

# Programme Specification

HNC Electrical & Electronic Engineering



Awarded by

# Programme Specification

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## Title of Programme: HNC Electrical Engineering

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

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| <b>1. Awarding Body</b>   | Pearson BTEC   |
| <b>2. Teaching location</b>   | Woodlands Campus, Solihull College   |
| <b>3. Accreditation details</b>   | N/A  |
| <b>4. Final award</b>   | Higher National Certificate  |
| <b>5. Name of award</b>   | Pearson BTEC Level 4 Higher National Certificate in Engineering (Electrical Engineering) |
| <b>6. Codes</b>   |  |
| <b>a. UCAS code</b>   | N/A  |
| <b>b. Solihull Qualification Code</b>   | ENFFA041   |
| <b>c. Edexcel Programme Code (&amp; approval dates)</b>   | 61012312 September 2024  |
| <b>7. QAA Subject Benchmark or other external reference such as published by Edexcel if the course is a Higher National</b> | Engineering 2024 Subject Benchmark   |
| <b>8. Date this specification applies from</b>  | 01.09.2024   |

**Approved**

Ahmed Hussein  
Head of School – Engineering

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# 1. Educational Aims of the Programme

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This programme aims to:

- Equip individuals with knowledge, understanding and skills for success in employment in the Electrical & Electronic engineering and related sectors.
  - Enable progression to an undergraduate degree or further professional qualification in Electrical & Electronic engineering or related areas.
  - Provide opportunities for specialist study relevant to individual vocations and contexts.
  - Develop the individual's ability to make an immediate contribution to employment in the Electrical & Electronic engineering sector, through effective use and combination of the knowledge and skills gained in different parts of the programme.
  - Develop a range of skills and techniques, personal qualities and attributes essential for successful performance in working life and thereby enabling learners to make an immediate contribution to employment.
  - Provide education and training for a range of careers in the Electrical & Electronic Engineering sector.
  - Provide opportunities for learners to gain a nationally-recognised vocationally-specific qualification to enter employment in the sector or progress to higher education qualifications such as a fulltime degree in a related area.
  - Present opportunities for learners to focus on the development of the higher level skills in Electrical & Electronic engineering and related areas.
  - Provide opportunities for learners to develop a range of skills and techniques and attributes essential for successful performance in working life.
  - Assist in the development of learners' knowledge, understanding and skills in the field of Electrical & Electronic Engineering.
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## 2. Intended Learning Outcomes

The programme provides opportunities for students to develop and demonstrate generic knowledge, skills, behaviour, qualities and other attributes as shown in Figure 1.

<h1>Engineering Standards</h1>			
Knowledge	Skills	Behaviours	
<p><b>K1</b> Understanding the importance of complying with statutory, quality, organisational and health and safety regulations.</p> <p><b>K2</b> Understanding of general engineering/manufacturing mathematical and scientific principles, methods, techniques, graphical expressions, symbols formulae and calculations used by engineering technicians.</p> <p><b>K3</b> Understanding the structure, properties and characteristics of common materials used in the sector.</p> <p><b>K4</b> Understanding the typical problems that may arise within their normal work activities/environment.</p> <p><b>K5</b> Understanding approved diagnostic methods and techniques used to help solve engineering/manufacturing problems.</p> <p><b>K6</b> Understanding the importance of only using current approved processes, procedures, documentation and the potential implications for the organisation if this is not adhered to.</p> <p><b>K7</b> Understanding and interpreting relevant engineering /manufacturing data and documentation in order to complete their job role.</p> <p><b>K8</b> Understanding the different roles and functions in the organisation and how they interact.</p> <p><b>K9</b> Understanding why it is important for an organisation to continually review their processes and procedures.</p>	<p><b>S1</b> Obtaining, checking and using the appropriate documentation (such as job instructions, drawings, quality control documentation).</p> <p><b>S2</b> Working safely at all times, complying with health, safety and environmental legislation, regulations and organisational requirements planning and where applicable obtaining all the resources required to undertake the work activity.</p> <p><b>S3</b> Undertaking the work activity using the correct processes, procedures and equipment.</p> <p><b>S4</b> Carrying out the required checks (such as quality, compliance or testing) using the correct procedures, processes and/or equipment.</p> <p><b>S5</b> Dealing promptly and effectively with engineering/manufacturing problems within the limits of their responsibility using approved diagnostic methods and techniques and report those which cannot be resolved to the appropriate personnel.</p> <p><b>S6</b> Completing any required documentation using the defined recording systems at the appropriate stages of the work activity.</p> <p><b>S7</b> Restoring the work area on completion of the activity and where applicable return any resources and consumables to the appropriate location.</p>	<p><b>B1</b> Personal responsibility, resilience and ethics. Comply with health and safety guidance and procedures, be disciplined and have a responsible approach to risk, work diligently at all times, accept responsibility for managing time and workload and stay motivated and committed when facing challenges. Comply with any organisational policies/codes of conduct in relation to ethical compliance.</p> <p><b>B2</b> Work effectively in teams. Integrate with the team, support other people, consider implications of their actions on other people and the business.</p> <p><b>B3</b> Effective communication and interpersonal skills. Open and honest communicator, communicating clearly using appropriate methods, listening to others and have a positive and respectful attitude.</p> <p><b>B4</b> Focus on quality and problem solving. Follow instructions and guidance, demonstrates attention to detail, follow a logical approach to problem solving and seek opportunities to improve quality, speed and efficiency.</p> <p><b>B5</b> Continuous personal development. Reflect on skills, knowledge and behaviours and seeks opportunities to develop, adapt to different situations, environments or technologies and have a positive attitude to feedback and advice.</p>	

