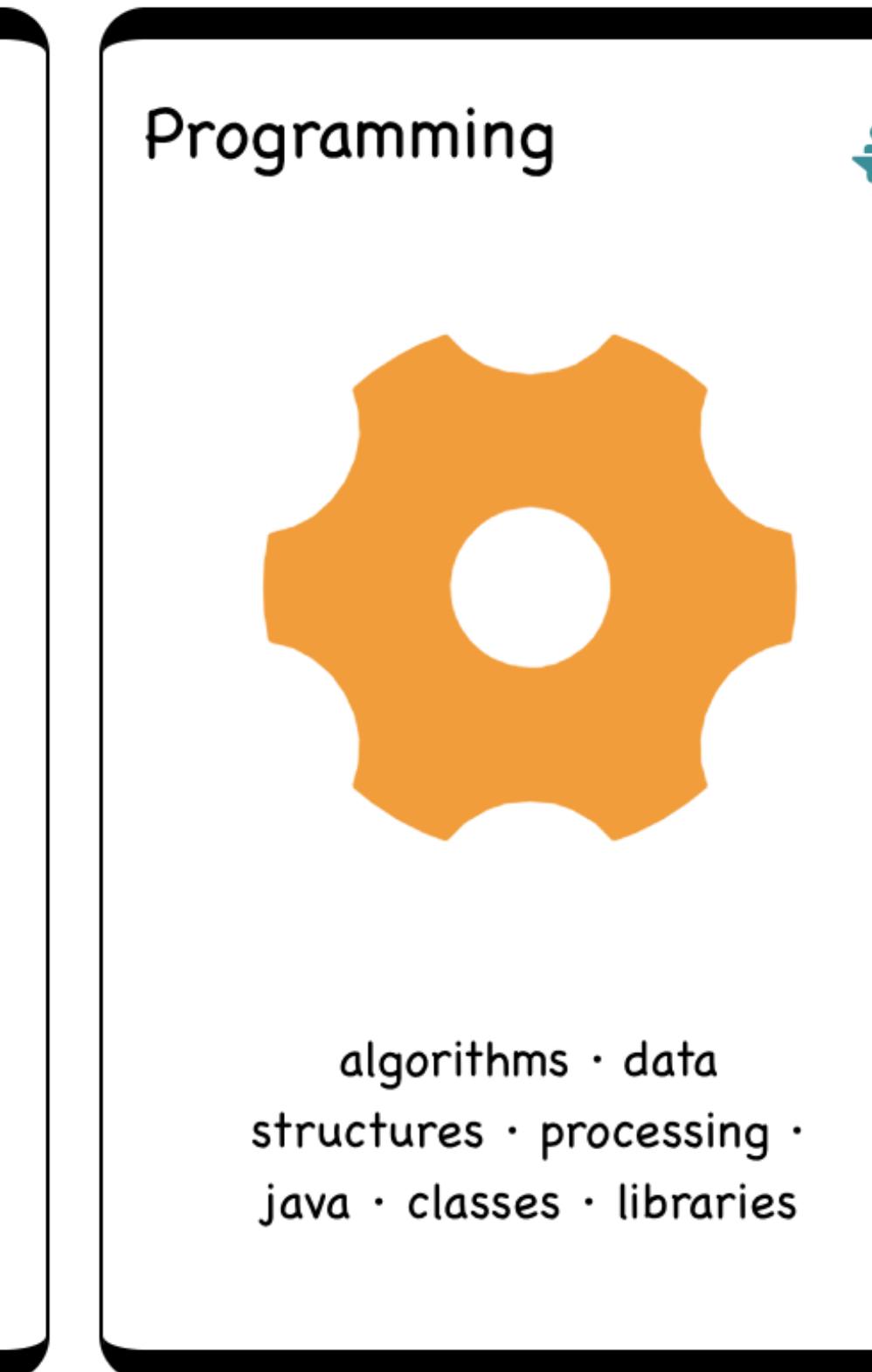
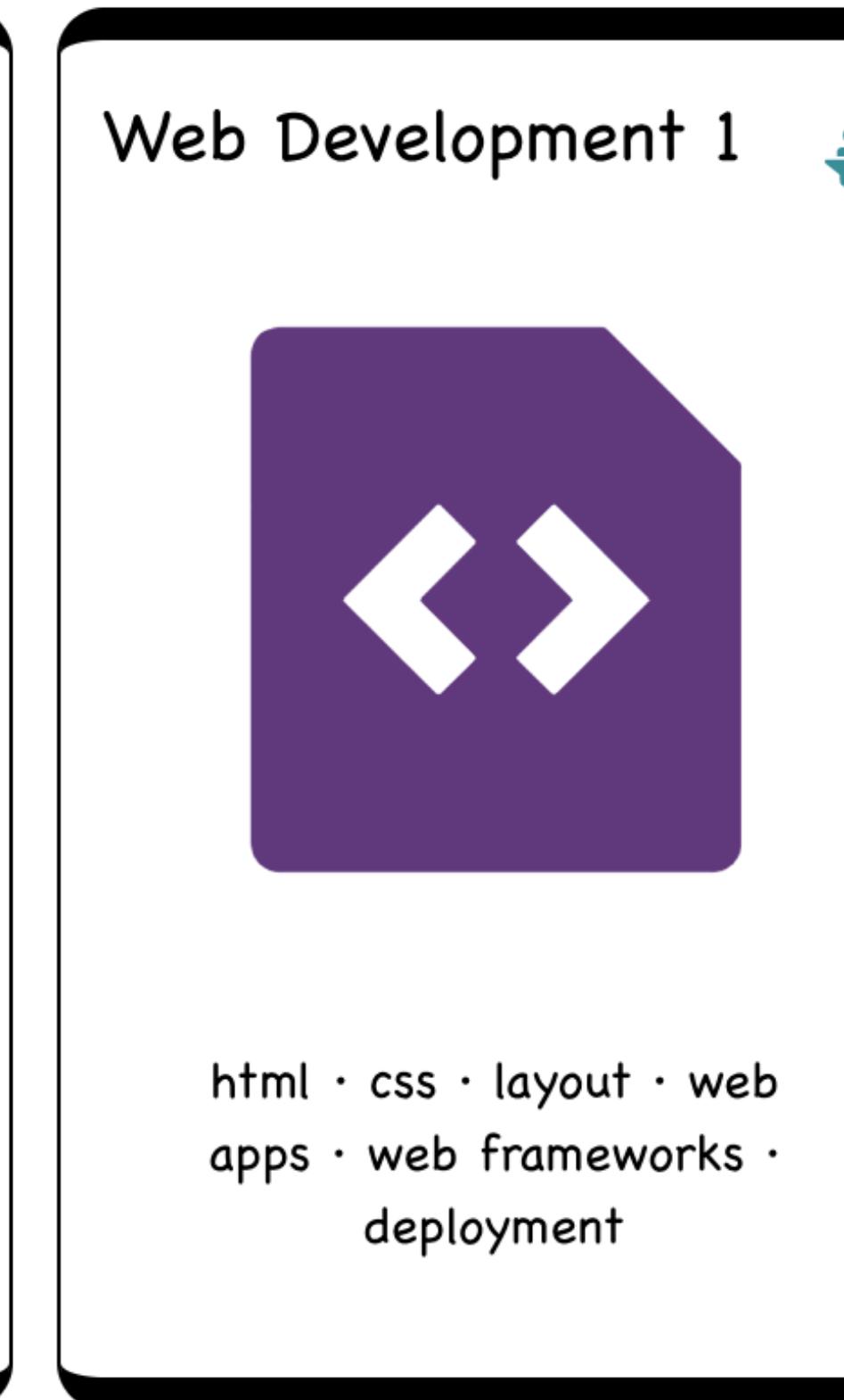
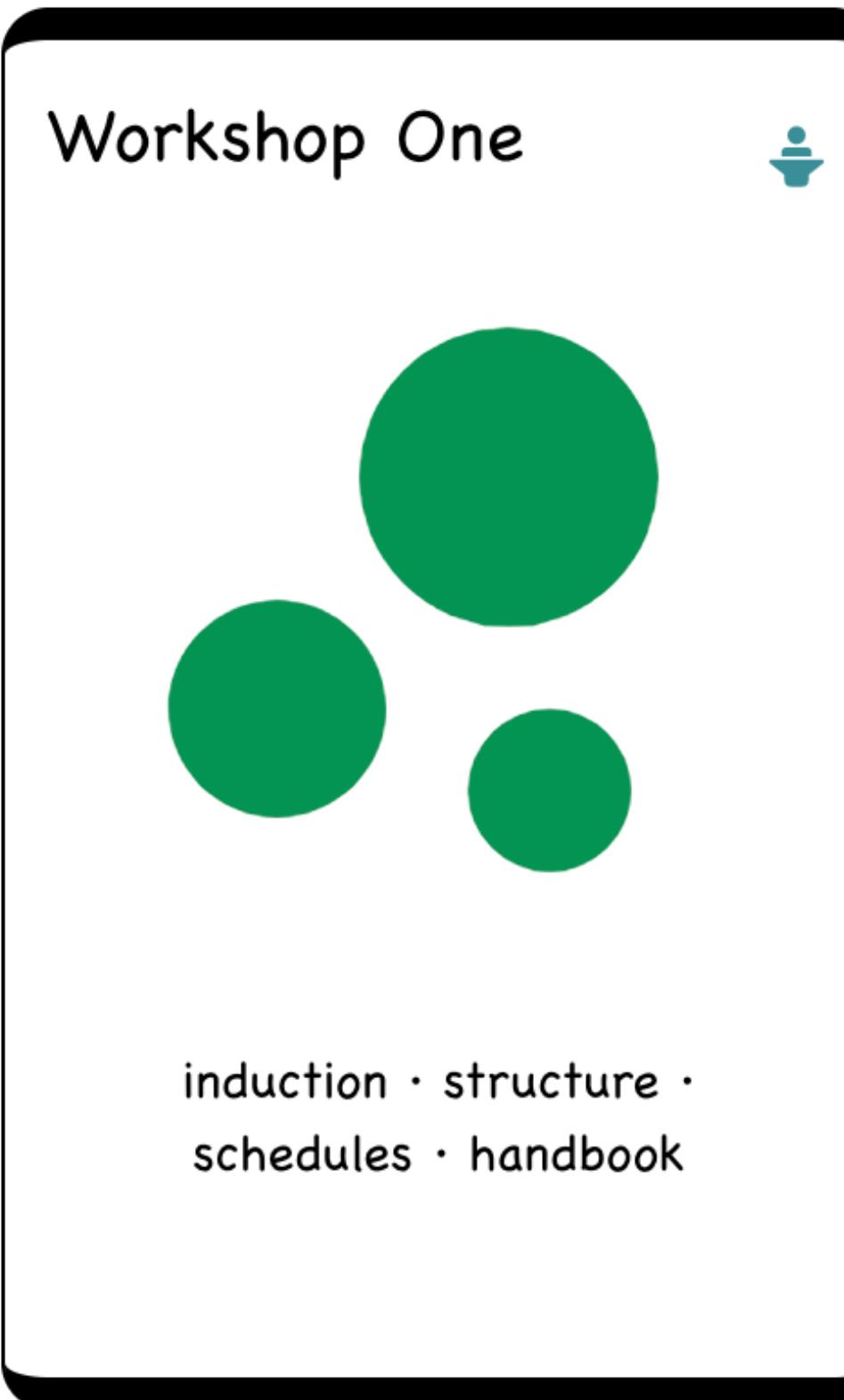




