Digital & Technology Solutions

Degree Apprenticeship

QAC020X328

Software Engineering and DevOps

Level 6

20 credits

Written by: Peter Behague

Checked by: Matt Phelan (Oct 24)

Programme Leader Approval: Michal Sikora

Approved for Single / Multiple Use:

Review (Multiple Use): 12 months from creation

Assessment brief

This assessment brief includes the Coursework Section of the Assessment for your module. Where a module has multiple components, these are listed below. It will provide outline details of the examination and specific instructions for any coursework elements.

Component 1: Portfolio (75%)

Description: Various development artefacts and a 3,000-word report

Component 2: Professional Discussion/Viva (25%)

Description: 7 mins. *Submitted as a recorded video/ppt presentation with audio and video*

*Both Components must be attempted*

Submission Details

|  |  |  |
| --- | --- | --- |
| **Component** | **Date** | **Time** |
| Assignment | Friday of Week 10 – Details on VLE Submission Point | 14:00 |

Module Learning Outcome Assessment Matrix

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Portfolio** | **Viva** |
| Build a secure complex application from a given business idea. | X |  |
| Appraise the programming concepts and syntax, especially from a security perspective, used to build a secure complex application. |  | X |
| Apply a DevOps systems development approach to the building of a secure complex application. | X |  |
| Compare and contrast the key skills, tools and techniques, roles and responsibilities that support the systems development process from a DevOps perspective with other approaches. |  | X |

# Component 1:

## Portfolio

Total Marks: 100 marks (75%)

Word Count: 3,000 words

Note, that the word count only includes words within the main body of the assignment from the start of the first task to the end of the last task. Words in diagrams are ignored unless deliberately wordy. The words in the Program logic, Cover Sheet, Table of Contents, Bibliography and Appendices are not counted.

**All submissions must have a completed Cover Sheet (see Appendix A) attached to your submission.**

# Component 2:

Viva

Total Marks: 50 marks (25%)

Word count: The overall time limit is 7 mins (± 10%)

This is a simulated Viva that will support the development of your skills required in future Viva environments. The submission is the creation of a formal video presentation, that will involve answering a pre-defined set of questions. The video will be assessed on your ability to answer the questions, understanding of the topic and critical appraisal of the project, as well as your choice of techniques and tools used.

See [LINK](https://www.youtube.com/watch?v=Y5dgwwa5XRA) for instructions for making a narrated PowerPoint video.

Component 1 - Portfolio

## Coding Specification

**Instructions**

Please carefully read the full Assessment Brief including the Marking Rubric before starting your assignment and to check with your tutor, if necessary, to ensure that you have fully understood what is required.

**Requirements**

You are required to design, develop, and test a **secure** complex web application in Python and Flask or other web development technology using a DevOps systems development approach with a supporting description of the programming concepts and syntax, and the DevOps systems development processes used.

The application should be based on something of relevance to your job role and/or organisation. For example, this could be to manage IT Assets, Help Desk Tickets or Customer Details. Note, you may need to simplify your real data to fit the brief. This is fine, but if are unsure seek guidance from your tutor.

The application should include a simple (Maximum of 4 tables) database that can be implemented as tables in an SQLite database. The tables in the finished database should contain several sample records (rows) for testing purposes. Table columns should include a range of appropriate data types. Suitable fields should be included to act as the Primary and Foreign Keys. It is important that the database is held at a centralised location such that all web users interact with the same data.

The web application should allow users to browse records from at least one of the tables in the database, it should also allow them to add, update and delete records from some or all the tables.

Ideally the web app will cater for both regular users and administrators. Administrators should have the ability to make changes to the underlying database data that regular users cannot do.

Validation should be included so that the user cannot perform an invalid action or enter non-conformant data for a field. Appropriate error messages should be displayed when validation rules are breached.

**Guidelines**

* Your solution should adhere to the basic design guidelines of modularisation by dividing the functionality up into appropriate elements.
* Ensure the quality and readability of your code by following basic programming guidelines such as naming conventions, indentation, comments and refactoring to avoid duplication of logic.
* Usability should be considered. For example, after completing an option, the user should be shown an appropriate message that indicates the success or failure of their action. Also, to confirm with the user before quitting the application or deleting a record.
* The app must be demonstrably secure from attacks that attempt to exploit any relevant OWASP Top 10 vulnerabilities.

