The Further Education and Training Awards Council (FETAC) was set up as a statutory body on 11 June 2001 by the Minister for Education and Science. Under the Qualifications (Education & Training) Act, 1999, FETAC now has responsibility for making awards previously made by NCVA.

Module Descriptor

Mechanical Maintenance Skills

Level 6  L31511

www.fetac.ie
# Level 6 Module Descriptor

## Summary of Contents

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<th>Description</th>
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</thead>
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<td>Describes how the module functions as part of the national vocational certificate framework.</td>
</tr>
<tr>
<td><strong>Module Title</strong></td>
<td>Indicates the module content. This title appears on the learner’s certificate. It can be used to download the module from the website <a href="http://www.fetac.ie">www.fetac.ie</a>.</td>
</tr>
<tr>
<td><strong>Module Code</strong></td>
<td>An individual code is assigned to each module; a letter at the beginning denotes a vocational or general studies area under which the module is grouped and the first digit denotes its level within the national vocational certificate framework.</td>
</tr>
<tr>
<td><strong>Level</strong></td>
<td>Indicates where the module is placed in the national vocational certificate framework, from Level 3 to Level 6.</td>
</tr>
<tr>
<td><strong>Credit Value</strong></td>
<td>Denotes the amount of credit that a learner accumulates on achievement of the module.</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Describes in summary what the learner will achieve on successfully completing the module and in what learning and vocational contexts the module has been developed. Where relevant, it lists what certification will be awarded by other certification agencies.</td>
</tr>
<tr>
<td><strong>Preferred Entry Level</strong></td>
<td>Recommends the level of previous achievement or experience of the learner.</td>
</tr>
<tr>
<td><strong>Special Requirements</strong></td>
<td>Usually ‘none’ but in some cases detail is provided here of specific learner or course provider requirements. There may also be reference to the minimum safety or skill requirements that learners must achieve prior to assessment.</td>
</tr>
<tr>
<td><strong>General Aims</strong></td>
<td>Describe in 3-5 statements the broad skills and knowledge learners will have achieved on successful completion of the module.</td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td>Structure the learning outcomes; there may be no units.</td>
</tr>
<tr>
<td><strong>Specific Learning Outcomes</strong></td>
<td>Describe in specific terms the knowledge and skills that learners will have achieved on successful completion of the module.</td>
</tr>
<tr>
<td><strong>Portfolio of Assessment</strong></td>
<td>Provides details on how the learning outcomes are to be assessed.</td>
</tr>
<tr>
<td><strong>Grading</strong></td>
<td>Provides details of the grading system used.</td>
</tr>
<tr>
<td><strong>Individual Candidate Marking Sheets</strong></td>
<td>List the assessment criteria for each assessment technique and the marking system.</td>
</tr>
<tr>
<td><strong>Module Results Summary Sheet</strong></td>
<td>Records the marks for each candidate in each assessment technique and in total. It is an important record for centres of their candidate’s achievements.</td>
</tr>
<tr>
<td><strong>Appendices</strong></td>
<td>Can include approval forms for national governing bodies.</td>
</tr>
<tr>
<td><strong>Glossary of Assessment Techniques</strong></td>
<td>Explains the types of assessment techniques used to assess standards.</td>
</tr>
<tr>
<td><strong>Assessment Principles</strong></td>
<td>Describes the assessment principles that underpin FETAC approach to assessment.</td>
</tr>
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</table>
Introduction

A module is a statement of the standards to be achieved to gain a FETAC award. Candidates are assessed to establish whether they have achieved the required standards. Credit is awarded for each module successfully completed.

The standards in a module are expressed principally in terms of specific learning outcomes, i.e. what the learner will be able to do on successful completion of the module. The other elements of the module - the purpose, general aims, assessment details and assessment criteria - combine with the learning outcomes to state the standards in a holistic way.

