THE EMIRATES

2020-2021

Creative Design & Innovation

Teacher Guide

Grade 11

Creative Design and Innovation

G11 General Teacher's Guide

CREATIVE DESIGN
INNOVATION

Term 2

2020-2021

Contents

Introduction:

This Teacher's Guide aims to provide the teachers of Creative Design and Innovation with a set of teacher support materials. This includes the Instructional Planner (IP), the Lesson Plans (LPs) and Answer Keys.

The Instructional Planner aims to provide teachers with the scope and sequence during the term. Teachers will be able to have a detailed idea of when to teach each section of the book and accordingly organise their work during the entire term in advance. This IP can be found on LMS.

The Lesson Plans provide a model teaching strategy for Creative Design and Innovation teachers. It highlights the core points that allows teachers to support the progress of their students. It also provides a plenty of advices for the teachers to follow in class promoting various teaching methodologies, practices and strategies. It contains answer keys for all the questions and activities within the book, in order to provide teachers with model answers that guarantee a moderate and consistent level for answers across the country.

As a CDI teacher for Grade 11 students, you have a great responsibility of enlightening your students with the available opportunities in their higher education studies. CDI is a very important and rich subject that eventually feeds into many science engineering and design fields. Please demonstrate this importance at the beginning and throughout the CDI course. This will allow students to give extra attention to the subject and motivate students to explore the subject outside the classroom.

Wishing you a very successful and fruitful term with your creative and innovative students!

The authors,

December 2020.

Instructional Planner:

Trimester Planner
Term two (T2) 2020/2021

SUBJECT: Creative Design and Innovation (CDI)

Grade **11**
General

Overview:

This Instructional Planner contains a traditional **Weekly Planner** which outlines the anticipated Scope and Sequence for teaching the course during the term, detailing SLOs per week. The IP also highlights what resources are needed to complete the relevant sections of the workbook throughout the weeks.

The CDI curriculum features **two main books** for students to use. The structure of the three books is outlined below:

- **Book #1**: **Student's Book**:
  - This is students' reference book and their main learning resource.
  - SB will be available **online ONLY** for students and teachers.

- **Book #2: Workbook:**
  - This is students' resource for documenting their work. **It is accordingly the main book for students to use**. Completing the workbook means completing the course and achieving all outcomes required.
  - WB will be **printed for each student**.
  - WB will also be **available online** for students.

- **CDI Books Printing Matrix:**

Book	Printed per Student	Online
Student's Book	×	√
Workbook	√	√

Note:
- All learning outcomes are essential unless highlighted in Green.
- The learning outcomes in **Bold** are from the Stream project.

Week	Chapter	Section	Books	Overview	Learning Outcomes	WB Activities	DL Platforms	Resources	Can be covered through		
									Distance learning	Self-learning	Self-study
1	SB: 6	1	SB/ WB	**Section 1**: Creating a speaker housing	• Define position of required components using suitable joints. • Create a 3D model around existing 3D component. • Create a suitable top cover for the 3D model.	6.1.1	Diwan Teams, Autodesk Fusion 360	Laptop Internet Connection Fusion 360	✓	✓	
				Programming Heartbeat activity	• Consolidate programming skills through solving a range of problems.	6.1		Laptop Internet Connection	✓	✓	
2	WB: Stream project	1	WB	**Stream project 1: Portable smart speaker design** **1.Brief** **2.Analysis of Brief**	• **Analyse the main sections of a design brief.** • **Address the constraints and requirements of a design problem.**	Start the project **STAGES 1 - 2** 1.2.1-1.2.3	Diwan Teams	Laptop Internet Connection	✓	✓	
				3.Research	• **Apply different methods of research.**	Continue the project **STAGE 3** 1.3.1-1.3.2	Diwan Teams	Drawing kit Laptop Internet Connection	✓	✓	

3	WB: Stream project	1	WB	**4.Possible Solution**	• **Transform research ideas into two possible solutions for a design problem.**	Continue the project **STAGE 4** 1.4.1-1.4.2		Drawing kit Laptop CAD software Internet Connection	✓	✓	
				5. Final solution	• **Sketch Final Solutions for prototype.**	Continue the project **STAGE 5** 1.5.1		Drawing kit Laptop CAD software Internet Connection	✓	✓	
4	WB: Stream project	1	WB	**6. Design realisation**	• **Construct a prototype to solve a design problem through various prototyping means.**	Continue the project **STAGE 6** 1.6.1-1.6.2		Drawing kit Laptop CAD software Internet Connection	✓	✓	
5	WB: Stream project	1	WB	**6. Design realisation**	• **Construct a prototype to solve a design problem through various prototyping means.**	Continue the project **STAGE 6** 1.6.3-1.6.4		Drawing kit Laptop CAD software Internet Connection	✓	✓	
				7. Evaluation	• **Evaluate the success of implementing the proposed design idea.**	Complete the project **STAGE 7** 1.7.1		Drawing kit Laptop CAD software Internet Connection	✓	✓	
					• **Create a business plan and work within a team to achieve it.**	Complete the project business plan		Laptop Internet Connection	✓	✓	

6 & 7	SB: 4	2	SB / WB	**Section 2:** Introduction to electronic components	• Explain the fundamental laws of electrical circuits. • Calculate quantities relating to fundamental laws of electrical circuits. • Determine the functions and types of various electronic components. • Recommend appropriate electronic components for suitable applications. • Categorise components as input and output. • Calculate the voltage, amperage, and resistance of series and parallel circuits.	4.2.1 – 4.2.8		Laptop Internet Connection Electronic fundamentals kit Fritzing / TinkerCad	✓	✓	
8	SB: 4	2	SB / WB	**Section 2:** Introduction to electronic components	• Determine the functions and types of various electronic components. • Recommend appropriate electronic components for suitable applications. • Categorise components as input and output. • Determine the different applications of printed circuit	4.2.9 – 4.2.14		Laptop Internet Connection Electronic fundamentals kit Fritzing / TinkerCad	P	✓	

					boards and breadboards. • Produce a prototype for common electric circuit using breadboards and/or computer simulation tools						
9 & 10	SB: 4	2	SB / WB	**Section 2:** Introduction to electronic components	• Determine the functions and types of various electronic components. • Categorise components as input and output. • Determine the different applications of printed circuit boards and breadboards. • Produce a prototype for common electric circuit using breadboards and/or computer simulation tools	4.2.15 – 4.2.19		Laptop Internet Connection Electronic fundamentals kit Fritzing / TinkerCad	✓	✓	
-	SB: 4	2	SB / WB	**Section 3:** Introduction to electronic components	• Choose appropriate tools and joining methods to build permanent circuits. • Demonstrate safety procedures when dealing with electrical circuits. • Produce a soldered prototype of an electric circuit.	4.3.1 – 4.3.5		Laptop Internet Connection	✓	✓	

LESSON PLAN 1	**Grade:** 11 G	**Chapter 6:** Design realisation II **Section 1:** Creating a speaker housing

1) Learning outcomes

Essential LOs

- ☐ Define position of required components using suitable joints.
- ☐ Create a 3D model around existing 3D component.
- ☐ Create a suitable top cover for the 3D model.
- ☐ Consolidate programming skills through solving a range of problems.

