

## NON-HYPERELLIPTIC MODULAR CURVES OF GENUS 3

ENRIQUE GONZÁLEZ-JIMÉNEZ AND ROGER OYONO

ABSTRACT. A curve  $C$  defined over  $\mathbb{Q}$  is modular of level  $N$  if there exists a non-constant morphism  $X_1(N) \rightarrow C$  defined over  $\mathbb{Q}$  for some positive integer  $N$ . We present an algorithm to compute explicitly equations for modular non-hyperelliptic curves defined over  $\mathbb{Q}$  of genus 3. Let  $C$  be a modular curve of level  $N$ , we say that  $C$  is new if the corresponding morphism between  $J_1(N)$  and  $\text{Jac}(C)$  factorizes through the new part of  $J_1(N)$ . We compute equations of 44 non-hyperelliptic new modular curves of genus 3, that we conjecture to be the complete list of this kind of curves. Furthermore, we describe some aspects of non-new modular curves.