

Printable Challenge Pack



Engineers Week

4 - 10 March 2017



WWW.ENGINEERSWEEK.IE

Info For teachers

Thank you so much for deciding to get involved in Engineers Week. This challenge pack contains lots of ideas to help you organise fun challenges that create a positive awareness and spark enthusiasm about the engineering profession in young people.

Submit the details of any activities you and your class plan to complete on EngineersWeek.ie in order to receive an Engineers Week participation certificate!

Take part and Win!

1. Carry out the engineering challenges
2. Complete the Engineers Week 2017 poster
3. Take a photo with your engineering challenges and challengers!
4. Tweet photo #EngWeek17 or Email: steps@engineersireland.ie

You could win a fun, engaging STEM (science, technology, engineering and mathematics) show or workshop!

INFo For teachers

In this pack you will find the following free printables:

1. 2017 Engineers Week parent and guardian letter including quiver sheet
2. Draw an engineer activity sheet
3. Engineering design process poster
4. Engineering challenge organiser
5. #EngWeek17 engineering challenges
6. Engineering discipline posters

1. 2017 Engineers Week parent and guardian letter INCLUDING quiver sheet

The letter can be sent to parents telling them more about Engineers Week. The letter also gives suggestions on how parents can get involved and help you gather the materials you need for the Engineers Week challenges!

PRINT: The parent and guardian letter including quiver sheet double-sided and send it home in advance of Engineers Week.

2. Draw an engineer activity sheet

The draw an engineer activity is a good opportunity to generate some discussion about who engineers are and find out what the class already knows about engineering.

PRINT: The draw an engineer activity sheet for each student in the class

ASK: In teams, ask students to draw, crayon or paint a picture of an engineer.

RESPONSES: Get a volunteer from the class to display the drawings on the whiteboard or flip chart if there is one available.

ASK: The students to explain their drawings.

EXPLAIN: That engineers bring dreams to life! Engineers are from diverse backgrounds and they take ideas and turn them into reality, using science, maths and imagination. Engineers are masters of problem-solving and creative design. For an overview of what engineers do, check out the engineering discipline posters. Visit steps.ie for more information about engineering.

TWEET: Drawings using hashtag #EngWeek17

3. Engineering design process poster

The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times the solution involves designing a product.

The basic STEPS in the Engineering Design Process:

- Identify the problem. (Ask)
- Brainstorm solutions. (Imagine)
- Design, build and test a model. (Plan & Create)
- Use results to improve the model. (Make it better)

PRINT: The engineering design process poster and display on the whiteboard. It is great to use with each of the #EngWeek17 Engineers Week challenges

4. Engineering challenge organiser

The engineering challenge organiser is an easy to use organiser for the design cycle! It is perfect for use with each of the #EngWeek17 Engineers Week challenges.

5. #EngWeek17 engineering challenges

Engineers love a challenge! The challenges give students a chance to try out the engineering design process in the classroom. Challenges work best in teams.

6. Engineering discipline posters

These posters contain lots of information about the various engineering disciplines! Print the posters and stick them up in the classroom to learn about the different types of engineering jobs.

1 2017 ENGINEERS WEEK PARENT LETTER

Dear Parents and Guardians

Engineers Week is coming!

Engineers Week is a week-long programme of nationwide events with the aim of celebrating the world of engineering in Ireland. Coordinated by the Engineers Ireland STEPS programme this week is an opportunity for everyone to raise awareness of the contribution of engineering to our society. It will be held in our school from Monday 6th to Friday 10th March 2017.

How you can be involved

#EngWeek17 CHALLENGES

Throughout the week our class will be participating in engineering challenges that get students involved in Science, Technology, Engineering and Maths (STEM). Students will work together on hands-on, engaging challenges. We need your help collecting materials. Here are some things we could use:

- Shoe boxes or boxes
- Paper cups or bowls
- Spaghetti
- Toilet paper tubes
- Ziploc or sandwich bags
- Marshmallows

#EngWeek17 events

All around Ireland people will be taking part in Engineers Week. To find out what events are happening in our local area, check out engineersweek.ie.

#EngWeek17 activities

Download engineering activities from Engineersweek.ie that you can do at home. The activities have clear instructions and can be used to investigate and observe engineering.

