In recent years, industrial and agricultural development has brought environmental waste problem. Composting, which is one of the valorization methods used to accelerate decomposition and stabilization of organic wastes, is well known and getting widespread. This study covers design and instrumentation of fifteen-automatically controlled laboratory scaled reactor composting systems based on engineering principles. With this system, basic scientific data (decomposition rates of composting materials, optimum temperature and moisture content, optimum aeration rates, mixing times, fan on/off times, etc) are will be available for construction of large-scale composting facilities and operation of composting process. The system consists of composting reactors, data acquisition and control system, aeration system, the O$_2$/CO$_2$ concentration measurement system, cumulative NH$_3$ measurement system and energy consumption measurement system. In this study, each component of this system will be introduced. This study has been conducted under the program of 1007 - Public Institutions Research Funding Program (KAMAG) of the Scientific and Technological Research Council of Turkey (TÜBİTAK).