INSTITUTE OF SOFTWARE TECHNOLOGIES

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JUNIOR SOFTWARE ENGINEER – TRAINING SCHEDULE

JavaScript

Duration of unit: 5 Days * 6 hours

Unit Description

This unit covers the competencies required to apply fundamentals and advanced of JavaScript, develop a JavaScript Program, define functions and create Arrays, Use JavaScript Objects, Apply Object oriented in JavaScript, working with JavaScript data structures.

Summary of Learning Outcomes

1. Apply fundamentals of JavaScript
2. Develop a JavaScript Program
3. Define functions and create Arrays
4. Use JavaScript Objects
5. Apply Object oriented in JavaScript
6. Working with JavaScript control structures

Learning Outcomes, Content and Suggested Assessment Methods

Day	Learning outcome	Contents	Evaluation Methods
Day 1333	1. An Introduction	❑ An Introduction to JavaScript ❑ Manuals and specifications ❑ Code editors ❑ Developer console	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments

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Day	Learning outcome	Contents	Evaluation Methods
	2. JavaScript Fundamentals	❑ Hello, world! ❑ Code structure ❑ The modern mode, "use strict" ❑ Variables ❑ Data types ❑ Interaction: alert, prompt, confirm ❑ Type Conversions ❑ Basic operators, maths ❑ Comparisons ❑ Conditional branching: if, '?' ❑ Logical operators ❑ Nullish coalescing operator '??' ❑ Loops: while and for ❑ The "switch" statement ❑ Functions ❑ Function expressions ❑ Arrow functions, the basics ❑ JavaScript specials	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments
	3. Code quality	❑ Debugging in the browser ❑ Coding Style ❑ Comments ❑ Ninja code ❑ Automated testing with Mocha ▪ Polyfills and transpilers	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments

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Day	Learning outcome	Contents	Evaluation Methods
Day 2	4. Objects	❑ Objects ❑ Object references and copying ❑ Garbage collection ❑ Object methods, "this" ❑ Constructor, operator "new" ❑ Optional chaining '?.' ❑ Symbol type ❑ Object to primitive conversion	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments
	5. Data types	❑ Methods of primitives ❑ Numbers ❑ Strings ❑ Arrays ❑ Array methods ❑ Iterables ❑ Map and Set ❑ WeakMap and WeakSet ❑ Object.keys, values, entries ❑ Destructuring assignment ❑ Date and time ❑ JSON methods, toJSON	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments
	6. Advanced working	❑ Recursion and stack ❑ Rest parameters and spread syntax	❑ Observation ❑ Oral assessment

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Day	Learning outcome	Contents	Evaluation Methods
	with functions	❑ Variable scope, closure ❑ The old "var" ❑ Global object ❑ Function object, NFE ❑ The "new Function" syntax ❑ Scheduling: setTimeout and setInterval ❑ Decorators and forwarding, call/apply ❑ Function binding ❑ Arrow functions revisited	❑ Trainee presentation ❑ Written assessments
Day 3	7. Object properties configuration	❑ Property flags and descriptors ❑ Property getters and setters	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments
	8. Prototypes, inheritance	❑ Prototypal inheritance ❑ F.prototype ❑ Native prototypes ❑ Prototype methods, objects without __proto__	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assessments
	9. Classes	❑ Class basic syntax ❑ Class inheritance ❑ Static properties and methods	❑ Observation ❑ Oral assessment ❑ Trainee presentation

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Day	Learning outcome	Contents	Evaluation Methods
		❑ Private and protected properties and methods ❑ Extending built-in classes ❑ Class checking: "instanceof" ❑ Mixins	❑ Written assessments
	10. Error handling	❑ Error handling, "try...catch" ❑ Custom errors, extending Error	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assesments
	11. Promises, async/await	❑ Introduction: callbacks ❑ Promise ❑ Promises chaining ❑ Error handling with promises ❑ Promise API ❑ Promisification ❑ Microtasks ❑ Async/await	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assesments
Day 4	12. Data structure	❑ **Space & Time Complexity** ✔ Introducing Space and Time complexity ✔ Native methods & JavaScript ✔ Big O notation ✔ Big O Loop ✔ Big O Property Lookup ✔ Big O: Push, Shift & unsift	❑ Observation ❑ Oral assessment ❑ Trainee presentation ❑ Written assesments

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Day	Learning outcome	Contents	Evaluation Methods
		❑ **Iterative Sorts** ✔ Bubble sort ✔ Insertion Sort ❑ **Recursion** ✔ Merge Sort ✔ Quick Sorts ❑ **List** ✔ Array List ✔ Linked List ❑ **Trees** ✔ Binary Search tree ✔ Self-balancing AVL Tree ✔ Depth First Trees ✔ Breadth First Tree ✔ Heap Sort	
Day 5	13. Applying Algorithms	✔ Graph Data Structures ✔ Path Finding ✔ Tries ✔ Recursion Application - Traversing hierarchical data structure - FileSystem / Organization Structure / Family Tree	❑