3. Semesters & Modules



Semester 1: January - June 2023



*“..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..”***

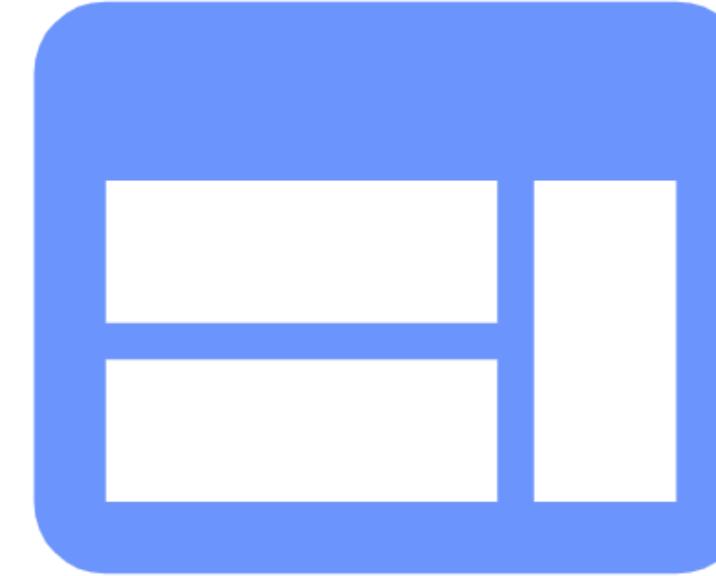
Semester 1: June - December 2023

Workshop Two



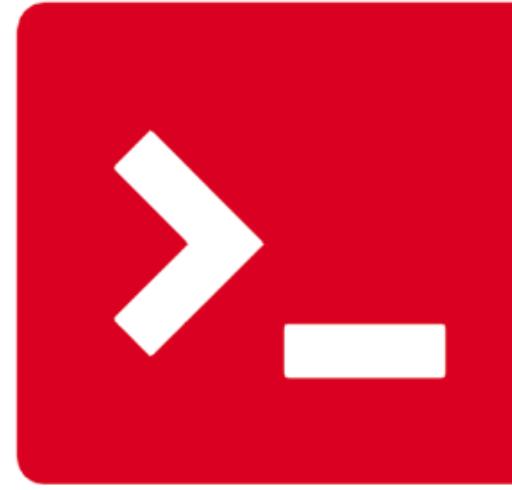
student perspectives ·
project & placement ·
introducing semester 2

Web Development 2



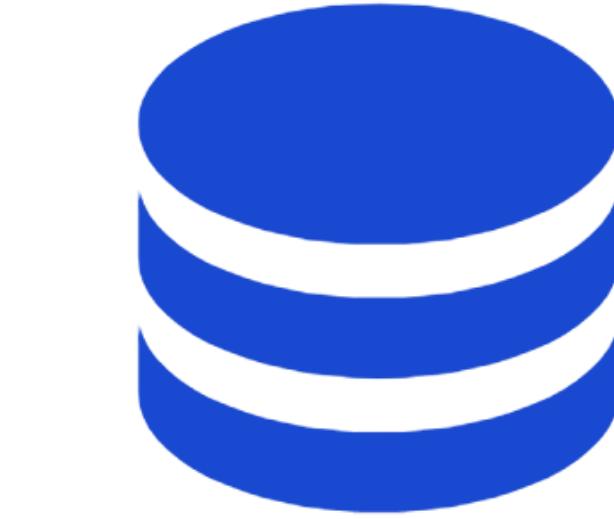
javascript · node · express
· git · github · glitch