While FETAC is responsible for setting the standards for certification in partnership with course providers and industry, it is the course providers who are responsible for the design of the learning programmes. The duration, content and delivery of learning programmes should be appropriate to the learners’ needs and interests, and should enable the learners to reach the standard as described in the modules. Modules may be delivered alone or integrated with other modules.

The development of learners’ core skills is a key objective of vocational education and training. The opportunity to develop these skills may arise through a single module or a range of modules. The core skills include:

- taking initiative
- taking responsibility for one’s own learning and progress
- problem solving
- applying theoretical knowledge in practical contexts
- being numerate and literate
- having information and communication technology skills
- sourcing and organising information effectively
- listening effectively
- communicating orally and in writing
- working effectively in group situations
- understanding health and safety issues
- reflecting on and evaluating quality of own learning and achievement.

Course providers are encouraged to design programmes which enable learners to develop core skills.
Module Title: Mechanical Maintenance Skills

Module Code: L31511

Level: 6

Credit Value: 1 credit

Purpose:
This module is a statement of the standards to be achieved to gain a FETAC credit in Mechanical Maintenance at Level 6. The module is designed to equip the participant with the knowledge and skills necessary to understand modern maintenance systems and perform the fault finding and repair tasks required in the mechanical maintenance area.

Preferred Entry Level:
Relevant life and work experiences.

Special Requirements:
None.

General Aims:

Learners who successfully complete this module will:

8.1 Appreciate the different strategies in modern maintenance systems

8.2 Develop an awareness of the properties of ferrous and non-ferrous materials and alloys

8.3 Be able to diagnose fault in mechanical transmission systems be able to use the standard mechanical measuring instruments

8.4 Be able to perform a wide range of maintenance tasks safely

Units:
The specific learning outcomes are grouped into 4 units.

Unit 1 Maintenance Systems
Unit 2 Common Mechanical Engineering Materials
Unit 3 Power Transmission Systems
Unit 4 Maintenance Best Practice
10 Specific Learning Outcomes

Unit 1 Maintenance Systems

Learners should be able to:

10.1.1 Distinguish between the main Maintenance Systems
10.1.2 Explain the use of maintenance records
10.1.3 Suggest planned maintenance checks
10.1.4 List the common methods of condition monitoring
10.1.5 Outline the operation of a computerised maintenance programme

Unit 2 Common Mechanical Engineering Materials

Learners should be able to:

10.2.1 Distinguish between elements and alloys
10.2.2 List the properties of ferrous and non-ferrous materials
10.2.3 Explain how these properties are related to wear in components
10.2.4 Understand the need for standard sizes
10.2.5 Understand the tolerances, limits and fits
10.2.6 Read standard engineering drawings
10.2.7 Check the dimensions of standard parts.

Unit 3 Power Transmission Systems

Learners should be able to:

10.3.1 Explain the principles of mechanical power transmission between rotating shafts
10.3.2 List standard drive transmission systems
10.3.3 List the advantages and disadvantages of these systems
10.3.4 Distinguish between the components used in these systems
10.3.5 Evaluate the efficiency of lubrication systems
10.3.6 Explain the principles of operation of static and dynamic seals
10.3.7 Evaluate the readings on standard instruments on these systems
Unit 4  Maintenance Best Practice

Learners should be able to:

10.4.1 Identify standard hazard warning signs for dangerous substances
10.4.2 Analyse a maintenance procedure for inherent risks
10.4.3 specify the steps required to ensure safety during work on a system component
10.4.4 Perform maintenance checks
10.4.5 Identify fault symptoms
10.4.6 Analyse symptoms to diagnose faults
10.4.7 Use standard mechanical measurement instrument for maintenance tasks
10.4.8 Perform standard maintenance repairs safely

11 Portfolio of Assessment

11.1 Examinations
The internal assessor will devise 2 theory based examinations that will assess candidates’ ability to recall and apply theory and understanding, requiring responses to a range of short answer questions in writing.

The examination will be based on the specific learning outcomes of Units 1 and 2, and will each be 1 hour in duration.

