COUNTY DUBLIN VEC

Programme Module for

Electronics

Leading to

Level 5 FETAC

Electronics 5N1606

Introduction
This programme module may be delivered as a standalone module leading to certification in a FETAC minor award. It may also be delivered as part of an overall validated programme leading to a Level 5 FETAC Certificate.

The teacher/tutor should familiarise themselves with the information contained in the County Dublin VEC programme descriptor for the relevant validated programme prior to delivering this programme module.

The programme module is structured as follows:

1. Title of Programme Module
2. FETAC Component Title and Code
3. Duration in hours
4. Credit Value of FETAC Component
5. Status
6. Special Requirements
7. Aim of the Programme Module
8. Objectives of the Programme Module
9. Learning Outcomes
10. Indicative Content
11. Assessment a. Assessment Technique(s) b. Mapping of Learning Outcomes to Assessment Technique(s) c. Guidelines for Assessment Activities
12. Grading
13. Learner Marking Sheet(s), including Assessment Criteria

Integrated Delivery and Assessment
The teacher/tutor is encouraged to integrate the delivery of content where an overlap between content of this programme module and one or more other programme modules is identified. This programme module will facilitate the learner to develop the academic and vocational language, literacy and numeracy skills relevant to the themes and content of the module.

Likewise the teacher/tutor is encouraged to integrate assessment where there is an opportunity to facilitate a learner to produce one piece of assessment evidence which demonstrates the learning outcomes from more than one programme module. The integration of the delivery and assessment of level 5 Communications and level 5 Mathematics modules with that of other level 5 modules is specifically encouraged, as appropriate.

Indicative Content
The indicative content in Section 10 does not cover all teaching possibilities. The teacher/tutor is encouraged to be creative in devising and implementing other approaches, as appropriate. The use of examples is there to provide suggestions. The teacher/tutor is free to use other examples, as appropriate. The indicative content ensures all learning outcomes are addressed but it may not

follow the same sequence as that in which the learning outcomes are listed in Section 9. It is the teacher's/tutor's responsibility to ensure that all learning outcomes are included in the delivery of this programme module.

1. Title of Programme Module
Electronics

2. Component Name and Code
Electronics 5N1606

3. Duration in Hours
150 HOURS

4. Credit Value
15

5. Status
This programme module may be compulsory or optional within the context of the validated programme. Please refer to the relevant programme descriptor, Section 9 Programme Structure

6. Special Requirements
None. However good colour vision is an advantage

7. Aim of the Programme Module
This module is designed to give the learner the necessary skills to construct electronic circuits competently and safely. It introduces the learner to electronic theory and practice and shows the learner how to design basic electronic circuits

8. Objectives of the Programme Module

- To enable the learner to identify a wide range of electronic components and their symbols
- To facilitate the learner to build a range of electronic circuits from design to completion
- To facilitate the learner to use appropriate test equipment
- To provide the learner with the skills to develop safe working practices
- To enable the learner to perform a variety of calculations for circuits and components
- To assist the learner to develop the academic and vocational language, literacy and numeracy skills related to (Security systems technology/security systems) through the medium of the indicative content
- To enable the learner to take responsibility for his/her own learning.

9. Learning Outcomes of Level 5 Electronics 5N1606

Learners will be able to:

1. Explain the principles and capabilities of a range of components utilised in electronics, to include use of capacitors, transducers, sensors, bipolar transistor

2. Determine key characteristics of components using data sheets and or catalogues

3. Interpret a range of electronic terminology and symbols to include terms associated with ohmic and non ohmic devices, direct current (DC), alternating-current (AC), back electromotive force (EMF)

4. Analyse health and safety implications in relation to electronic devices and suggest initiatives aimed at reducing associated risks

5. Install a range of electronic components to include diodes light emitting diode (LED) and Darlington Pairs

6. Use appropriate test equipment to measure readings and diagnose faults on electronic circuits

7. Employ a cathode ray oscilloscope to measure a range of Signals including, peak to peak voltage of an AC signal and period of an AC signal.

8. Employ an operational amplifier (OP-AMP) as a comparator and as a voltage amplifier

9. Employ a range of electronic related calculations to include voltages, currents and resistances, RC timing, period and frequency.

10. Construct a range of electronic circuits from design to final completion to include strip board, prototype board, single sided printed board, voltage divider

11. Construct an electronic circuit from design to completion to produce a digital output from transducers

12. Build electronic circuits from design to completion to switch a range of devices including bulbs, motors and solenoids in response to conditions monitored by transducers

13. Determine the appropriate use for a range of switches to include ,tilt, reed, limit, roller, push to break, push to make, SPST and DPDT switches.

14. Indicative Content

This section provides suggestions for programme content but is not intended to be prescriptive. The programme module can be delivered through classroom based learning activities, group discussions, one-to-one tutorials, field trips, case studies, role play and other suitable activities, as appropriate.

