

Basic trades for small island nations

Small Engine User Maintenance

Tutor Guide



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Credits

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The following companies products have been used to illustrate or describe examples in this course material

AC	Denso	Shell
Autolite	Honda	Stihl
Bosch	Johnson	Suzuki
BP	Mercury	Techumseh
Brigs and Stratton	McCulloch	Valvoline
Caltex	Mobil	Victa
Castrol	NGK	Yamaha
Champion	Ryobi	

While these are all excellent products, COL does not endorse them as being available or especially suitable for any of the many and varied locations and situations of the intended use of this course.

The Tutor guide

This Tutor's guide will help you lead students through this course. It contains teaching material, resources, and suggestions on how to use them.

What is this course for?

This course is an introduction to the basic operator maintenance of small engines. It is intended for school leavers and community groups who have limited knowledge or experience working on small engines.

It helps students to:

- Understand how engines work.
- Understand the major parts of an engine and what they do
- Apply preventative maintenance
- Carry out basic routine servicing jobs
- Know their limits - what they should NOT try to do
- Identify simple faults
- Use basic tools.

Students will work with engines, materials and tools that are available locally. The focus of this course is on outboard engines for small boats, but the theory and practical maintenance apply to most other uses for small engines – such as mowers, brush-cutters and generators.

Students who complete this course may be able to work on simple engine maintenance on their own. They will still need to send more complex work to an experienced service mechanic.

What does the course cover?

Small engine user maintenance covers six main topics that can be taught as separate modules:

How small engines work

Students learn about the basic 4- stroke and 2-stroke cycle engines and the types of equipment they power. The course concentrates on outboard motors. They identify the types of engines and materials available locally and where to get them from.

Safety

This a checklist to remind students of safety issues before they start to get their hands on the engines. Safety is also covered in each module.

Major engine components - operation and maintenance

Students learn about the main components needed for an engine to run. They look at the different types and systems used for: Air, fuel, electrics, cooling and oil. They learn about the things they can do to help keep an engine trouble –free (preventative maintenance) and they practice servicing the parts they should check, clean or replace.

Maintenance for non-engine parts

Students learn about other maintenance on their equipment that is not covered in the engine component sections. For example, controls, gear-cases, blades, chains, propellers. There are worksheets for different types of equipment. These are information sheets only and do not include detailed student activities.

Fault finding

Students follow logical steps in a guide to find the cause of basic engine faults.

Tools and spare parts

Suggestions for the tools and spare parts the students need to carry out operator maintenance. Students will also identify what service parts they need for their engine and where they can get them from.

How is the course put together?

The course is a basic introduction for people who know little about looking after a small engine

The course **must** be led by a tutor or experienced trades person who can show students the steps and how to use tools correctly and guide them on their developing skills.

The course will work best with small groups of students who can talk about things and learn from each other.

The course is packaged in two parts:

- This Tutor guide
- Student workbook

Here is some information on each part:

Tutor guide

The *Tutor guide* you are reading gives you preparation plans and tutor notes for each module and each section within the modules.

The main learning material for each section is included in the both the student workbook and this tutor guide. This gives you a planned order for the things you need to talk about, explain and demonstrate. It also gives questions and activities – and practice - for students.

The Tutor Notes at the beginning of each section – on the blue pages – suggest the things that you need to find out, or collect, before you start each section. The notes then suggest additional ideas, points or questions for you to use as you work through the learning material.

Student workbook

The *workbook* contains the main learning material. It has exercises, illustrations and explanations of processes for students as well as space to make their own notes.

All the workbook material is repeated in the Tutor guide with notes and directions added.

In what order do I run the course?

You can run the course material as a continuous 'block' course over several days, or you can run it as a number of shorter sessions spread over a longer period.

You should run the *How small engines work* module first, followed by the safety worksheet. You can change the order of the others, if you wish, to fit-in with the engines you have available – especially the order of the main engine components and the non-engine parts.

Each section about the engine has information about maintenance and servicing included. You may want to talk about all the theory of the various components and then cover maintenance altogether, OR you could cover the maintenance of each component as you get to it.

What resources do I need?

This *Tutor guide* and the *Student workbook* are the main written resources for the course.

You will also need to provide students with materials, tools and equipment to work with. The front page of each section lists the specific resources needed, but here are some general requirements and suggestions:

Tools and equipment for students

You will need enough tools for small groups of students to work with. You can use tools that are similar to those shown. You do not need tools of exactly the same style – but they will need to be suitable for the engine and the job you are doing. Ideally, students could work on their own engines with the tools they normally use.

Working area

Students will need an area where they can work on an engine. This does not need to be a workshop, but it does need to be somewhere that work can be carried out safely and correctly. Think about:

- Tables/benches or engine stands
- Ventilation for petrol or exhaust fumes
- Keeping parts free of sand, dust and dirt
- Somewhere to get rid of used oil, liquids and filters.

Materials

You will need engines and materials for students to work with. You will need quantities of maintenance materials and spare parts. You could take students to look at / buy these and bring them back from local suppliers.

If you have them available, old or scrap engines and parts could be useful for students to look at and practice on.

You could ask some local businesses to help you with some samples and technical information. They can also give you local information parts sizes, availability, prices etc.

The role of the Tutor

As a tutor for this course you should be a competent tradesperson with knowledge of small engine servicing and maintenance - and skills in using the tools.

You do not need to be a formal teacher, but you do need to be able to follow the material in this guide, talk to students about the topics and how things apply locally, and then show them the correct use of tools and processes.

