

CARCRAFT

Lesson Plans



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Lesson Plan 1- Foundations of Internal Combustion (IC)



Challenge title:	Challenge #1: Foundations of Internal Combustion (IC)		
Aim:	The aim of this challenge is for students to fill in the gaps of a brief text description of the role of an internal combustion engine with the appropriate terms.		
Related content:	Introduction to Internal Combustion (IC)		
General Description of the challenge:	<p>An Internal Combustion Engine (ICE) is a heat engine where the combustion of a fuel occurs with an oxidizer (usually air) in a combustion chamber that is an integral part of the working fluid flow circuit. In an internal combustion engine the expansion of the high-temperature and high-pressure gasses produced by combustion apply direct force to some component of the engine.</p> <p>The force is applied typically to pistons. This force moves the component over a distance, transforming chemical energy into useful mechanical energy.</p>		
Learning outcomes:	<ul style="list-style-type: none"> ❖ Students will be able to know what an internal combustion is ❖ Students will be able to recognize terms regarding the internal combustion ❖ Students will be able to recognize and understand the operation of the different types of internal combustion engines 		
Material/Resources:	Introduction to Internal Combustion (IC), car craft challenge 1 (game)		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	A brief text is displayed to the students.	10
	2	Certain words are replaced with place holders.	5
	3	Students are prompted to fill in the gaps.	15
	4	The different terms are displayed as options.	5
	5	The students can select from the list of terms for each one of the gaps.	5
Discussion:	<p>What is an internal combustion? What is the operation of the different types of internal combustion engines?</p> <p>(5 minutes)</p>		
Assessment after the completion of the lesson:	Students need to fill in correctly all the gaps		



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Lesson Plan 2- Classification of IC engines

Challenge title:	Challenge #2: Classification of IC engines	
Related content	Classification and operation of IC piston engines	
Aim	The aim of this challenge is for students to match the correct types of engine for each of the engine classification types.	
Steps	<ol style="list-style-type: none"> Two columns with options are displayed to the students. The students need to match the blocks of text from the right column to the correct classification type displayed at the left column. 	
General Description of the challenge:	<p>According to the type of fuel used:</p> <p>According to the number of strokes per cycle:</p> <p>According to the method of ignition:</p> <p>According to the cycle of combustion:</p> <p>According to the number of cylinders:</p> <p>According to the arrangement of cylinders:</p> <p>According to method of cooling:</p>	<ul style="list-style-type: none"> - Petrol engine. - Diesel engine. - Gas engine. - Bi-fuel engine. - 4 – stroke engines. - 2 – stroke engines. - Spark ignition, (SI) - Compression ignition, (CI) - Otto cycle. - Diesel cycle. - Dual combustion. - Single cylinder. - Multi cylinder. - Vertical engine. - Horizontal. - Inline engine. - Radial engine. - V- engine. - Air cooled engine. - Water cooled engine.
Learning outcomes:	<ul style="list-style-type: none"> ❖ Students will be able to recognize and understand the operation of the different types of internal combustion engines ❖ Students will be able to understand the engine classification types 	



Material/Resources:	Classification and operation of IC piston engines , Car craft game		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	Two columns with options are displayed to the students.	10
	2	The students need to match the blocks of text from the right column to the correct classification type displayed at the left column.	30
Discussion:	(5 minutes) How would you classify internal combustion engines?		
Assessment after the completion of the lesson:	Students need to match correctly all the options		