Task 1 DevOps Overview (20 Marks)

For your organisation/department/team as appropriate compare, contrast and critically evaluate the key elements of your current IT development and operations approach with DevOps guidelines and best practices. Use a conceptual framework, such as CALMS or The Three Ways, to structure your overview and ensure you cover all the major aspects.

Task 2: Develop Secure Application (50 Marks)

Using an *APPROPRIATE ENVIRONMENT AND LANGUAGES/TOOLS/DATABASE* design, build and test a secure application that satisfies the requirements and guidelines.

***Evidence required:***

* ***A brief summary/explanation of the application.***
* ***A zip file of all coding artefacts, including the SQLite database and automated unit tests or include a document that includes a link to the repository containing all necessary artefacts. This should enable the application to be executed and tested by your tutor.***
* ***Screenshots and/or video evidence of app defending itself from attacks that attempt to exploit at least three different OWASP Top 10 vulnerabilities.***
* ***Also, include the source code for all coding artefacts as text (copy/paste) in the appendices (this is not included in the total word count).***

Task 3: Supporting Artefacts (20 Marks)

Provide an explanation of the elements you used (or could have used) from the DevOps/Development/Deployment Pipeline in the development of your web application. Explain what each of the elements does, how you may have used it and where possible provide evidence of its use in your (or another work based) development:

See: <https://opensource.com/article/19/4/devops-pipeline>

* Continuous Integration/Continuous Deployment (CI/CD) Tool – GitLab/GitHub
* Source Control Management (SCM) – Git
* Build Automation Tool – A-A-P (Python)
* Web Application Server – Django or Flask (Python)
  + Containers – Docker
  + Middleware Automation Tools - Puppet
* Code Testing/Quality – UnitTest/PyTest/Coverage/Hypothesis (Python)
* Automated test plan specifically including security tests

***Evidence required:***

* ***A brief summary/explanation of the artefacts.***
* ***Evidence of artefact use.***

Academic Conventions (10%)

Your application code and related artefacts should adhere to secure programming guidelines such as naming conventions, indentation, comments and refactoring to avoid duplication of logic.

Screen displays and messages should be well presented, using consistent formatting, with correct spelling, punctuation, and grammar where appropriate.

The supporting documentation and report should likewise be well presented, using consistent formatting, diagrams, and images where appropriate, with correct spelling, punctuation and grammar. At a minimum, it should include:

* A fully completed Cover Sheet including correct word count - See Appendix A
* A Table of Contents
* A Bibliography, listing where appropriate any references that were cited in your report. Relevant references should be cited and formatted using the [Harvard style](https://libguides.roehampton.ac.uk/c.php?g=604242&p=4247622).
* Your website code should also be contained in a bibliography and at set of any referenced that were cited in the code. Relevant code references should be cited and formatted using the [(PDF) Referencing within Code in Software Engineering Education! (researchgate.net)](https://www.researchgate.net/publication/233473922_Referencing_within_Code_in_Software_Engineering_Education)

Component 1 - Evidence to be uploaded:

***Two******separate submissions are required via Canvas:***

* ***A single Word document (.docx file) that contains:***
  + ***Task 1 DevOps Overview***
  + ***Task 2 Develop Application – Brief summary/explanation of application/code.***
  + ***Task 3 Supporting Artefacts – Brief summary/explanation of artefacts.***
  + ***Appendix A Source Code and supporting artefacts - Copy/Paste as text.***
* ***A zip file of all coding artefacts, including automated unit tests if applicable or include a document that includes a link to the repository providing access to unit test and automation processes. This should enable the application to be executed and tested by your tutor.***

# Component 2 – Viva

The presentation will be marked out of 50 – **Up to 10 marks** can be awarded for the quality of your video submission. This will be awarded on overall organisation, oral fluency, and attention to detail. Strict adherence to the time limit is a necessity, (see penalties below for deviation from the 7-minute length of the stipulated video).

**Technical Information**

The video can be designed in PowerPoint or similar application.

You may also prepare your video in any other suitable film or presentation medium or appropriate “social media App”.