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- hole
- fillet
- chamfer
- shell
- offset

3) Resources

- Computer
- Student Book
- Workbook
- LMS
- Microsoft teams
- Fusion 360
- Video tutorials

4) Prior knowledge

- Sketching
- Technical graphics
- Basic 3D modelling Fusion 360

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Teacher to lead the class discussion on creating a speaker housing using Fusion 360.	• Students to engage in discussion on how the speaker housing may be created.
• Teachers to ensure all students have access to required 3D components.	• Students to upload all required components to the data panel of Fusion 360.
• Teachers to demonstrate creating a basic speaker shell.	• Students to model the sample speaker shell on F360.
• Teachers to demonstrate mounting the speakers into the speaker shell.	• Students to mount the speakers into the shell.
• Teachers to demonstrate mounting potentiometer and audio jack into the design.	• Students to mount potentiometer and audio jack into the design.
• Teachers to demonstrate creating a top cover for the design.	• Students to create a top cover for the design.
• Teachers to demonstrate mounting LED matrix into the design.	• Students to mount LED matrix into the design.
• Teachers to make sure that student's complete activity 6.1.1 • LMS activity	• Students to complete activity 6.1.1 • LMS activity

Workbook activities	9) Cross-curricular links
★ **6.1.1**	▪ (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

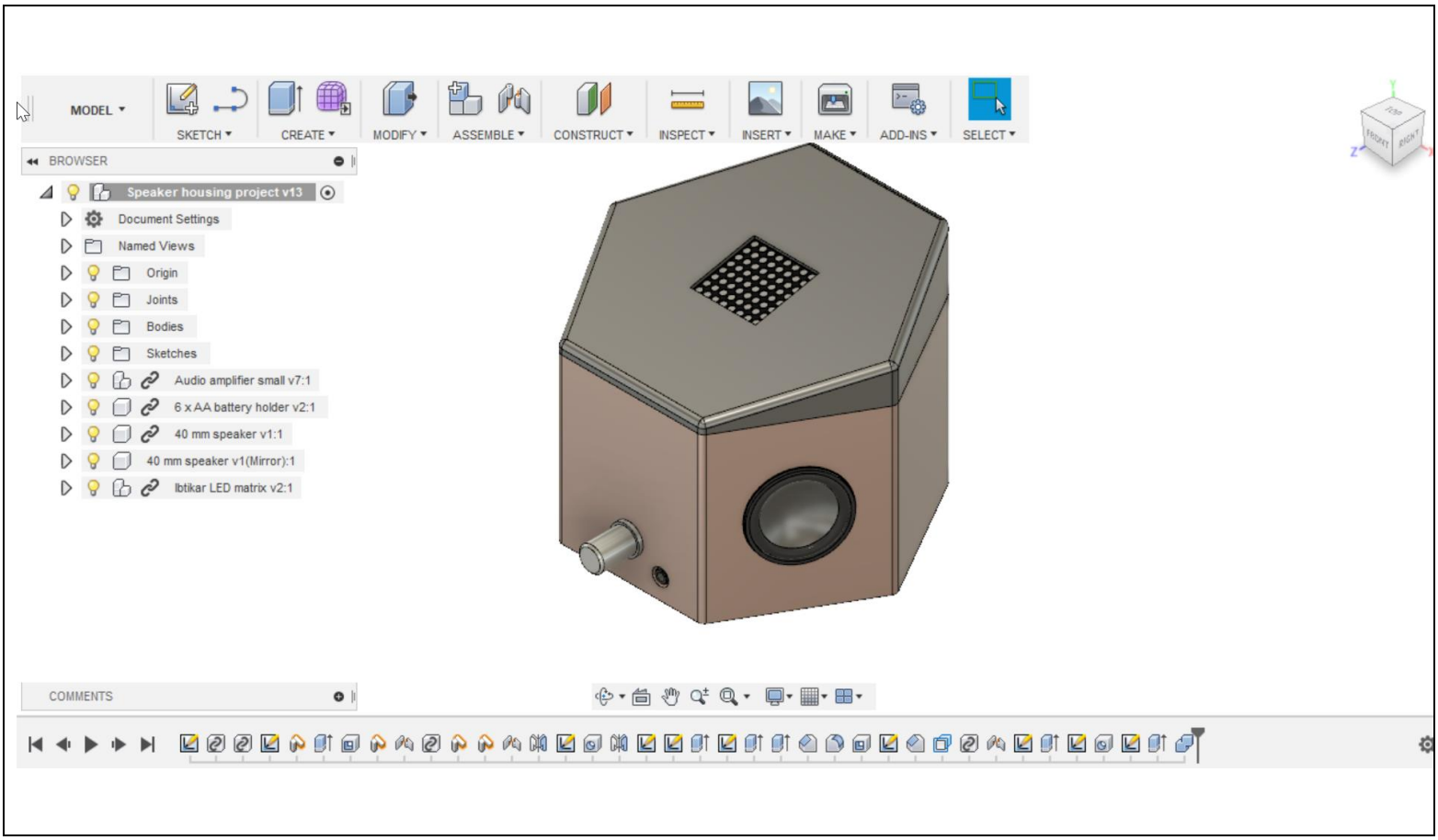
- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Answer Key – Workbook

Activity 6.1.1



LESSON PLAN 2	**Grade:** 11 G	**STREAM Project 1** **Stages 1 - 3**

1) Learning outcomes

Essential LOs

- ☐ Analyse the main sections of a design brief.
- ☐ Address the constraints and requirements of a design problem.
- ☐ Apply different methods of research.

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- brief
- research

3) Resources

- Computer
- Student Book
- Workbook
- LMS
- Microsoft teams
- Video tutorials

4) Prior knowledge

- Sketching
- Technical graphics
- Basic 3D modelling Fusion 360

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Introduce students to the brief in Stream project 1.	• Read the brief.
• Introduce stage 2, analysing the brief and ensure all students understand how to analyse a brief.	• In groups discuss the brief and the problem to be solved. • Analyse the brief by completing activities 1.2.1-1.2.3
• Facilitate and provide feedback as students complete stage 2 of the design process. • LMS activity	• LMS activity • Become familiar with the research questions
• Introduce students to stage 3 of the design process. • Discuss different methods of gathering information for the research stage. • Facilitate and provide feedback as groups begin to research the design problem. • LMS activity	• Discuss in groups various methods that can be used to research the project. • Begin to research the design problem and create suitable research questions and ideas by completing activities 1.3.1-1.3.3. • LMS activity

Workbook activities

Stream Project 1

★ **1.2.1-1.2.3**
★ **1.3.1-1.3.3**

9) Cross-curricular links

- (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Answer Key

Stream Project 1 **Stage 2: Analysing the brief**

Activity 1.2.1

In the space below, list and explain at least 6 keywords from the brief.	
Keyword	Meaning:
Student list relevant keywords and correct meanings for these words.	

Activity 1.2.2

Key areas of the brief:	Possible questions	Explain the key areas in the brief.
Aims and objectives	What is the overall aim? What steps will you take to meet this aim?	Answers may vary
Budget and schedule	Do you have a budget? When must your project be completed?	Answers may vary
Target audience	Who is this project aimed at?	Answers may vary
Materials	What restrictions will you have to deal with when choosing materials for manufacture?	Answers may vary
Style or theme	Is there a style or theme required for the line follower?	Answers may vary

Activity 1.2.3

In the space below, create your own Mind Map. Add key information you have taken from activity 1.2.2.

Neat display of relevant information

Stage 3: Research and Investigation

Activity 1.3.1

Design research

Consider the questions below to help you carry out your design research:

1) What is an LED matrix?