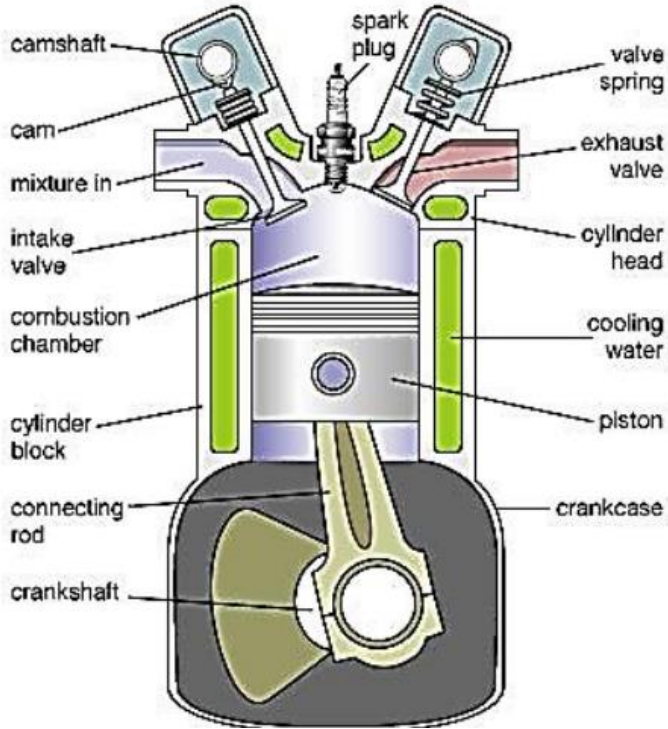


Lesson Plan 3- Identification of engine components

Challenge title:	Challenge #3: Identification of engine components		
Related content	Classification and operation of IC piston engines		
Aim	The aim of this challenge is for students to identify the correct engine components		
Steps	<ol style="list-style-type: none"> 1. Images of the following engine components displayed. 2. The students need to match the correct engine component name to the corresponding image. 		
General Description of the challenge:	<p>Image of the following engine components to be displayed.</p> <p>The names of the following engine components are listed:</p> <ol style="list-style-type: none"> 1. Cylinder 2. Piston 3. Piston rings 4. Connecting rod 5. Crank and crankshaft 6. Valves 7. Flywheel 8. Crankcase 		
Learning outcomes:	<ul style="list-style-type: none"> ❖ Students will be able to recognize and understand the operation of the different types of internal combustion engines ❖ Students will be able to identify the correct engine components 		
Material/Resources:	Classification and operation of IC piston engines, Car Craft game		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	Images of the following engine components displayed.	10
	2	The students need to match the correct engine component name to the corresponding image.	30
Discussion:	(5 minutes)		

	Can you identify the correct components?
Assessment after the completion of the lesson:	Students need to match correctly all the components to the correct images.

Lesson Plan 4- Identification of ICE components

Challenge title:	Challenge #4: Identification of ICE components		
Related content	Identify the correct engine components		
Aim	The aim of this challenge is for students to identify the correct engine parts.		
Steps	<ol style="list-style-type: none"> 1. The ICE image is displayed. 2. The students need to match the correct ICE component name to the corresponding engine part as displayed below. 		
General Description of the challenge:	<p>There is an image about ICE without its components and students have to put the components to the correct place.</p> <p>Engines Parts</p> 		
Learning outcomes:	<ul style="list-style-type: none"> - To understand how the ICE works - To recognize and identify the ICE compounds 		
Pre assessment (optional):	A list with several components and students have to select the ICE components from the others (but at this stage they don't have to put them to the correct place) - it is just a selection from a list		
Material/Resources:	A video on how ICE works		
Main activity/activities:	Activity number	Description of the steps	Duration

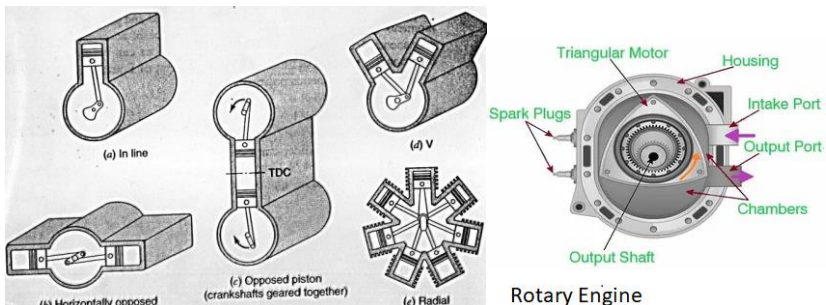


In the game place the components to the items using flight mode	1	Students have to match the correct ICE components name to the corresponding engine part	
	2	If it is not played in the game, students can teach each other	
Discussion:	Discussion about the different types of internal combustion engines		
Assessment after the completion of the lesson:	The components of ICE – by game or an exam		





Lesson Plan 5- Identification of ICE types

Challenge title:	Challenge #5: Identification of ICE types		
Related content	Rotary IC engines		
Aim	The aim of this challenge is for students to identify the correct engine type.		
Steps	<ol style="list-style-type: none"> 1. The images of six ICE types are displayed. 2. The students need to match the correct ICE type to the corresponding image. 		
General Description of the challenge:	<p>Six images of ICE (Internal Combustion Engine) types are given to the player. The player then has to match the correct ICE types. The list of ICE types is:</p> <ul style="list-style-type: none"> -In-line -Horizontally opposed -Opposed Piston -V -Radial and Rotary 		
Learning outcomes:	<ul style="list-style-type: none"> - Students will be able to identify different ICE types - Students will have a clear image on what the categories are - Students will understand what the key differences are between different ICE types 		
Material/Resources:	<ul style="list-style-type: none"> - Six images of different ICE types - In-game items, retextured to represent the different ICE types 		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	A brief text is displayed to the students	0,5 –1
	2	The player has to match the images to the corresponding item frame	1 – 2



	3	The NPC encourages them and leads them to the next challenge	1
Discussion:	The students will get to understand the different ICE types and categorize them. The simple illustration that is presented gives them the key points in order to differentiate the different ICE types. They are then prepared to mind what type of ICE is given in the next challenge in order to mindfully calculate the engine capacity (because it varies between different ICE types)		
Assessment after the completion of the lesson:	The knowledge that is being assessed is that different ICE types exist and have distinct geometrical features and perform differently. Also, all the different ICE types are addressed and reminded to the player.		