Computer Systems &
Networks



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

Databases

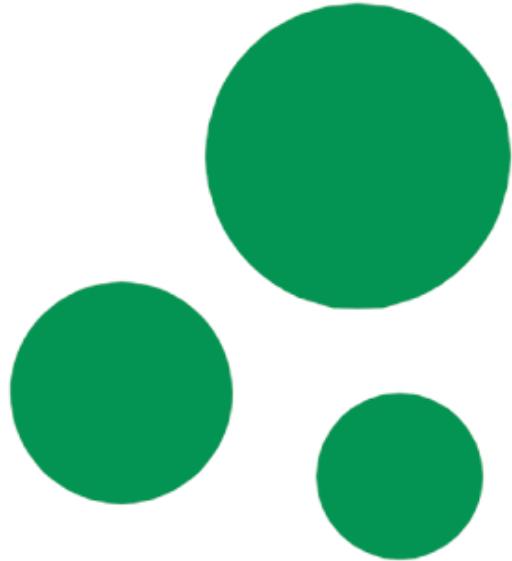


entities · tables · rows ·
sql · er · nosql

*“..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..”*

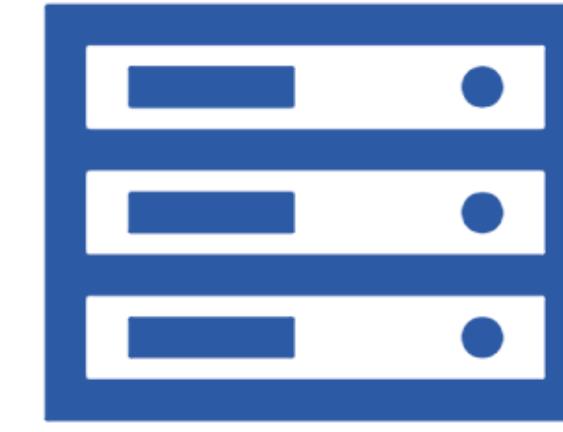
Semester 3: January - June 2024

Workshop Three



agile methods · cv preparation · introducing semester 3

Full Stack Development 1



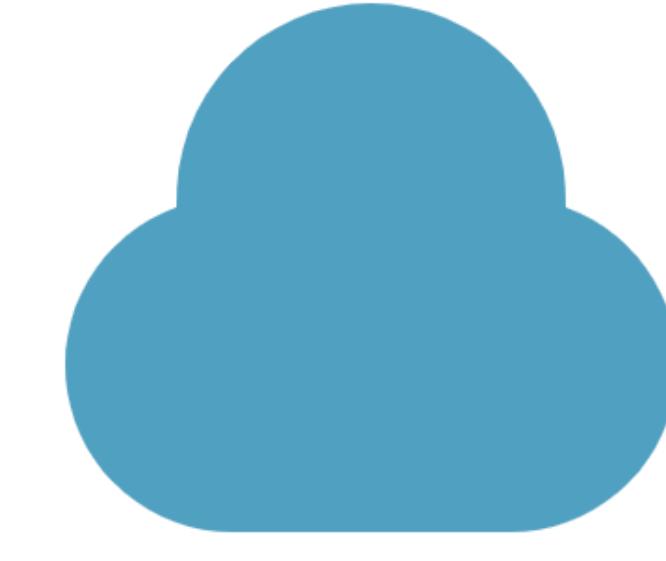
javascript · node · apis · tdd · frameworks · front-end · svelte

