In 1986 Jerry Kovacic developed an algorithm for solving second order linear homogeneous differential equations with coefficients in $C(x)$, where $C$ is an algebraically closed field of characteristic zero, using the classification of the algebraic subgroups of $\text{SL}_2(C)$, since the differential Galois group associated to such an equation is realizable as an algebraic subgroup of $\text{SL}_2(C)$ after a possible change of variables.

In this talk we will discuss how to generalize Kovacic’s algorithm to compute the differential Galois group associated to a second order linear homogeneous differential equation with parameters. In this case the differential Galois group is realizable as a differential algebraic subgroup of $\text{SL}_2$, again after a change of variables. In this work we rely on William Sit’s classification of the differential algebraic subgroups of $\text{SL}_2$ as well as the representation theory of linear differential algebraic groups. (Received September 22, 2011)