2) What size is the provided LED matrix?

3) How can you incorporate advanced modelling skills into the design? Name at least 2 possible advanced modelling skills.

Answers may vary.

Activity 1.3.2

In the space below, create a mood board/research page to display the information gathered in activities 1.2.1 – 1.3.1. You may use a combination of images, sketches, and notes.

Neat display of relevant information

LESSON PLAN 3	Grade: 11 G	STREAM Project 1 Stage 4

1) Learning outcomes

Essential LOs

- ☐ Transform research ideas into two possible solutions for a design problem.
- ☐ Sketch Final Solutions for prototype.

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- Possible solution
- Final solution

3) Resources

- Computer
- Drawing kit
- Student Book
- Workbook
- LMS
- Microsoft teams
- Video tutorials

4) Prior knowledge

- Sketching
- Technical graphics
- Basic 3D modelling Fusion 360

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Introduce students to stage 4 of the design process, the possible solutions. • Facilitate and provide feedback as students complete sketches of their possible solutions. • LMS activity	• Create two possible solutions to the design brief by completing stage 4 activities 1.4.1 – 1.4.6. • LMS activity
• Introduce students to stage 5 of the design process. • Instruct students that they must complete a final sketch of the chassis of the line follower. • Facilitate and provide feedback as students complete their final sketch of the chassis. • LMS activity	• Students will create a final sketch of the chassis of the line follower by completing activity 1.5.1. • LMS activity

Workbook activities

Stream Project 1

★ **1.4.1 – 1.4.6**
★ **1.5.1**

9) Cross-curricular links

- (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Answer Key

Stage 4: Possible solutions

Possible solution 1

Activity 1.4.1

Sketch the given possible solution

In the space below, create a 3D sketch to show one possible design idea for a unique speaker design that securely houses an LED matrix. Clearly show where you will include advanced modelling skills in the design.

State at least one advantage and one disadvantage of the design.

Remember to sketch lightly in pencil then define the sketch with heavy lines.

In the space provided in WB, students should sketch a possible solution.

Sketch should be neat and tidy.

At least one advantage and disadvantage must be stated.

Activity 1.4.2

In the space below, create a 3D sketch to show a second possible design idea for a unique speaker design that securely houses an LED matrix. Clearly show where you will include advanced modelling skills in the design.

State at least one advantage and disadvantage of the design.

Remember to sketch lightly in pencil then refine the sketch with heavy lines.

In the space provided in WB, students should sketch a possible solution.

Sketch should be neat and tidy.

At least one advantage and disadvantage must be stated.

Activity 1.5.1

Choose one final solution for a unique speaker design that includes advanced modelling skills and houses the provided LED matrix. In the space below, create a pictorial drawing of the final design. Clearly show how you will mount the LED matrix and where you will include the advanced modelling skills.

State at least two advantages and two disadvantages of the final design.

Label all the key components of the design.

In the space provided in WB, students create a pictorial drawing of the final solution.

Drawing should be neat and tidy.

At least two advantages and disadvantages must be stated.

In the space below, create an orthographic drawing of the chosen final design. Include the front elevation, plan and end elevation of your design idea.

In the space provided in WB, students create an orthographic drawing of the final solution.

Drawing should be neat and tidy.

At least two advantages and disadvantages must be stated.

LESSON PLAN 4	Grade: 11 G	STREAM Project 1 Stage 6

1) Learning outcomes

Essential LOs

☐ Construct a prototype to solve a design problem through various prototyping means.

Strategies/Activities

Distance learning

★ LMS discussion forms
★ Microsoft teams group meetings, chats and assignments
★ E-Surveys
★ E-Polls

2) Keywords

- Design Realisation
- Evaluation

3) Resources

- Computer
- Drawing kit
- Student Book
- Workbook
- LMS
- Microsoft teams
- Video tutorials

4) Prior knowledge

- Sketching
- Technical graphics
- Basic 3D modelling Fusion 360
- modify tools
- assemblies

5) Assessment

Assessment for learning

★ Observations
★ Conversations
★ Notes
★ Work sample
★ Checklist
★ Diagnostics

Assessment as learning

★ Self-assessment
★ Peer-assessment
★ Presentation
★ Graphic Organizer
★ Collaboration
★ Homework

Assessment of learning

★ Workbook activities
★ Test
★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
★ Differentiated LMS in class activities assigned to specific students.
★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Introduce students to stage 6 of the design process.	
• Instruct students that they must create a 3D model of the main body of their final speaker design and submit to activity 1.6.1 • LMS activity	• Students will begin to create a 3D model of their main body design by completing activity 1.6.1. • LMS activity
• Instruct students that they must create a 3D model of the top cover of their final speaker design and submit to activity 1.6.2 • LMS activity	• Students will begin to create a 3D model of their top cover design by completing activity 1.6.2. • LMS activity
• Facilitate and provide feedback as students create a 3D model of their final design.	
• Remind students that Chapter 6- 3D Design Realisation 2. Will aid them in creating a speaker model.	• Students will use Chapter 6- 3D Design Realisation 2 to help guide them.

Workbook activities

Stream Project 1

★ **1.6.1 1.6.2**

9) Cross-curricular links

- (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Answer Key

Stage 6: Design realisation

Activity 1.6.1

Create a new Fusion 360 design. Insert all the required components to your design. Create a 3D model of the main body of your final design. Paste an image of your completed design below. Use hidden views or multiple views from different angles to showcase your unique design.

Paste an image of your model the main body below. Clearly show all the features used in the timeline. *Paste image of completed model and list features used to create model.*	*List the features used to create the main body.*

Activity 1.6.2

Use your knowledge of 3D modelling to create a suitable lid or cover for the opening in your main body design.

Paste an image of your model with the main body and the cover as two separate bodies. Clearly show all the features used in the timeline. *Paste image of completed model and list features used to create model.*	*List the features used to create the main body.*

LESSON PLAN 5	Grade: 11 G	STREAM Project 1 Stage 6 + 7

1) Learning outcomes

Essential LOs

- ☐ Construct a prototype to solve a design problem through various prototyping means.
- ☐ Evaluate the success of implementing the proposed design idea.
- ☐ Create a business plan and work within a team to achieve it.

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- Design Realisation
- Evaluation

3) Resources

- Computer
- Drawing kit
- Student Book
- Workbook
- LMS
- Microsoft teams
- Video tutorials

4) Prior knowledge

- Sketching
- Technical graphics
- Basic 3D modelling Fusion 360
- modify tools
- assemblies

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Instruct students that they must continue stage 6 by adding an LED matrix to their design and submit to activity 1.6.3 • LMS activity	• Students will continue to create a 3D model of their main body design by completing activity 1.6.3 • LMS activity
• Instruct students that they must mount the LED matrix and submit to activity 1.6.4 • LMS activity	• Students will continue to create a 3D model of their top cover design by completing activity 1.6.2. • LMS activity
• Facilitate and provide feedback as students finalise a 3D model of their final design.	
• Remind students that Chapter 6 - 3D Design Realisation 2. Will aid them in creating a speaker model.	• Students will use Chapter 6- 3D Design Realisation 2 to help guide them.
• Facilitate as students evaluate their project by completing activity 1.7.1	• Students will evaluate their project by completing activity 1.7.1
• Instruct students to create a business plan for their project idea	• Students to create a business plan for their project idea

Workbook activities

Stream Project 1

★ **1.6.3 - 1.6.4**
★ **1.7.1**
★ **Business plan**

9) Cross-curricular links

- (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Stage 6: Design realisation

Activity 1.6.3

Insert the LED matrix model into your design. Define the LED matrix position using a rigid joint.

