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

Injection Moulding Using SPC

Level 5   C20247

www.fetac.ie
## Level 5 Module Descriptor

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<th>Description</th>
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<td>Introduction</td>
<td>Describes how the module functions as part of the national vocational certificate framework.</td>
</tr>
<tr>
<td>Module Title</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>Module Code</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>Level</td>
<td>Indicates where the module is placed in the national vocational certificate framework, from Level 3 to Level 6.</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Denotes the amount of credit that a learner accumulates on achievement of the module.</td>
</tr>
<tr>
<td>Purpose</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>Preferred Entry Level</td>
<td>Recommends the level of previous achievement or experience of the learner.</td>
</tr>
<tr>
<td>Special Requirements</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>General Aims</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>Units</td>
<td>Structure the learning outcomes; there may be no units.</td>
</tr>
<tr>
<td>Specific Learning Outcomes</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>Portfolio of Assessment</td>
<td>Provides details on how the learning outcomes are to be assessed.</td>
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<td>Provides details of the grading system used.</td>
</tr>
<tr>
<td>Individual Candidate Marking Sheets</td>
<td>List the assessment criteria for each assessment technique and the marking system.</td>
</tr>
<tr>
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<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>
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<tr>
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<td>Can include approval forms for national governing bodies.</td>
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<tr>
<td>Glossary of Assessment Techniques</td>
<td>Explains the types of assessment techniques used to assess standards.</td>
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**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: Injection Moulding using SPC

Module Code: C20247

Level: 5

Credit Value: 1 credit

Purpose: This module is a statement of the standards to be achieved to gain a FETAC credit in Injection Moulding using SPC at Level 5. It is designed to develop the learners understanding of the injection moulding process and to enable the learner to reduce process variation to a minimum level.

Preferred Entry Level: Level 4 Certificate, Leaving Certificate or equivalent.

Special Requirements: The learner will need to have a number of years experience in injection moulding, or have completed Level 5 module - Inj.Moulding- Process Optimisation L21743.

General Aims:

Learners who successfully complete this module will:

8.1 further their knowledge of injection moulding process optimisation
8.2 understand what “process variation” is and how it can be minimised
8.3 understand statistical process control and be able to use SPC techniques to measure process variation
8.4 complete a full tool trial on a mould and reduce variation to pre-determined levels
8.5 develop their understanding of process control and troubleshooting.

Units: This module has 4 units

Unit 1: Statistical Process Control
Unit 2: Process Variation
Unit 3: Plastic Materials and Polymer Rheology
Unit 4: Advanced Troubleshooting and Process Optimisation
10 Specific Learning Outcomes

Unit 1 Statistical Process Control

Learners should be able to:

10.1.1 understand and be able to define the terms “standard deviation”, “mean”, “median”, “Cp” and “CpK”
10.1.2 demonstrate how to work out the “mean” and “standard deviation” from a given set of data
10.1.3 demonstrate how to work out “Cp” and “CpK” from a given set of data
10.1.4 display an understanding of Cp and CpK observed values and what these values indicate about the process.

Unit 2 Process Variation

Learners should be able to:

10.2.1 explain why processes can vary
10.2.2 be able to differentiate “normal variation” and “special conditions”
10.2.3 demonstrate an ability to observe a machine in production and deduce where process variation is coming from
10.2.4 explain how “Cp” and “CpK” values relate to process variation
10.2.5 demonstrate an ability to optimise the process to reduce variation to a minimum value
10.2.6 demonstrate an ability to balance variation control with production output requirements
10.2.7 outline how process variation can be attributed to:
   - materials
   - mould
   - process parameters
   - process equipment.

Unit 3 Plastic Materials and Polymer Rheology

Learners should be able to:

10.3.1 outline the difference between amorphous and crystalline materials and the different moulding conditions required
10.3.2 describe the connection of cooling systems and the problems that can occur if not properly connected
10.3.3 describe how plastic material flows in a mould
10.3.4 calculate the optimum clamp tonnage and how high or low tonnage affect mould filling
10.3.5 describe where process parameters are derived for various materials
10.3.6 relate part defects to material considerations.