Figure 1 – Engineering Standards

### A sound basic knowledge and understanding that includes:

- Mathematics relevant to Engineering.
- Engineering practice (including codes of practice, regulatory frameworks and requirements for safe operation).
- Scientific principles underpinning the specific engineering discipline such as energy transfer systems i.e. heat transfer through lagged pipe work system and power transmission in machinery
- Application of computers for quantitative analysis, simulation and solution of engineering problems and the manipulation and presentation of engineering information, such as the use of PLC, CAD or CAM CNC software.
- General principles and techniques of design and the characteristics of basic engineering materials and components
- Management and business practices

**Higher level academic/ intellectual skills including ability to:**

- Plan, conduct and report a programme of research
- Analyse and solve engineering problems
- Design a system, component or process to meet a need
- Be creative in the solution of problems and in the development of designs
- Evaluate design, processes and products, and make improvements.
- Integrate and evaluate information and data from a variety of sources.
- Use of commercial software to solve engineering problems

**Higher practical and professional skills including the ability to:**

- Plan and execute safely a series of experiments.
  - Use laboratory equipment and software packages to generate data
  - Design a system, component or process to meet a need.
  - Be creative in the solution of problems and in the development of designs.
  - Evaluate design processes and products and make improvements
  - Integrate and evaluate information and data from a variety of sources.
  - Produce a design for a system, component or process to meet specified requirements relating to Project Management
  - Research and undertake tests for a design solution and report the results effectively, within a Project
  - Cognitive skills of critical thinking, analysis and synthesis
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- Effective problem solving and decision making using appropriate quantitative and qualitative skills including identifying, formulating and solving problems
- Effective communication skills, both oral and written, using a range of media widely used in the sector, e.g. the preparation and presentation of reports
- Numeric and quantitative skills including data analysis, interpretation and extrapolation
- Effective use of communication and information technology for Electrical & Electronic related areas.
- Effective self-management in terms of time, planning and behaviour motivation, self-starting and individual initiative.
- Developing an appropriate learning style.
- Effective performance within a team environment including leadership, team building, influencing and project management skills
- Interpersonal skills, e.g. effective listening, negotiating, persuading and presentation

***Higher Level transferable skills development including:***

- The ability to manage and develop self
  - The ability to communicate ideas effectively both orally and in writing
  - The ability to apply numeracy in an Electrical & Electronic engineering context
  - The ability to apply technology in an Electrical & Electronic engineering context
  - To manage tasks and solve problems
  - Apply design and creativity to solving and array of aerospace engineering problems
  - The ability to work effectively as an individual and as part of a team
  - The ability to be flexible and respond to the change within the Electrical & Electronic engineering sector
  - Designing, planning, conducting and reporting on the needs of the Electrical & Electronic engineering sector.
  - The ability to use ICT and Management Information Systems in an Electrical & Electronic engineering setting.
  - Read and use appropriate literature with a full and critical understanding
  - Solve problems applying subject knowledge and understanding to address familiar and unfamiliar problems within an Electrical & Electronic engineering context.
  - Think scientifically, statistically and logically in relevant contexts.
  - Think independently and take responsibility for their own learning whilst recognising their learning style.
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## ***Teaching and Learning Methods***

The following opportunities are provided to enable learners to develop and demonstrate their achievement of learning outcomes:

- Acquisition of core knowledge is through a mixture of lecture/presentations/demonstrations, tutorials, group seminars and directed study
- Analytic thinking skills are developed through discussion and debate in-group and tutorial sessions and question sheets.
- Practical skills are an essential component of the programme and will involve group work, presentations, demonstrations, laboratory experiments,
- Common skills such as oral and written communication are developed by means of course notes, presentations of project work, appropriate reading, and written tutor feedback.
- Design skills and the ability to create simple engineering designs using multi-disciplinary approach is developed by means of sample project work.

### ***Assessment methods:***

#### **Summative assessment methods include:**

- Written work required in various formats such as reports, essays, blogs, dissertation
- In-class controlled assessments, where applicable.
- Oral presentations to a group audience using teaching aids such as PowerPoint, poster, Electronic Whiteboard, Practical Models.
- Assessment is enhanced by encouraging the students to use technology e.g. digital cameras, flip videos, analysis software to augment their presentational work.
- Project work.
- Small scale research studies
- Work-based learning

As far as possible all assignment work is connected to a vocational relevant scenario. Students receive individual written and oral feedback within 3 weeks of submission date.