Paste an image of your model with the LED matrix in position.

Paste image of model showing all detail

Activity 1.6.4

Modify the speaker model to include a mount for the LED matrix.
chapter 6 of the student book will aid you to create mounts for the LED matrix. Your design must be unique and not the same as the sample.

Paste an image of your model with the main body and the cover as two separate bodies. Clearly show all the features used in the timeline.

Paste image of completed model and list features used to create model.

Which modelling features have you used to mount the LED matrix?.

Stage 6: Design realisation

Activity 1.7.1

Encourage honest reflection and evaluation of each question. It is not a wrong answer to say something went wrong.
How well does the prototype meet the brief?

Is the LED matrix mounted securely in the model?

Are the components inside easily accessible?

Is your model aesthetically pleasing? How could it be improved?

Create at least two more relative questions to gain a true insight into the success of the project.

State two things that went well.
State two things that could be improved.

LESSON PLAN 6	Grade: 11 G	Chapter 4: Fundamentals of Electric Circuits I Section 2: Introduction to electronic components

1) Learning outcomes

Essential LOs

- ☐ Explain the fundamental laws of electrical circuits.
- ☐ Calculate quantities relating to fundamental laws of electrical circuits.
- ☐ Determine the functions and types of various electronic components.
- ☐ Recommend appropriate electronic components for suitable applications.
- ☐ Categorise components as input and output.
- ☐ Calculate the voltage, amperage, and resistance of series and parallel circuits.

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- breadboard
- fuse
- capacitor
- diode

3) Resources

- Computer
- Student Book
- Workbook
- LMS
- Microsoft teams
- TinkerCad / Fritzing / Electronic kit
- Video tutorials

4) Prior knowledge

- Understand what an electrical circuit is.
- Identify basic electronic components.

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Teacher to lead the class discussion on what is meant by electricity and facilitates as they complete WB activity 4.2.1. • LMS activities • Teacher to explain what electricity is and briefly explain the main difference between DC and AC. • Students demonstrate learning by completing activity 4.2.1 in the SB.	• LMS activities Divide the students into groups and ask the groups to complete activity 4.2.1. • LMS activities Students to complete WB activity 4.2.2.
• Teacher to explain the main terms in direct current electricity while providing real life examples to aid the understanding of the student. • Teacher to explain Ohm's law. • Students demonstrate learning by completing activity 4.2.2 in the WB. • LMS activities	• LMS activities Students to complete WB activities 4.2.3 and 4.2.4. • LMS activities Students to complete WB activity 4.2.6. • LMS activities Students to complete WB activities 4.2.6 and 4.2.7.
• Teacher to explain the short circuit and open circuit faults. • Teacher to clearly illustrate the safety precautions when dealing with electricity and the importance of following them all the time. • Teacher to explain how to use a breadboard for building a simple electronic circuit and explain their connection structure. • Students demonstrate learning by completing activity 4.2.2 in the SB.	• Students should complete the activities as homework and submit them on LMS if not finished.
• Teacher to explain why resistors are used in electrical circuits and know their schematic symbols. • Teacher to explain the difference between 4- and 5-band resistors. • Teacher to explain how to use the colour code table in reading the resistance value through solving examples 4.2.2 and 4.2.3 in the SB. • Students demonstrate learning by completing activities 4.2.3 and 4.2.4 in the WB. • LMS activities	
• Teacher to explain what a series connection is, what is a parallel connection, and where to use each type of connection in circuits.	

• Divide students into groups, then go through example 4.2.4 in the SB to understand how to calculate the total resistance for resistors connected in series. • Students demonstrate learning by completing activity 4.2.6 in the WB. • LMS activities • Divide students into groups, then go through example 4.2.5 in the SB to understand how to calculate the total resistance for resistors connected in parallel. • Students demonstrate learning by completing activities 4.2.7 and 4.2.8 in the WB. • LMS activities	
Student book activities ★ **4.2.1 and 4.2.2** **Workbook activities** ★ **4.2.1 – 4.2.8**	**9) Cross-curricular links**  ▪ (Teacher to make cross-curricular links and activities where possible.)
10) Plenary ▪ Teacher to facilitate as students evaluate learning. ▪ Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved? ▪ Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives. ▪ Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities. ▪ Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students. ▪ Teacher to use LMS awards to give students recognition badges.	
11) Reflection & Next steps	
Activities that worked	**Topics to be revisited**

Answer Key – Student book

SB Activity 4.2.1

Answer the following questions:

1. Which part of an atom does an electric current originate from?
   a) Nucleus
   b) Positively charged protons
   c) Negatively charged electrons

2. Conventional flow assumes charges flow from:
   a) Positive to negative
   b) Positive to positive
   c) Negative to positive

3. Electron flow assumes charges flow from:
   a) Negative to positive
   b) Negative to negative
   c) Positive to negative

SB Activity 4.2.2

Look at the picture below. Which LED is connected correctly? The red LED or the blue LED? Explain.

The blue LED

Answer Key – Workbook

Activity 4.2.1

Research each of the following scientist's findings on electricity.

Answers may vary. Possible answers are listed in the table below.

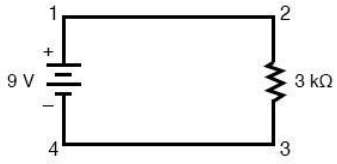
Scientist	**Their findings on electricity**
Alessandro Volta	invented the electric battery
Michael Farady	discovered the principles of electromagnetic induction
Nikola Tesla	contributed to the design of the modern alternating current (ac) electricity supply system
Joseph Swan	developer of a successful incandescent light bulb
Thomas Edison	developed many devices in fields such as electric power generation

Activity 4.2.2

Determine the following values for the circuit shown below:

a) the current passing through the resistor

b) the power dissipated by the resistor



Answer: a) $V = I/R$

$= 9V/3k\Omega$

$= 9V/3000\Omega$

$= 0.003A = 3mA$

b) $P = I^2R$

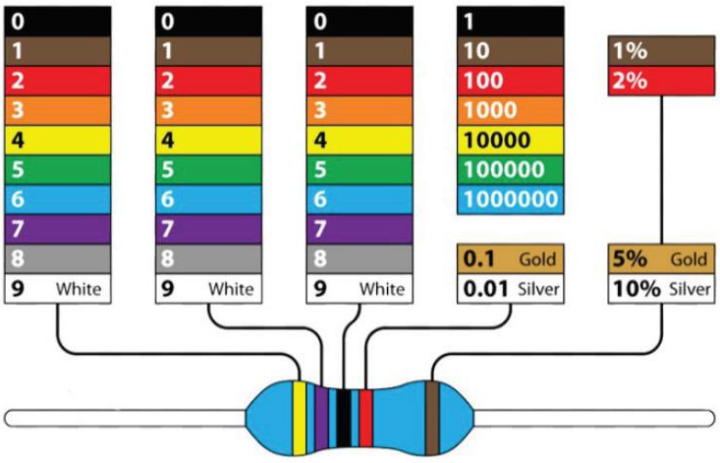
$= (3mA)^2(3k\Omega)$

$= (0.003A)^2(3000\Omega)$

$= 0.027W = 27mW$

Activity 4.2.3

Find the resistance value for the 5-band resistor shown below.



	colour 1	colour 2	colour 3	colour 4	colour 5
5-band	Yellow	Purple	Black	Red	Brown
	4	7	0	100	1%
	470×100Ω ± 1% 47000Ω ± 1% 47kΩ ± 1%				

Activity 4.2.4

If the labelled resistance value of a 4-band resistor is 470Ω ±1%, identify the resistor colours.

