STUDENT MODULE HANDOUT FOR

APPLICATION DEVELOPMENT – DICT 312

Module code	**DICT312**
Programme name	**Diploma in Information and Communication Technology (DICT)**
School name	**School of Computing & Mathematical Sciences (SCMS)**
Faculty name	**Faculty of Agriculture & Natural Sciences (FANS)**

Compiled by:

Lecturer's Name	**Dr. O.S Ogunleye**
Building No	**Building 5**
Office No	**212**
Email address	**olalekan.ogunleye@ump.ac.za**
Telephone	**0130020227**

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1. WELCOME PAGE

1.1. Welcome and Introduction

On behalf of the University of Mpumalanga, we welcome you to the Diploma in Information and Communication Technology Programme with Application Development (DICT312) as a subject. This Student's Module Handout aims to provide written guidelines on what to expect of the University and what the University expects of you, the students, regarding this course.

Software development skills play an increasingly vital role in almost all occupations, contributing to productivity gains, innovation and employment growth across all South African and international industries. This leads to exciting career opportunities, especially in maiden areas such as Mpumalanga, where new jobs have been created and long-term career prospects continue to strengthen. Thus, this module is designed to expand your knowledge and skills in mobile app development.

Application Development is one of the compulsory subjects for year three of the Diploma in Information Technology. This exciting course will guide students in creating and developing advanced systems using Java and Jakarta principles. Learners will be able to understand Java (Jakarta) Servlets' complex logical operations to create Java objects, constructors and software packaging through Java's Jakarta Framework**.** Completing this subject offers vertical articulation within the ICT Diploma's Programme and is portable to another institution offering the same Programme.

The responsibilities of the students about participation and attendance are stated, and an overview of the learning and teaching approach is provided. Comprehensive assessment details for the course are given in this section, and details of the materials that will be used, e.g., textbooks.

1.2. Introduction to the Teaching Staff

Title and Surname	Building and Office No.	Telephone and Email address	Consultation
Dr O.S. Ogunleye	**Building 5 office 212**	**0130020227**	**By Appointment only**

1.3. Introduction to Academic Leadership

The Module (Application Development) forms part of the Diploma in Information and Communication Technology, and the Acting Programme Leader is Professor Billy Mathias Kalema.

The Programme is placed in the School of Computing & Mathematical Sciences, and the Head of the School is Professor N. Wayi-Mgwebi.

The school is part of the Faculty of Agriculture and Natural Science, and the Dean is Professor N. Ludidi.

This important information is summarised below:

Academic leadership position	Title and name	Building and Office No.	Telephone and Email address	Consultation
Programme Leader	Prof. B.M Kalema	Building 5 Office 205	0130020395 billy.kalema@ump.ac.za	By Appointment
Head of School	Prof. Wayi-Mgwebi	Building 5 Office 202	0130020206 N.Wayi-Mgwebi@ump.ac.za	By Appointment
Dean	Prof. N. Ludidi	Building 6	0130020208 Lilly.sithole@ump.ac.za	By Appointment

You will typically interact with your academic teaching staff and the Programme Leader as a student.

2. CURRICULUM STRUCTURE FOR THE MODULE

2.1. General information

The module is 15 credits, which is offered in the first semester.

The module is taught through lectures and practicals, with one lecture per week and one practical every week. The teaching timetable and venues are presented later.

2.2. Prerequisites and Co-Requisites

The prerequisite to this module is a DICT. However, students are requested to have a deep understanding of Java.

2.3. Progression from this Module

Students who take and pass Module DICT312 will be certified to have met one of the requirements of the DICT program.

2.4. Purpose of the Module

The module is designed to equip learners with advanced skills in enterprise application development. In this module, the practical implementation of theoretical concepts is pursued. The course is largely practical-based and consists of computer lab work. The software tools are the industry-standard Java, Jakarta and Application Server, mostly in a Windows environment. The topics covered are – Introducing the Jarkata EE and Cloud Computing, Jakarta Servlet, Jakarta Context Depency and Injection, Jakarta Restful Web Service, Jakarta Enterprise Bean, Jakarta Persistence, Jakarta Messaging, Jakarta Security, Jakarta Bean Validation.

Practical examples and exercises are used through presentations, making it a perfect choice for students with Java programming experience. Extra resources such as videos and prescribed textbooks expand and clarify topics, while a wealth of reviews and exercises in each chapter help students improve their coding skills.