The format of each of the theory-based examinations will be as follows:

<table>
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<tr>
<th>Percentage Range</th>
<th>Time Allocated</th>
<th>No. of Questions</th>
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<tbody>
<tr>
<td>20%</td>
<td>1 Hour</td>
<td>10 s/a</td>
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11.2 Skills Demonstration
In 3 Skills Demonstrations, candidates will assessed in a broad range of practical skills and knowledge as outlined in the specific learning outcomes of Units 4 and 5.

The skills tested will be chosen at random by the assessor on the day of assessment.

12 Grading

Pass 50 - 64%
Merit 65 - 79%
Distinction 80 - 100%
<table>
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<tr>
<th>Assessment Criteria</th>
<th>Maximum Mark</th>
<th>Candidate Mark</th>
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**TOTAL MARKS**  
This mark should be transferred to the Module Results Summary Sheet  

20

**Internal Assessor’s Signature:** ___________________________  **Date:** ____________

**External Authenticator’s Signature:** ________________________  **Date:** ____________
Candidate Name: ____________________________  PPSN: ________________________

Centre: ______________________________________ Centre No.: _________

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<th>Assessment Criteria</th>
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**TOTAL MARKS**  
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*External Authenticator’s Signature: ____________________________ Date: ___________
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**TOTAL MARKS**

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*External Authenticator’s Signature: ___________________________ Date: ___________
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<tr>
<th>Assessment Criteria</th>
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<tbody>
<tr>
<td>Section A: short answer questions</td>
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<td>Question No.:*</td>
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<td>Section B: structured questions</td>
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<td>Question No.:*</td>
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<tr>
<td>TOTAL MARKS</td>
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* The internal assessor is required to enter here the question numbers answered by the candidate.
<table>
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<tr>
<th>Assessment Criteria</th>
<th>Maximum Mark</th>
<th>Candidate Mark</th>
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<tbody>
<tr>
<td></td>
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<td>Assignment 1</td>
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<td>Assignment 2</td>
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Subtotal

TOTAL MARKS 20

This mark should be transferred to the Module Results Summary Sheet

Internal Assessor’s Signature: ____________________________ Date: __________

External Authenticator’s Signature: ____________________________ Date: __________
FETAC Module Results Summary Sheet

Module Title: Mechanical Maintenance  
Module Code: L31511

<table>
<thead>
<tr>
<th>Candidate Surname</th>
<th>Candidate Forename</th>
<th>Total 100%</th>
<th>Grade*</th>
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Signed: ___________________________

Internal Assessor: ___________________________  Date: ____________

Grade*  
D: 80 - 100%  
M: 65 - 79%  
P: 50 - 64%  
U: 0 - 49%  
W: candidates entered who did not present for assessment

This sheet is for internal assessors to record the overall marks of individual candidates. It should be retained in the centre. The marks awarded should be transferred to the official FETAC Module Results Sheet issued to centres before the visit of the external Authenticator.
# FETAC Module Results Summary Sheet

**Module Title:** Mechanical Maintenance  
**Module Code:** L31511

<table>
<thead>
<tr>
<th>Candidate Surname</th>
<th>Candidate Forename</th>
<th>Mark Sheet 1</th>
<th>Mark Sheet 2</th>
<th>Total 100%</th>
<th>Grade*</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>40%</td>
<td>60%</td>
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</table>

**Maximum Marks per Marking Sheet**

- Mark Sheet 1: 40%
- Mark Sheet 2: 60%

**Signed:**  
Internal Assessor: ______________________ Date: ______________

This sheet is for internal assessors to record the overall marks of individual candidates. It should be retained in the centre. The marks awarded should be transferred to the official FETAC Module Results Sheet issued to centres before the visit of the external Authenticator.

