

**BQA NCQF Qualification Template**

DNCQF.FDMD.GD04

Issue No.: 01

| QUALIFICATION SPECIFICATION  |  |  |  |                                  |  |                   |  | SECTION A |  |
|--|--|--|--|----------------------------------|--|-------------------|--|-----------|--|
| <b>QUALIFICATION DEVELOPER</b>   |  | Botho University                         |  |                                  |  |                   |  |           |  |
| <b>TITLE</b>   |  | Bachelor of Science in Mobile Computing  |  |                                  |  | <b>NCQF LEVEL</b> |  | 7         |  |
| <b>FIELD</b>   |  | Information and Communication Technology |  | <b>SUB-FIELD</b>                 |  | Mobile Computing  |  |           |  |
| New qualification  |  | <b>X</b>                                 |  | Review of existing qualification |  |                   |  |           |  |
| <b>SUB-FRAMEWORK</b>   |  | General Education                        |  |                                  |  | TVET              |  |           |  |
|  |  |  |  |                                  |  | Higher Education  |  | <b>X</b>  |  |
| <b>QUALIFICATION TYPE</b>  |  | Certificate                              |  |                                  |  | Diploma           |  |           |  |
|  |  | Bachelor Honours                         |  |                                  |  | Master            |  |           |  |
| <b>CREDIT VALUE: 480</b>   |  |  |  |                                  |  |                   |  |           |  |
| <b>RATIONALE AND PURPOSE OF THE QUALIFICATION</b>  |  |  |  |                                  |  |                   |  |           |  |
| <p><b>Rationale:</b></p> <p>Human Resource Development Council (HRDC) of Botswana has published a document in 2016 which provides a list of occupations that have been identified by the employers as being in high demand at a national level. Priority skills in each occupation have been identified and these include both the core skills and soft skills (HRDC, 2016).</p> <p><i>'Information and Communication Technology'</i> has been identified as one of the occupations that are currently experiencing shortages in the labor market (short term) and occupations that show relatively strong employment growth (long term) (HRDC, 2016). BSc Mobile Computing qualification has been developed to feed this employment growth with job ready graduates. To ensure responsiveness of the qualification to the economic needs of Botswana, the design of the qualification not only included technical side of mobile computing modules, but also soft skills in the areas of entrepreneurship, life skills, research, job and wealth creation, mobile commerce, disaster recovery and business continuity, statistics and probability, and Information Technology Law. These modules combined prepare graduates of this qualification for the world of work, changes in the world around them, and life in general.</p> |  |  |  |                                  |  |                   |  |           |  |

The market need analysis which was conducted among potential students, alumni and industry stakeholders helped to identify the demand for BSc in Mobile Computing qualification. “An 89.7% from alumni indicated that they would recommend anyone for this qualification, and the industry showed that they would accommodate mobile computing students for internship in their companies”. “Skills indicated in industry and alumni responses, are parallel to qualification modules (unit standards) shown in the qualification structure, indicating a potential in the market, and that companies will be willing to work with the institution to develop and improve the qualification”.

According to Statistics Botswana's Information & Communications Technology Statistics Report 2015, Mobile cellular telephone subscriptions increased from 3,410,507 in 2014 to 3,475,327 in 2015, registering a growth of 1.9 percent. During the period under review, Internet subscriptions rose by 39.2 percent from 2,524,013 subscriptions in 2014 to 3,512,172 in 2015 for both mobile and fixed internet subscriptions. Mobile internet subscriptions accounted for more than 98% of the increase from 2,496,146 subscriptions in 2014 to 3,475,327 in 2015. The BSc in Mobile Computing addresses the needs of such users by addressing needs of learners through inclusion of modules such Fundamentals of Internet Technologies, Mobile Application Development, Mobile Game Development, Web Content Development, Mobile Hardware Troubleshooting and Mobile Application Security.

