**CURRICULUM MATERIAL DEVELOPMENT in VOCATIONAL EDUCATION THROUGH 3D PRINTING**
**2019-1-EE01-KA202-051698**

**LESSON PLAN**

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| **SUBJECT:** | **OHM'S LAW TRIANGLE** |
| **GRADE/CLASS** | 10 Grade |
| **LESSON** | Basics of Electric-Electronic |
| **DURATION** | 8 class hour |
| **OBJECTIVE** | Student will learn the OHM's law which is one of the basic rules of electricity. Student will be able to recall the relevant formula permanently. |
| **LEARNING OUTCOMES** | 1. Designs in accordance with health and safety rules at work.<br>2. Produces at 3D printing and mechanics workshop.<br>3. Creates the assembly flow chart.<br>4. Selects necessary softwares.<br>5. Install softwares.<br>6. Retains the OHM's law permanently.<br>7. Improves 3D printing skills to produce other basic formulas of Electric and Physics. |
| **LEARNING ENVIRONMENT AND EQUIPMENT** | **Environment:** CAD Laboratory, mechanical production workshop, electrict-electronic workshop and computer laboratory.<br><br>**Equipment:** 3D printer, flament |
| **EVALUATION** | Evaluation tools such as observation form, numerical rating scale and rubrics can be used to evaluate the student performance. Additionally, self-assesment and peer-assessment forms can be used to improve the students' engagement into learning processes. |

**ACHIEVEMENT NUMBER AND TIMETABLE**

| LEARNING SUBJECT | ACHIEVEMENT NUMBER | HOURS | PERCENTAGE (%) |
|---|---|---|---|
| **Designing and Producing Mechanical Parts** | 3 | 2 | 25% |
| **Parts Assembly** | 2 | 2 | 25% |
| **Preparing Other Formula Charts** | 3 | 2 | 25% |

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| | **Software Installation** | 2 | 2 | 25% |
| **TOTAL** | | 10 | **8** | **100** |

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| LEARNING SUBJECT | SUBJECTS | ACHIEVEMENTS AND DESCRIPTION |
|---|---|---|
| **1 Designing and Producing OHM's Law Triangle** | **1- Designing OHM's Law Triangle**<br>**2- Producing the Part**<br>**3- Identifying the available (available in the market) parts** | 1. Designing OHM's Law Triangle<br>● Makes a literature review.<br>● Designn the parts in the sketch form.<br>● Draws the parts on CAD softwares.<br>● Checks the compatibility of parts with each other.<br>2. Producing the Part<br>● Prepares the parts drawn on CAD softwares for 3D printing.<br>● Produces the parts with 3D printer.<br>● Makes surface cleaning.<br>3. Identifying the available (available in the market) parts<br>● Places the printed formula in appropriate places at the laboratory to remember the rule when necessary. |
| **Parts Assembly** | **1- Assembly Flow Chart**<br>**2- Assembling the Parts** | 1. Assembly Flow Chart<br>● Creates the assembly flow chart in sketch form.<br>● Assembles the parts on CAD software.<br>● Determines the assembly relations on CAD software.<br>● Simulates the assembly on CAD software.<br>2. Assembling the Parts<br>● Groups the parts according to the assembly flow chart.<br>● Assembles by joining the groups together.<br>● Checks the movements of the assembly. |
| **Software Installation** | **1- Softwares**<br>**2- Installing the Softwares** | 1. Softwares<br>● Identifies the necessary softwares for an OHM's Law Triangle.<br>● Learns the functions of softwares.<br>● Uses softwares.<br>2. Installing the Softwares<br>● Installs the softwares to the circuit components from the computer.<br>● Identifies the issues that may happen during software installation. |

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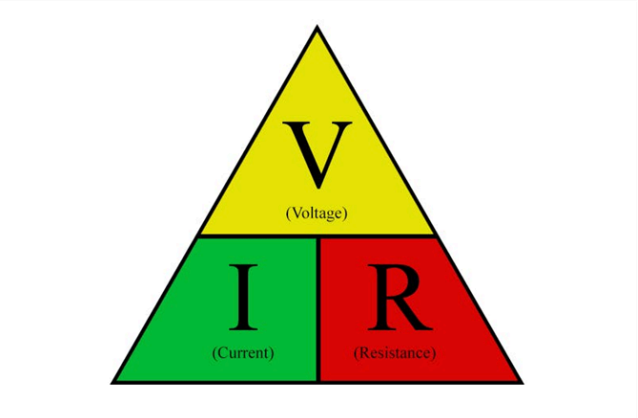
| **Part Visual** |  |

**DESCRIPTION OF IMPLEMENTATION**

1. CAD laboratory, 3D printer, drill press, milling machine, electric-electronic connection components should be available for the lesson.
2. Functions of electric-electronic connection components should be identified.
3. CURE software should be taught in order to print with 3D.
4. Compatibility of parts should be checked in every stage.

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