**Academic criteria and Professional context**

Your presentation should include:

* Proposals for your organisation/department/team (select as appropriate) to compare, contrast and critically evaluate the typical approach taken to systems development from a DevOps perspective.
* An Evaluation of how closely the roles and responsibilities of people in your organisation/department/team (select as appropriate) reflect those of an idealised DevOps environment.
* Highlight a key piece of code that protects the website created in your assignment from a specified OWASP top 10 vulnerability and critically evaluate its capabilities.
* Suggest, with justifications, a single key development that could be achieved (or undertaken) to further improve the security of the website created for your assignment.

It is advisable to plan and rehearse your video to last for SEVEN minutes, as strict adherence to the time limit is a necessity. A video of **less than SEVEN minutes** could compromise your opportunity to complete the assessment to the required standard.

For a video of **more than SEVEN minutes**, the following penalties will apply:

|  |  |  |
| --- | --- | --- |
| Up to 10% | Up to 7 mins 42 secs | No penalty |
| Between 11 and 15% | Up to 8 mins 3 secs | A discretionary penalty of no more than 3 marks may be applied |
| Between 16 and 40% | Up to 9 mins 48 secs | A penalty of 5 marks will be applied |
| Above 40% | More than 9 mins 48 secs | A penalty of 8 marks will be applied |
| Any penalties will be reflected in the feedback given | | |

**References:**

Your submission for all Tasks is expected to be referenced throughout. You will be using in-text citations, provide a reference list (or bibliography), and identify appropriate academic papers to support your work.

Traditional websites such as technical blogs and Wikis should not be used.

Section 2 General Assessment Brief Guidance

Supporting Assessment documentation, rules and regulations.

To view the academic rules and guidance documents for the topics listed below please follow this link to the Degree Apprenticeship Handbook (DAH) module in Canvas: <https://canvas.qa.com/courses/1041>

If you are unable to access this module, please contact [academicservices@qa.com](mailto:academicservices@qa.com) who will be able to resolve this for you.

The guidance found in the DAH includes:

* University of Roehampton Academic Regulations
* Regulations & Quality Assurance Overview
* Key contacts
* Mitigating Circumstance documentation
* Academic misconduct Procedure
* Final degree award calculation
* Appeals guidance
* Examination regulations
* Student feedback committees
* External examiner reports

