

Validation Report



BN121

**Bachelor of Engineering (Honours)
in Mechatronics**

(4 Year, Ab-initio, NFQ Level 8, 240 ECTS credits)

Incorporating

BN422

**Bachelor of Engineering (Honours)
in Mechatronics**

(1 Year, Add-on, NFQ Level 8, 60 ECTS credits)

Introduction

The mission of the Institute is to serve its students and the community by meeting the skills needs in the economy and increasing the level of participation in third-level education and training, particularly in Dublin North-West and its environs.

The Institute in 2006 was awarded delegated authority enabling the development, validation, implementation and continuous improvement of its existing taught higher education and training programmes up to and including level 9 of the National Framework of Qualifications.

The purpose of this document is to report on the findings of the peer review panel established to validate this proposed programme against the criteria for the validation of programmes as stipulated in the Institute policy document 2MP01¹.

This submission by the School of Informatics and Engineering evolved through:

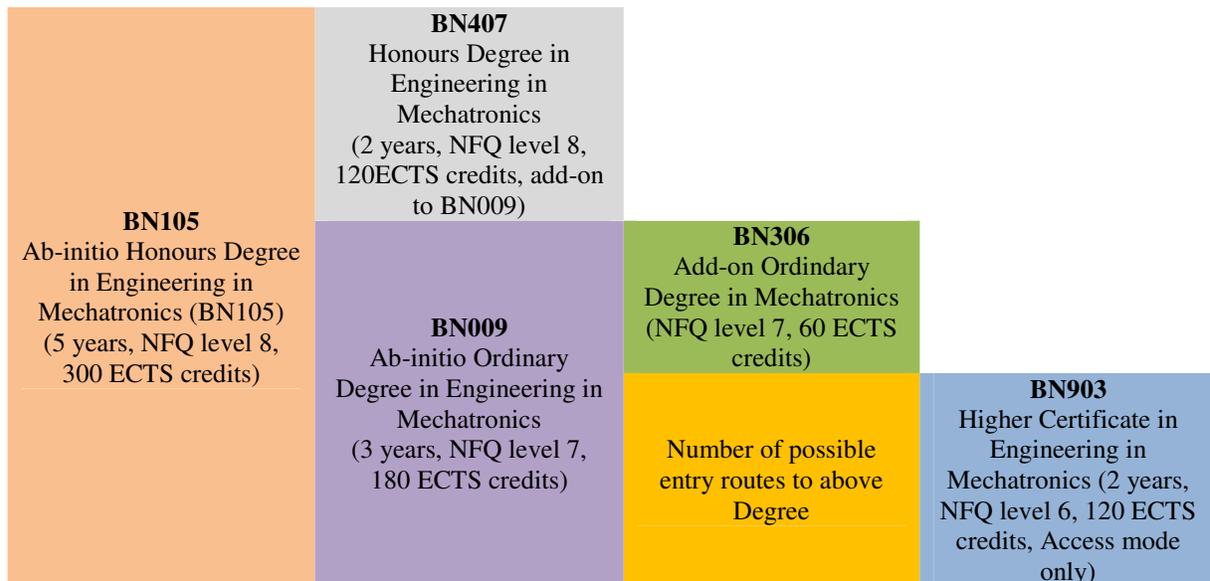
- examining the competence, expertise and experience of staff in addition to the strategy of the department/school/Institute and government educational policy
- identifying through research and stakeholder consultation the need for and the preferred structure and characteristics of the proposed programme

¹ 2MP01 Design, validation and accreditation of new academic programmes

Mechatronic programme developments

The School of Informatics and Engineering undertook a review of its programmes and activities during the current academic year during which the mechatronics programmes currently available at NFQ levels 6 and 7 listed in ‘Table1’ below were assessed in areas such as student applications, throughput, assessment methodologies and progression opportunities. A thorough analysis of all modules, delivery methods and physical resources resulted in a number of change proposals being presented to an external peer-review expert panel. The overall recommendation of the panel was that all proposed changes to existing syllabi and recommendations made in the self-evaluation report produced in preparation for programmatic review are accepted and that all programmes be accredited for five years¹.

