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.

FETAC
Further Education and Training Awards Council
Comhairle na nDámhachtainí Breisoideachais agus Oiliúna

Module Descriptor

Mathematics

Level 5 C20139

www.fetac.ie

Level 5 Module Descriptor

Summary of Contents

Introduction	Describes how the module functions as part of the national vocational certificate framework.
Module Title	Indicates the module content. This title appears on the learner's certificate. It can be used to download the module from the website www.fetac.ie.
Module Code	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.
Level	Indicates where the module is placed in the national vocational certificate framework, from Level 3 to Level 6.
Credit Value	Denotes the amount of credit that a learner accumulates on achievement of the module.
Purpose	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.
Preferred Entry Level	Recommends the level of previous achievement or experience of the learner.
Special Requirements	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.
General Aims	Describe in 3-5 statements the broad skills and knowledge learners will have achieved on successful completion of the module.
Units	Structure the learning outcomes; there may be no units.
Specific Learning Outcomes	Describe in specific terms the knowledge and skills that learners will have achieved on successful completion of the module.
Portfolio of Assessment	Provides details on how the learning outcomes are to be assessed.
Grading	Provides details of the grading system used.
Individual Candidate Marking Sheets	List the assessment criteria for each assessment technique and the marking system.
Module Results Summary Sheet	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.
Appendices	Can include approval forms for national governing bodies.
Glossary of Assessment Techniques	Explains the types of assessment techniques used to assess standards.
Assessment Principles	Describes the assessment principles that underpin FETAC approach to assessment.

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.

1	**Module Title**	**Mathematics**
2	**Module Code**	**C20139**
3	**Level**	**5**
4	**Credit Value**	**1 credit**
5	**Purpose**	This module is a statement of the standards to be achieved to gain a FETAC credit in Mathematics at Level 5. It is designed to be taken across a wide range of FETAC certificates. The module is designed to enable the learner to extend the mathematical skills that have already been encountered to a higher level, master selected new mathematics and to extend mathematical problem solving skills. This module is one of a suite of modules which include Mathematics for Engineering C20174 and Mathematics for Computing C20175. The core units which are common to the suite of modules extend the learner's Level 3 in essential mathematics and generic mathematical skills. This is achieved through a broad vocational orientation in the core and a more specific vocational orientation in the clearly defined vocational units of individual modules. The vocational units elaborate the skills acquired from the core units and provide a Level 3 for further study and employment.
6	**Preferred Entry Level**	Level 4 Certificate, Leaving Certificate or equivalent qualifications and/or relevant life and work experiences.
7	**Special Requirements**	For the purpose of certification leading to an award, this module cannot be combined with the following modules: Mathematics for Engineering C20174 Mathematics for Computing C20175.

8 General Aims

Learners who successfully complete this module will:

8.1	apply mathematics in a variety of real life situations
8.2	acquire mathematical skills including: number sense, basic algebra, geometry, data handling, chance and rates of change
8.3	develop competence in problem solving, mathematical computation, mathematical thinking and conceptual development.

9 Units

The specific learning outcomes are grouped into 6 units.
Units 1-4 (core units) are common to the following modules:
Mathematics for Engineering C20174
Mathematics for Computing C20175

Unit 1	**Modelling using Mathematics**
Unit 2	**Graphs, Functions and Rates**
Unit 3	**Geometry and Trigonometry**
Unit 4	**Statistics and Chance**
Unit 5	**Further Calculus**
Unit 6	**Complex Numbers and Trigonometry**

10 Specific Learning Outcomes

Unit 1 **Modelling using Mathematics**

Learners should be able to:

10.1.1	explain the concept of model
10.1.2	distinguish mathematical models from physical models
10.1.3	explain what is meant by a mathematical model
10.1.4	recognise simple mathematical models in use in practical situations
10.1.5	explain the modelling process in diagrammatic form
10.1.6	devise simple mathematical models of practical significance
10.1.7	solve simple mathematical models using various known mathematical skills, processes and results in arithmetic, algebra, geometry etc
10.1.8	explain the concepts of accuracy/precision

10.1.9	round numerical values to a given number of decimal places or significant figures
10.1.10	use standard models in appropriate circumstances eg linear models, exponential models, trigonometric models
10.1.11	use simple mathematical models to explain and predict behaviour.