Grade*

- D: 80 - 100%
- M: 65 - 79%
- P: 50 - 64%
- U: 0 - 49%
- W: candidates entered who did not present for assessment
Glossary of Assessment Techniques

Assignment

An exercise carried out in response to a brief with specific guidelines and usually of short duration.

Each assignment is based on a brief provided by the internal assessor. The brief includes specific guidelines for candidates. The assignment is carried out over a period of time specified by the internal assessor.

Assignments may be specified as an oral presentation, case study, observations, or have a detailed title such as audition piece, health fitness plan or vocational area profile.

Collection of Work

A collection and/or selection of pieces of work produced by candidates over a period of time that demonstrates the mastery of skills.

Using guidelines provided by the internal assessor, candidates compile a collection of their own work. The collection of work demonstrates evidence of a range of specific learning outcomes or skills. The evidence may be produced in a range of conditions, such as in the learning environment, in a role play exercise, or in real-life/work situations.

This body of work may be self-generated rather than carried out in response to a specific assignment e.g. art work, engineering work etc.

Examination

A means of assessing a candidate’s ability to recall and apply skills, knowledge and understanding within a set period of time (time constrained) and under clearly specified conditions.

Examinations may be:

- practical, assessing the mastery of specified practical skills demonstrated in a set period of time under restricted conditions
- oral, testing ability to speak effectively in the vernacular or other languages
- interview-style, assessing learning through verbal questioning, on one-to-one/group basis
- aural, testing listening and interpretation skills
- theory-based, assessing the candidate’s ability to recall and apply theory, requiring responses to a range of question types, such as objective, short answer, structured, essay. These questions may be answered in different media such as in writing, orally etc.

Learner Record

A self-reported record by an individual, in which he/she describes specific learning experiences, activities, responses, skills acquired.

Candidates compile a personal logbook/journal/diary/daily diary/record/laboratory notebook/sketch book.
The logbook/journal/diary/daily diary/record/laboratory notebook/sketch book should cover specified aspects of the learner’s experience.
Project

A substantial individual or group response to a brief with guidelines, usually carried out over a period of time.

Projects may involve:

- research – requiring individual/group investigation of a topic
- process – e.g. design, performance, production of an artefact/event

Projects will be based on a brief provided by the internal assessor or negotiated by the candidate with the internal assessor. The brief will include broad guidelines for the candidate. The work will be carried out over a specified period of time.

Projects may be undertaken as a group or collaborative project; however the individual contribution of each candidate must be clearly identified.

The project will enable the candidate to demonstrate: (some of these – about 2-4)

- understanding and application of concepts in (specify area)
- use/selection of relevant research/survey techniques, sources of information, referencing, bibliography
- ability to analyse, evaluate, draw conclusions, make recommendations
- understanding of process/planning implementation and review skills/planning and time management skills
- ability to implement/produce/make/construct/perform
- mastery of tools and techniques
- design/creativity/problem-solving/evaluation skills
- presentation/display skills
- team working/co-operation/participation skills.

Skills Demonstration

Assessment of mastery of specified practical, organisational and/or interpersonal skills.

These skills are assessed at any time throughout the learning process by the internal assessor/another qualified person in the centre for whom the candidate undertakes relevant tasks.

The skills may be demonstrated in a range of conditions, such as in the learning environment, in a role-play exercise, or in a real-life/work situation.

The candidate may submit a written report/supporting documentation as part of the assessment.

Examples of skills: laboratory skills, computer skills, coaching skills, interpersonal skills.
FETAC Assessment Principles

1. Assessment is regarded as an integral part of the learning process.

2. All FETAC assessment is criterion referenced. Each assessment technique has **assessment criteria** which detail the range of marks to be awarded for specific standards of knowledge, skills and competence demonstrated by candidates.

3. The mode of assessment is generally local i.e. the assessment techniques are devised and implemented by internal assessors in centres.