Table1: Existing mechatronics programmes structure

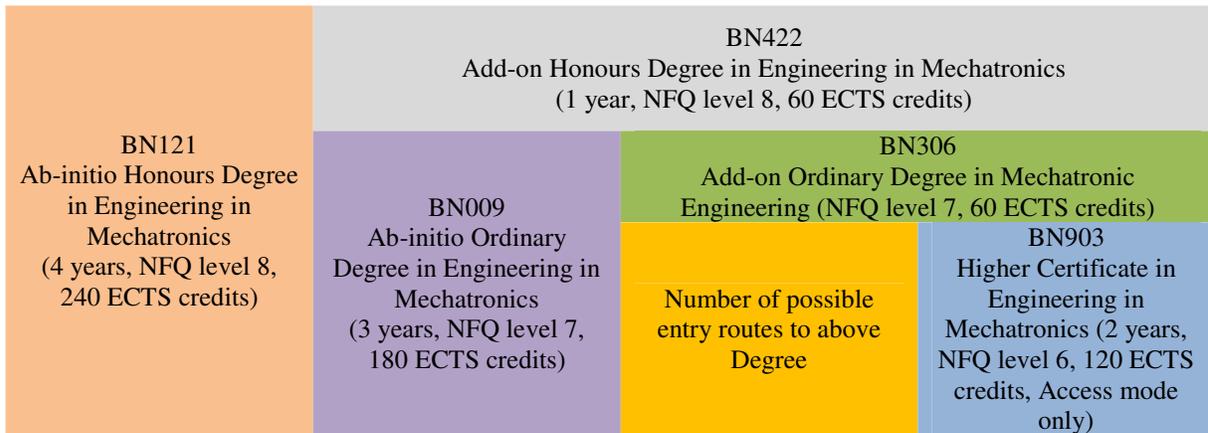


Due to falling numbers of students enrolling on BN407 the Bachelor of Engineering (Honours) in Mechatronics, NFQ level 8, two year add-on to BN009 and issues that arose due to the changing nature of Engineers Ireland accreditation rules the Department of Engineering has decided to discontinue this programme. In addition BN105 the Bachelor of Engineering (Honours) in Mechatronics, NFQ level 8, five year ab-initio programme comprising of BN009 (years 1-3) and BN407 (years 4-5) that was previously available has also been discontinued.

¹ Programmatic Review; School of Informatics & Engineering (Peer-review panel report), 9th December 2010.

‘Table2’ below illustrates the proposed new mechatronics programmes structure. It is proposed to replace BN407, the two year NFQ level 8 add-on, and BN105, the five year ab-initio programmes with BN422 a new one year NFQ level 8 add-on programme and associated four year NFQ level 8 ab-initio programme (BN121).

Table2: Proposed new mechatronics programmes structure



Programme overview of BN422 (Year 4 of BN121)

Whilst emphasising integration and giving the engineering graduate a broad breadth of knowledge of relevant areas, it was decided that the new programme should also encompass one or more themes, in this case those of design and automation, which reflect the demands of local industry, the expertise of staff and offer consistency with the current support infrastructure in place for mechatronics at IT Blanchardstown.

The proposed programme will provide learners with detailed knowledge of theory and practice, as relevant to mechatronics, in the fields of:

- Embedded Systems, and their application in Mechatronics Systems
- System Integration (through the project)
- Business management systems
- Software Engineering
- Sustainable Energy systems
- Industrial Robotics and Vision
- Control Systems
- Mechanics and Materials
- Computer Aided Design.