One of the main findings of e-Readiness Study in the Maitlamo document is: “while technical infrastructure and Internet access are important parts of the ICT puzzle, the most important piece is human capital and a workforce that is capable of maximizing the benefits of the ICT infrastructure for social, economic and cultural benefits. Botswana will need to focus many of its ICT efforts, and budget, on learning and the development of technologically literate students if it is to create a vibrant future in the networked world.” The BSc in Mobile Computing qualification structure and modules addresses this through its diversified contemporary modules that address both theoretical and practical knowledge in such modules as Mobile Communications, Mobile Adhoc Networks, Mobile Technologies for Health, Mobile Forensics, Cloud Computing and Information Technology Law.

Given the fact that there are more mobile phones in the world than conventional computers and more mobile phones in the Botswana than there are people, it is perhaps not surprising then that mobile and embedded devices are the primary means by which many people now access the internet. This has opened up exciting opportunities for people who know how to design, create and use mobile computing

devices. To be an effective practitioner in this area requires the ability to stay up-to-date with rapidly changing technologies and the competence to apply these technologies effectively. BSc in Mobile Computing qualification equips students through modules such as Mobile Interaction Design, Mobile Application Development, Mobile Game Development, Web Content Development Practice, Mobile Hardware Troubleshooting, Mobile Internet Applications and Services.

In a nutshell, the development of BSc in Mobile Computing qualification has been influenced by reports and policy documents such as; Human Resource Development Council (HRDC), Statistics Botswana's Information & Communications Technology Statistics Report 2015, Maitlamo, Vision 2036, Vision 2016, and Mobile Computing Market Analysis.

An industrial survey was conducted to establish whether the qualification was viable. The responses from the survey were positive with aspiration and conviction that the qualification was contemporary, needed, and sustainable.

**Purpose of the qualification:**

The purpose of the qualification is to provide students with an education in mobile computing that will enable them to develop the skills, knowledge and understanding necessary to pursue a career in industry, commerce or education. The overall goal of the qualification is to aid the nation at large in reforming our contemporary economy as Botswana through the use of mobile technologies. This national goal is informed by the newly launched Botswana Vision 2036 aimed at achieving prosperity for all as it cites the need to “leverage leading information communication technology (ICT) as a key contributor to economic growth and employment whilst also enabling an efficient private and public sector” (Vision 2036). The qualification aims to empower students not only as potential employees crucial to our development but also as future entrepreneurs that would propel our economy by addressing the need for jobs and technological prowess for a sustainable development (Vision 2036).

**ENTRY REQUIREMENTS (including access and inclusion)**

Entry into this qualification is through any one of the following requirements;

- 1) The minimum entry requirement is BGCSE or other equivalent with passes in relevant subjects..
- 2) Certificate V or Diploma in a related Field, with provisions for exemptions, where applicable, in line with CATS and RPL Policies.
- 3) Applicants that do not meet the above criteria but possess relevant industry experience will be considered through recognition of prior learning (RPL).

**QUALIFICATION SPECIFICATION  
B**

**SECTION**

**GRADUATE PROFILE (LEARNING OUTCOMES)**

**ASSESSMENT CRITERIA**

Apply different concepts, principles and technologies of mobile computing to guide effective implementation of mobile computing solutions.

- Describe the concepts of mobile operating systems and mobile communications.
- Explain the concepts and demonstrate the practical implementation of relational database management systems.
- Explain about the internet technologies, protocols and internet networking.
- Demonstrate the integration of mobile technologies with healthcare industry, as an applicable area of mobile technologies.

Design and develop individual innovative, secured mobile applications and websites using multiple programming languages and databases.

