```
#define chargePin 13     // capacitor charge pin
#define dischargePin 11  // capacitor discharge pin

#define bufferSize 10      // data buffer length
#define dataDiff 3         // difference between "equal" values
#define startInterval 1000 // initial sampling interval (ms)
#define finalInterval 5000 // final sampling interval (ms)
#define slopeRef 250.0     // reference value for sampling interval computation
#define resistance 100   // value (ohm) of discharge resistor- era 98.1

unsigned long startTime = 0;
unsigned long currentTime = 0;
unsigned long dataInterval = startInterval;
unsigned long sensor0Value = 0;
unsigned long sensor1Value = 0;
unsigned long sensor2Value = 0;
unsigned long values[bufferSize];
unsigned int bufferIndex = 0;
unsigned int bufferOlder = 0;
boolean isDone = false;
boolean finalValue = false;

void  setup () {
  pinMode (chargePin, INPUT );            // high impedance
  pinMode (dischargePin, INPUT );         // high impedance
  Serial.begin (9600);                    // initialize serial communication
  for (int i = 0; i < bufferSize; i++) {  // initialize buffer
    values[i] = 0;
  }
  Serial.println ("");
  Serial.println ("Carica di un condensatore");
  Serial.println ("Scarica su di un LED");
  Serial.println ("-------------------------");
  delay(100);
}

void loop(){
  if (!isDone) {
    // CHARGING
    Serial.println("CARICA");
    pinMode (chargePin, OUTPUT );
    digitalWrite (chargePin, HIGH );   // start charging the capacitor
    sensor0Value = analogRead (analogCAP);
    currentTime = (micros () - startTime) / 1E6;  // time in seconds
    while (sensor0Value < 1021) {       // 1023 corresponds to 5 V  --- era 1010
      //Serial.print (100*sensor0Value/1023.0, 0); // print percentage
      //Serial.println ("%");
      Serial.println (sensor0Value); // print percentage
      delay(1000);
      sensor0Value = analogRead (analogCAP);
      currentTime = (micros () - startTime) / 1E6;
    }
    pinMode(chargePin, INPUT);
```

```
    // DISCHARGING
    Serial.println("SCARICA");
    Serial.println("tempo (s)     tensione (V)   corrente (mA)");
    Serial.println("-----------------------------------------");
    pinMode (dischargePin, OUTPUT );
    digitalWrite (dischargePin, LOW );   // start discharging the capacitor
    sensor0Value = analogRead (analogCAP);
    sensor1Value = analogRead (analogLED);
    sensor2Value = analogRead (analogSNK);
    startTime = micros ();    // begin experiment
    currentTime = micros ();  // time in seconds
    insertValue(sensor0Value);
    while (!isFinal()) {
      Serial.print ((currentTime - startTime)/1E6, 3);    // print elapsed time
      Serial.print ( "\t\t" );
      Serial.print (5*(sensor1Value-sensor2Value)/1023.0, 3); // print LED voltage (V)
      //Serial.print (5*sensor0Value/1023.0, 3); // print condenser voltage (V)
      //Serial.print (5*sensor2Value/1023.0, 3);  // debug: print sink voltage (V)
      Serial.print ( "\t\t" );
      Serial.println ((5.0/resistance)*(sensor0Value-sensor1Value)/1.023, 3); // print current (mA)
      if (dataInterval<finalInterval) {
        dataInterval = round(slopeRef/(sensor0Value-sensor1Value))*1000;
        if (dataInterval>finalInterval)
          dataInterval = finalInterval;
      }
      delay(dataInterval);
      sensor0Value = analogRead (analogCAP);
      sensor1Value = analogRead (analogLED);
      sensor2Value = analogRead (analogSNK);
      currentTime = micros ();
      insertValue(sensor0Value);
    }
    pinMode (dischargePin, INPUT );
    isDone = true;
    Serial.println("SCARICA TERMINATA");
  }
}

void insertValue(unsigned long value) {
  if (bufferIndex == bufferSize)
     bufferIndex = 0;
  values[bufferIndex] = value;
  bufferIndex++;
}
boolean isFinal() {
  bufferOlder = bufferIndex;
  if (bufferOlder == bufferSize)
     bufferOlder = 0;
  if (abs((int)sensor0Value - (int)values[bufferOlder]) <= dataDiff)
     return true;
  else return false;
}
```