Lesson Plan 6- Calculation of engine capacity

Challenge title:	Challenge #6: Calculation of engine capacity		
Related content	Rotary IC engines		
Aim	The aim of this challenge is for students to calculate an engine's capacity in terms of its volume.		
Steps	<ol style="list-style-type: none"> 1. Students are given the cylinder diameter, the stroke length and the number of cylinders for an engine. 2. Students must select the correct answer from four possible answers. 		
General Description of the challenge:	Consider displaying the calculation formula. A display will show the figures provided for the engine features. Students may use the calculator to enter the figure and have the result displayed.		
Learning outcomes:	<ol style="list-style-type: none"> 1. Students will be able to recognize different types of internal combustion engines 1. Students will become familiar with the parameters of the engine (cylinder diameter, stroke length, etc.) number of cylinders 1. Students will understand how engine capacity is calculated in terms of its volume 		
Pre assessment (optional):	The calculation formula will be shown and handed out to students, their first task is to recognize the parameters of the formula		
Material/Resources:	PPT presentation of the calculation form and a video of an engine showing the path that we used in the calculation, cylinder, show		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	Learners have to form groups (pairs or triplets) and calculate together exemplary tasks (in a tournament mode)	
	2	They will also have the opportunity to solve the played task in Carcraft	
Discussion:	Students have to change pairs/groups and reflect on the activity and create a SWOT regarding their learning		
Assessment after the completion of the lesson:	The student's capability to calculate the engine capacity will be measured through an exam with 5-10 calculation examples		



Lesson Plan 7- Identification of components of a four stroke engine

Challenge title:	Challenge #7: Identification of components of a four stroke engine		
Related content	Key Engine Components		
Aim	The aim of this challenge is for students to identify the correct parts of a four stroke engine.		
Steps	<ol style="list-style-type: none"> 1. The image of the four stroke engine is displayed. 2. The students need to match the correct component name to the corresponding engine part as displayed below. 		
General Description of the challenge:	<p>An image of a four-stroke engine is displayed, and the students need to identify each of the components of the engine</p> <div style="text-align: center;"> <p>Four stroke engine</p> <p>Internal combustion engine</p> </div>		
Learning outcomes:	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> - Identify the components of the engine - Distinguish each component - Develop a clear understanding of their purpose - Match correctly the components 		
Material/Resources:	The internal combustion engine book will be used, as well as ppt presentations and videos of the four-stroke engine working principle will be displayed		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	The image of a four-stroke engine is displayed	5 mins
	2	Students need to see the components and identify them	15 mins

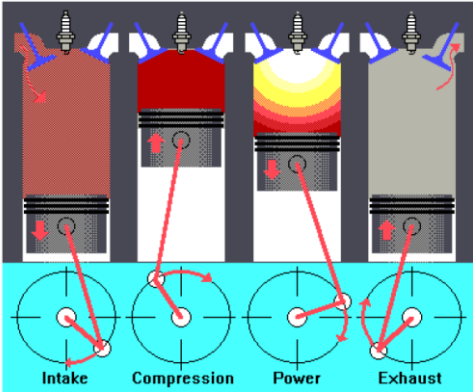
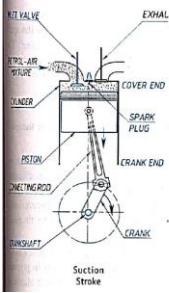
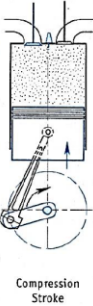

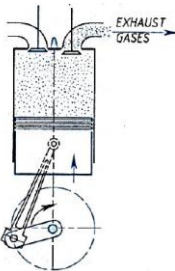


	3	Students are prompt to match correctly the components	15 mins
	4	Students are finished and see again the correct match	10 mins
Discussion:	<p>What is an internal combustion engine?</p> <p>Which are the main components?</p> <p>What is their purpose?</p>		
Assessment after the completion of the lesson:	This is the assessment. To identify and to match correctly the engine components		





