



**UNIVERSITY OF CAPE TOWN
DEPARTMENT OF ELECTRICAL ENGINEERING**

MOBILE AND WIRELESS NETWORKS

EEE4121F MODULE A

PROJECT 1

Date: 2 March 2023

First Report (Tasks 1-5) Due Date: **10 March 2023**

Final Report (Task 1-10) Due Date: **21 March 2023**

PROJECT 1

A heterogeneous wireless network consists of a number of radio access technologies (RATs) connecting users' devices and providing network services to users. In a heterogeneous wireless network, a vertical handover occurs when a call is handed over from one RAT to another RAT of a different technology. This project focuses on developing an algorithm for making handover decisions in a heterogeneous wireless network.

Using a multi-criteria decision-making technique, develop an algorithm for making vertical handover decisions for handover calls in a heterogeneous wireless network, and evaluate the performance of the algorithm. In the heterogeneous wireless network, assume that: (i) at least, there are three RATs, (ii) at least, each RAT can support one class of calls, (iii) at least, there are three criteria for making RAT-selection decisions, (iv) at least, there are six weight levels a user can assign to a RAT-selection criterion, and (v) all users' devices can support all available RATs.

Perform the following tasks:

1. Write a literature review on heterogeneous wireless networks, vertical handover algorithms, and a multicriteria decision making technique. The literature review should not be more than four pages in length, and it should contain some diagrams and references. (15 marks)
2. In the heterogeneous wireless network to be evaluated, specify the available RATs, the call(s) supported in each RAT, the RAT-selection criteria, the decision matrix, and the set of weights a user can assign to a RAT-selection criterion. (10 marks)
3. Illustrate the heterogeneous wireless network to be evaluated using a diagram. (5 marks)
4. Draw a flowchart showing the procedure for making RAT-selection decisions for vertical handoff calls in the heterogeneous wireless network. (10 marks)
5. For the multicriteria decision making technique chosen, write the equations for normalizing the decision matrix and write the normalized decision matrix. (10 marks)
6. Write the equation for ranking the available RATs for a vertical handoff call in the heterogeneous wireless network and illustrate how the ranking value for each RAT is obtained. (10 marks)
7. Evaluate the effect of the users' weight assigned to the first RAT-selection criterion on RAT-selection decisions for vertical handoff calls in the heterogeneous wireless network. Draw a bar chart to illustrate the effect and explain the reason for the results obtained. (15 marks)
8. Evaluate the effect of the users' weight assigned to the second RAT-selection criterion on RAT-selection decisions for vertical handoff calls in the heterogeneous wireless network. Draw a bar chart to illustrate the effect and explain the reason for the results obtained. (10 marks)
9. Evaluate the effect of the users' weight assigned to the third RAT-selection criterion on RAT-selection decisions for vertical handoff calls in the heterogeneous wireless network. Draw a bar chart to illustrate the effect and explain the reason for the results obtained. (10 marks)
10. Write a summary of the key findings of the project. (5 marks)

General Instructions

The first report (Project 1a) should contain Tasks 1-5 (**Due date: 10 March 2023**).

The final report (Project 1(a & b)) should contain Tasks 1-10 (**Due date: 21 March 2023**).

For your reports, use 1.2 line spacing, and Times New Roman font, with a font size of 12. Include your programming code in the final report. Submit your reports on Amathuba.