Module Outcomes

At the end of this module, students will be able to:

- Outline the purpose and scope of the Jakarta architecture
- Develop web applications in Java using JSF's (Jakarta) Faces Servlet, faces-config.xml, and the JSF(Jakarta) request/response lifecycle
- Apply Facelets tag libraries to build JSF views
- Apply managed beams for encapsulation form handling and server-side presentation logic
- Implement control logic as Jakarta event listeners or action methods

- Use validators and converters to implement a validation phase for a JSF application
- Develop composite UI fragments or custom components using Facelets
- Develop Ajax applications with JSF (Jakarta): client-side behaviours and partial requests and responses followed by DOM updates

2.5. Module Content

Curriculum Structure for Module (DICT312)

	Lectures	Assessment	Practical
Week 1 & 2	Introduction to Jakarta EE and Cloud-Computing. • Understanding what Jakarta EE is • J2EE and Java EE • Cloud computing • Microservice architecture • Twelve-factors • Jakarta EE Goals • Jakarta EE Specification Process • Jakarta NoSQL • Eclipse Enterprise for Java • From Java EE to Jakarta EE • Jakarta EE 9 • Understanding the Jakarta EE Tiers • Jakarta EE profiles		Lab Activity (Creating A Jakarta Web Application) Installing and Configuring Glassfish Server

	• Server applications • Requirements for working with Jakarta EE		
Week 3	Jakarta Servlet • Understanding what Jakarta Servlet is • Creating a Servlet • Filtering the request and response • Understanding Forward and RequestDispatcher • Asynchronous processing • Using Nonblocking I/O • Using Server Push		Lab Activity (Configuring and Setting Up Enterprise Environment by Installing Maven,
Week 4	Jakarta Context and Dependency Injection (CDI) • Understanding Jakarta Context and Dependency Injection • Creating and injecting beans • CDI life cycle • Using producer method, producer field, and dispose method • Creating a CDI interceptor • Creating a CDI decorator • Using CDI event		Lab Activity: Creating and Injecting beans, Creating CDI interceptor, Using CDI event
Week 5	Semester Test	**Covering work done in Weeks 1,2, & 3**	

Week 6	Jakarta RESTful Web Service Jakarta Enterprise Bean • Jakarta RESTful web service • Creating a RESTful resource class • Creating a Jakarta RESTful client • Asynchronous invocation in the Client • Using CompletionStage • Understanding how to use server-sent events • Understanding the Jakarta Enterprise Bean • Session beans • Understanding the stateless bean, stateful bean, and singleton bean • Stateless bean • Stateful • Singleton • Understanding how the Jakarta Enterprise Bean manages the transaction • Container-managed transaction • Commit and rollback • Creating a schedule • Persistent schedule • Scheduling programmatically • Understanding how we		Lab Activities: Creating and Using Restful Service, Creating and using Stateful and Stateless Bean Using Singleton Creating and Persisting Schedule Creating Asynchronous invocation in Client

	can create message-driven beans		
Week 7	Jakarta Persistence Jakarta Message • Understanding the Jakarta Persistence • Entity • EntityManager • Creating an entity • Creating an entity relationship • Using JPQL • Controlling concurrent access to entity data • Creating fetch plans and entity graphs • Conclusion • Understanding the Jakarta Messaging • Queue • Topic • Message • Creating a producer to queue • Creating the consumer to queue • Creating a producer to topic • Creating a consumer to topic • Creating a consumer using message-driven bean		Lab Activities: Creating Entity and EntityManager Creating and using JPQ Controlling Concurrent Access to Data Creating Message and Using Message Queque
Week 8	Jakarta Security Jakarta Bean Validation	Lab Activities: Creating Identity Store, Creating Credentials	

	• Understanding Jakarta Security • HTTP authentication mechanism • Identify store • Credential • Context security • Securing a Web application • Securing Jakarta's RESTful resource • Implementing a user's authentication programmatically • Using custom form-based HTTP authentication • Securing a Jakarta Enterprise Bean • Implementing a Custom Identity Store • Understanding the Jakarta Bean Validation • Validating method • Validation annotations • Using bean validation in a RESTful resource • Validating persistence • Creating a custom constraint • Customising validator messages	Implementing User Authentication Using Bean Validation, Secure Enterprise Jakarta Bean, Implement Custom Identity, Validating Persistence, Create Custom Constraint, Implementing a user's authentication programmatically
Week 9	**Semester Test 2**	**Covering work done in Weeks 4, 6, 7 & 8**
Week 10	Revision and Consultation	
Week 11	Project Submission	
Week 12 & 13	Revision and Consultation	

Week 14	Consultation		

3. LECTURE INFORMATION (TIMETABLE, VENUE)

Each week, you will spend the following amount of time with your subject lecturer in the following ways to ensure that you fully engage with this subject's material.