Lesson Plan 8- Put in order the strokes of a four stroke engine

Challenge title:	Challenge #8: Put in order the strokes of a four stroke engine
Related content	Key Engine Components
Aim	The aim of this challenge is for students to order the strokes of a four stroke engine.
Steps	<ol style="list-style-type: none"> 1. The image of the four stroke engine is displayed. 2. Images for each of the four strokes are displayed. 3. The students need to put the four strokes in the correct order.
General Description of the challenge:	<p>The image of the four stroke engine is displayed. The students need to put the four strokes in the correct order.</p> <p>The images of each of the four strokes are shown but may not be used. It depends on the choice of the designer.</p>   <p>SUCTION STROKE</p> <ul style="list-style-type: none"> • Inlet is open exhaust is closed. • Piston moves from TDC to BDC. • Crankshaft revolves half the rotation. • Cranking • Petrol air mixture drawn into cylinder due to pressure difference.  <p>COMPRESSION STROKE</p> <ul style="list-style-type: none"> • Both inlet and exhaust are closed. • Piston moves from BDC to TDC. • Crankshaft revolves half the rotation. • Cranking • Petrol air mixture is compressed to a ratio of 1:11. • This mixture is ignited by spark plug. <p>POWER STROKE</p> <ul style="list-style-type: none"> • Piston moves from TDC to BDC. • Crankshaft revolves half the rotation. • burnt gases generate energy and force the piston to move down.  <p>EXHAUST STROKE</p> <ul style="list-style-type: none"> • exhaust is open and inlet is closed. • Piston moves from BDC to TDC. • crankshaft revolves half the rotation. • energy for this stroke is supplied by flywheel. • Burnt gases are expelled out through outlet port. 
Learning outcomes:	Students should be able to: Put in the order the stroke of a four-stroke engine









Main activity/activities:	Activity number	Description of the steps	Duration
	1	The image of the four-stroke engine displayed	10 minutes
	2	Image for each of the four stroke are displayed	10 minutes
	3	The students need to put the four stroke in the correct order	30 minutes
Discussion:	<p>How does a four stroke engine work?</p> <p>How does its stroke work?</p> <p>What will happen if the strokes are not put in the correct order?</p>		
Assessment after the completion of the lesson:	Students need to order correctly all the strokes of a four stroke engine.		



















Lesson Plan 9- Identification of tuning components

Challenge title:	Challenge #9: Identification of tuning components
Related content	Upgrade components (attention - not listed in the five topics of the programme yet)
Aim	The aim of this challenge is for students to identify the correct tuning components.
Steps	<ol style="list-style-type: none"> 1. The images of thirteen engine tuning components are displayed. 2. The students need to match the correct tuning component to the corresponding image.
General Description of the challenge:	<p>Images of tuning components are displayed. The students need to identify the correct images for each tuning component.</p> <ol style="list-style-type: none"> 1. Turbo  2. Intercooler  3. Air filter   <i>Φιλτροχάνη</i> <i>Σκούπα</i> 4. Intake manifold  5. engine compression Increase – cylinder head resurfacing 
Learning outcomes:	<p>Students will be able to:</p> <ul style="list-style-type: none"> - Describe the various subsystems of internal combustion engines - Identify the correct images for each tuning component



<p>Material/Resources:</p>	<ol style="list-style-type: none"> 1. Turbo  2. Intercooler  3. Air filter  <i>Φιλτροχόανη</i>  <i>Σκούπα</i> 4. Intake manifold  5. engine compression Increase – cylinder head resurfacing  6. ECU tuning  7. camshaft replacement  8. flywheel lightening  9. forged pistons  10. Exhaust manifold  11. Racing catalytic converter  12. Injector  13. Nitro  		
<p>Main activity/activities:</p>	<p>Activity number</p>	<p>Description of the steps</p>	<p>Duration</p>





	1	The images of thirteen engine tuning components are displayed.	10 minutes
	2	The students need to match the correct tuning component to the corresponding image	25 minutes
Discussion:	Discuss the functionalities of each of the engine tuning components.		
Assessment after the completion of the lesson:	The challenge itself		





Lesson Plan 10- Put in order the engine tuning components

Challenge title:	Challenge #10: Put in order the engine tuning components		
Related content	Timing systems		
Aim	The aim of this challenge is for students to put tuning components in the correct order.		
Steps	<ol style="list-style-type: none"> 1. The images of engine tuning components are displayed. 2. The names of the tuning components are also displayed. 3. The students need to put the components in the correct order. 		
General Description of the challenge:	<p>Tuning components images are displayed below. Students need to put the correct number next to each component to show the correct order of these components.</p>		
Learning outcomes:	<p>Students will be able to:</p> <ul style="list-style-type: none"> - Describe the various subsystems of internal combustion engines. - Familiarize and identify the engine components 		
Material/Resources:	Timing systems		
Main activity/activities:	Activity number	Description of the steps	Duration
	1	The images of engine tuning components are displayed.	10 minutes
	2	The names of the tuning components are also displayed.	15 minutes





	3	The students need to put the components in the correct order.	25 minutes
Assessment after the completion of the lesson:	Students need to put the tuning components in the correct order.		