4. Assessment techniques in FETAC modules are valid in that they test a range of appropriate learning outcomes.

5. The reliability of assessment techniques is facilitated by providing support for assessors.

6. Arising from an extensive consultation process, each FETAC module describes what is considered to be an optimum approach to assessment. When the necessary procedures are in place, it will be possible for assessors to use other forms of assessment, provided they are demonstrated to be valid and reliable.

7. To enable all learners to demonstrate that they have reached the required standard, candidate evidence may be submitted in written, oral, visual, multimedia or other format as appropriate to the learning outcomes.

8. Assessment of a number of modules may be integrated, provided the separate criteria for each module are met.

9. Group or team work may form part of the assessment of a module, provided each candidate's achievement is separately assessed.
1) Explain the purpose of the Maintenance function.

2) Define the following terms:
   - Preventive Maintenance
   - Corrective Maintenance

3) State 3 advantages of Condition Monitoring.

4) Explain one method of Condition Monitoring

5.a) Name two factors that are important in the trouble shooting process.
5.b) Explain one of these.

6) State the main differences between Ferrous and Non-Ferrous metals.

7) Suggest a suitable material for:
   - A Bearing Bushing
   - A Roller Bearing
   - A Lathe Bed
   - A Hammer
   In each case, give a reason for your choice.

8.a) Explain the term Alloy, and state why such a material is used.
8.b) Name one Alloy, and state its advantages

9) State the standard shapes in which bar material is normally available. Sketch these shapes, and give a standard size for each.

10) Draw the hazardous material sign for:
    - A non-flammable gas
    - A flammable liquid.
    In each state, state the colour of the sign.
1) Show, with neat labelled sketches, the following:
   - Angular misalignment of shafts
   - Parallel misalignment of shafts
   - How you would overcome the two above

2) State the flexible difference between the following couplings:
   - Flexible
   - Rigid
   Draw a simple sketch of an example of each type, and state its main characteristics.

3) Name the types of load that can be applied to bearings. Name a bearing type suitable for each case.

4) With the aid of neat, labelled sketches, show the formation of the lubrication film in a plain bearing.

5) With the aid of a neat, labelled sketch show how you would cold mount a cylindrical bore bearing in a gearbox? (2 * 10 marks)

6) Sketch a pumped lubrication system for a bearing, and comment on the required cleanliness of the lubricant.

7) Name two symptoms and two causes of failure in both plain and rolling element bearings.

8) Explain the principle of operation of both Vee–belt and chain drives. Show with a neat labelled sketch how you would measure the slack in either a V-belt or chain drive set up.

9) a) Explain what is meant by the term “BACKLASH” in gears?
   b) Explain, with the aid of a sketch, the difference between a Single reduction and a Triple reduction gear drive.

10) Explain the principle of operation for the following seals:
    - Static Seal
    - Dynamic Seal
    Sketch one example of each.

11) Describe, briefly, how you would ensure that a bed plate is level.
Mechanical Maintenance Skills: Skills Demonstration 1

Course Assessor: Date:

This assessment carries 200 marks

Align the sprockets on the chain drive supplied, using a spirit level or straight edge, to within 0.01mm.

Name: ___________________________________________________________

Date: ___________________________________________________________

Do not mark below this line.

Assessors Remarks:

Was work carried out:

➢ Within time YES/NO
➢ First Time YES/NO
➢ Safely YES/NO
➢ Using Correct Procedure YES/NO

Total:

Assessors Signature: ____________________________________________

Date: ____________________________________________
Mechanical Maintenance Skills: Skills Demonstration 2
Course Assessor:     Date:

This assessment carries 200 marks

Level a bedplate, as supplied, to within 0.01 mm, using a spirit level, dial test indicator and shims.

Name: _____________________________________________________________________
Date: _____________________________________________________________________

Do not mark below this line.

Assessors Remarks:

Was work carried out:

➢ Within time YES/NO
➢ First Time YES/NO
➢ Safely YES/NO
➢ Using Correct Procedure YES/NO

Total:

Assessors Signature: ______________________________________________________
Date: _____________________________________________________________