Module name: **Electrical Circuits 1**
Module ID: **IS-FEE-10070W**
Module type: **Specialization Workshop**
Semester: **winter 2024/2025**
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Workshop 03 (25.11.2024)

1. Use the PSpice program to determine the currents flowing through the voltage sources in the circuit from the group task in Test 1, conducted during the classes. Compare the obtained results with the calculations performed during the test.

   The report should include:
   - an electrical circuit diagram,
   - an electrical circuit diagram (from the PSpice program) showing the determined current values,
   - conclusions: a comparison of the calculation results with the computer simulation results and an assessment of whether the rated current of the fuses is sufficient.

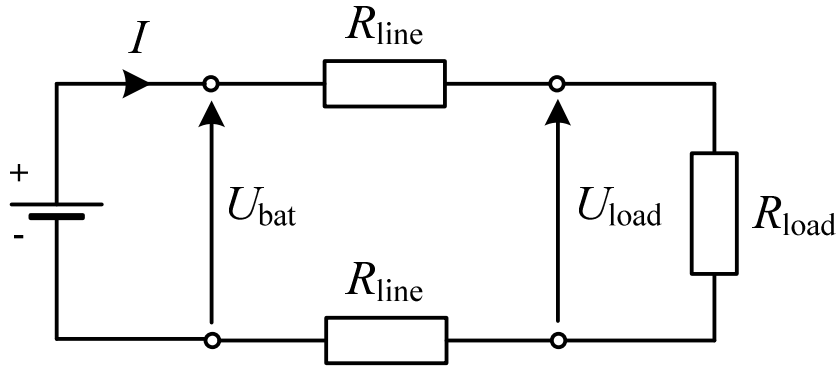
2. Use the PSpice program to determine the equivalent resistance of the circuit from the first individual task in Test 1, conducted during the classes. Power the circuit using a DC source and determine the current drawn by the circuit. Then, apply Ohm's Law to calculate the equivalent resistance. Finally, compare the obtained results with the calculations performed during the test.

   The report should include:
   - an electrical circuit diagram,
   - an electrical circuit diagram (from the PSpice program) showing the determined current value,
   - conclusions: a comparison of the calculation results with the computer simulation results.

3. Use the PSpice program to determine the currents flowing through the resistors in the circuit from the second individual task in Test 1, conducted during the classes. Calculate the power dissipated by each resistor and compare the obtained results with the calculations performed during the test.

   The report should include:
   - an electrical circuit diagram,
   - an electrical circuit diagram (from the PSpice program) showing the determined current values,
   - conclusions: a comparison of the calculation results with the computer simulation results and an assessment of whether the resistors' power rating is sufficient for the proper functioning of the circuit.

4. Electric water heater (boiler) with a heater power of P_n = 120 W is powered by U_{bat} = 12 V DC battery. The heater's operating voltage ranges from 10.8 V to 14.6 V. When the specified range is exceeded, the heater automatically turns off. A copper cable with a cross-section area of S = 2.5 mm^2 is used to connect the heater. Check whether the heater voltage will remain sufficient after connecting it with a cable of the following lengths: a) 5 m, b)10 m, c) 15 m. For simplicity, assume that the heater's power is constant. The electrical resistivity of copper at 20 °C is $\rho_{Cu} = 1.72 \cdot 10^{-8}$ Ω·m. The electrical circuit of the analyzed system is presented In the figure below.



   Calculate the R_{line} resistances for each cable length. Using PSpice, determine the U_{load} voltage drops across the R_{load} for each cable length.

   The report should include:
   - an electrical circuit diagram,
   - line resistance calculations for each cable length,
   - an electrical circuit diagram (from the PSpice program) showing the determined voltage values,
   - conclusions: an assessment of the cable length at which the system will function correctly.