Marking Rubric

*Component 1: Portfolio*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Criteria** | **Outstanding**  **80% -100%** | **Excellent**  **70% - 79%** | **Very Good**  **60% - 69%** | **Good**  **50% - 59%** | **Pass**  **40% - 49%** | **Poor**  **0% - 39%** |
| **Task 1**  **DevOps Overview**  **[20 Marks]** | **Outstanding**  **[16 to 20 Marks]**  An outstanding overview, comparison, contrast and critically evaluation of your approach with DevOps guidelines, that exceeds all requirements. | **Excellent**  **[14 to 15 Marks]**  An excellent overview, comparison, contrast and critically evaluation of your approach with DevOps guidelines, that meets all requirements. | **Very Good**  **[12 to 13 Marks]**  A very good overview, comparison, contrast and critically evaluation of your approach with DevOps guidelines, that meets most requirements. | **Good**  **[10 to 11 Marks]**  A good overview, comparison, contrast and critically evaluation of your approach with DevOps guidelines, that meets key requirements. | **Basic**  **[8 to 9 Marks]**  A basic overview, comparison, contrast and critically evaluation of your approach with DevOps guidelines, that meets some requirements. | **Poor**  **[0 to 7 Marks]**  A poor overview, comparison, contrast and critically evaluation of your approach with DevOps guidelines, that meets few or no requirements. |
| **Task 2**  **Develop Secure Application**  **[50 Marks]** | **Outstanding**  **[40 to 50 Marks]**  An outstanding application that executes and exceeds all requirements and guidelines.  The code is outstandingly modularised and utilises both files and functions in an exemplary manner.  Usability has been outstandingly considered with extreme attention to detail.  Code is outstandingly refactored with no duplication.  Validation of all data is exemplary and utilises a model approach to error logging.  The storage and retrieval of data have been implemented outstandingly. | **Excellent**  **[35 to 39 Marks]**  An excellent application that executes and meets all requirements and guidelines.  The code is excellently modularised and utilises both files and functions in an almost flawless manner.  Usability has been excellently considered with thorough attention to detail.  Code is excellently refactored with little duplication.  Validation of all data is almost flawless with appropriate error logging being carried out.  The storage and retrieval of data have been implemented excellently. | **Very Good**  **[30 to 34 Marks]**  A very good application that executes and meets most requirements and guidelines.  The code has been very well modularised and utilises both files and functions in a very good way.  Usability has been very well thought through with very good attention to detail.  Code has been well refactored with moderate duplication.  Validation of most data has been very well carried out as has the logging of errors  The storage and retrieval of data have been very well implemented. | **Good**  **[25 to 29 Marks]**  A good application that executes and meets key requirements and guidelines.  The code has been well modularised and utilises functions in a well thought out way.  Usability has been well thought through with good attention to detail.  There is some evidence of refactoring but there are areas of logic that need attention.  Validation of data and error logging has generally been well carried out but there are some gaps.  The storage and retrieval of data have been well implemented with few problems. | **Basic**  **[20 to 24 Marks]**  A basic application that executes and meets some requirements and guidelines.  There has been some attempt at modularisation, but more could be done.  Usability is lacking with some limited messaging.  There is little evidence of refactoring.  Some validation of data and error logging has been done but there are some significant gaps.  An attempt has been made at the storage and retrieval of data but there are significant issues. | **Poor**  **[0 to 19 Marks]**  A poor application that may not execute and meets a few or no requirements and guidelines.  There has been little or no attempt at modularisation.  Usability is lacking with little or no messaging.  There is no evidence of refactoring.  Little or no attempt has been made at the validation of data or error logging.  Little or no attempt has been made at the storage and retrieval of data. |
| **Task 3**  **Supporting Artefacts**  **[20 Marks]** | **Outstanding**  **[16 to 20 Marks]**  An outstanding set of supporting artefacts that exceeds all requirements. | **Excellent**  **[14 to 15 Marks]**  An excellent set of supporting artefacts that meets all requirements. | **Very Good**  **[12 to 13 Marks]**  A very good set of supporting artefacts that meets most requirements. | **Good**  **[10 to 11 Marks]**  A good set of supporting artefacts that meets key requirements. | **Basic**  **[8 to 9 Marks]**  A basic set of supporting artefacts that meets some requirements. | **Poor**  **[0 to 7 Marks]**  A poor set of supporting artefacts that meets few or no requirements. |
| **Academic Conventions**  **[10 marks]** | **Outstanding**  **[8 to 10 Marks]**  An outstanding presentation of application code, artefacts, output, documentation and report that exceeds requirements.  An extensive range of relevant literature and online resources are used to inform work.  Faultless accurate and assured use of academic conventions. | **Excellent**  **[7 Marks]**  An excellent presentation of application code, artefacts, output, documentation and report that meets all requirements  A wide range of relevant literature and online resources are used to inform work.  Consistently accurate and assured use of academic conventions. | **Very Good**  **[6 Marks]**  A very good presentation of application code, artefacts, output, documentation and report that meets most requirements  A broad range of relevant literature and online resources are used to inform work.  Mostly accurate and assured use of academic conventions but with some minor errors. | **Good**  **[5 Marks]**  A good presentation of application code, artefacts, output, documentation and report that meets key requirements.  A general range of relevant literature and online resources are used to inform work.  Generally accurate and assured use of academic conventions but with some key errors. | **Basic**  **[4 Marks]**  A basic presentation of application code, artefacts, output, documentation and report that meets some requirements.  A limited range of relevant literature and online resources are used to inform work.  Some accurate and assured use of academic conventions but with many errors. | **Poor**  **[0 to 3 Marks]**  Poor presentation of application code, artefacts, output, documentation and report that meets a few or none of the specified requirements.  Little or no use of relevant literature and online resources are used to inform work.  Little or no accurate and assured use of academic conventions with significant errors. |