Software Security



security · crypto · threats · vulnerabilities

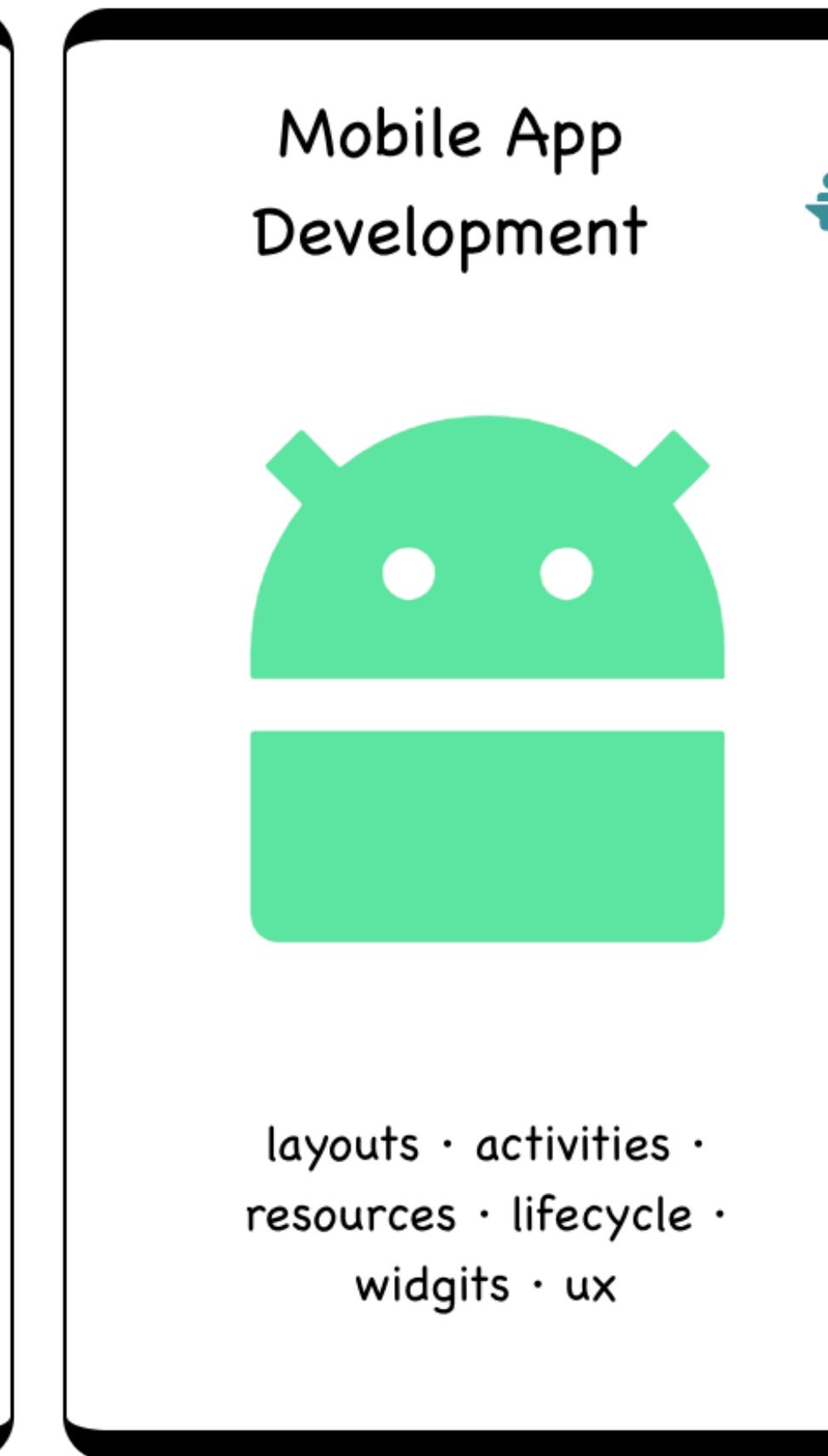
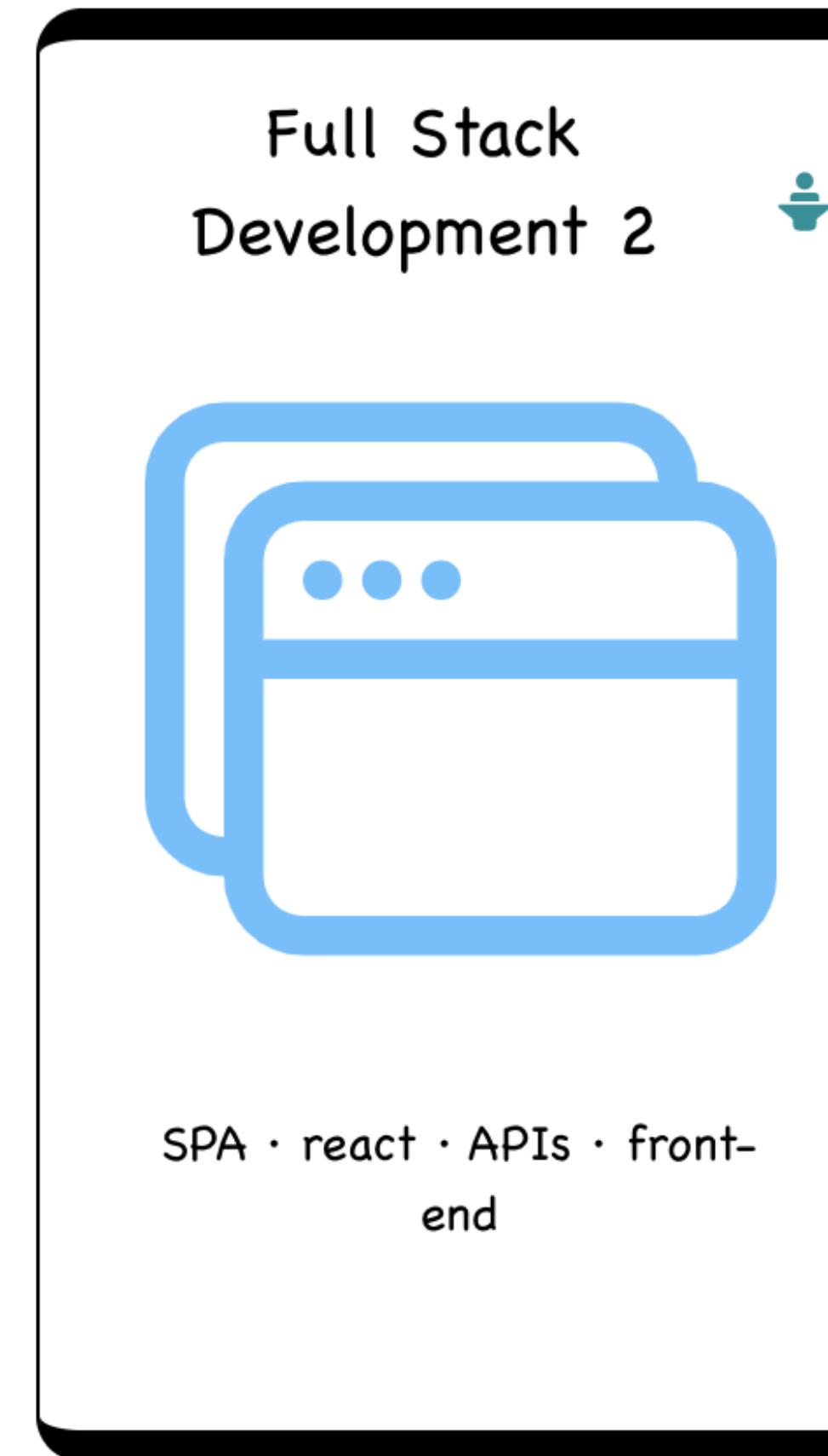
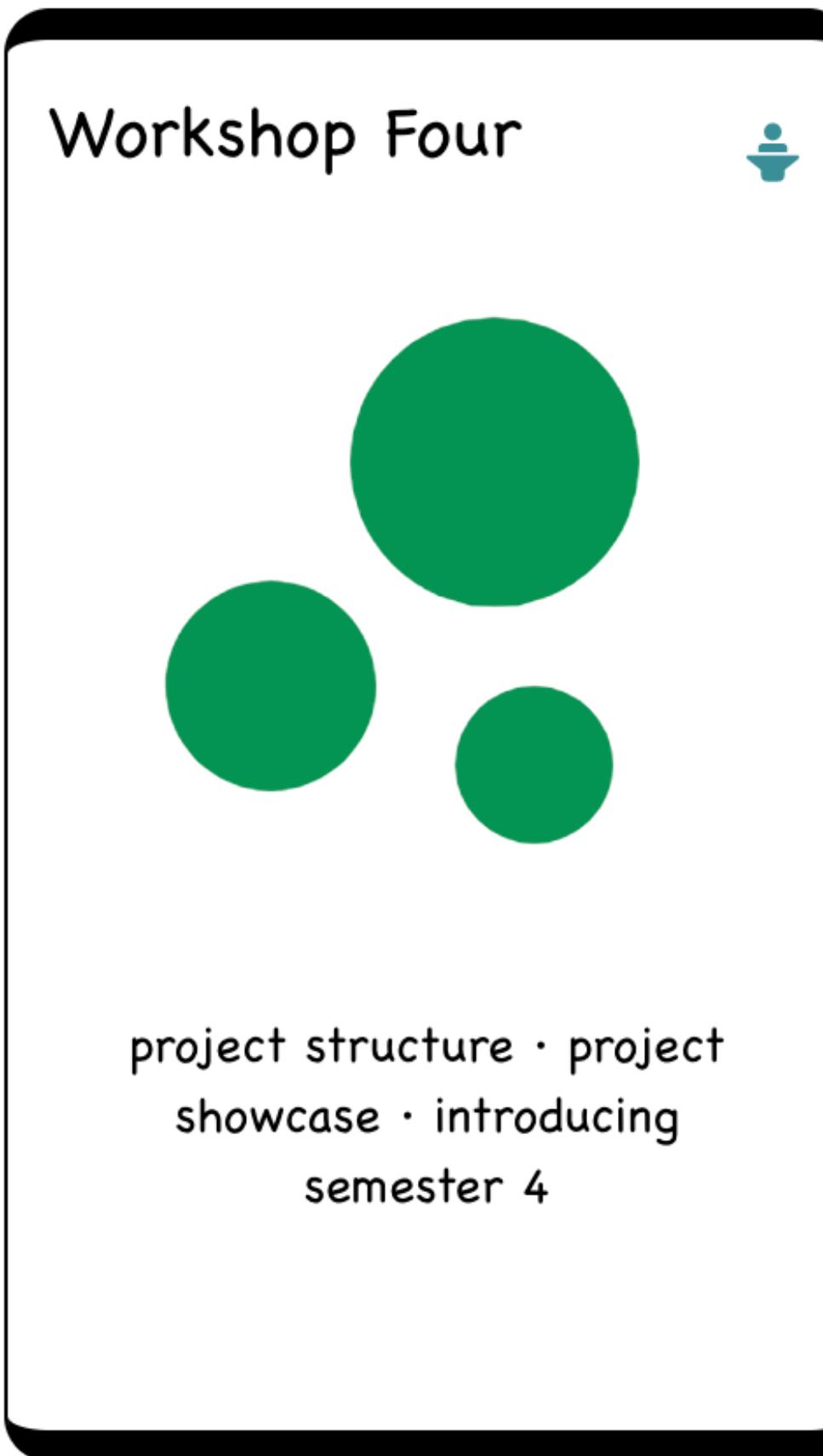
Developer Operations