- Interpret the android security architecture and demonstrate their ability to individually implement the security features.

|   |  |
|---|--|
|   | <ul style="list-style-type: none"> <li>• Demonstrate their ability to use mobile databases with major mobile application platforms such as IOS and android.</li> <li>• Explain the theoretical aspect and demonstrate the practical aspect of web content development.</li> </ul>  |
| Demonstrate and apply advanced knowledge and understanding of the crucial concepts, practices, legal aspects and ethics and hence enable graduate employment in applications of Mobile Computing. | <ul style="list-style-type: none"> <li>• Describe the knowledge on internet applications, services and distributed systems.</li> <li>• Apply mathematical concepts and principles for computing programmes.</li> <li>• Interpret mobile computing essentials and Computer system architecture concepts.</li> <li>• Demonstrate the use of Microsoft excel and Google collaborative tools.</li> <li>• Explain the concepts in software engineering critical for more advanced software development projects.</li> <li>• Apply the awareness on application of substantive law, ethics and regulation to IT activities.</li> </ul> |
| Synthesize the current knowledge in the field of Mobile Computing by applying research methodologies and Techniques.  | <ul style="list-style-type: none"> <li>• Demonstrate the in-depth knowledge of new or emerging mobile technologies.</li> <li>• Analyze future trends in healthcare technologies and wireless telemedicine.</li> <li>• Conduct a research in an academically appropriate manner and, report the process and findings.</li> <li>• Identify mobile cell phone faults and solve them.</li> </ul>   |

|   |   |
|---|---|
| <p>Design and implement mobile applications for IOS, android and hybrid platforms, through the integration of object-oriented programming concepts, different tools and technologies.</p>                     | <ul style="list-style-type: none"> <li>• Illustrate the possibilities of Interactive Mobile Applications and dynamic differences in Mobile Design.</li> <li>• Demonstrate the ability to develop highly interactive and interesting games.</li> <li>• Design and implement mobile solutions for android, IOS and hybrid platforms.</li> <li>• Apply the concepts and demonstrate the practical experience of object-oriented programming.</li> <li>• Illustrate the basic programming skills essential to work with any programming languages.</li> </ul> |
| <p>Integrate the current techniques, skills, and tools necessary for Mobile computing practice.</p>   | <ul style="list-style-type: none"> <li>• Interpret the different tools and parts required to repair faulty mobile phone.</li> <li>• Demonstrate the assembly and disassembly of a mobile cell phone.</li> <li>• Describe the ability to troubleshoot hardware and software problems.</li> <li>• Illustrate the in-depth knowledge of concepts and techniques of mobile commerce.</li> </ul>   |
| <p>Critically analyze the existing systems and solve complex problems through development of innovative mobile computing solutions and critically evaluate them in a real time project-based environment.</p> | <ul style="list-style-type: none"> <li>• Explain the knowledge areas within the Mobile Computing project management discipline.</li> <li>• Analyze, Identify and solve complex mobile computing problems.</li> <li>• Demonstrate the entrepreneurial process and its components.</li> <li>• Apply appropriate mobile computing solutions to achieve specific objectives.</li> </ul>   |

|   |   |
|---|---|
|   | <ul style="list-style-type: none"> <li>• Demonstrate the ability to generate and critically analyze business theory, concepts and new venture ideas.</li> </ul>   |
| Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. | <ul style="list-style-type: none"> <li>• Demonstrate the deep understanding of leadership principles and practices in Mobile Computing.</li> <li>• Illustrate the characteristics and approaches inherent to successful leadership of Mobile Computing teams.</li> <li>• Demonstrate the ability to lead teams to achieve business objectives through the effective use of mobile technology.</li> <li>• Develop and test mobile applications to support business services or functions.</li> </ul> |