Unit 2	**Graphs, Functions and Rates**
	Learners should be able to:
10.2.1	construct simple graphs in the co-ordinate plane showing the relationship between two variables
10.2.2	define a function as a relation, together with a domain and range
10.2.3	represent a function in various ways eg rule, relation, table, system (input-process-output) and graph
10.2.4	define the inverse of a function
10.2.5	use a graphical test to determine if a given function has an inverse
10.2.6	derive the inverse of a function from its algebraic expression in simple cases
10.2.7	plot and interpret the graphs of a variety of basic functions eg linear, quadratic, exponential, log, trigonometric
10.2.8	analyse graphs of standard functions for important properties eg domain/range, maximum and minimum values, increasing/ decreasing intervals, periodicity
10.2.9	calculate and interpret gradients from graphs including average rates
10.2.10	recognise the equation of a straight line $y = mx + c$ and derive information from the equation
10.2.11	determine the equation of a straight line graph and use various associated formulae eg point-slope and two point formulae, gradient, distance between two points
10.2.12	graph linear inequalities and half planes
10.2.13	solve maximum and minimum problems with limitations given by linear inequalities
10.2.14	calculate average rates of change for related variables x and y for a variety of standard functions $y = f(x)$
10.2.15	interpret the average rate of change of a function as the gradient of a chord
10.2.16	define the derivative as the gradient of a tangent

10.2.17	differentiate simple standard functions using a table of derivatives
10.2.18	use standard functions to model simple situations in Science, Engineering, Technology and Business where two variables are related and solve the models eg linear relationships, growth and decay, cyclic behaviour.

Unit 3	**Geometry and Trigonometry**
	Learners should be able to:
10.3.1	identify standard imperial and metric units of measure for length, area, volume, capacity
10.3.2	convert from standard metric to imperial units and from imperial to metric units using conversion factors and charts
10.3.3	measure the size of any angle in degrees using a protractor
10.3.4	convert between degrees and radians
10.3.5	use standard results for angles, triangles, polygons, circles, common solids
10.3.6	describe folding and rotational symmetry in common structures, shapes and objects
10.3.7	describe pattern
10.3.8	use Pythagoras' theorem
10.3.9	define sine and cosine as ratios of sides of a right triangle
10.3.10	define tangent as ratio of sides of a right triangle
10.3.11	solve right triangles using sine, cosine, tangent
10.3.12	use sine, cosine, tangent to solve practical problems eg angles of elevation/depression, bearings, simple surveying problems
10.3.13	define sine, cosine, tangent functions as related to the unit circle
10.3.14	graph and analyse the functions $y = \sin x$, $y = \cos x$, $y = \tan x$
10.3.15	derive the period, amplitude and phase of trigonometric functions.

Unit 4	**Statistics and Chance**
	Learners should be able to:
10.4.1	organise raw data in an array
10.4.2	distinguish between discrete and continuous variable
10.4.3	tabulate frequencies from raw data and construct a frequency table

10.4.4	interpret data presented in graphical form eg bar chart, pie chart, trend graph, scatter diagram, histogram
10.4.5	represent data graphically eg bar chart, pie chart, trend graph, histogram
10.4.6	summarise data using averages eg mean, median, mode
10.4.7	explain the meaning of each average, mean, median, mode
10.4.8	calculate the mean for raw data and grouped data
10.4.9	determine the median and mode for raw data
10.4.10	explain the meaning of the measures of spread, range and standard deviation
10.4.11	calculate the range of a set of data
10.4.12	calculate the standard deviation for ungrouped and grouped data
10.4.13	interpret various statistics for a set of real data eg mean, median, mode, range, standard deviation
10.4.14	contrast two sets of data using their means and standard deviations
10.4.15	measure probabilities on a scale from 0 to 1 and assign meanings to points on this scale
10.4.16	use the fundamental principle of counting to count permutations and combinations
10.4.17	calculate simple probabilities using the theoretical and relative frequency approaches
10.4.18	solve simple problems involving chance using basic probability and counting techniques.

Unit 5	**Further Calculus**
	Learners should be able to:
10.5.1	use the chain rule, the product and quotient rules
10.5.2	use differentiation to solve simple rates of change problems
10.5.3	integrate standard integrals, polynomials, trigonometric and exponential functions
10.5.4	solve simple differential equations using integration
10.5.5	apply the fundamental theorem of calculus
10.5.6	find the area enclosed between a curve and the x-axis using integration
10.5.7	use the Trapezoidal Rule and Simpson's Rule
10.5.8	apply differentiation and integration to solving problems in Engineering and Science.

Unit 6	**Complex Numbers and Trigonometry**	
	Learners should be able to:	
10.6.1	define a complex number in rectangular form	
10.6.2	represent complex numbers as vectors in the plane	
10.6.3	plot complex numbers on the Argand diagram	
10.6.4	determine the conjugate of a complex number	
10.6.5	determine the modulus of a complex number and the argument	
10.6.6	add, multiply and divide complex numbers	
10.6.7	solve quadratic equations with complex roots	
10.6.8	write complex numbers in polar form	
10.6.9	apply de Moivre's theorem to finding powers of Z and to finding the cube roots of 1	
10.6.10	graph the function $y = a + b\sin x$ and determine its amplitude and period	
10.6.11	apply the Sine Rule and the Cosine Rule to solving triangles	
10.6.12	use double angle formulae	
10.6.13	solve simple trigonometric equations.	