#EngWeek17 quiver Sheet

Engineers face the challenge of keeping up with rapid advances in technology and often work at the leading edge of innovation. Colour the quiver sheet with your child, download the Quiver app and explore 3D augmented reality.

Thank you for your support!

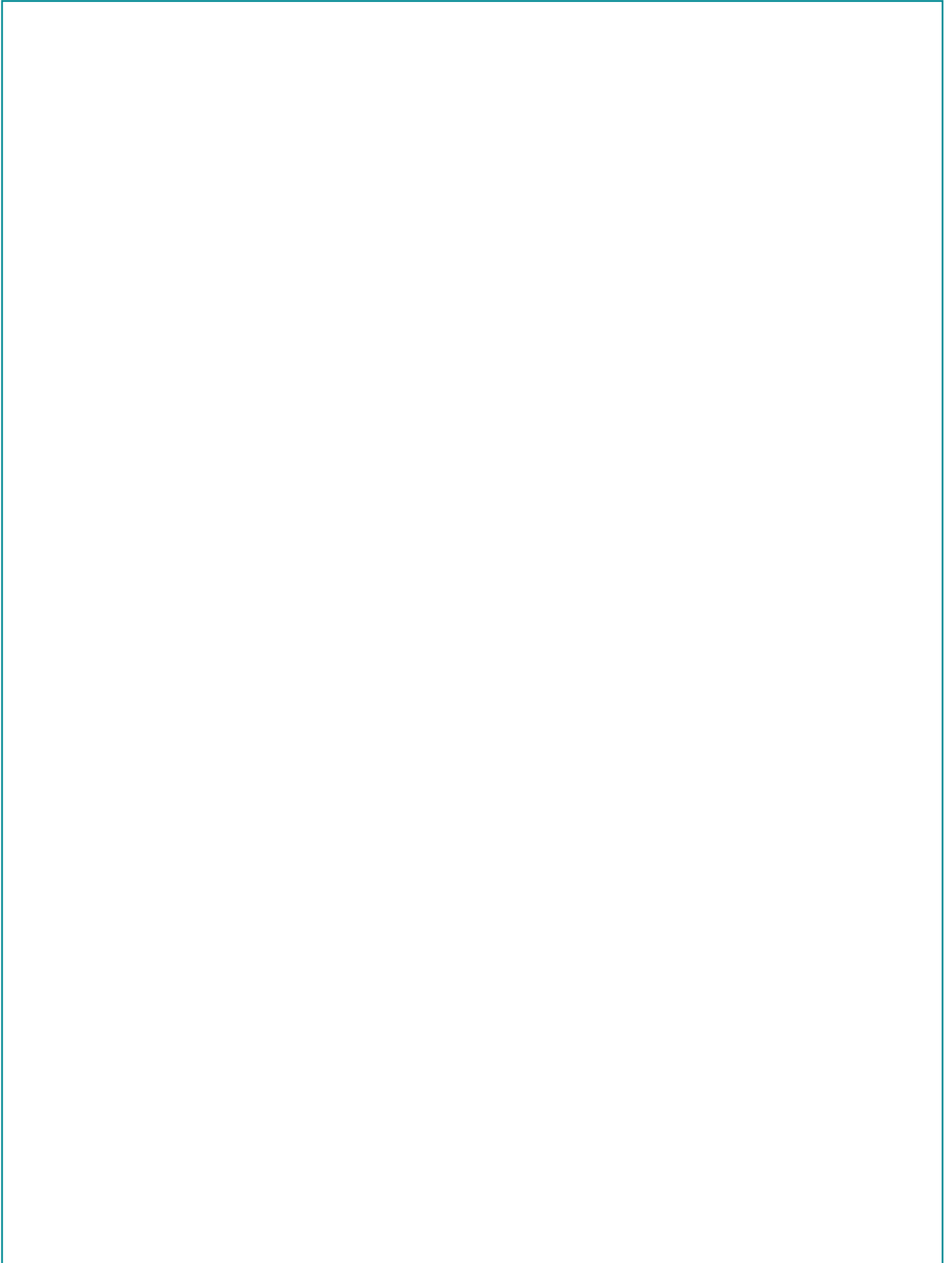


QuiverVision.com

1 Print **2** Color **3** Play

2

DRAW, PAINT OR CRAYON AN ENGINEER

A large, empty rectangular box with a thin blue border, intended for a child to draw, paint, or use crayons to create an illustration of an engineer. The box occupies most of the page below the title.