Theory 1 x 120-minute periods per week

Practical 1x 180-minutes periods per week

NB: Subject to timetable changes

	08:00 09:50	10:00 10:50	11:00 12:50	13:00 17:00
Monday				
Tuesday	**DICT312**			
Wednesday			**DICT312**	
Thursday				
Friday				

4. LEARNING AND TEACHING STRATEGIES

The School of Computing and Mathematical Science(SCMS) supports various teaching strategies, including but not limited to outcome-based education, interactive teaching and learning, learner-centred, blended learning and any other teaching and learning style designed to produce an all-rounded graduate. **Learning Management Systems, such as Moodle, will also be used as a learning and teaching tool.**

5. ASSESSMENT AND EVALUATION

5.1. Assessment Methods

- ✓ Continuous, formative assessment: Throughout the semester, it is in the form of class tests, assignments, self-evaluation exercises, practical work, and a semester test. Dates for the formal assessment are included in the curriculum structure.
- ✓ Summative assessment in the form of the semester examination.

The calculation of the Final Module mark is as follows.

The continuous, formative assessment is worth 50% of the final mark, and the exam is worth 50%. The continuous, formative assessment is calculated from the various assessment tasks as follows:

- Project (Mini) 60%
- Semester Tests 30%
- Lab Tests 10%

Assessment	Date
Practical/Assignment	Every Wednesday
Quizzes	No specific dates, but you will be informed at least one day before the quiz date. The quiz may be part of the Semester Test Mark if needed. However, it is the lecturer's discretion to use the Quizzes.
Test 1	21 August 2024
Test 2	18 September 2024
Sick tet	**28 August 2024 for Test 1** **25 September 2024 for Test 2** **Note that these test dates are importants. Not test will or assessment will be conducted outside of these dates.** **To be allowed to sit for sick, Students must have a genuine reason backed by evidence. Such Evidence should be submitted directly to Ms. Lilly at the reception office and not to the Lecturer. Inability to provide this means students will not be allowed to sit for sick test.**

Table 1: Assessment Schedule

Assessment	Weight	Month	Test week
Semester Test 1 **Sick Test Test 1**	10%	August	**21 August 2024** **28 August 2024**
Semester Test 2 **Sick Test 2**	10%	September	**18 September 2024** **25 September 2024**
Lab Tests	10%	July to October	No Test
Project (Mini project)	70%	October	**Due Date: October 2nd**
Total (Predicate)	100%		

5.2. Assessment Criteria

In oral (discussions, presentations), written assignments (tests and exams) and project work, evidence of achievement of the stated outcomes will be demonstrated when students can provide/do the following:

Learning Outcomes	Assessment Criteria
1. Apply the object-oriented approach in programming. Be able to analyse and design a computer program to solve real-world problems based on object-oriented principles.	The student will employ object-oriented concepts to design and develop an Android application that will use content, images, and audio to solve real-world problem specifications.
2. Implement the basic components of an Android application.	Develop basic, simple applications like a calculator, where the output is displayed on the same screen.
3. Demonstrate the basics of event handling in Android	The student will develop an app that implements event listeners like ItemClickListeners, OnItemClickListener, ListViews and View Models.
4. Demonstrate how to use persistent storage	Students will be expected to create an app that will store data on the database. Two database systems will be introduced, one running locally and the other on the cloud.
5. Implement techniques of advanced programming	Students will be expected to demonstrate how to write fully functioning applications with audio, maps and online application features.

6. LEARNING MATERIALS

The following are the prescribed textbooks:

1. Title: Jakarta EE for Java Developers: Build Cloud-Native and Enterprise Applications Using A High-Performance Enterprise Java Platform
   Edition: 1st
   Author(s): Rhuan Rocha
   Year of Publication:2022
   Place of Publication: N/A
   Publisher: BPB Publications
   ISBN: 978-93-55510-082

The following are the recommended textbooks:

2. Title: Design Patterns and Best Practices in Java
   Edition: 1st
   Author(s): Torje L, Ianculescu A and Singh K
   Year of Publication: 2018
   Place of Publication: N/A
   Publisher: Packt Publishing
   ISBN: 978-1-78646-359-3

7. STATEMENT OF ROLES AND RESPONSIBILITIES

The lecturers' and learners' roles and responsibilities are clearly defined. These could be related to

7.1 Attendance of classes

Students are required to attend at least 80% of the classes to be eligible for the exam as stipulated in the University Academic policy. Attendance registers will be signed in all lectures. Students are expected to arrive at least five (5) minutes before the commencement of the lecture. Recaps and/ or updates on the lesson will not be provided for latecomers.

7.2 Absence from class and tests.

Absence from classes is not tolerated in any way. However, an exception for a special test may be given where circumstances that led to the absence could be justified through some evidence provided on paper. The school should be notified of such an incident no later than three days later.

