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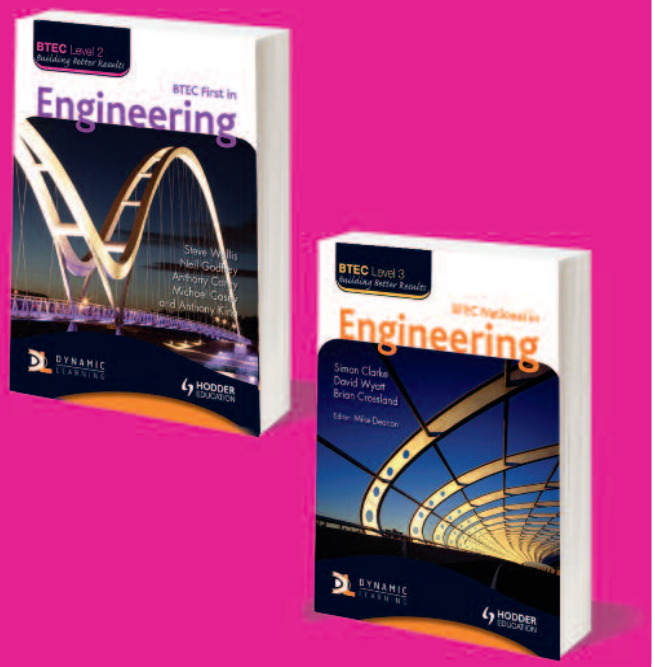

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BTEC Level 2 First Engineering

With an author team of experienced BTEC teachers, this clearly-written assessment-focused Student's Book is vital for your students' success and includes exactly what you need to manage and plan the teaching of the new Level 2 BTEC course.

All core units and many of the popular optional units are covered in the Student's Book, which supports and develops your students' engineering knowledge and skills. The book is written in a lively and visual manner and is bursting with full-colour photographs and illustrations that will appeal to any budding engineer!

The Student's Book contains case studies set in vocational contexts, enabling you to show your students how engineering is used in everyday life. There are lots of activities within the textbook, which are linked to the Pass, Merit, and Distinction criteria, ensuring students understand what evidence they need to demonstrate.

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How will this book help your students get better results?

- Simple, **concise explanations** with relevant images covering the key elements of the unit content to give students and teachers a quick and easy reference
- **'Make the grade'** – A thorough reference to the assessment criteria enables students to understand what is required to make the grade for each level
- **'Team Talk'** – An informal discussion is included to support the main text where information may need to be clarified or expanded
- There is a **choice of assignments** that can be easily adapted to match students' ability so they can work at their own pace
- **Straightforward** language for learners at this level

cut-out hole

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'Team Talk' references clarify new ideas and concepts

Illustrations of apparatus give students a visual guide of how real engineering machines work

Down-cut milling: this method is called down-cutting because the cutting tool rotates anti-clockwise onto the workpiece. In order to use this method, a device known as a backlash eliminator is required. CNC machines do not have lead screws and so this method is used because it gives a better surface finish and is a more efficient method of cutting.

Vertical milling

In the case of a vertical milling machine, the cutter spins in the vertical position.

The workpieces and table move in exactly the same way as for horizontal milling, but the cutting tool is vertical, or perpendicular, to the table. It looks a little like a pedestal drill or bench drill but with a moveable table.

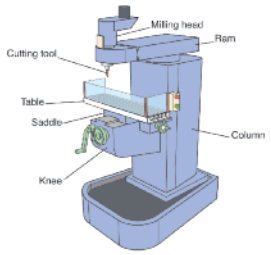

Figure 14.4

Team Talk

Neil: **'What types of shapes can vertical milling machines produce?'**
Tony: **'A vertical milling machine can cut along edges or surfaces of material. It is great for making straight edges or a flat surface on the top of a workpiece. It can also produce slots, holes and keyways.'**

Secondary machining techniques: drilling and grinding

P1 D1

In this Learning Pod, you will learn about two secondary machining techniques and how they are used:

- drilling;
- grinding.

Drilling machines

Drilling is the simplest type of secondary machining technique. Figure 14.5 shows a pedestal drill.

Drilling machines have a worktable that can move to locate the workpiece, but it does not move during drilling.

The drilling machine is mainly used to drill holes. In an engineering workshop, holes from 1 mm to around 25 mm can be drilled. These machines are also used for reaming, which is an accurate way of producing a hole.

Grinding machines

Grinding machines are used when extreme accuracy is required. .

Grinders generally fall into two main types:

- surface grinders;
- cylindrical grinders:
  1. centreless grinding;
  2. profile grinding;
  3. thread grinding.

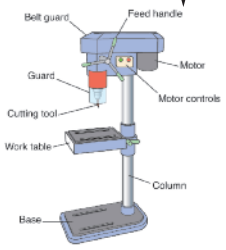

Figure 14.5 Pedestal drill

Surface grinders

Surface grinders are used for very accurate or precision machining. They use a spinning ceramic grinding wheel that rotates at a very high speed. A component that has been machined using a milling process can then be finished to a more accurate size using a surface grinder. Grinders have the advantage of being able to remove material that is very hard, which milling processes cannot do. They do not generally remove lots of material.

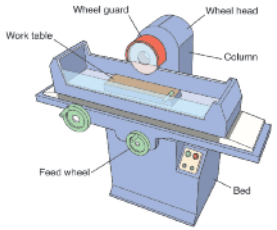

Figure 14.6

Cylindrical grinders

A cylindrical grinder uses a high-speed, spinning ceramic grinding wheel to produce highly accurate components. The products produced are cylindrical. Where products have been machined using a lathe, a cylindrical grinding machine will finish these to a very accurate size. These machines can also finish boreholes to high precision.

Centreless grinding: this process is similar to cylindrical grinding but it does not use a spindle. It is used in mass production. The workpiece goes between the grinding wheel that cuts it and the regulating wheel that positions it.

Profile grinding: sometimes a more complex shape needs to be ground onto the surface

Clear grade indicators throughout the Student's Book remind students what level is gained after completing the task

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Written by the BTEC unit writers and edited by the Principal Standards Verifier to ensure specific tasks and activities relate to each units learning outcome, and the related Pass, Merit and Distinction criteria.

How will this book help your students get better results?

- **'Key Terms'** help explain the language of engineering in an accessible format
- There are **numerous examples** on how to tackle problems, giving students ideas and tips on how to develop their portfolios
- Hundreds of **illustrations and photographs** help to reinforce theory and make the subject of engineering more tangible to students
- **'Make the grade'** directly guides students towards providing the correct types of evidence to achieve the grade at each level

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Our authors

Experienced BTEC and educational professionals have written our resources so you can be confident they know exactly what is needed to get better results.

All five authors have a wealth of experience in delivering, verifying or writing for BTECs.

Mike Deacon is the Principal Standards Verifier for a leading examinations board

Simon Clarke is BTEC unit writer and lecturer at Swindon College

Brian Crossland is a BTEC unit writer and experienced author

David Wyatt is an Engineering practitioner and experienced author

Steve Wallis, Neil Godfrey, Anthony Carey, Michael Casey, Anthony King are all teachers at Hartlepool College of Further Education and have many years' experience of teaching at this level.

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Dynamic Learning

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- **Further activities** that can be used to generate evidence for students' portfolios
- **Interactive assessment** tools enable your students to test their knowledge as they proceed with the course
- Vocational-based **case studies** to provide your students with suggestions and ideas for their assignments
- **Illustrations** and **images** from the book that can be used to enhance classroom teaching

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