Unit 4 Advanced Troubleshooting and Process Optimisation

Learners should be able to:
10.4.1 show a deep understanding of the cause of process defects
10.4.2 demonstrate how to eliminate difficult defects
10.4.3 demonstrate how to optimise process parameters to give a robust process and minimise variation
10.4.4 explain what causes warpage and how it can be minimised
10.4.5 summarise how process variables influence part quality
10.4.6 explain how cycle time reduction can cause part defects.

11 Portfolio of Assessment

Summary Skills Demonstration 70%
Written Examination 30%

11.1 Technique Skills Demonstration

Format Candidates must demonstrate the acquisition of practical skills by completing several functional tasks under the supervision of the trainer. These tasks will demonstrate the skills that have been outlined in the SLO’s

11.2 Technique Written Examination

Format A written examination must be completed by the candidate under the supervision of the trainer. The examination will cover some of the more theoretical aspects of Units 1-4

12 Grading

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Pass</td>
<td>50 - 64%</td>
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<tr>
<td>Merit</td>
<td>65 - 79%</td>
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<tr>
<td>Distinction</td>
<td>80 - 100%</td>
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</table>
Candidate Name: _____________________________________ PPSN: __________
School/Centre: _______________________________________ Centre No: __________

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Maximum Mark</th>
<th>Candidate Mark</th>
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<tbody>
<tr>
<td><strong>Skill Demonstration</strong></td>
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<tr>
<td>• Effective execution of each task showing a good working</td>
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<tr>
<td>knowledge of the injection moulding process</td>
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<td>• Safe use and careful handling of machinery and equipment</td>
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<tr>
<td>Practical Skill 1.</td>
<td>14</td>
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<td>Practical Skill 2.</td>
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<td>Practical Skill 3.</td>
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<td>Practical Skill 4.</td>
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<td>Practical Skill 5.</td>
<td>14</td>
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</table>

Total Mark 70
WEIGHED TOTAL 70%

This mark should be transferred to the Module Results Summary Sheet

Assessor’s Signature: ___________________________ Date: ____________

External Authenticator’s Signature: __________________ Date: ____________
Candidate Name: _____________________________________  PPSN: _______________
School/Centre: _______________________________________  Centre No: __________________

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Maximum Mark</th>
<th>Candidate Mark</th>
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<tbody>
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<td><strong>Duration: 1 hour</strong></td>
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<td><strong>Section A: Answer the 15 short questions below.</strong></td>
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<td>Q.1</td>
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<td>Q.2</td>
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<td>Q.3</td>
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<td>Q.4</td>
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<td>Q.5</td>
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<td>Q.6</td>
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<td>Q.8</td>
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<td>Q.9</td>
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<td>Q.14</td>
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<tr>
<td>Q.15</td>
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<td><strong>Subtotal</strong></td>
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<td><strong>Section B: Answer the long question below</strong></td>
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<td><strong>20</strong></td>
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<tr>
<td><strong>Subtotal</strong></td>
<td><strong>20</strong></td>
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<tr>
<td><strong>Total Mark</strong></td>
<td><strong>80</strong></td>
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<tr>
<td><strong>WEIGHED TOTAL</strong></td>
<td><strong>30%</strong></td>
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</tbody>
</table>

*This mark should be transferred to the Module Results Summary Sheet*

Assessor’s Signature: ___________________________  Date: ____________
External Authenticator’s Signature: ___________________________  Date: ____________
# FETAC Module Results Summary Sheet

**Module Title:** Injection Moulding using SPC  
**Module Code:** C20247

<table>
<thead>
<tr>
<th>Candidate Surname</th>
<th>Candidate Forename</th>
<th>Mark Sheet 1 (70(W 70%))</th>
<th>Mark Sheet 2 (80(W 30%))</th>
<th>Total 100%</th>
<th>Grade*</th>
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</table>

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.