3

ENGINEERING DESIGN PROCESS – YOU ARE AN ENGINEER



ASK

What's the challenge?
How can you solve it?



IMAGINE

What are some solutions?
Brainstorm ideas with your team



PLAN AND CREATE

Make a drawing.
Use your plan to test your
ideas with your team



IMPROVE

Think about what could work better.
Modify your design and try again!

4

MY ENGINEERING CHALLENGE ORGANISER

Name: _____

Date: _____

What's needed For today's challenge?

Problem solving
Creative thinking

Team work
Communication

What is today's challenge?

What ideas do you have For completing the challenge?

Design it!

What can we change to make it better?

What Worked Well?

What didn't Work Well?

5 #ENGWEEK17 CHALLENGES

1. Take the Marshmallow Challenges

Teacher Directions

HERE'S WHAT YOU NEED:

- Spaghetti
- Jelly
- Marshmallows or any soft sweets
- Measuring tape
- Disposable baking dish
- Timer

PREPARATION:

- Give each team spaghetti and sweets
- Build the earthquake by preparing a baking dish with jelly the night before
- Share the dish with the class and demonstrate the testing procedures by shaking dish from side to side
- Gather a measuring tape to measure tallest structure

CHALLENGE GOAL:

Students will design and build structures using spaghetti and marshmallows. They will then test the strength of their structures to see if it can withstand an earthquake. Students will build the tallest structure racing against the clock in the time provided by the teacher using the spaghetti and sweets provided.

A. AMAZING TRIANGLES

Engineers design and construct buildings and infrastructure.

What structures can you make using spaghetti and marshmallows?

CHALLENGE INSTRUCTIONS:

- Your goal is to build a structure using spaghetti and marshmallows.
- You must use only spaghetti and marshmallows or other soft sweets.
- Construct your structure on top of the table.
- Be creative! Use triangles and squares. Look up pictures of different structures.

B. EARTHQUAKE IN THE CLASSROOM

Engineers construct buildings to withstand damage from earthquakes. Engineers strive to make buildings stronger to resist the forces of earthquakes.

What is the strongest structure you can make?

CHALLENGE INSTRUCTIONS:

- Your goal is to make the strongest structure. Redesign and rebuild and test again.
- You must prepare the jelly the night before so that it is fully set.
- Use your amazing triangles structures.
- Test your structure by shaking the baking dish back and forwards to stimulate an earthquake.

C. RACE AGAINST THE CLOCK

Engineers work in teams to design, test and improve on their ideas.

What is the tallest structure you can make?

CHALLENGE INSTRUCTIONS:

- Your goal is to race against the clock as a team and make the tallest structure.
- Construct your structures on a flat surface.
- You must use only spaghetti and marshmallows or other soft sweets.
- Rebuild and alter your structures to improve them.
- Use measuring tape to see which team built the tallest structure.

2. DEVELOP SLIME CHALLENGE!

Teacher Directions

HERE'S WHAT YOU NEED:

- PVA glue (white or clear)
- Food colouring (optional)
- Stirring stick
- Paper cups or bowls
- Borax powder (Found in pharmacy or the cleaning aisle in supermarkets)
- Safety glasses or sun glasses
- Water
- Ziploc bags

PREPARATION:

- Gather materials
- Provide each team with the materials to make slime
- Safety: Provide safety or sun glasses to students

CHALLENGE GOAL:

Students will mix materials together to make slime and investigate their favourite slime.

Engineers are in demand and you'll find engineers working in almost all industries.

What type of slime can you make?

CHALLENGE INSTRUCTIONS:

- Your goal is to develop a recipe for making your favourite slime.
- Mix $\frac{1}{2}$ cup of water and $\frac{1}{2}$ cup of glue in one bowl.
- Mix 1 teaspoon of borax powder with 1 cup of water.
- Pour borax solution into glue and water and mix together!
- Modify your recipe using food colouring and a different type of glue.
- Store your slime in a ziploc bag once you have finished experimenting with it.

