



**STATE UNIVERSITY OF MEDAN**

**THE EFFECT OF TPACK BASED DIFFERENTIATED  
COLLABORATIVE LEARNING MODEL TO INCREASE  
MOTIVATION AND PHYSICS PROBLEM SOLVING  
ABILITY IN SMA N 1 MERBAU**

**THESIS**

**Submitted to Fulfill The Requirements for  
The Degree of Bachelor of Education**

**By:**

**Desi Safitri**

**Reg Number: 4203121028**

**Bilingual Physics Education Study Program**

**PHYSICS DEPARTEMENT  
FACULTY OF MATHEMATICS AND SCIENCE**

**MEDAN  
APRIL 2025**