cloud computing · scripting · scaling · automation · monitoring

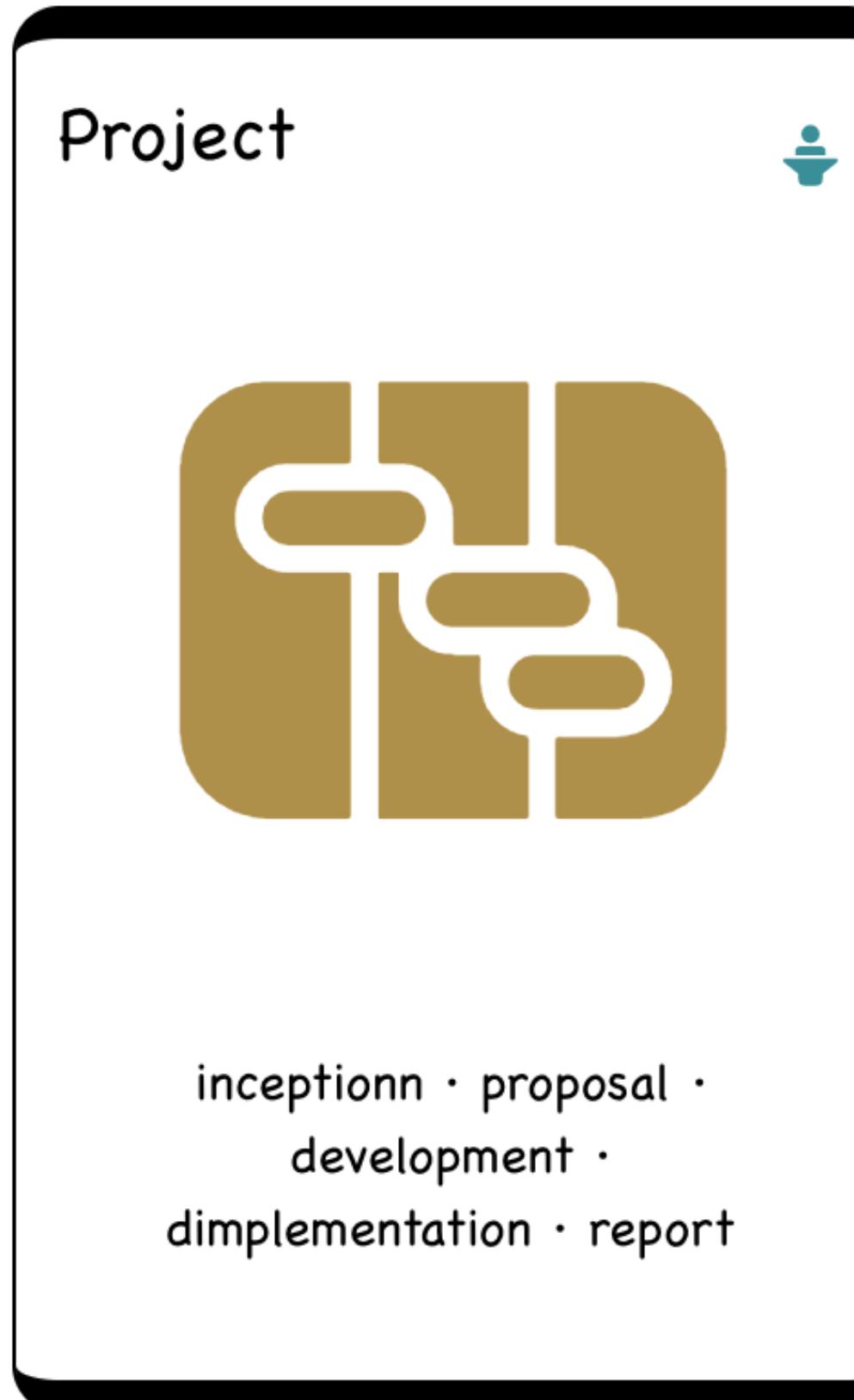
“... students are expected to take a specialisation which reflects their own strengths as demonstrated on the programme to date...”

Semester 4: June - December 2024



“... 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



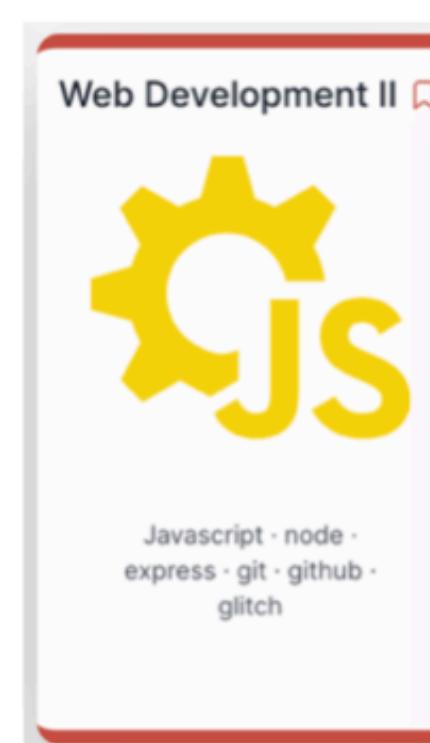
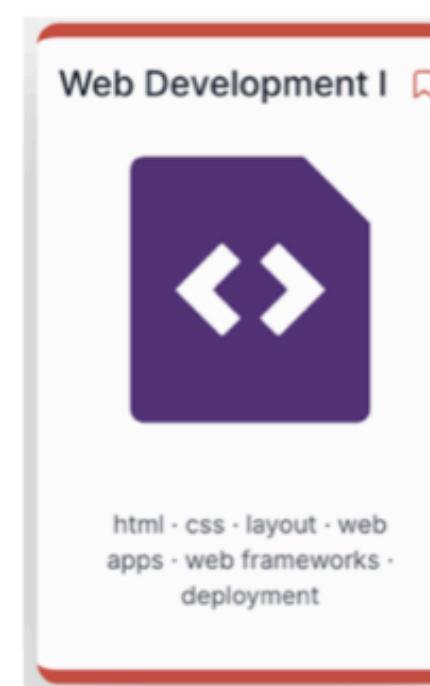
“Internships or work placements are seen as crucial to providing graduates with the context and confidence in their new knowledge...”