**Mapping of Exit learning outcomes of the qualification to NCQF's knowledge, skills and competency**

| <b>Exit learning outcome</b> | <b>Knowledge</b> | <b>Skills</b> | <b>Competence</b> |
|------------------------------|------------------|---------------|-------------------|
| EL1                          |                  |               |                   |
| EL2                          |                  |               |                   |
| EL3                          |                  |               |                   |
| EL4                          |                  |               |                   |
| EL5                          |                  |               |                   |
| EL6                          |                  |               |                   |
| EL7                          |                  |               |                   |
| EL8                          |                  |               |                   |

| <b>QUALIFICATION STRUCTURE</b>                                      |                                    |              |                  |
|---|------------------------------------|--------------|------------------|
|   |                                    |              | <b>SECTION C</b> |
| <b>FUNDAMENTAL COMPONENT</b><br>Subjects / Units / Modules /Courses | <b>Title</b>                       | <b>Level</b> | <b>Credits</b>   |
|   | Professional Issues and Ethics     | 6            | 10               |
|   | Academic Writing for STEM          | 6            | 10               |
|   | Entrepreneurship and Innovation    | 8            | 20               |
|   |                                    |              |                  |
| <b>CORE COMPONENT</b><br>Subjects / Units / Modules /Courses        |                                    |              |                  |
|   | Computer and its Essentials 1      | 5            | 10               |
|   | Mathematics                        | 5            | 10               |
|   | Operating Systems and Hardware     | 5            | 20               |
|   | Programming Logic and Design       | 5            | 10               |
|   | Mobile Computing Essentials        | 6            | 20               |
|   | Computer and its Essentials 2      | 6            | 10               |
|   | Computer System Architecture       | 6            | 10               |
|   | Database Management Systems        | 6            | 10               |
|   | Database Management Practice Lab   | 6            | 10               |
|   | Mobile Hardware Troubleshooting    | 6            | 10               |
|   | Software Engineering               | 6            | 10               |
|   | Programming using C++              | 6            | 20               |
|   | Mobile Data Communications         | 6            | 10               |
|   | Mobile Operating Systems           | 6            | 10               |
|   | Programming Using Java             | 6            | 20               |
|   | Web Design and Development         | 6            | 10               |
|   | Web Design Practice Lab            | 6            | 10               |
|   | Mobile Application Development - 1 | 7            | 20               |
|   | Mobile Databases                   | 6            | 10               |
|   | Internet Technologies              | 7            | 10               |
|   | Mobile Application Security        | 7            | 10               |

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|   |  |   |    |
|---|--|---|----|
|   | Mobile Application Development - 2         | 7 | 20 |
|   | SMS Integration and Applications           | 7 | 10 |
|   | Research Methods for STEM                  | 7 | 10 |
|   | Professional Practice in Computing         | 7 | 40 |
|   | Mobile Game Development                    | 7 | 10 |
|   | Hybrid Mobile Application Development      | 7 | 10 |
|   | Research Project 1: Proposal Writing       | 7 | 10 |
|   | Mobile Forensics                           | 7 | 10 |
|   | Mobile Ad-hoc Networks                     | 7 | 10 |
|   | Research Project 2: Dissertation           | 8 | 20 |
|   | Cloud Computing and Security               | 7 | 10 |
| <b>ELECTIVE COMPONENT</b><br>Subjects / Units /<br>Modules /Courses   | Distributed Systems                        | 7 | 10 |
|   | Mobile Technologies for Health             | 7 | 10 |
|   | Mobile Internet Applications and Services. | 7 | 10 |
|   | Information Technology Law                 | 8 | 10 |
|   | Mobile Electronic Commerce                 | 8 | 10 |
|   | Mobile Interaction Design                  | 8 | 10 |
| <b>Rules of combinations, Credit distribution (where applicable):</b> |  |   |    |

- This qualification will have at least 480 credits and take at least four years to complete including a full semester internship under the normal fulltime mode of study.
- The 40 credits internship module, called the Professional Practice module, may typically be done after the student has passed at least 240 credits worth of modules.
- The credit combination for this qualification is from 40 fundamental components, 420 core components and the remaining 20 is from elective component