5-band	Digit 1	Digit 2	Multiplier	Tolerance
	4	7	10	±1%
	colour 1	colour 2	colour 3	colour 4
	Yellow	Purple	Brown	Brown

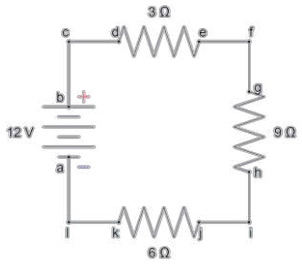
Activity 4.2.5

What is the range of resistance (R) for the 5-band resistor given in Activity 4.2.3?

$$Tolerance = \pm 1\ \%\ of\ 47000\ \Omega$$
$$1\%\ of\ 47000\ \Omega = \frac{1}{100} \times 47000\ \Omega = 470\ \Omega$$
$$\therefore Tolerance = \pm(1\ \%\ of\ 47000) = \pm 470\ \Omega$$
$$\therefore Range\ (R) = 47000\ \Omega \pm 470\ \Omega$$
$$\therefore R\ is\ between\ (47000 - 470)\ \Omega\ and\ (47000 + 470)\ \Omega$$
$$\therefore R\ is\ between\ (47470)\ \Omega\ and\ (46530)\ \Omega$$
$$\therefore R\ is\ between\ 47.47k\Omega\ and\ 46.53k\Omega$$

Activity 4.2.6

Calculate the following values for the circuit shown below:



a) the total resistance

$R_{total} = R_1 + R_2 + R_3$
$= 3\Omega + 9\Omega + 6\Omega$
$= 18\Omega$

b) the total current from the power supply

$I_{total} = V_{total}/R_{total}$
$= 12V/18\Omega$
$= 0.67A$

c) the current passing through each resistor

$I_{total} = I_1 = I_2 = I_3$

d) the voltage drop across each resistor

$V_1 = I_1 \times R_1$
$= 0.67A \times 3\Omega$
$= 2V$

$V_2 = I_2 \times R_2$
$= 0.67A \times 9\Omega$
$= 6V$

$V_3 = I_3 \times R_3$
$= 0.67A \times 6\Omega$
$= 4V$

e) the power dissipated in each resistor

$P_1 = V_1 \times I_1$
$= 2V \times 0.67A$
$= 1.33W$

$P_2 = V_2 \times I_2$
$= 6V \times 0.67A$
$= 4.00W$

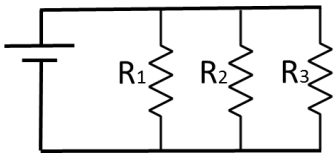
$P_3 = V_3 \times I_3$
$= 4V \times 0.67A$
$= 2.67W$

f) the total power dissipated in the circuit

$P_{total} = P_1 + P_2 + P_3$
$= 1.33W + 4.00W + 2.67W$
$= 8.00W$

Activity 4.2.7

Calculate the following values for the circuit shown below:



$R_1 = 10\Omega$, $R_2 = 270\Omega$ and $R_3 = 20\Omega$ and $V = 12V$

a) the total resistance

$1/R_{total} = (1/R_1) + (1/R_2) + (1/R_3)$
$= (1/10\Omega) + (1/270\Omega) + (1/20\Omega)$
$= 0.154\Omega$
$R_{total} = (1/0.154)\Omega = 6.5\Omega$

b) the total current from the power supply

$I_{total} = V_{total}/R_{total}$

$= 12V/6.5\Omega$

$= 1.85A$

c) the current passing through each resistor

$I1 = V1/R1$

$= (12V)/(10\Omega)$

$= 1.2A$

$I2 = V2/R2$

$= (12V)/(270\Omega)$

$= 0.044A$

$I3 = V3/R3$

$= (12V)/(20\Omega)$

$= 0.6A$

d) the voltage drop across each resistor

$VT = V1 = V2 = V3 = 12V$

e) the power dissipated in each resistor

$P_1 = V_1 \times I_1$

$= 12V \times 1.2A$

$= 14.4W$

$P_2 = V_2 \times I_2$

$= 12V \times 0.044A$

$= 0.53W$

$P_3 = V_3 \times I_3$

$= 12V \times 0.6A$

$= 7.2W$

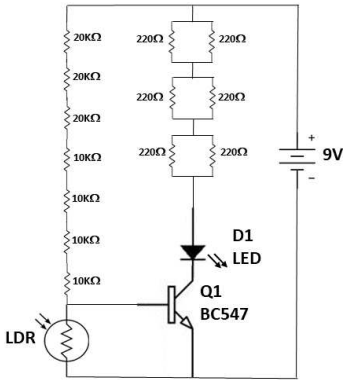
f) the total power dissipated in the circuit

$P_{total} = P_1 + P_2 + P_3$

$= 14.4W + 0.53W + 7.2W$

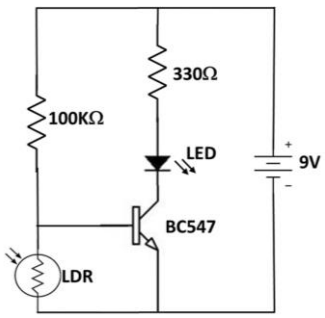
$= 22.13W$

Study the schematic diagram of an automatic night lamp circuit shown below. Then answer the questions.



1. How many resistors did you use in the circuit?
   13 resistors (14 including the LDR).
2. Design the same automatic night lamp circuit using fewer resistors. In the space below, draw the schematic diagram of your simplified circuit.
   - Students should use their knowledge of calculating total resistance in figuring out the total resistance in the left branch
   (**Series**: 20KΩ+20KΩ+20KΩ+10KΩ+10KΩ+10KΩ+10KΩ = **100KΩ**)
   They should replace all these resistors by a single **100KΩ** resistor from their Kit.

   - Students should use their knowledge of calculating total resistance in figuring out the total resistance in the right branch ($\frac{1}{R_{parallel}} = \frac{1}{220\Omega} + \frac{1}{220\Omega}$, **R Parallel = 110Ω**) This will be repeated for the 3 parallel branches.
   (**Series**: 110Ω + 110Ω + 110Ω = **330Ω**)
   They should replace all these resistors by a single **330Ω** resistor from their Kit.



3. What are the advantages of using fewer resistors for reconstructing the same circuit? Think of the following aspects: design and schematic, wiring, cost, practicality, time, effort, size, etc.