Based on a range of electronic components facilitate the learner to:

- Understand the principles and capabilities of a resistor in a circuit.
    - Know that resistance is measured in ohms
    - Recognise the symbol for a resistor
    - State the resistance of a resistor from the colour code or printed code
    - State the tolerance of a resistor from the colour code and hence calculate the maximum and minimum resistances possible
    - State and use the equation R = V/I in its three forms using different units and perform simple calculations
    - Calculate the effective resistance of a number of resistors in series
    - Build a circuit using breadboard, stripboard or some other medium consisting of two or more resistors in series and measure the voltages and currents involved using a multimeter.

Facilitate the learner to:

- Understand the principles and capabilities of a capacitor in a circuit.
    - State what a capacitor does and recognise its symbol
    - State that a capacitance is measured in Farads and sub-units(microFarads)
    - Interpret the markings on a capacitor to determine its capacitance and working voltage
    - Understand the concept of a polarised component and its implications when building a circuit
    - State some uses of capacitors
    - Build a circuit using breadboard, prototype or single sided p c b board or some other medium to demonstrate the use of a capacitor in its role in a timing circuit.
    - Substitute various values of capacitor in the circuit and observe their effect.
    - Calculate and measure RC times.

Facilitate the learner to:

- Understand the principles and capabilities of silicon, zener and light emitting diodes in circuits.
    - State what each does and recognise its symbol.
    - Understand the concepts of forward and reversed biased components.
    - Examine catalogues or brochures to determine the forward currents and reverse voltages of various diodes.
    - Understand the need for a series resistor
    - Build a circuit using breadboard, prototype board, singe sided printed circuit board or some other medium to demonstrate the use of (a) a silicon diode (b) an LED in its role as a forward and reversed component.
    - Measure the currents and voltages in these circuits.

Facilitate the learner to:

- Understand the principles and capabilities of a transistor in a circuit.
    - Draw the symbols for npn, pnp and Darlington pair transistors and name the three leads.
    - Understand the current flow in a npn transistor circuit and explain the relationship between base and collector currents.
    - Build a circuit using a transistor as a switch.
    - Use the circuit to switch a number of different devices such as bulbs, leds ,motors and solenoids.
    - Solve numerical problems on transistor switching circuits.

Facilitate the learner to:

- Understand the principles and capabilities of an op amp
    - Understand the concept of an integrated circuit
    - Explain the pin numbering and other marking conventions.
    - Build a circuit using the op amp (i) as a comparator (ii) as a voltage amplifier
    - Use the circuit to switch a number of different devices in response to conditions monitored by transducers.

Facilitate the learner to:

- Understand DC and AC currents and voltages.
    - Interpret a range of terms and symbols associated with DC and AC currents and voltages
    - Use a multimeter to measure AC and DC currents and voltages (EMFs).
    - Use an oscilloscope to measure a range of signals including peak to peak period and frequency of an A C signal
    - Determine the appropriate use for a range of switches to include, tilt, reed, limit, roller, push to break, push to make, SPST and DPDT switches

Facilitate the learner to:

- Analyse health and safety implications in relation to electronic devices and suggest initiatives aimed at reducing associated risks

15. Assessment

11a. Assessment Techniques

Project 40%
Skills Demonstration 30%
Examination 30%

11b. Mapping of Learning Outcomes to Assessment Techniques

In order to ensure that the learner is facilitated to demonstrate the achievement of all learning outcomes from the component specification; each learning outcome is mapped to an assessment technique(s). This mapping should not restrict an assessor from taking an integrated approach to assessment.

1 Explain the principles and capabilities of a range of components utilised in electronics, to include use of capacitors, transducers, sensors, bipolar transistor	Skills Demonstration/ Examination
2 Determine key characteristics of components using data sheets and or catalogues	Skills Demonstration /project
3 Interpret a range of electronic terminology and symbols to include terms associated with ohmic and non ohmic devices, direct current (DC), alternating-current (AC), back electromotive force (EMF)	Project/Skills Demonstration/Examination
4 Analyse health and safety implications in relation to electronic devices and suggest initiatives aimed at reducing associated risks	Project/Skills Demonstration/Examination
5 Install a range of electronic components to inclide diodes, light emitting dilde(LED) and Darlington Pairs	Skills Demonstration/Project
6 Use appropriate test equipment to measure readings and diagnose faults on electronic circuits	Skills Demonstration/Project
7 Employ a cathode ray oscilloscope to measure a range of Signals including, peak to peak voltage of an AC signal and period of an AC signal	Skills Demonstration/Project
8 Employ an operational amplifier (OP-AMP) as a comparator and as a voltage amplifier	Skills Demonstration/Project
9 Employ a range of electronic related calculations to include voltages, currents and resistances, RC timing, period and frequency.	Project/Skills Demonstration/ Examination
10 Construct a range of electronic circuits from design to final completion to include strip board, prototype board, single sided printed board, voltage divider	Skills Demonstration/Project
11 Construct an electronic circuit from design to completion to produce a digital output from transducers	Skills Demonstration/Project
12 Build electronic circuits from design to completion to switch a range of devices including bulbs, motors and solenoids in response to conditions monitored by transducers	Skills Demonstration/Project
13 Determine the appropriate use for a range of switches to include, tilt, reed, limit, roller, push to break, push to make, SPST and DPDT switches	Project/Skills Demonstration/ Examination

11c. Guidelines for Assessment Activities

The assessor is required to devise assessment briefs and marking schemes for the project and Demonstration skills, and the examination paper, marking scheme and outline solutions for the Examination. In devising the assessment briefs/examination papers care should be taken to ensure that the learner is given the opportunity to show evidence of achievement of ALL the learning outcomes. Assessment briefs may be designed to allow the learner to make use of a wide range of media in presenting assessment evidence, as appropriate. Quality assured procedures must be in place to ensure the reliability of learner evidence.