3. BUILD a PINBALL MACHINE CHALLENGE

Teacher Directions

HERE'S WHAT YOU NEED:

- A shoe box or box
- Ice-cream sticks
- Tape
- Various items for obstacles e.g. toilet paper tubes, cd's
- Various items for decorating e.g. stickers, glitter

PREPARATION:

- Gather shoebox or take a cardboard box, cut off the front and tape up all the sides

CHALLENGE GOAL:

Students create a pinball machine using a cardboard box that will allow a ball to roll.

Engineers love solving problems.

Can you build a pinball machine using a cardboard box?

CHALLENGE INSTRUCTIONS:

- Your goal is to build a pinball machine using a cardboard box.
- Research pinball machine shapes and ideas.
- Use your scissors to create holes in the sides of your box for your levers.
- Tape two sticks together to form the desired length for each lever.
- Glue a long paper towel tube for the ball dispenser and build your obstacle course.
- Decorate and test your machine.

4. Paper bridge CHALLENGE

Teacher Directions

HERE'S WHAT YOU NEED:

- A4 sheet of paper
- Books or blocks (i.e. things to make two banks of a river)
- Coins

PREPARATION:

- Give the children one sheet of A4 paper
- Decide where the river will be (space between two books)
- Provide coins for weights

CHALLENGE GOAL:

Students to design and build the strongest paper bridge using a single sheet of paper.

Engineers enjoy making, breaking or designing things.

What is the strongest paper bridge you can design using a single sheet of A4 paper?

CHALLENGE INSTRUCTIONS:

- Your goal is to design and build a bridge using only one sheet of A4 paper.
- Make a simple bridge on top of two books or blocks.
- Test the strength of the bridge by adding coins to the bridge.

5. Egg drop CHALLENGE

Teacher Directions

HERE'S WHAT YOU NEED:

- Raw eggs
- Plastic straws
- Scissors
- Sellotape
- Sandwich bags
- Old newspaper

PREPARATION:

- Decide what height you will drop the eggs from
- Provide a raw egg for each team
- Put the eggs into sandwich bags so they won't destroy the classroom
- Spread newspaper onto your work surface to make clean-up easier.

CHALLENGE GOAL:

Students will build a cradle out of sellotape and straws that safely gets an egg to the ground after being dropped from a specific height.

Engineers are naturally curious about how things work.

Can you design an egg drop cradle using sellotape and straws that gets your egg safely to the ground?

CHALLENGE INSTRUCTIONS:

- Your goal is to design an egg cradle using sellotape and straws that will keep your raw egg safe.
- Drop your egg safely to the ground.
- Make your cradle strong and lightweight.
- Your egg must stay inside the cradle without cracking or breaking.

6. Green House Challenge

Teacher Directions

HERE'S WHAT YOU NEED:

- Empty milk cartons
- Soil
- Tape
- Straws (for the frame)
- Seeds
- Large sandwich bags (to cover the frame)
- Scissors

PREPARATION:

- Explain the greenhouses effect
- Provide each team with materials

CHALLENGE GOAL:

Students build a working miniature greenhouse using materials provided to grow plants.

Engineers like the idea of working as part of a team.

Can you build a mini greenhouse?

CHALLENGE INSTRUCTIONS:

- Your goal is to build a mini greenhouse using only the materials provided.
- Cut milk carton in half to make the greenhouse base.
- Tape and bend straws to make the greenhouse frame.
- Cut out plastic to cover the top and sides of frame.
- Leave the front side loose so you can water and tend to the plants.
- Add soil and seeds and watch plants grow.

6

BIOMEDICAL ENGINEERING



Biomedical engineers develop technologies and equipment to help save people's lives and improve their health.

CHEMICAL AND PROCESS ENGINEERING



CHEMICAL ENGINEERS develop the industrial process used to make everyday products such as food, drink, drugs, cosmetics, plastics and electronics.

CIVIL ENGINEERING



Civil, structural and environmental engineers design and construct the buildings and infrastructure that are essential to our modern society.