   Using less components will:
   - make the design less complex and user friendly
   - make it easy to interpret the schematic diagram
   - make it easy to wire up the circuit and have tidier connections

- generally cost less as less components are to be purchased
- be more practical as:
    - it will save time
    - it requires less effort
    - it makes the design compact (enhances size efficiency)
    - it decreases the probability of having faulty equipment, and hence non-functional circuits

LESSON PLAN 7	Grade: 11 G	Chapter 4: Fundamentals of Electric Circuits I Section 2: Introduction to electronic components

1) Learning outcomes

Essential LOs

- ☐ Determine the functions and types of various electronic components.
- ☐ Recommend appropriate electronic components for suitable applications.
- ☐ Categorise components as input and output.
- ☐ Determine the different applications of printed circuit boards and breadboards.
- ☐ Produce a prototype for common electric circuit using breadboards and/or computer simulation tools

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- breadboard
- fuse
- capacitor
- diode

3) Resources

- Computer
- Student Book
- Workbook
- LMS
- Microsoft teams
- TinkerCad / Fritzing / Electronic kit
- Video tutorials

4) Prior knowledge

- Understand what an electrical circuit is.
- Identify basic electronic components.

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Teacher explain how variable resistors work, then introduce their different types and schematic symbols. • Teacher explain the first type of variable resistor, potentiometer. • Teacher to play a relevant video on the applications of potentiometers. • Student demonstrate learning by completing activity 4.2.9 in the WB. • LMS activity	• LMS activity Students to complete WB activity 4.2.9 • LMS activity Students to complete WB activity 4.2.10 • LMS activity Students to complete WB activities 4.2.11 and 4.2.12
• Teacher explain the second type of variable resistor, LDR. • Student demonstrate learning by completing activity 4.2.9 in the WB. • LMS activity	• LMS activity Students to complete WB activities 4.2.13 and 4.2.14
• Teacher to explain capacitors and demonstrate example 4.2.6. • Facilitate as students complete SB Activity 4.2.3 and WB activities 4.2.11 and 4.2.12 • LMS activities	• Students should complete the activities as homework and submit them on LMS if not finished.
• Teacher to explain switches and fuses • Facilitate as students complete SB Activity 4.2.4 and WB activities 4.2.13 and 4.2.14 • LMS activities	

Student book activities

★ **4.2.3 and 4.2.4**

Workbook activities

★ **4.2.9 – 4.2.14**

9) Cross-curricular links

- (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Answer Key – Student book

QR code links:	
Topic	***Link***
Application of a potentiometer	https://youtu.be/S-AMqJW0Cvo
How does an LDR work?	https://youtu.be/u9Riurh4y9U
How capacitors work	https://youtu.be/SbGMKSqz8IY
How fuses work	https://youtu.be/4MUeldH3Zhk

SB Activity 4.2.3

What do you think would happen to this capacitor if it was placed in a 12V DC circuit?

The maximum voltage this capacitor can tolerate between its terminals is 10V. connecting it in a 12V circuit would damage it.

SB Activity 4.2.4

Have you ever seen a fuse? Take out your laptop chargers and look at the plug. What is written on the back?

Fused.

Now, flip it. Take off the cap and check the fuse inside it. Can you read the amperes?

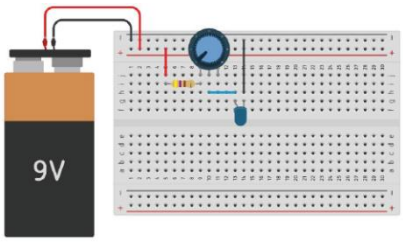
3A.

Answer Key – Workbook

Activity 4.2.9

Construct the circuit shown below to test the functionality of a potentiometer. You will need:

1. Breadboard
2. 9V battery
3. Potentiometer
4. LED
5. 470Ω resistor

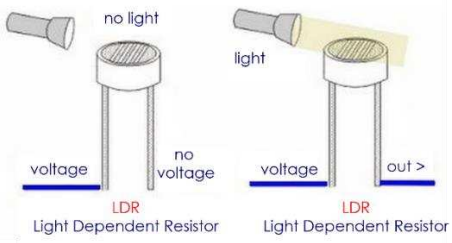


If the circuit constructed properly, as students rotate the knob of the potentiometer the brightness of the LED must change.

Note: students can use TinkerCad, an online simulation tool to build the circuit (https://www.tinkercad.com/). Or, they can use Fritzing (offline software) if connecting to the internet was an issue, but, they will not be able to test the circuit's functionality.

Activity 4.2.10

The figure below shows that the resistance of the LDR is high when the torch is off. No current passes through it. When the torch is turned on, the resistance of the LDR decreases. This allows current to pass through it.



Try to cover the LDR with your hand so the LDR does not detect light, then observe the status of the LED. Note down your conclusion:

LDR is a resistor where the resistance decreases with the strength of the light. In this circuit, the transistor you use works as a switch. It closes the circuit when the LDR doesn't sense light (dark) and opens the circuit when the LDR senses light (light). Hence, if the circuit is constructed properly, when the LDR detects light the LED will turn off.

Note: students can use TinkerCad, an online simulation tool to build the circuit (https://www.tinkercad.com/). Or, they can use Fritzing (offline software) if connecting to the internet was an issue, but, they will not be able to test the circuit's functionality.

Activity 4.2.11

- The capacitor shown below has a capacitance of 25μF and is initially uncharged. The battery provides a potential difference of 120V. After the switch is closed, how much charge will the capacitor store?

  $Q = C \times V$

  $= 25 \times 10^{-6}F \times 120V$

  $= 0.003C = 3mC$

- If a capacitor stores 800μC at a potential difference of 4V, what will its capacitance be?

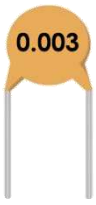
  $C = Q/V$

  $= (800 \times 10^{-6}C)/4V$

  $= 200 \times 10^{-6}F = 200\mu F$

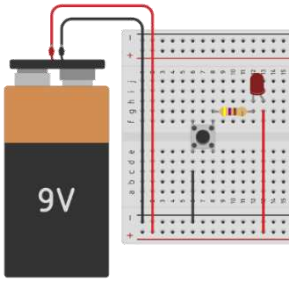
Activity 4.2.12

- What is the capacitance for each of the ceramic capacitors below?

	104 is a whole number. 104 is >100. So, we'll use: $Digit_1Digit_2 \times 10^{Digit_3}\ pF$. $Digit_1$ is 1, $Digit_2$ is 0 and $Digit_3$ is 4. So, $Digit_1Digit_2 \times 10^{Digit_3}\ pF$ $= 10 \times 10^4\ pF$ $= 10 \times 10^4 \times 10^{-12}F$ $= 10 \times 10^{4+(-12)}\ F$ $= 10 \times 10^{-8}\ F$ $= \mathbf{0.1\mu F}$
	22 is a whole number. 22 is <100. So, 22 means **22pF**.
	0.003 is a decimal. So, 0.003 means **0.003μF**.

Activity 4.2.13

- Use a pushbutton to light an LED when pressed.
  You will need:
  1. Breadboard
  2. 9V battery
  3. Pushbutton
  4. LED
  5. 470Ω resistors



If the circuit constructed properly, when the students press the pushbutton the LED should turn on.

Note: students can use TinkerCad, an online simulation tool to build the circuit (https://www.tinkercad.com/). Or, they can use Fritzing (offline software) if connecting to the internet was an issue, but, they will not be able to test the circuit's functionality.

Activity 4.2.14

Calculate the fuse rating for the fuse used in this cake mixer?