Modules and Streams across BN422 and year 4 of BN121 (* Elective)

BN422 / BN121	Maths	Electronics	Mechanics/ Science	Manufacturing & Automation	Engineering Practice and Design	Information Technology	Support Stream
Year 4 Semester One	Maths 7	Embedded Systems		Control Systems	Advanced Computer Aided Design*	Software Engineering	
				Industrial Robotics & Vision Inspection*	Final Year Project		
Year 4 Semester Two			Mechanics & Materials	Industrial Networks and Distributed Systems*	Computational Design Methods*		Sustainable Energy Systems
					Final Year Project		Entrprise Resource Management

Learners will be equipped with the technical, design and logistical know-how to plan, design and implement mechatronics systems. Learners will develop their powers of critical analysis and exhibit the conceptual and practical ability to tackle cross-functional, multi-functional and specialist mechatronic decision making in a coherent and logical manner. In so doing the learner will be able to apply cognitive skills of critical thinking, synthesis and professional judgement to:

- Analyse quantitative and qualitative information pertaining to a variety of functional planning and decision making scenarios.
- Create, evaluate and assess a range of engineering options appropriate to those scenarios
- Formulate tactical and operational plans to ensure decisions made are efficiently and effectively implemented.

Lectures, laboratory/workshop exercises and project work pertinent to each course module will be delivered in a structured manner. Primarily, each module will aim to introduce the student to the fundamentals/concepts of the subject area. Instruction will then be progressed to such a level as to cover in-depth knowledge, to foster development of individual aptitudes and competences, and to develop team-working skills in respective areas. There will be individual and group laboratory/workshop assignments, problem solving and project work including industrial visits and case studies. Industrial standards and protocols of best industrial practice will be followed.

Case studies in design/simulation and project implementation, assignment and oral presentations, and directed private study will be used as appropriate, throughout the course. Enquiry based learning methods will require research literature review and collation of information from a variety of sources, to communicating the findings through written, visual, and oral communication media. Problem based learning techniques as introduced to learners in years 1-3 will be applied where feasible in year 4 also. The final stage of the project will consolidate and integrate skills and knowledge so as to make the graduates of the proposed programme of immediate value to industry. In order to develop and enhance the learners self-directed learning ability it is proposed that the full-time learner should take one module per semester in on-line mode. This approach is motivated by our review of literature in which it is shown that on-line learning can significantly enhance learners self-directed learning ability. It is proposed to deliver both the mathematics and the enterprise resource management modules online.

Programme detail

Programme title	Bachelor of Engineering (Honours) in Mechatronics
Award title	Bachelor of Engineering (Honours)
Award type	Major – Ab-initio
NFQ^I level	8
ECTS^{II} credits	240
Programme code	BN121
Banner code	BN_EMEC4_8

Programme title	Bachelor of Engineering (Honours) in Mechatronics
Award title	Bachelor of Engineering (Honours)
Award type	Major – Add-on
NFQ level	8
ECTS credits	60
Programme code	BN422
Banner code	BN_EMEC4_B

^I National Framework of Qualifications

^{II} European Credit Transfer and Accumulation System

Panel composition

Chairperson:

Mr. John Vickery
ITT Dublin – Institute of Technology Tallaght

Panel members:

Dr. Pat Phelan
University of Limerick

Mr. Joe Lawless
Athlone Institute of Technology

Mr. Mark Pentony
Hewlett-Packard (Manufacturing) Limited

Mr. James Kearney
Intel

Ms. Fiona Cranley
ITT Dublin – Institute of Technology Tallaght

In attendance:

Dr. Diarmuid O’Callaghan
Registrar, Institute of Technology Blanchardstown

Mr. Michael Keane
QA Officer, Institute of Technology Blanchardstown

Date of Panel Meeting

Tuesday 14th June 2011

Institute staff present

Session I Meeting with Head of School, Head of Department and Programme Leader(s)

Dr. Larry McNutt Head of School of Informatics & Engineering

Mr. Richard Gallery Head of Department of Engineering

Mr. Niall Campbell Department of Engineering

Mr. Niall Bell Department of Engineering

Session II Meeting with the programme design team

Dr. Larry McNutt

Mr. Niall Campbell

Mr. Richard Gallery

Dr. James Duffy

Mr. Cormac MacMahon

Mr. Paul Stacey

Dr. Garret Brady

Mr. Derek Kerr

Dr. Barry Kirkpatrick

Mr. John Massey

Mr. Niall Bell

Mr. Benjamin Toland

Mr. Damian Cox

Panel findings

In evaluating the appropriateness, quality and proposed operation of this programme the following criteria has been considered and is hereby reported upon:

Strategic planning

The panel was satisfied that the programme is in keeping with the Institute's mission, that it does not constitute redundant provision and that it makes efficient use of resources.

