1. Define the energy

$$E(t) = \int_0^1 u(x,t)^2 \, dx$$

For the constant solution $u \equiv 1$, we have

$$E(t) = \int_0^1 1^2 \, dx = 1 \quad , \text{ for all } t \geq 0 \quad \text{—} (*)$$

Since $f \equiv 0$, the energy estimate (2) becomes

$$E(t) \leq e^{-\gamma t} E(0)$$

$$\Rightarrow 1 \leq e^{-\gamma t} \cdot 1$$

However, for any $t > 0$, we have $e^{-\gamma t} < 1$, which contrdicts the inequality above.
Therefore, the energy estimate (2) does not hold in this case.