In case of absenteeism from a test, a written proof will have to be provided as indicated below:

- In case of the death of an immediate family member or guardian – Proof of a death certificate will be required
- In case of sickness, a student – A sick note from a doctor will have to be provided with the practice letterhead and the doctor's practice number.
- Lately submitted assignments and projects will not be marked, and a zero allocation will be made in the score of the person concerned.
- The use of cell phones during practical or theory classes is prohibited. Students are expected to respect one another in class.

7.3 Extra Class Schedule

Students should be aware that they are enrolled as full-time students. Therefore, if there is a need for an additional lecture, the lecturer has the authority to schedule it, provided there is an available time slot that does not conflict with the existing timetable.

8. PLAGIARISM

Include a paragraph on plagiarism, what it is and how to avoid it. This can be a standard text used throughout your school. Ensure that it aligns with the Policy on the Promotion of Academic Integrity.
Dishonesty and plagiarism will not be tolerated. The University and the Faculty view the issue of plagiarism in a serious light. Evidence of plagiarism or dishonesty will be dealt with according to the University's and/or Faculty's Regulations.

Plagiarism is to:

- Present the ideas, words or results of another person as your own without acknowledging the original author;
- Use the ideas or words of another person without giving due credit to that person or source;
- Use sentences, paragraphs or parts of articles and books without quotation marks and/or appropriate acknowledgement;
- Download sentences, paragraphs or sections of writings from the Internet and use them without quotation marks and/or proper acknowledgement;
- Use another person's direct words without quotation marks, even when acknowledging the source.

Use ideas without making them properly your own, even though you might have acknowledged the original source;

- Formulate your words so closely to those of the original author that it is obvious that you could not have written them without having had the source next to you, i.e. your paraphrasing of the author's words is too close to the original author's use of the words, even if you did acknowledge your source.

Source: Booth, et al. and Schuklenk

If you use the words and ideas of other people, their words must be clearly indicated in quotation marks and used correctly. Their source must be indicated to avoid being guilty of plagiarism. No copying of textbooks is allowed.

Plagiarism is wrong because:

- It is theft of intellectual property.
- The person (plagiarist) lies about the contribution made to the project.
- The person (plagiarist) cannot give a true account of how the research was carried out.

Source: Udo Schuklenk (University of the Witwatersrand)

Benefits to be derived from consciously avoiding plagiarism:

By deliberately avoiding plagiarism, learners learn:

- The value of doing original work
- To develop professional skills such as doing research, giving attention to detail and analysing arguments;
- To act with honesty and integrity in their professional lives and
- To write professionally and engage in debate.

Source: Faculty of Law, the University of the Witwatersrand

9. GLOSSARY OF TERMS

Identify and explain the meaning of keywords and technical terms used in the guide/course /Programme that students will need to know to succeed in their studies.

Apply	Put to practical use or make use of a relevant equation or law.
Calculate	Determine the value using formulae or specific calculation methods.
Classify	Group concepts or subjects together based on certain characteristics or commonalities.
Compare	Point out the similarities and differences between objects or points of view. The word *contrast* can also be used.
Convert	Transform a quantity expressed in one unit to a quantity expressed in another unit.
Define	Give a short and clear description of a term or concept.
Demonstrate	Show clearly/prove/make clear by reasoning or evidence/illustrate and explain, especially with many examples.
Derive	Deduce or infer something from the given information.
Describe	Tell in detail how a process works or how a subject appears. You do not need to comment on the process or the subject or give your own point of view.

Differentiate	Find differences between objects or statements.
Discuss	Explain terms or concepts in your own words. Give comments or give your point of view.
Distinguish	Write down the differences between subjects or concepts.
Draw	Create a drawing, diagram or representation of a subject or concept.
Explain	Write about the subject in your own words. Clarify or give reasons – it may be useful to use examples or illustrations. You must prove that you understand the content.
Formulate	Express in a concise, systematic way.
Identify	Establish the identity or recognise a process.
Illustrate	Explain by means of detailed descriptions and drawings.
Interpret	Explain or clarify the meaning of a concept/value.
List/Name	Briefly write down the facts or main points.
Motivate	Give reason(s) for your answer.
Name	Nominate or specify a site or process.
Organise	Arrange data according to certain criteria.
Relate	Show the relation/connection of entities and how the concepts can be linked.
Solve	Find an answer by using critical thinking and/or calculations.
Summarise	Briefly state/list/write down only the most important details/facts.
Understand	Show insight into or know the meaning/nature of a concept or term to comprehend.

Approvals		
Program Leader	Name: Professor B. M. Kalema Signature:	Date: 23rd July 2024
Head of School	Name: Professor N. Wayi-Mgwebi Signature:	Date: 23rd July 2024