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Day	Learning outcome	Contents	Evaluation Methods

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer
- Guided learner activities and research to develop underpinning knowledge
- Supervised activities and projects in a workshop
- Group discussions
- Presentations, practical demonstrations and exercises
- Workplace experiential learning
- Supervised activities and projects
- Case studies
- Simulation

Recommended Resources

Tools 1. Text editors 2. Computer Software 3. Browser 4. Internet
Equipment Computer CD/DVD Drive
Materials and supplies ● Digital instructional material including DVDs and CDs

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Reference materials
Trainer-recommended resources including web resources

Databases

Duration of Unit: 2 days * 6 hours

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Unit Description:

This unit covers the competencies required to Apply Key Database Concepts, Model Real-Life situations using Entity-Relationship Diagram, Manage Database Tables, Create Database Relationships, query a database and apply Object oriented Data Model.

Summary of Learning Outcomes:

1. Apply Key Database Concepts
2. Model Real-Life situations using Entity-Relationship Diagram
3. Manage Database Tables
4. Create Database Relationships
5. Query a database
6. Apply Object oriented Data Model

Learning Outcomes, Content and Suggested Assessment Methods

Day	Learning Outcome	Content	Suggested Assessment Method
Day 1	1. Introduction	❑ Relational Database - Mysql / Postgres / Sql Server ❑ NoSql Mongo	❑ Written tests ❑ Oral tests ❑ Practical Tests
	2. Relational Databases	**Database Design** ✔ Tables ✔ Keys and Relations ✔ Constraints ✔ DDL **Data Manipulation** ✔ Queries ✔ Joins	❑ Written tests ❑ Oral tests ❑ Practical tests

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		✔ Stored Procedures / Functions ✔ try catch ✔ Transaction	
Day 2	3. No SQL	❑ Documents and Collections	❑ Written tests ❑ Oral tests ❑ Practical tests
	5. UML	❑ Sequence diagram ❑ Database diagram ❑ Flow charts	❑ Written tests ❑ Oral tests Practical tests

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised practical assignments and projects
-

Recommended Resources

Tools ● MYSQL ● MongoDB
Equipment ● Computers
Materials and supplies ● Instructional materials ● Stationery
Reference materials • Trainer-recommended resources including web resources

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GIT and GITHUB

Duration of Unit: 2 days * 6 hours

Unit Description:

This unit specifies required competencies to manage collaborative development using Git and GitHub. It involves applying basic and advanced Git and GitHub concepts, using git and GitHub repositories, applying Git branching and merging, git foundations, stashing, git history and implementing developer collaboration using Git

Summary of Learning Outcomes:

1. Apply basic Git and GitHub concepts
2. Use Git and GitHub repositories
3. Apply Git branching and merging
4. Apply git stashing
5. Apply git history
6. Implement developer collaboration using Git

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Method
Day 1	❑ Data Storage Life Cycle ❑ Git Blobs and Trees ❑ Git commits	❑ Practical tests ❑ Written tests ❑ Oral tests
	❑ Working area, Staging Area, Repository ❑ Staging and Stashing	❑ Practical tests ❑ Written tests ❑ Oral tests

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	❑ References ❑ Tags & Annotated Tags ❑ Detached Head & Dangling commits ❑ Branching ❑ Merging and Fast Forward ❑ Merging conflicts	
Day 2	❑ Git Log ❑ Git show & Diffs ❑ History and Diffs ❑ Rebase & Amend	❑ Practical tests ❑ Written tests ❑ Oral tests
	❑ GitHub vs Git ❑ Remotes ❑ Forks, Pull Requests, & Upstream ❑ GitHub workflow	❑ Practical tests ❑ Written tests ❑ Oral tests

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised practical assignments and projects

Recommended Resources

Tools
• Git • Github account

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Equipment
Materials and supplies ● Instructional materials ● Stationery
Reference materials ● Trainer-recommended resources including web resources

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RESTful API using Node.js and MySQL

Duration of Unit: 6 days * 6 hours

Unit Description:

This unit specifies required competencies to create RESTful API using Node.js and MySQL. It involves applying basic and advanced Node.js, Express and MySQL concepts, creating a database to for adding, updating and removing data.