Note: the power and voltage values are written on the mixer's image.

$$Fuse\ rating\ = \left(\frac{Power\ (Watt)}{Voltage\ (V)}\right) \times 1.25$$

$$= \frac{500W}{240A} \times\ 1.25 = 2.6\ A$$

LESSON PLAN 8

Grade: 11 G

Chapter 4: Fundamentals of Electric Circuits I
Section 2: Introduction to electronic components

1) Learning outcomes

Essential LOs

- ☐ Determine the functions and types of various electronic components.
- ☐ Recommend appropriate electronic components for suitable applications.
- ☐ Categorise components as input and output.
- ☐ Determine the different applications of printed circuit boards and breadboards.
- ☐ Produce a prototype for common electric circuit using breadboards and/or computer simulation tools

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- breadboard
- fuse
- capacitor
- diode

3) Resources

- Computer
- Student Book
- Workbook
- LMS
- Microsoft teams
- TinkerCad / Fritzing / Electronic kit
- Video tutorials

4) Prior knowledge

- Understand what an electrical circuit is.
- Identify basic electronic components.

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Teacher to introduce semiconductors and their applications. • Teacher explain how diodes work, their function, and how to connect them properly in a circuit. • Students demonstrate learning by completing activities 4.2.15 and 4.2.16 in the WB. • LMS activities	• LMS activities Students to complete WB activities 4.2.15 and 4.2.16 • LMS activities Students to complete WB activity 4.2.17 • LMS activities Students to complete WB activities 4.2.18 and 4.2.19
• Teacher explain how transistors work and introduce their main types and schematic diagram. • Explain how to calculate the amplification gain of a transistor through example 4.2.7. • Students demonstrate learning by completing WB activity 4.2.17 • LMS activities	• Students should complete the activities as homework and submit them on LMS if not finished.
• Teacher to introduce the functions and applications of integrated circuits in general. • Teacher explain the circuit diagram of the op-amp and explain how to calculate its amplification gain. • Students demonstrate learning by completing WB activities 4.2.18 and 4.2.19 • LMS activities	

Workbook activities

★ **4.2.15 – 4.2.19**

9) Cross-curricular links

- (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

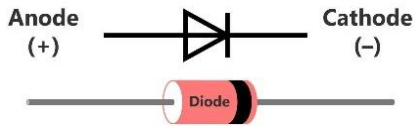
Answer Key – Student book

QR code links:	
Topic	***Link***
Transistors as switches	https://youtu.be/HqhE-8xXeCQ
Transistors as amplifiers	https://youtu.be/mDUTTLCM2K8
How op-amps work	https://youtu.be/9IweZqC9N44

Answer Key – Workbook

Activity 4.2.15

Can you tell from the figure shown below, which way the current can flow through the diode? Draw the arrow on the figure.



It will allow the current to go from the left side to the right side (from the anode to the cathode).

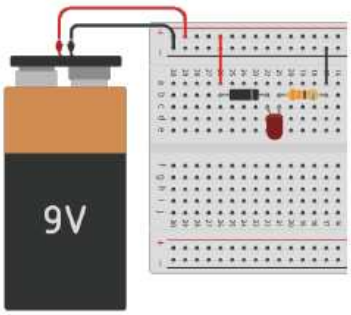
- Research applications that use diodes.

Answers will vary. Applications may include all electronic devices, power supplies and lighting appliances.

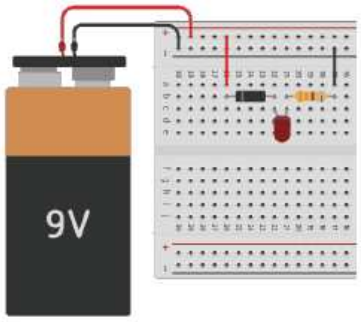
Activity 4.2.16

- Test the concept of diodes. Build the circuits shown in the figures below and observe the status of the LED.

Case 1: LED turns on.



Case 2: LED stays off.

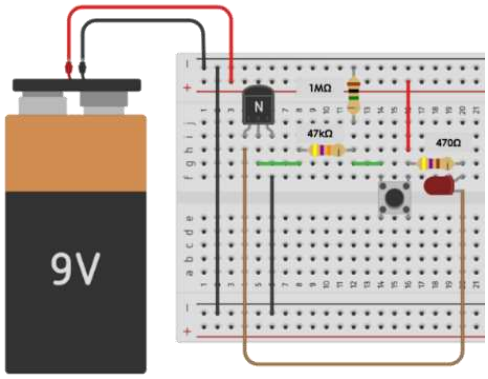


The status of the LED depends on whether the diode was connected correctly or not. It must be connected in the direction that allows the current to flow through it.

Note: students can use TinkerCad, an online simulation tool to build the circuit (https://www.tinkercad.com/). Or, they can use Fritzing (offline software) if connecting to the internet was an issue, but, they will not be able to test the circuit's functionality.

Activity 4.2.17

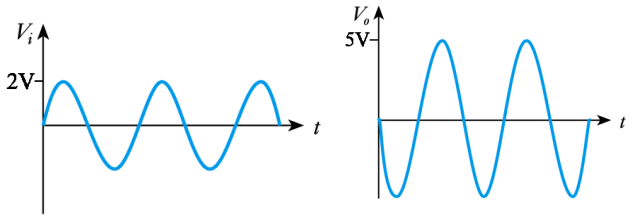
- Build the circuit shown below. Record your observation. What is the role of the transistor in this circuit?

The transistor as a switch	Observation
	○ If the pushbutton switch is open, the transistor is locked and the **LED** is dark. ○ If you close the pushbutton switch, the transistor is **"saturated"** and switches through completely. The LED **lights up**. https://www.youtube.com/watch?v=HqhE-8xXeCQ

Note: students can use TinkerCad, an online simulation tool to build the circuit (https://www.tinkercad.com/). Or, they can use Fritzing (offline software) if connecting to the internet was an issue, but, they will not be able to test the circuit's functionality.

Activity 4.2.18

The graph below shows the input and output voltage of the amplifier. What is the gain of the amplifier?



$$Gain = \frac{5}{2} = 2.5$$

Activity 4.2.19

Calculate the gain of an inverting op-amp where Rf = 15 kΩ and Rin = 220 Ω? What does the '–' sign mean?

$$Gain = -\frac{Rf}{Rin} = -\frac{15 \times 10^3}{220} = -68.2$$

Note that the gain cannot be negative. The negative sign just means that the output is inverted.

LESSON PLAN 9

Grade: 11 G

Chapter 4: Fundamentals of Electric Circuits I

Section 3: The soldering process

1) Learning outcomes

Non-essential LOs

- ☐ Choose appropriate tools and joining methods to build permanent circuits.
- ☐ Demonstrate safety procedures when dealing with electrical circuits.
- ☐ Produce a soldered prototype of an electric circuit.

Strategies/Activities

Distance learning

- ★ LMS discussion forms
- ★ Microsoft teams group meetings, chats and assignments
- ★ E-Surveys
- ★ E-Polls

2) Keywords

- solder
- soldering iron
- printed circuit board (PCB)
- workstation
- long-nose pliers
- wire strippers

3) Resources

- Computer
- Student Book
- Workbook
- LMS
- Microsoft teams
- TinkerCad / Fritzing / Electronic kit
- Video tutorials

4) Prior knowledge

- Understand what an electrical circuit is.
- Identify basic electronic components.