As a tutor, you need to:

- Collect resources – local examples and working stock, tools, equipment etc
- Lead students through the material
- Explain how students can apply the material to their own engines.
- Know when to tell students to stop – at the limit of their abilities.
- Demonstrate how to use tools correctly and safely
- Watch students work and give feedback on how they are doing.

Copies of each module and section of learning material are included in your *Tutor guide* as well as in the *Student workbook*.

You need to work through each section with the students, talking about the tools and equipment and showing students how to use them.

The student worksheets cover the basic information. As tutor you should talk through and explain more complex and additional ideas. You must also explain the different details of engines and parts fitted to specific engine types and makes in your area.

The learning material is **not** designed to be used by students learning on their own. It should be a useful reference for them later though.

You will find more detailed guidance on how to prepare yourself and lead students through the learning material in the section called **General – tutor notes** later in this Introduction.

Important note

Engines, fuel and waste oil can seriously damage our world and environment. Make sure YOUR students know how to use engines responsibly and know how to dispose of old fuel and oil safely in your local environment.

Activities

The activities in the material should help students to find out about their engine, collect information and gain a basic skill in doing the job and using the tools.

Make sure you give students **lots** of time to have **lots** of practice.

Assessment

No formal assessment is included in this course.

Each worksheet has suggested practical activities for students to practise and complete. You should watch these activities, give feedback to students and encourage practice until your students are competent.

A Student checklist is provided for you to check-off each activity for each student. This will then provide a record of completion for each of the key requirements of the course.

Projects

Provide your group of students with a project (or projects) to work on through the course so they can apply the skills they have learned. Ideally, these should be their own, real working engines. Other engines with faults would be useful.

Students should work together in small groups.

Suitable projects could include:

- Carry out a full maintenance check and service on their engine
- Diagnose faults on engines – and fix it if possible.

Student learning

Whether or not your students have had much time at school, they have much knowledge and skills from their life experience. You should use this when you are teaching groups. Students like to compare what they are learning with their experience. The introductory sessions of this course help students to link the course material with the resources, tools and techniques used in their own locality. Talking about their knowledge, experience and feelings is important.

Discussions are important for learning. Asking questions and looking for solutions to problems are good ways of helping students to learn. Students learn best by working things out for themselves - the activities and practise sessions are most important. As a tutor you should be a guide rather than a teacher.

Most importantly, make every person feel that their thoughts, feelings, and experiences are important. Then, people will be more confident at taking part in group discussions and activities.

This course gives a great deal of information and knowledge about small engines, but the main learning should be in developing basic skills. Students must be able to use the tools – not just talk about them. The course material and the tutor can show how an engine or spark plug works and how to use a spanner, but it needs practice and feedback for a student to begin to develop any skill. Give plenty of time and materials for practice and activity sessions.

Groups of two or three students working together, watching and giving each other feedback can work well. It encourages students to recall knowledge, look critically at what they see and then give feedback to each other.

General – tutor notes

These tutor notes should help you use the workbook with students.

Preparing yourself

Before you start working with students you need to get yourself ready.

Look though the students workbook material to see what you have to cover.

Then read the tutor notes. These notes will:

- tell you what to collect or find out for each section
- give extra important information and guidance that you should include as you work through each section of the workbook.

Each section of the course starts by telling you:

What students will learn

Your notes and the student workbook modules each start by saying what the students should be able to do when they have finished the section.

Things you need before you start

Each section tells you what you need to find out, or things you need before you start. These are usually:

Information

Such as ideas, where to buy materials and what they cost, local regulations or ways to do things.

Materials

Materials for students to use. For example, spark plug wrench, wire brush, feeler gauge.

Tools or equipment

Tools and equipment for the students to work with

Activity projects

For most activities, students change, fix or clean things. If you can find or create a real problem to work on, it is much better than a practice piece of work.

Working through the material with students

Workbooks

The Student Workbook sections have notes, pictures and activities for students. Most modules are in sections that follow a process – or the steps in which to do things.

Copies of the workbook sections are included in your manual here as well as in the Student Workbook.

The workbooks are not designed to be used by the students learning on their own.

You need to work through each section with the students, talking about each step and showing the students how to do it.

Tutor Notes

The tutor notes at the beginning of each section give you extra or important information and guidance that you should include as you work through each section of the workbook

Here are some general ideas about using the workbook notes.

Talk the students through each section of the module

The *How small engines work* module gives information about engine basics. The worksheets have notes for students.

The engine *component* sections are more active. They have sections that show:

- how to carry out maintenance on this component
- the equipment, tools and materials needed
- safety issues
- activities for the student to answer or practise

Show and explain

You need to:

- show local examples of engines, materials and tools
- explain and follow each step, demonstrating how to:
 - do it correctly
 - use each tool
- help students find information they need and apply what they have learned to the activities
- explain any dangers and
- show safe ways to do things.

Student activity

The activities in the workbook should help students to gain a basic skill in looking after their engines. The activities take students through preventative steps and any maintenance within their ability.

The students will also collect technical information about *their* engine and the spares required – and where to get them from.

In most activities, students have to answer questions and then practise each stage on a real project or job.

Make sure you give them time to handle the materials and have lots of practice with the equipment.

Where possible, get students to work in small groups of 2 or 3 people.

Encourage them to

- talk about what they are doing
- help each other to get things right
- check that others are doing things safely.

You should continue to help, show and guide students through the activities – they are not exams! However, let the students do all the thinking and the work.

Check the students activity work and give feedback on how they have done.