**Credit Distribution:**

| Level and Credits  | Compulsory | Elective |
|--------------------|------------|----------|
| Level 5 Credits    | 50         | 0        |
| Level 6 Credits    | 190        | 0        |
| Level 7 Credits    | 180        | 10       |
| Level 8 Credits    | 40         | 10       |
| Total Credits: 480 | 460        | 20       |

**ASSESSMENT AND MODERATION ARRANGEMENTS**

**Assessment:**

**Integrated Assessment:**

Because assessment practices must be open, transparent, fair, valid, reliable and ensure that no learner is disadvantaged in any way whatsoever, an integrated assessment approach is incorporated into the qualification. Both formative and summative assessment processes are monitored during the qualification and to determine competence at the end of the qualification.

**Summative assessment:**

Integrated assessment, focusing on the achievement of the exit-level outcomes, will be done by means of a written examination (of at least 2 - 3 hours) at the end of every module (per module).

**Project:** Students need to do a project and submit their project work at the end of the qualification.

**Professional Practice:** All students will go through the work placement. Tutor assigned to student will visit the intern at workplace and do the evaluation. (15%). A second visit at the intern place is conducted and evaluation is completed (15%). Supervisor evaluates the intern and submits a report to the tutor (20%). At the end of professional practice, student will submit a project report (50%). All the marks from the internship, tutor visits, supervisor evaluation of intern and report will be captured in the form called 'internship report feedback form'. Monitoring of students' during internship is done using weekly logbook.

**Formative assessment:**

Learners are continuously assessed through:

- Practical test
- Class assignments
- Presentations
- Informal class tests
- Formal modular tests

**Pass requirements:**

A learner passes a module if he/she obtains a final mark of 50% or more in the module. The final mark is constituted of class participation (5%) the formative assessments (35%) and the summative assessment (60%). A learner qualifies for the BSc In Mobile Computing degree on NCQF level 7 when he/she passed all required modules individually. The final mark for the qualification is calculated by averaging the marks obtained in the various modules. The student should complete 480 credits to complete the qualification.

**Moderation:**

Moderation of assessments focuses on:

- a) Ensuring the assessment is aligned to the module objectives and the learning outcomes.
- b) Ensuring assessment is consistent on all levels within the institution and does not show any bias or academic disregard and that it is immune to all forms of prejudice.

- c) Ensuring the level of assessment appropriately matches to students' level of study. This ensures that the assessments remain viable, relevant and provide an accurate judgement of a student's achievements and level of knowledge.
- d) Maintaining consistency in the marking process

**Pre-assessment Moderation:**

This moderation is carried before assessment tasks are given to students. All submitted sets of question papers & marking keys are shared with the moderators. Each assessment pack should be moderated by two Moderators where possible. The question paper moderation report should be filled in for each question paper. Moderator report will be shared with question paper setter so that moderator feedback will be taken into account when finalizing the question paper.

**Post-assessment moderation or moderation of marking:**

Moderation of completed assessment tasks is categorized as post-assessment moderation. It is carried out after assessment tasks have been marked. The set of answer scripts and marking keys are shared with the moderators. At least 10% of the answer scripts in a module should be moderated during post assessment moderation.

**RECOGNITION OF PRIOR LEARNING (if applicable)**

A clear framework through which students can accumulate learning credits and transfer such credits toward appropriate qualifications helps to validate and recognize learning gained through formal and informal means, provides flexibility to students, and allows students to progress relatively seamlessly through their lifelong learning journey.

Candidates may apply for recognition of prior learning whether such learning has been gained through formal programmes of study, through workplace learning, or through any other formal or informal means. Any candidate applying for recognition of prior learning (RPL) will be expected to provide evidence of such learning that must be relevant, sufficient, valid, verifiable, and authentic. In addition, the candidate may be interviewed by a member of staff or have to take a formal test, which may include a live demonstration of skills and competencies, to assess competence.