5) Assessment

Assessment for learning

- ★ Observations
- ★ Conversations
- ★ Notes
- ★ Work sample
- ★ Checklist
- ★ Diagnostics

Assessment as learning

- ★ Self-assessment
- ★ Peer-assessment
- ★ Presentation
- ★ Graphic Organizer
- ★ Collaboration
- ★ Homework

Assessment of learning

- ★ Workbook activities
- ★ Test
- ★ Quiz

6) Starter

Distance learning

- At the beginning of the lesson, introduce students to the lesson aim.
- Teacher to ensure all learning outcomes are outlined on LMS under the correct lesson.
- Use Microsoft teams screen sharing to show all learning outcomes and ensure understanding.
- Introduce the lesson's keywords through an LMS quiz or through an online game-based learning platform such as Kahoot or Quizlet.

7) Differentiation strategies

Differentiation to be met through designing various levels of activities. Some examples are outlined below:

Distance learning

- ★ LMS quizzes with visual aids MCQ, true or false and multi – response questions.
- ★ Differentiated LMS in class activities assigned to specific students.
- ★ Reflection through LMS surveys or polls.

Identify possible differentiation needs of the class based on prior classes and the starter activities.

8) Lesson activities

Distance learning

Teacher led activities	Student led activities
• Teacher to start an online lesson on Microsoft teams. • Teacher to upload reading materials to LMS prior to the lesson. • Students can view the books online via Al Diwan platform.	• Students to log on to Microsoft teams lesson • Download any required material for the lesson from LMS. • Open the required book on Al Diwan.
• Teacher to introduce soldering and question pupils about prior knowledge of soldering. • Teacher to introduce the soldering iron and soldering safety. • Teacher to demonstrate the soldering process (Video) • Facilitate as student's complete WB activities 4.3.1 - 4.3.5 • LMS activities	• Students to discuss any knowledge of soldering. • Students to take note of the soldering iron and key points of soldering safety. • Students to take note of the correct soldering procedure. • LMS activities Students to compete WB activities 4.3.1 - 4.3.5
Workbook activities ★ **4.3.1 – 4.3.5**	**9) Cross-curricular links** ▪ (Teacher to make cross-curricular links and activities where possible.)

10) Plenary

- Teacher to facilitate as students evaluate learning.
- Question pupils on what they have learned. Have learning outcomes been met? Has the lesson aim been achieved?
- Teacher to use LMS quiz or an online game-based learning platform such as Kahoot or Quizlet to check students understanding of the lesson objectives.
- Teacher to post homework activities through LMS and to assign a time frame for that for all unfinished activities.
- Teacher to create an LMS/Google/Microsoft surveys and share it with students where a checklist showing students' reflection will help self-reflect on the lesson for both teacher and students.
- Teacher to use LMS awards to give students recognition badges.

11) Reflection & Next steps

Activities that worked	Topics to be revisited

Answer Key

Activity 4.3.1

Give five examples of risks associated with soldering.

Answers may vary

Activity 4.3.2

Complete the sentences below using the following words:

1. The tip of the solder iron can reach temperatures of 440°C
2. Give any soldered surface a minute or two to cool down before you touch it.
3. Never solder on a live electrical circuit.
4. Always return the soldering iron to its stand when not in use.

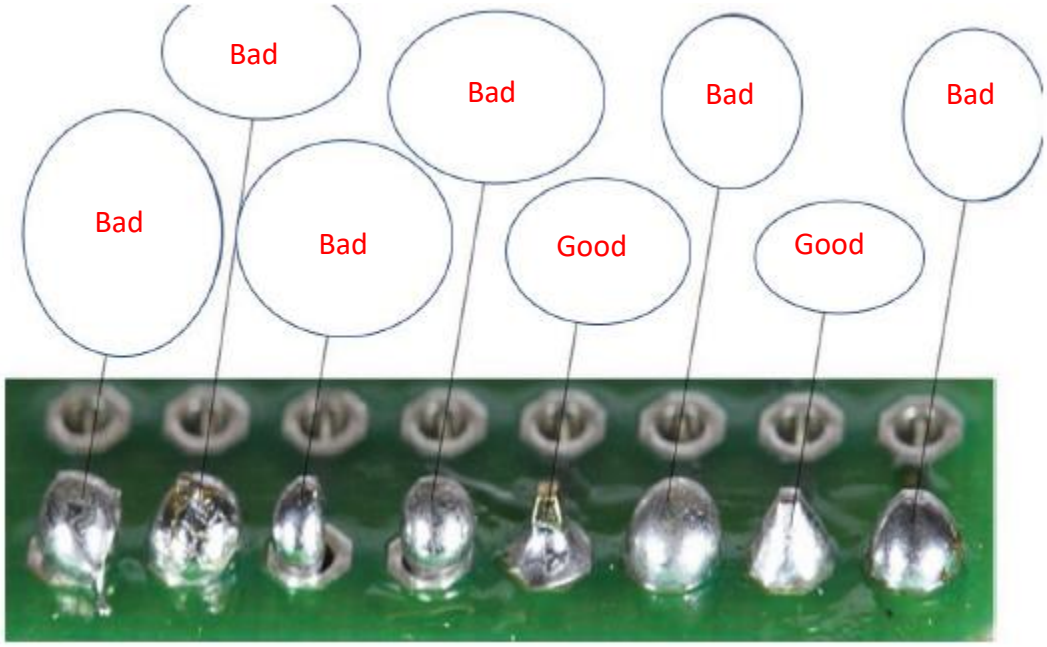
Activity 4.3.3

Describe, in your own words, why designated workstations or safe zones are important in a practical classroom.

Answers may vary

Activity 4.3.4

There are eight solder joints shown below. Write good or bad in the circles below to highlight the quality of these soldered joints.



1. Bad
2. Bad
3. Bad
4. Bad
5. Good
6. Bad
7. Good
8. Bad

Activity 4.3.5

How do you prevent an LED or a transistor from overheating and getting damaged during soldering?

Using a heat sink. A crocodile clip or plier can be placed on the legs of the components in these situations to absorb heat.

Heartbeat Activity 6.1

Develop a Python program which accepts the radius of a circle from the user and calculates the area.

```
from math import pi
r = float(input ("Input the radius of the circle : "))
print ("The area of the circle with radius " + str(r) + " is: " + str(pi * r**2))
```

Heartbeat Activity 4.1

Develop a Python code that creates a calculator for Ohm's law. The program must ask the user what value they want to calculate: voltage, resistance, or current. Based on the user's selection, the program must ask the user to enter the needed values to complete the calculations. Then, the requested value is displayed and the program's menu is listed again.

```
loop = "5"
while (loop == "5"):
    print("---------------------------------")
    print("---------Ohm's Law Menu----------")
    print("1. Calculate Voltage")
    print("2. Calculate Resistance")
    print("3. Calculate Current")
    print("4. Exit Program")
    print("---------------------------------")
    ask = input("Choose an option (1-4): ")
    if (ask == "1"):
        print ("-- Calculating Voltage --")
        i = float(input("   Enter the current: "))
        r = float(input("   Enter the resistence: "))
        v = i * r
        print("Voltage = ",format(v,".2f"))


    elif(ask == "2"):
        print ("-- Calculating Resistance --")
        v = float(input("   Enter the voltage: "))
        i = float(input("   Enter the current: "))
        r = v / i
        print("Resistance = ",format(r,".2f"))

    elif(ask == "3"):
        print ("-- Calculating Current --")
        v = float(input("   Enter the voltage: "))
        r = float(input("   Enter the resistence: "))
        i = v / r
        print("Current = ",format(i,".2f"))

    elif(ask == "4"):
        loop = "X"
    else:
        print("Not an option, Try again")
print("End of Program")
```