Rationale

IT Blanchardstown recognises that the provision of Mechatronics education in Ireland is crucial to the continued competitiveness of the high technology sector of the economy. Implications for academic institutions are that contemporary education of engineers and technicians for the high technology sector must be interdisciplinary and should integrate the evolutionary advances in mechanics, electronics, computers and control inherent in mechatronics. IT Blanchardstown also recognises that a large pool of learners exist, working in local, related industry who have already achieved the award of Bachelor of Engineering in Mechatronics who wish to upskill to an Honours Degree in Engineering in Mechatronics, NFQ level 8.

Evidence of consultation

Through discussion with Institute staff, the panel found that a comprehensive research/consultation effort was undertaken with stakeholders to validate the need for, and the preferred structure and characteristics of the proposed programme.

Learner employment potential

Mechatronics is a field with a future, exciting career opportunities and a huge range of applications. Mechatronic systems are at the forefront of technological developments. Transport, healthcare, service, automotive and entertainment are just a few of the sectors that are benefiting from developments in mechatronics. These sectors are looking for graduates that have a broader engineering background including electronic, mechanical and IT skills.

Protection of learners

Section 43 of the Act^I does not apply.

Quality assurance

The panel was informed of how the submission had been developed and approved internally whilst complying with the Institute's quality assurance policies and procedures. The panel concurred that said policies and procedures had been applied to the development of the proposed programme.

Programme titles and award titles

Following discussion, the panel was satisfied that the title of the proposed programme is clear, accurate and fit for the purpose of informing prospective learners and other stakeholders and consistent with HETAC^{II} award titles.

Ethics

The panel was satisfied that the Institute has internal policies and procedures in place to ensure that all teaching, learning or research activity across the spectrum of NFQ levels is conducted / delivered in a manner that is both morally and professionally ethical.

Unity

The panel found that the programme design is consistent with HETAC's policy on Accumulation of Credits and Certification of Subjects, that it has an underlying unifying theme with modules bonded by linkages being either implicit or explicit. It was also clear to the panel how the standards of knowledge, skill and competence evolve throughout the programme as a whole.

^I Qualifications (Education and Training) Act, 1999

^{II} Higher Education and Training Awards Council

Teaching and learning

The panel discussed with staff of the Institute the various modes of interaction practised with learners. Evidence of a clear dialogue was confirmed, enabling learners to develop and have available to them the support of academic staff.

A tour of the facilities included a fully operational Manufacturing Technology Workshop used for teaching and the demonstration of engineering production techniques in addition to nine laboratory facilities dedicated to engineering science and electronic and computer engineering elements of mechatronic programmes.

Course management arrangements were discussed and deemed adequate.

Learner assessment

Through discussion with the design team, and from the submission document itself it was explained in detail to the panel the multiple modes of assessment, both formal and informal that will be employed. The panel heard how IT Blanchardstown's policy on continuous assessment is based on the objective of developing/enhancing the learners' application of knowledge, aptitude for critical analysis and problem solving within specific timeframes. Assessment procedures include combinations of tests, examination, assignments, reports, project presentations and seminars. Where appropriate, both theoretical and experimental techniques are covered, including the enhancement of skills in verbal and electronic communications, and technical report writing in both written and oral formats. Continuous assessment for respective course modules where appropriate, will include individual and teamwork assignments and projects in the form of class and laboratory exercises, laboratory/workshop practice, and assignments. The scale of learner assessment was deemed by the panel to be appropriate for the proposed programme however the panel recommended that a matrix of the assessment schedule be defined prior to programme delivery to ensure a consistent approach across all modules within all years of the programme. See recommendation six.