4. Calendar, Timetable & Assessment Sequencing

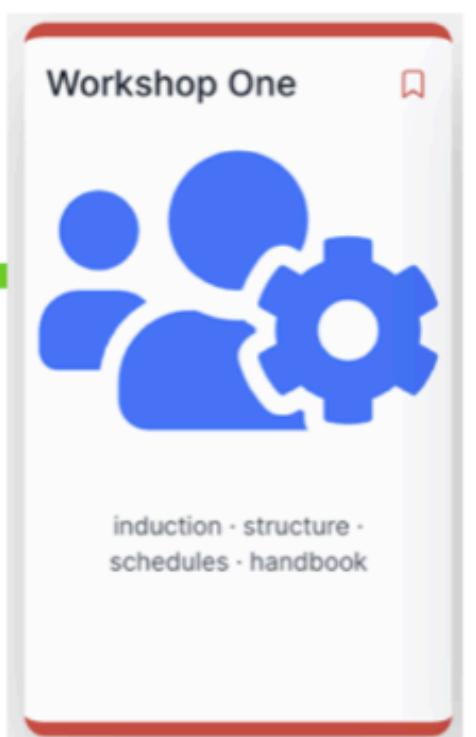


Semester 1

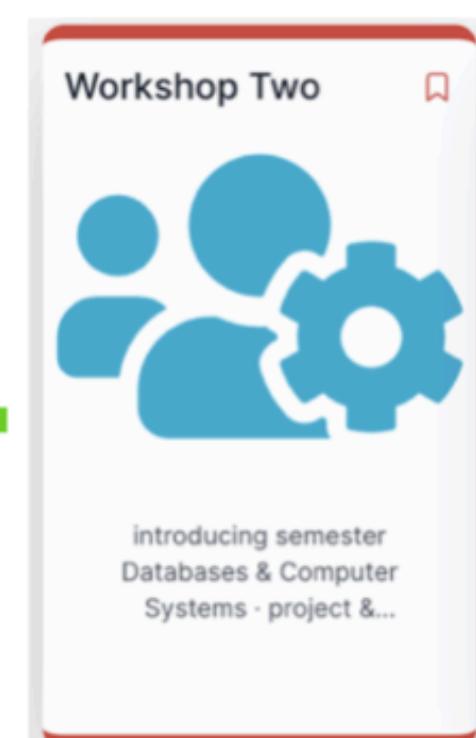
2023



	S	M	T	W	T	F	S
Week	1	2	3	4	5	6	7
January	8	9	10	11	12	13	14
1	15	16	17	18	19	20	21
2	22	23	24	25	26	27	28
3	29	30	31	1	2	3	4
February	reading	5	6	7	8	9	10
4	12	13	14	15	16	17	18
5	19	20	21	22	23	24	25
6	26	27	28	1	2	3	4
March	reading	5	6	7	8	9	10
7	12	13	14	15	16	17	18
8	19	20	21	22	23	24	25
9	26	27	28	28	30	31	1
April	<i>Easter 1</i>	2	3	4	5	6	7
	<i>Easter 2</i>	9	10	11	12	13	14
	10	16	17	18	19	20	21
	11	23	24	25	26	27	28
May	12	30	1	2	3	4	5
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	13	21	22	23	24	25	26
	14	28	29	30	31	1	2
June	14	4	5	6	7	8	9
	16	11	12	13	14	15	16
	17	18	†	20	21	22	23
	25	26	27	28	29	30	1
July	2	3	4	5	6	7	8