11 Portfolio of Assessment

Please refer to the glossary of assessment techniques and the note on assessment principles at the end of this module descriptor.
All assessment is carried out in accordance with FETAC regulations.
Assessment is devised by the internal assessor, with external moderation by FETAC.

Summary	**Assignments (2)**	**60%**
	Examination (Theory-Based)	**40%**

11.1 Assignments (2)

The internal assessor will devise two briefs that require candidates to produce evidence that demonstrates:

- understanding of mathematical problem solving strategies
- application of problem solving strategies to real life situations
- application of mathematical calculations, formulae and results
- ability to communicate mathematical concepts and logical progression of thought.

Assignment 1: The brief for the first assignment will cover a range of specific learning outcomes from at least two of the units 1 to 4.
Assignment 2: The brief for the second assignment will cover a range of specific learning outcomes from units 5 and 6.

Each assignment may be presented using a variety of media, including written, oral, graphic, audio, and visual or any combination of these. Any audio or video evidence must be provided on tape.

Each assignment carries equal marks.

11.2 Examination

The internal assessor will devise a theory-based examination that assesses candidates' ability to recall mathematical facts and results, apply theory and understanding, and perform relevant calculations accurately, requiring responses to a range of short answer and structured questions.

The examination will be based on a range of specific learning outcomes from all units and will be 2 hours in duration

The format of the examination will be as follows.

Section A
12 short answer questions covering all units
Candidates are required to answer 10 (4 marks each).

Section B
3 structured questions from units 1-4
Candidates are required to answer 1 (20 marks).

Section C
3 structured questions from units 5-6
Candidates are required to answer 1 (20 marks).

12 Grading

Pass	50 – 64%
Merit	65 – 79%
Distinction	80 – 100%

Individual Candidate Marking Sheet 1	Mathematics C20139 Assignments (2) 60%

Candidate Name: _____ **PPSN:** _____

Centre: _____ **Centre No.:** _____

Assessment Criteria	Maximum Mark	Candidate Mark	
		Assignment 1	Assignment 2
Application • clear adherence to mathematical precedence rules • appropriate use of formulae and results • effective application of mathematics to real life situations by correctly: – formulating problems – modelling problems with appropriate mathematics eg formulae, equations, solving the mathematical model – verifying and interpreting the results	**30**		
Calculations • accurate use of appropriate degrees of precision eg significant figures, decimal places, rounding • correct use of calculator including simple checking routines • correct use of formulae including substitution, evaluation and transposition	**15**		
Communications and Layout • appropriate use of mathematical symbols, letters and terminology • effective demonstration of logical progression of thought • coherent format	**15**		
Subtotal	**60**		
TOTAL MARKS *This mark should be transferred to the Module Results Summary Sheet*	**120**		

Internal Assessor's Signature: _____ ***Date:*** _____

External Authenticator's Signature: _____ ***Date:*** _____

Individual Candidate Marking Sheet 2	Mathematics C20139 Examination (Theory-Based) 40%

Candidate Name: _____ PPSN: _____

Centre: _____ Centre No.: _____

Assessment Criteria	Maximum Mark	Candidate Mark
Section A: Short Answer Questions 12 short answer questions, answer any 10 (4 marks each) (Indicate questions answered) Question No.:* _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	**4** **4** **4** **4** **4** **4** **4** **4** **4** **4**	
Subtotal	**40**	
Structured Questions **Answer 2 questions - 1 from Section B and 1 from Section C**		
Section B 3 structured questions, answer 1 (20 marks) (Indicate question answered) Question No.:* _____	**20**	
Section C 3 structured questions, answer 1 (20 marks) (Indicate question answered) Question No.:* _____	**20**	
Subtotal	**40**	
TOTAL MARKS *This mark should be transferred to the Module Results Summary Sheet*	**80**	

Internal Assessor's Signature: **_____** ***Date:*** **_____**

External Authenticator's Signature: **_____** ***Date:*** **_____**

* The internal assessor is required to enter here the question numbers answered by the candidate.

FETAC Module Results Summary Sheet

Module Title: **Mathematics**

Module Code: **C20139**

Assessment Marking Sheets	Mark Sheet 1	Mark Sheet 2	Total Marks	Total ¸ 2 100%	Grade*
Maximum Marks per Marking Sheet	120	80	200		

Candidate Surname	*Candidate Forename*					

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 eg 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 – eg 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 situations.

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.

The development of the National Qualifications Framework is funded by the Department of Education and Science with assistance from the European Social Fund as part of the National Development Plan 2000-2006.