## **PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)**

**Learning Pathway:** Those who have achieved the qualification can progress as mentioned below:

### **Vertical:**

Completion of a Bachelor's Degree in Mobile Computing meets the requirement for admission to a Bachelor's Degree Honours, Post-Graduate Diploma or Post-Graduate Certificate (NCQF level 7) in the same or a cognate field.

### **Horizontal:**

A BSc in mobile computing candidate could continue to pursue a Bachelor's degree program in any other university in the mobile computing specialized disciplines such as;

- BSc in Mobile Communications and Security
- BSc in Mobile Technologies
- BSc in Web and Mobile Development
- BSc in Gaming & Mobile Application Development

### **Employment Pathway:**

The Bachelor of Science in Mobile Computing is targeted at those wishing to become;

- Mobile Solution Specialists
- Mobile Application Developers
- Mobile Computing Analysts
- Game Developers
- Mobile Technicians
- Mobile Security Experts
- Mobile Applications Developers

Graduates of this qualification can choose several career paths which include jobs in fields such as mobile entertainment, wireless applications, online banking and so on.

## **QUALIFICATION AWARD AND CERTIFICATION**

The learner will be awarded '**Bachelor of Science in Mobile Computing**' after attaining 480 credits as specified in the rules of combination and credit distribution. This qualification does not have exit awards. Therefore, if the candidate does not need the prescribed minimum standards of the qualification the learner will exit with a transcript.

## **REGIONAL AND INTERNATIONAL COMPARABILITY**

This qualification was compared with various universities running similar qualifications. The following universities and their qualifications were taken for the comparisons:

**Local:** Not Available

**Regional:**

- BSc In Mobile Computing, ZCAS University, Zambia.
- BSc In Mobile Computing and Communications, Uganda Technology and Management University.

**International:**

- BSc In Mobile Computing, Hof University of Applied Sciences, Germany.

### **Summary of Benchmarking**

#### ***With ZCAS University:***

The following modules are available in both the qualifications: Programming Principles, Mobile Computing, Operating Systems Fundamentals, Computer System Architecture, Mobile Web Application Development, Wireless Application Services, Advanced Mobile Development, Hybrid Mobile Application Development, Entrepreneurship and innovation.

In addition, this qualification has modules like Programming Logic and Design, Academic writing for STEM, Mobile Hardware Troubleshooting, Internet Technologies, Research Methods for STEM, Mobile Game Development, Mobile Interaction Design, Mobile Adhoc Networks, Mobile Forensics, Professional Issues and Ethics. However, ZCAS University provides modules like Artificial Intelligence and Mobile Computing, Theory of Computation, The Business and Culture of Wireless and Calculus which are not included in this qualification.

***With UTAMU***

The following modules are available in both the qualifications: Project, Mathematics, Community engagement, Mobile Operating Systems, Device Hardware, Object oriented programming, wireless communication technology, Business communication, computer networks and data communication and Human Computer interaction.

UTAMU has modules like distributed real time systems, artificial intelligence, introduction to signal processing which are not found in this qualification. However, this qualification has additional modules like, web application development, mobile forensics, programming using java which are not part of UTAMU's qualification.

***With Hof University***

Database Design, Software Engineering, Communications, Database Implementation, Programming, Computer Technology, Computer System Security, Web development, Mobile Implementation are the common modules in both the qualifications.

This qualification has additional Modules such as Mathematics, Operating systems and Hardware, Programming Logic and Design, Computer System Architecture, Academic writing for STEM, Mobile Hardware Troubleshooting, Internet Technologies, Mobile Operating systems, Research Methods for STEM, Mobile Game Development, Mobile Interaction Design, Entrepreneurship and innovation, Mobile Adhoc Networks, mobile forensics, professional issues and ethics. Hof University provides modules like Management in IT, Information System in Organizations, and Currents Trends in Networking, Augmented reality, pervasive computing and ubiquitous computing.

(For more details, please refer **Appendix 6 Bench Marking**)

**REVIEW PERIOD**

5 Years