Summary of Learning Outcomes:

1. Apply basic and advanced Node.js, Express and MySQL concepts
2. Use Express framework to create Routing
3. Defining Models and Controllers
4. Implementing node.js and express authentication

Learning Outcomes, Content and Suggested Assessment Methods

Day	Learning Outcome	Content	Suggested Assessment Method
Day 1	1. Introduction	❑ API ❑ REST ❑ Node.js for APIs ❑ Express ❑ MySQL	❑ Practical tests ❑ Written tests ❑ Oral tests

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Day 2	2. Express	❑ Environment setup for express ❑ Setting up Routes ❑ Routing & middleware ❑ Custom middleware ❑ REST routes with express ❑ Route Order ❑ Router & Sub Routes ❑ Router Verb Methods	❑ Practical tests ❑ Written tests ❑ Oral tests
Day 3	3. Data modelling	❑ Data modeling with MySQL ❑ Transition from schemas to models	❑ Practical tests ❑ Written tests ❑ Oral tests
Day 4	4. Controllers & Models	❑ Overview ❑ Express Response Object ❑ CRUD operations ❑ CRUD Controller Design Overview	❑ Practical tests ❑ Written tests ❑ Oral tests
Day 5	5. Auth	❑ JSON Web Token authentication ❑ Secure APIs with JWT ❑ Protect Routes with JWT	❑ Practical tests ❑ Written tests ❑ Oral tests

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer;

- Guided learner activities and research to develop underpinning knowledge;
- Supervised practical assignments and projects

Recommended Resources

Tools ● Text Editor ● Browser ● Node.js ● Postman ● Dockers ● Internet connectivity
Equipment ● Computer
Materials and supplies ● Instructional materials ● Stationery
Reference materials ● Trainer-recommended resources including web resources

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DevOps

Duration of Unit: 5 days * 6 hours

Unit Description

This unit specifies competencies required to increase the organization speed to deliver software applications and services. It involves remote desktop, Linux, virtual machines, Dockers, FTP and web hosting concepts.

Summary of Learning Outcomes

1. Control computer remotely
2. Writing shell scripts
3. Connecting with remote devices
4. Apply virtualization
5. Dockerizing applications
6. Transfer of files over the internet

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods

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Day 1	❑ Remote Desktop	❑ Practical tests ❑ Oral tests ❑ Written tests
Day 2	❑ Shell Scripting ❑ Putty	❑ Practical tests ❑ Oral tests ❑ Written tests
Day 3	❑ Introduction ❑ Types & Lifecycle ❑ Installations and configurations ❑ Running OS in Virtual Machines	❑ Practical tests ❑ Oral tests ❑ Written tests
Day 4	❑ **Getting started with Docker** ✔ What is Docker? ✔ What is the difference between VM and Containerization? ✔ Installing Docker ✔ Download your first image ✔ Docker Flow ❑ **Handling Docker Containers** ✔ Run your first container ✔ Terminology ✔ Working with Docker image ✔ Working with interactive container	❑ Practical tests ❑ Oral tests ❑ Written tests

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	❑ Building images ✔ Docker's integrated image building system ✔ A quick overview of the Dockerfile's syntax ✔ Dockerfile build instructions ✔ How to remove images ✔ How to remove containers ❑ Publishing image ✔ Understanding the Docker Hub ✔ How to push images to the Docker Hub ✔ Automatic building of images ✔ Private repositories on the Docker Hub ✔ Creating organisations on the Docker Hub ❑ **Running services in a container** ✔ Overview of container networking ✔ Envisaging Container as a Service (CaaS) ✔ Exposing container services	

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	❑ Sharing data volumes ✔ Sharing volumes between containers ✔ Practicality of data sharing between containers ✔ Sharing volumes between host and container ✔ Practicality of host data sharing ✔ Avoiding common pitfallsFF ✔ Filesystem vs. Volume **Orchestrating containers** ✔ Linking containers ✔ Orchestrating ✔ Example of docker-compose **Testing with Docker** ❑ Overview of TDD ❑ Testing your code inside Docker ❑ Integrating Docker testing into Jenkins ❑ **Debugging containers** ✔ Control groups	

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	✔ Docker debugging commands ❑ **Securing Docker containers** ✔ Is Docker secure? ✔ Best practices for container security ❑ **Running your private Docker infrastructure** ✔ The Docker registry and index ✔ Docker registry use cases ✔ Run your own index and registry ✔ Push the image to a newly created registry ❑ **Swarms** ✔ Set up your Docker environment ✔ Build an image and run it as one container ✔ Scale your app to run multiple containers ✔ Distribute your app across a cluster	

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	✔ Stack services by adding a backend database ✔ Deploy your app to production	
	❑ FTP Client	❑ Practical tests ❑ Oral tests ❑ Written tests
Day 5	❑ IIS ❑ nginx	❑ Practical tests ❑ Oral tests ❑ Written tests

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised practical assignments;

Recommended Resources

Tools ● Windows OS ● Linux Ubuntu OS ● Virtual Machines ● Servers
Equipment ● Computer
Materials and supplies ● Instructional materials ● Stationery

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Reference materials

- Trainer-recommended resources including web resources