Thursday
Jan 12

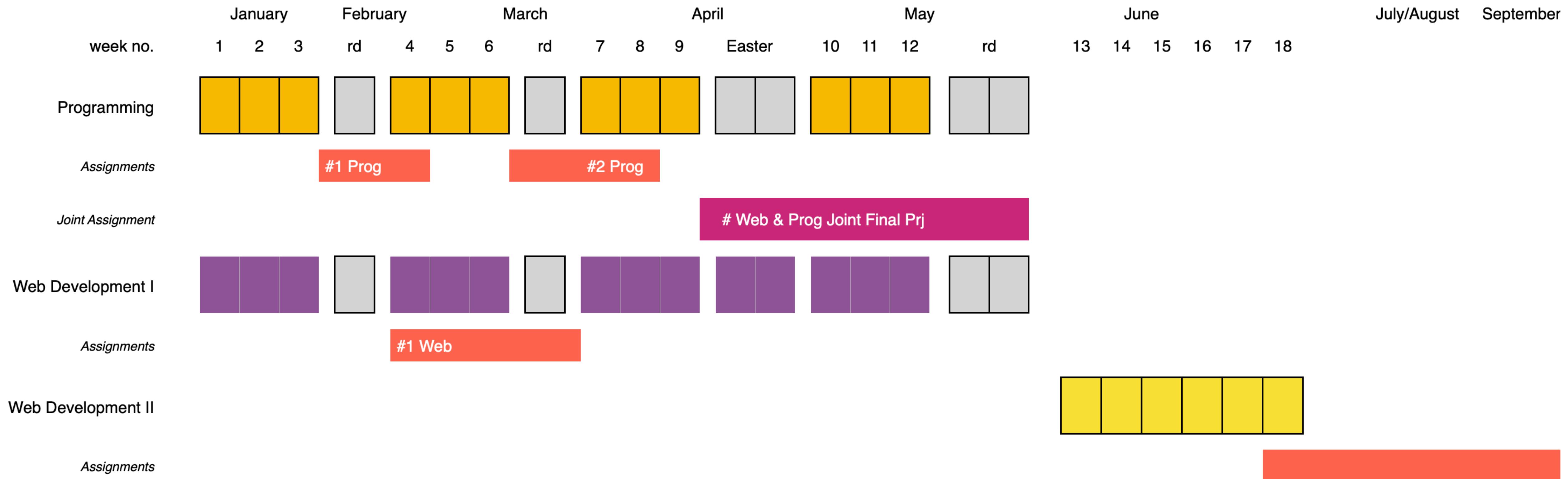


Thursday/Friday
June 8/9

Weekly Webinar Schedule

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

Semester 1 Assessment Schedule



4. 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

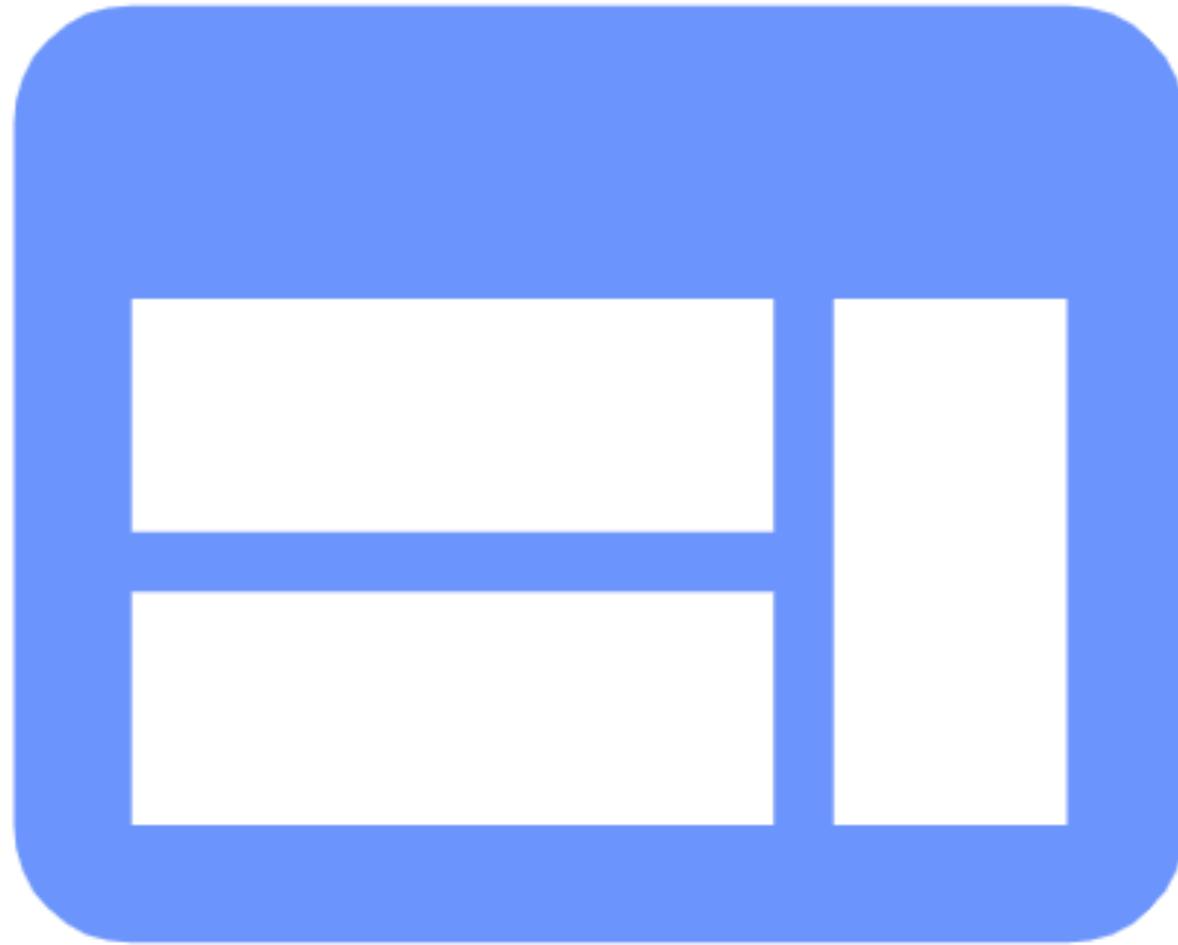


html · css · layout · web
apps · web frameworks ·
deployment

- 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.

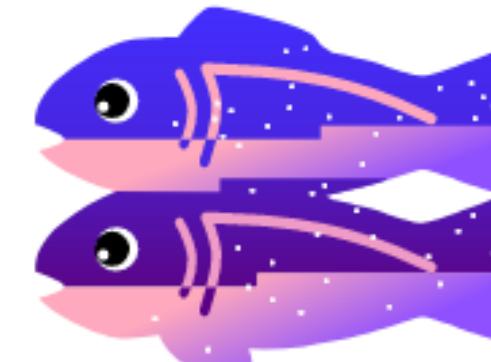


Web Development 2



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

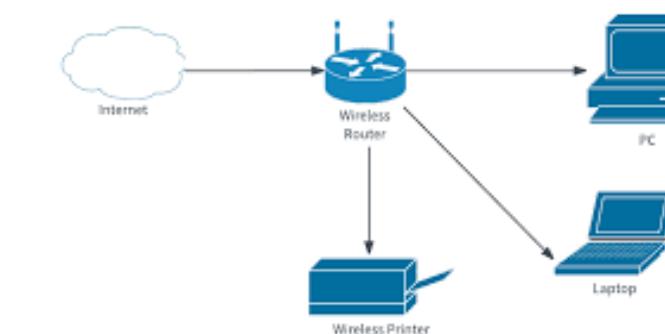


Computer Systems & Networks



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.



Databases



entities · tables · rows ·
sql · er · nosql

MySQL™

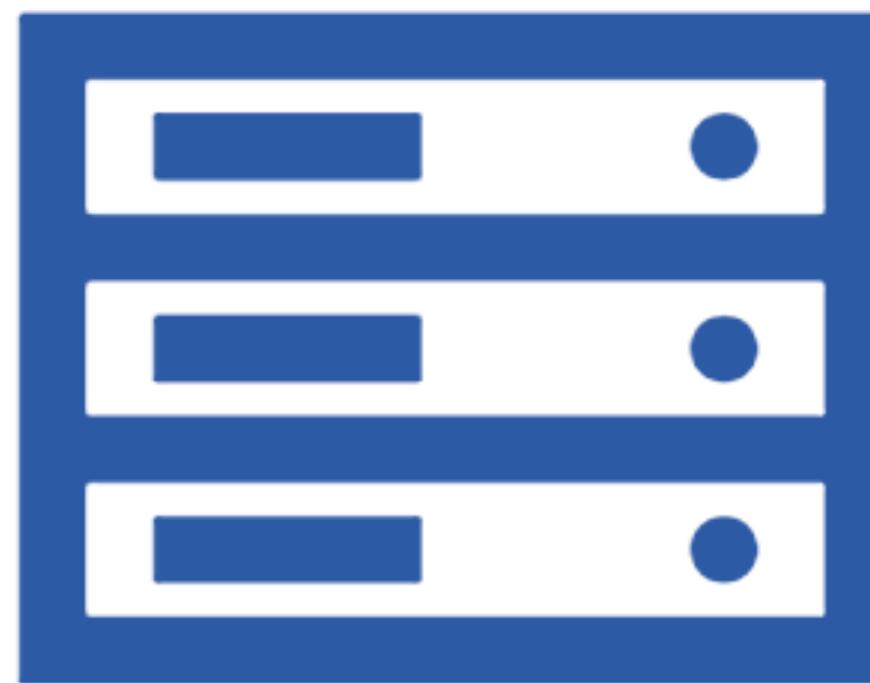
- Discuss the role of a database and its management system.
- Draw Entity Relationship (ER) diagram from an application problem and reproduce this diagram into a set of normalised relations, which are ready for database implementation.
- Design a NoSQL database suitable for a distributed environment 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®

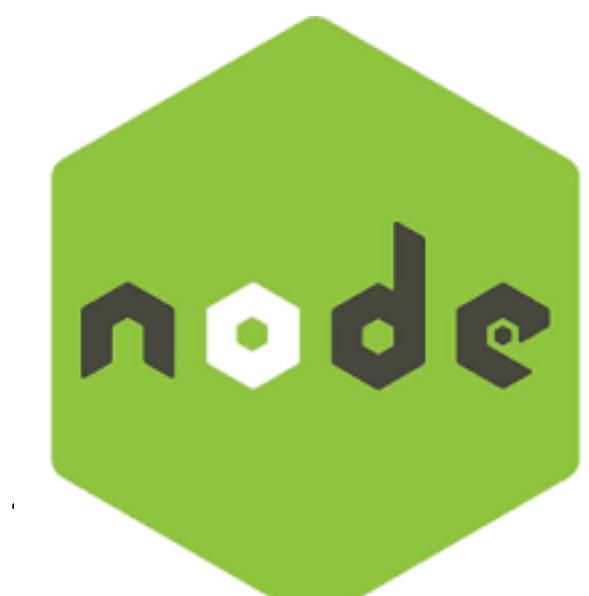
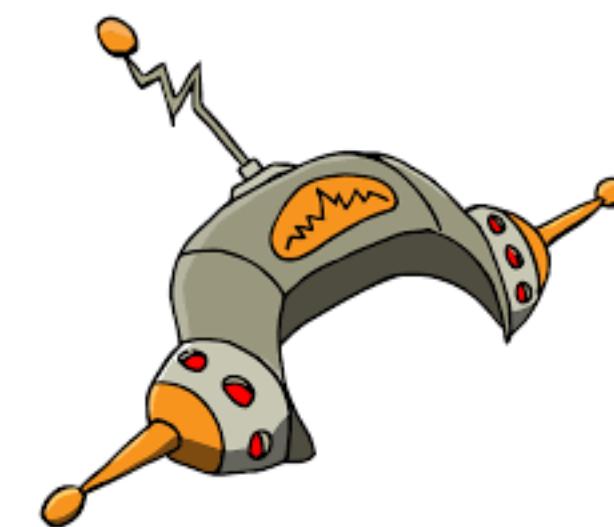
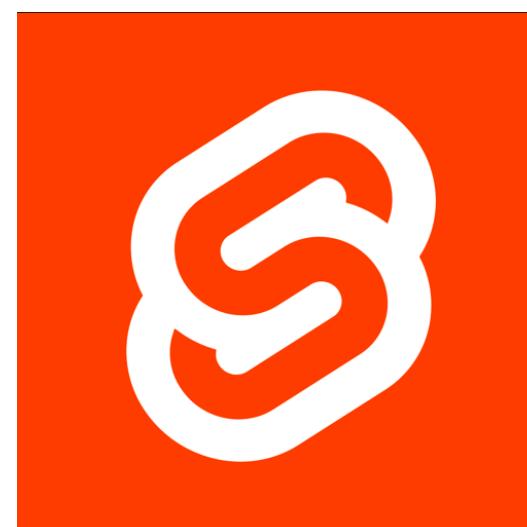
 mongoDB®