Standards of knowledge, skill and competence

The panel felt having reviewed the syllabi and assessment methods that learners would be capable of attaining the standards of knowledge, skill or competence relevant for this award. However the panel were of the opinion that a greater emphasis on the core mechatronic skill sets was required to produce graduates of immediate benefit to industry. See recommendation one.

Access, transfer and progression

The programme incorporates the established procedures for access, transfer and progression while accommodating a variety of access and entry requirements from applicants with expertise in related disciplines.

Decision of the panel

The panel recommended the approval of both the four year ab-initio Bachelor of Engineering (Honours) in Mechatronics and the one year add-on Bachelor of Engineering (Honours) in Mechatronics to the current NFQ level 7 offering (BN009). Details of programmes validated include:

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Award type	Major – Ab-initio
NFQ level	8
ECTS credits	240
Programme code	BN121
Banner code	BN_EMEC4_8

Programme title	Bachelor of Engineering (Honours) in Mechatronics
Award title	Bachelor of Engineering (Honours)
Award type	Major – Add on
NFQ level	8
ECTS credits	60
Programme code	BN422
Banner code	BN_EMEC4_B

Panel recommendations

1. Re-examine the two-stream concept as proposed within the submission document as the panel were strongly of the view that a greater emphasis on the core mechatronic skill sets was required to produce graduates of immediate benefit to industry. To effect this the panel recommended the following:
 - A. Reconsider the fourth year electives as proposed, with the panel of the opinion that the status of the following modules be changed from elective to mandatory:
 - MEC4 H4016 Industrial Robotics and Vision Inspection
 - MEC4 H4022 Industrial Networks and Distributed Systems
 - B. The panel was also of the opinion that the status of the module Sustainable Energy Systems (MEC4 H4019) be changed to elective.
2. Review the aims of the following modules placing a greater emphasis on mechatronic design with a focus on system integration:
 - MEC4 H4015 Advanced Computer Aided Design
 - MEC4 H4020 Mechanics and Materials
3. Review the module MEC4 H4021 Computational Design Methods with particular emphasis on the academic level and focus on mechatronic design at NFQ level 8.
4. Re-write the module learning outcomes and link to assessments using the module syllabus of H4012 Control Systems as proposed in the submission document as a template for same. The panel encouraged the use of Coursebuilder to accommodate this mapping thus making the relationships more transparent to learners.
5. Clarify student class contact hours and independent learning across all modules within the 4 year programme to balance against ECTS norms.

6. Define a matrix of the assessment schedule prior to programme delivery and use same to consider the appropriateness of the assessment load.
7. Review the module syllabi to clarify essential pre-requisites whilst ensuring that no unnecessary pre-requisites exist between sequential odd and even semesters and where feasible minimise the inclusion of co-requisites.
8. Apply a consistent approach within the module syllabi to recommended texts clearly identifying essential reading as opposed to supplemental reading whilst citing internet supports where available.
9. Revisit the titles of modules to more accurately reflect content as proposed. Suggested revisions as discussed during the panel visit include:
 - MECH H2026 Mechanics 1 ----- Mechanics and Materials 1
 - MECH H3024 Mechanics 2 ----- Mechanics and Materials 2
10. Consider a mechanism for capturing and providing evidence of the individual learner experience/skills acquired for presentation at interview post-graduation.
11. Make other technical and minor amendments as discussed at the panel meeting.

Panel observations

The panel commended and congratulated the design team on this initiative to identify, address and respond to stakeholder needs. They concurred on the wide range of skills a graduate of this programme seeking employment would require and felt that these were well reflected in the programme.

Panel signatures

Chairperson

Mr. John Vickery _____ Date _____

Secretary

Dr. Diarmuid O'Callaghan _____ Date _____