*Component 2: Viva*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Criteria** | **80 – 100 %** | **70 - 79 %** | **60 – 69 %** | **50 - 59 %** | **40 to 49 %** | **0 to 39 %** |
| **Task 4 – Part 1** | *An outstanding comparison and evaluation of the organisation’s approach to systems development from a DevOPS perspective. Outstanding evaluation of how the organisation’s, roles and responsibilities reflect those of an idealised DevOPS environment.* | *An excellent comparison and evaluation of the organisation’s approach to systems development from a DevOPS perspective. Excellent evaluation of how the organisation’s, roles and responsibilities reflect those of an idealised DevOPS environment.* | *A very good comparison and evaluation of the organisation’s approach to systems development from a DevOPS perspective. Very good evaluation of how the organisation’s, roles and responsibilities reflect those of an idealised DevOPS environment.* | *A good comparison and evaluation of the organisation’s approach to systems development from a DevOPS perspective. Good evaluation of how the organisation’s, roles and responsibilities reflect those of an idealised DevOPS environment.* | *A basic comparison and evaluation of the organisation’s approach to systems development from a DevOPS perspective. Basic evaluation of how the organisation’s, roles and responsibilities reflect those of an idealised DevOPS environment.* | *A limited comparison and evaluation of the organisation’s approach to systems development from a DevOPS perspective. Limited evaluation of how the organisation’s, roles and responsibilities reflect those of an idealised DevOPS environment.* |
| **20 marks** | 16 – 20 marks | 14 -15 marks | 12 -13 marks | 10 - 11 marks | 8 – 9 marks | 0 – 7 marks |
| **Task 4 – Part 2** | *An outstanding example of protective logic with exemplary evaluation of its capabilities. Outstanding suggestion and justifications of further security improvement.* | *An excellent example of protective logic with exemplary evaluation of its capabilities. Excellent suggestion and justifications of further security improvement.* | *A very good example of protective logic with exemplary evaluation of its capabilities. Very good suggestion and justifications of further security improvement.* | *A good example of protective logic with exemplary evaluation of its capabilities. Good suggestion and justifications of further security improvement.* | *A basic example of protective logic with exemplary evaluation of its capabilities. Basic suggestion and justifications of further security improvement.* | *A limited example of protective logic with exemplary evaluation of its capabilities. Limited suggestion and justifications of further security improvement.* |
| **20 marks** | 16 – 20 marks | 14 – 15 marks | 12 – 13 marks | 10 – 11 marks | 8 - 9 marks | 0 – 7 marks |
| **Formal Presentation** | *An outstanding video submission. This included a very effective narrative, with delivery of clear and accurate content. Outstanding organisation and attention to detail, including very high standards in maintaining interest, pace and timings.* | *An excellent video submission. This included a very effective narrative, with delivery of clear and accurate content. Excellent organisation and attention to detail, including high standards in maintaining interest, pace and timings.* | *A very good video submission. This included an effective narrative, with delivery of clear and accurate content. Very good organisation and attention to detail, including high standards in maintaining interest, pace and timings.* | *A good video submission. This included a somewhat effective narrative, with delivery of accurate content. Good organisation and attention to detail, including some high standards in maintaining interest, pace and timings.* | *A basic video submission. This included a somewhat effective narrative, with delivery of some accurate content. Basic organisation and attention to detail, somewhat lacking in the required standards in maintaining interest, pace and timings.* | *A limited video submission. This included a somewhat effective narrative, with delivery of some accurate content. Limited organisation and attention to detail, ultimately lacking in the required standards in maintaining interest, pace and timings.* |
| **10 marks** | 8 - 10 marks | 7 marks | 6 marks | 5 marks | 4 marks | 0 – 3 marks |

Appendix A

**ASSIGNMENT COVER SHEET**

|  |  |  |
| --- | --- | --- |
| **Student’s name** | (First name) | (Last name) |
| **Module name** |  | |
| **Title of assignment** |  | |
| **Complete Word Count in my assignment** |  | |
| **Date submitted** |  | |

All work must be submitted by the due date. If an extension of time to submit work is required, a [Mitigating Circumstances Extension Form](https://canvas.qa.com/courses/1041) must be submitted.

**Has an extension been approved? Yes No If yes, please give the new submission date ….…/..…./…….**

|  |
| --- |
| IMPORTANT: THIS STATEMENT MUST BE READ & SIGNED  **Academic Integrity Statement**  Academic integrity and honesty are fundamental to the academic work you produce at the University of Roehampton. You are expected to complete coursework that is your own and which is referenced appropriately. The university has in place measures to detect academic dishonesty in all its forms. If you are found to be cheating or attempting to gain an unfair advantage over other students in any way, this is considered academic misconduct, and you will be penalised accordingly.   ​  **I declare that the work I am submitting is my work, is properly referenced and has not been submitted elsewhere.** |
| **Student Signature (Full Name):**  **Date:** |