ELECTRONIC ENGINEERING



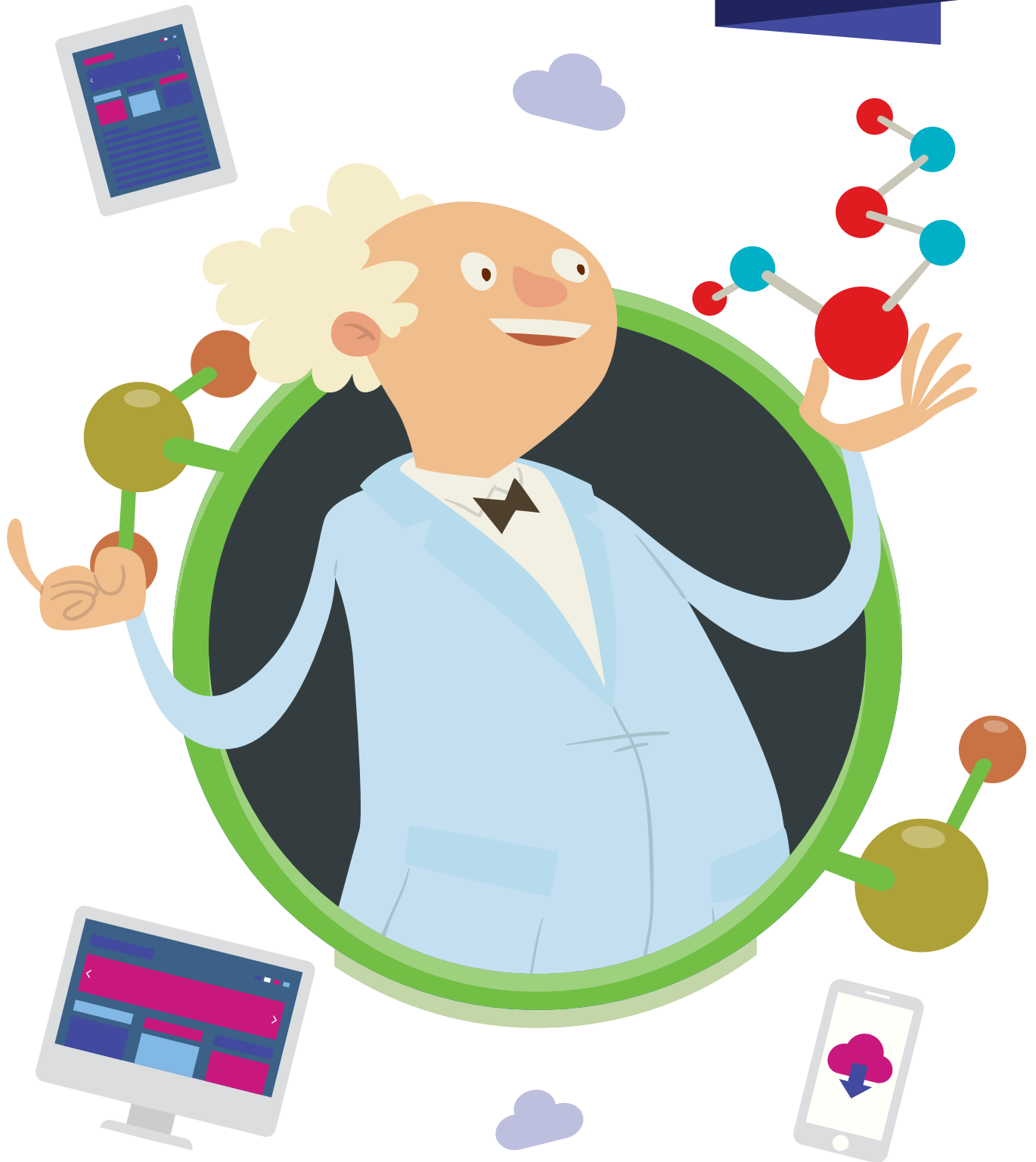
Electronic engineers design and develop the electrical and electronic equipment that we use every day, from mobile phones to microwaves.

MECHANICAL ENGINEERING



Mechanical engineers use their problem-solving skills to design machines and technologies to improve our world.

COMPUTER AND SOFTWARE ENGINEERING



Computer and Software engineers design and develop hardware, software and information systems for computers and mobile devices.