Assessment Technique - Project	**40%**
The learner will construct a project in a 3-4 hour period at the conclusion of the programme**.** .	

- Construct an electronic circuit which may be from design to final completion using prototype board, strip board or printed circuit board.
- The project should involve a range of electronic components and hardware(e.g.: switches solenoids etc.)
- Prove the system and diagnose any faults in the circuit by using appropriate test equipment
- Show a mastery of tools and techniques
- Operate safe work practices
- Demonstrate an understanding of the principles and key characteristics of the range of components used
- Employ a range of electronic terms and symbols

Evidence for this assessment technique may take the form of combination of written and visual evidence

The final piece of work will be accompanied by a report.
Evidence presented will include:

- The completed circuit
- A report which may contain:
  - Block diagram, circuit diagram, layout diagram
  - Wave form diagrams
  - Parts list including component specifications
  - Explanation of the operation of the circuit
  - Any appropriate calculations
  - Evaluation of the project

All instructions for the learner must be clearly outlined in an assessment brief.

N.b.: It is the tutors's/teacher's responsibility to ensure that each SLO is covered in its entirety in the assessment technique/s identified in Section 11b

Demonstration Skills	**30%**
The Learner will complete 1 or more Skills Demonstrations during the programme. Evidence of the Skills Demonstration must be included in the assessment portfolio. The evidence may be photographs, video, or other appropriate evidence of the learner completing the task	
The learner will demonstrate a wide range of practical skills which may include • Build circuits to demonstrate the capabilities of a range of components and hardware • Use test equipment to take measurements • Use test equipment to diagnose faults • Build circuits to prove calculations or laws of electronics • Write brief explanations of small circuits • Answer short questions on components, terms, symbols or calculations Evidence for this assessment technique may take the form of a circuit board photographic or video evidence . This may be supported by written work All instructions for the learner must be clearly outlined in an assessment brief **N.b.: It is the tutors's/teacher's responsibility to ensure that each SLO is covered in its entirety in the assessment technique/s identified in Section 11b**	
Examination	**30%**
The examination will be of a duration of one hour 30 minutes It will entail answering • 10 of 12 short question • 1 of 2 structured questions	
The internal assessor will devise a theory based examination that assesses the learner on a range of learning outcomes • Explain the principles and capabilities of a range of components. • Interpret a range of electronic terminology and symbols • Draw and explain a range of electronic circuits • Perform a range of simple calculations for a given circuit Evidence for this assessment technique may take the form of written Examination. **N.b.: It is the tutors's/teacher's responsibility to ensure that each SLO is covered in its entirety in the assessment technique/s identified in Section 11b** All instructions for the learner must be clearly outlined in an examination paper	

16. Grading

Distinction: 80% - 100%
Merit: 65% - 79%
Pass: 50% - 64%
Unsuccessful: 0% - 49%

At levels 4, 5 and 6 major and minor awards will be graded. The grade achieved for the major award will be determined by the grades achieved in the minor awards.

ELECTRONICS 5N1606	LEARNER MARKING SHEET 1 PROJECT 40% SKILLS DEMONSTRATION 30%

Learner's Name: _____ Learner's PPSN: _____

Assessment Criteria	Maximum mark	Candidate Mark
PROJECT • Circuit built as specified in the circuit diagram • Circuit operating correctly • Mastery of tools and techniques • Clear understanding the principles involved • Use of appropriate drawings, diagrams & calculations • Parts list complete with reference to circuit diagram	5 10 5 10 5 5	
Sub total	40	
SKILLS DEMONSTRATION Effective demonstration of each test exhibiting mastery of tools and techniques as appropriate to task involved	30	
Sub total	30	
TOTAL MARK	70	

Assessor's Signature: _____ Date: _____

External Authenticator's Signature: _____ Date: _____

ELECTRONICS 5N1606	LEARNER MARKING SHEET 2 EXAMINATION 30%

Learner's Name: _____ Learner's PPSN: _____

Assessment Criteria	Maximum Mark	Learner Mark
Section A: short answer questions 12 short answer questions, answer 10 (Indicate questions answered) Question No.:* _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	2 2 2 2 2 2 2 2 2 2	
Subtotal	20	
Section B: structured questions 2 structured questions answer 1 (30 marks each) (Indicate questions answered) Question No.:* _____	10	
Subtotal	**10**	
TOTAL MARKS	**30**	

Assessor's Signature: _____ Date: _____

External Authenticator's Signature: _____ Date: _____