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



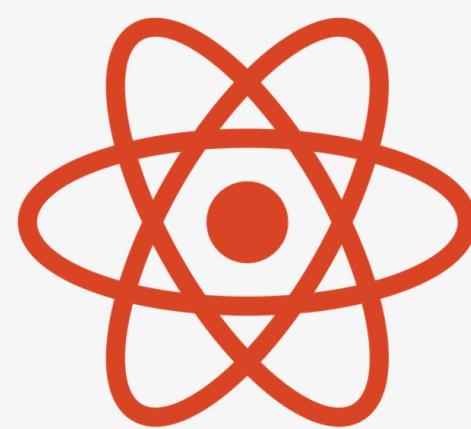
- Demonstrate specific security problems that can arise with web applications and how to address them.
- Compare and contrast alternative approaches to authentication in both enterprise and consumer-oriented web applications.
- Use a selection of best security practices in a web application.

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

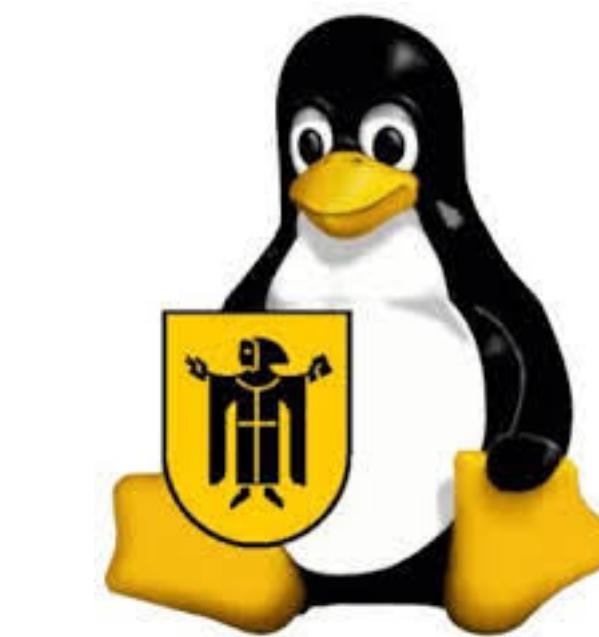


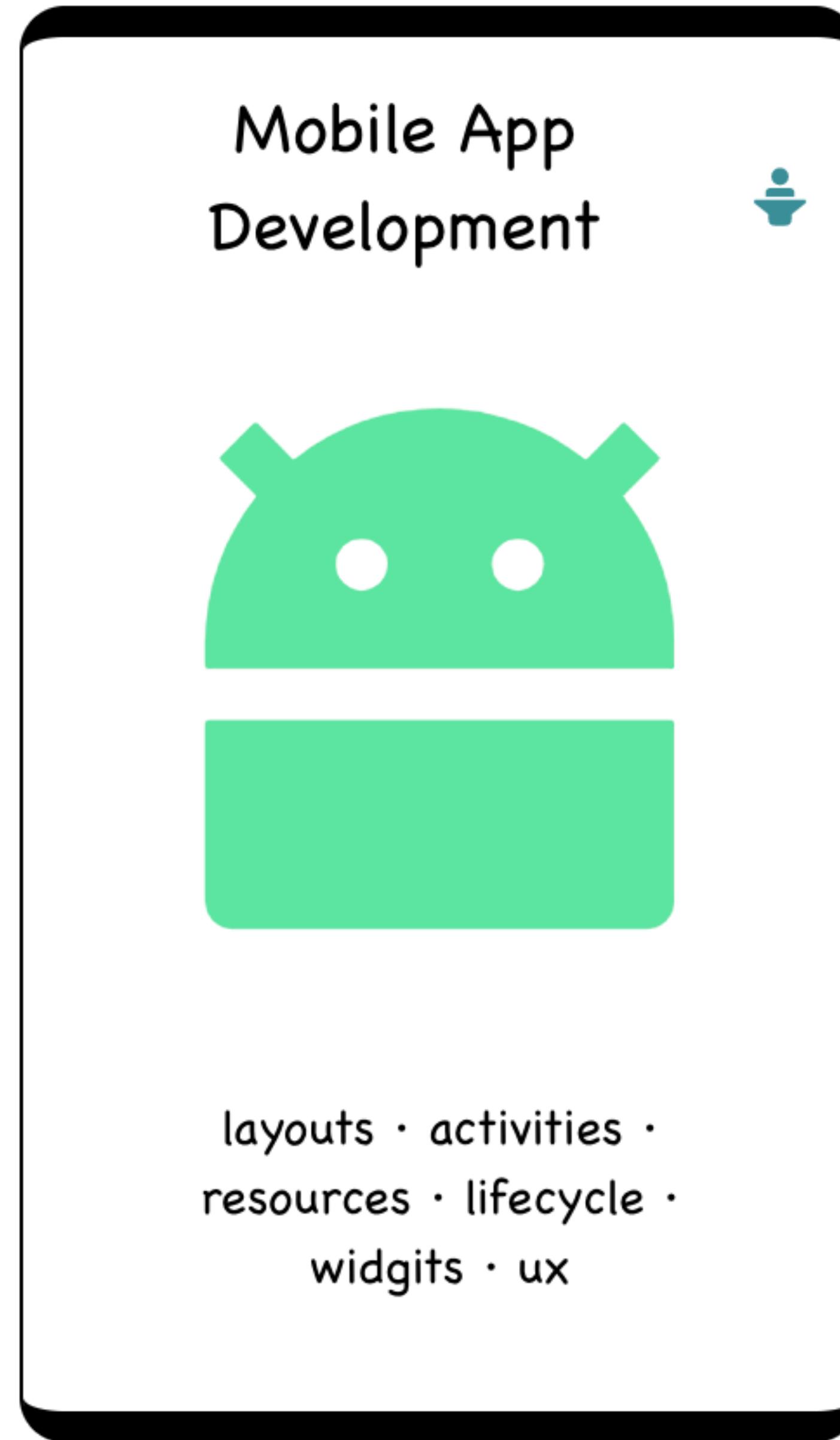
Developer Operations



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.