#### **Formative assessment for learning and feedback includes:**

- Interactive lectures and question & answer sessions can be used to examine student understanding and identify any additional guidance required.
  - Group activities involve students actively contributing to, leading and participating in discussions and debates on a wide range of subject areas, undertaking games or group activities allowing immediate assessment and feedback.
  - Subject related tutorials are led by the subject tutor and aim to address a particular module or assignment. These tutorials can be linked to workshop sessions where necessary.
  - Workshops are for students to develop skills in self-directed study with the support of tutors. These sessions will be supported by staff but not staff led. There will also be self-directed time for students to further develop these skills and spend time reading around topics using a variety of recommended sources.
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- Extension activities/quizzes/Discussion forums on Moodle.
- Presentations are used to support research skills, organisation, time-management skill and are also a confidence-building tool.
- The need for IT support in general will be identified and where necessary, IT support will be organised.
- Diagnostic testing identifying Maths and English support where necessary.

**Note:**

For further details on assessments, grading criteria, submissions and resubmissions of assignments, please refer to [btec-hncd-engineering-2024.pdf \(pearson.com\)](https://www.pearson.com/uk/academic/education/btec-hncd-engineering-2024.pdf). Also, please see below a traffic light system on using AI in assignments. This is being used by Oxford Brookes University and a number of Academic institutions.

✓ <b>Appropriate use</b>	? <b>At risk practices</b>	x <b>Inappropriate use</b>
✓ <b>Ethical</b> use where the student is still the author of the assignment	? Relying on AI tools for a significant part of the assignment	x <b>Unethical</b> use where the student is no longer the author of the assignment
✓ <b>Transparent</b> use where the student makes clear where and how they have used AI in their assignment	? Not making all use of AI tools clear	x <b>Deceptive, hidden use</b> where the student uses AI but does not declare it with their assignment
✓ Helping the student <b>get started</b> with the assignment with planning or ideas	? Using AI tools to generate a part of the assignment	x Putting <b>the whole assignment task</b> into an Artificial Intelligence tool and using what is generated with little or no changes
✓ Helping the student <b>with small changes</b> in the development of their assignment such as correcting spelling	? Using AI for a lot of the development of an assignment	x Asking an AI tool to <b>generate a reference list</b> instead of the student doing research
✓ Helping the student with <b>proofreading/</b> checking before submission of the assignment	? Using AI to re-write an assignment at the final stage	x Using AI tools to answer <b>exam questions</b>
✓ Using AI tools <b>with instruction or guidance from the tutor</b>	? Using AI in ways the tutor has not recommended	x Using AI when the assignment instructions state that <b>AI must not be used</b>

**Mode of Study**

The Higher National Certificate (HNC) is a Level 4 qualification made up of 120 credits. It is usually studied full-time over one year, or part-time over two years. Students can study for the Pearson BTEC Higher Nationals, either as a part time or full-time.

A full-time mode of study requires students to attend college two days per week to study all eight units (or approved units) with the intention to complete the programme in a single year.

A part-time mode of study requires students to attend college one day per week with the intention to complete a maximum of four units in a single year. In some cases, a part-time student may choose the minimum number of unit/s to study in a single year; this may extend the length of part-time study in order to successfully achieve the award.

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### 3. Programme Structure

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Module code	Module title	CATS Credit value	Level	Year	Option or Mandatory
Unit 4001	Engineering Design	15	4	2	Mandatory
Unit 4002	Engineering Mathematics	15	4	1	Mandatory
Unit 4003	Engineering Science I	15	4	1	Mandatory
Unit 4004	Managing a Professional Engineering Project (Pearson set)	15	4	2	Mandatory
Unit 4015	Automation, Robotics and Programmable Logic Controllers (PLCs)	15	4	2	Part of programme delivery and unit accreditation
Unit 4019	Electrical and Electronic Principles	15	4	1	(Specialist unit) Mandatory
Unit 4022	Electronic Circuits and Devices	15	4	2	Part of programme delivery and unit accreditation
Unit 4034	Computer Aided Design and Manufacture (CAD/CAM)	15	4	1	Part of programme delivery and unit accreditation

#### **Progression to Year 2**

Progression onto the second year of the programme requires completion and achievement of a minimum grade of a pass of all first - year units and after a successful progression interview.

Cases of student/s with approved mitigating circumstance who have outstanding referred assessment/s or unachieved assessment/s would be considered on individual bases by the academic exam board and then a decision would be made whether the student would be recommended to achieve the outstanding and/or unachieved assessment/s during the summer break in order to progress onto the second year.

Alternatively, the academic exam board may recommend the withdrawal of student/s with outstanding assessment and/or unachieved assessment from the programme.

Each case of a student with outstanding assessment/s or unachieved assessment/s would be considered on individual basis where student/s would be required to complete any outstanding/unachieved assessment at a minimum pass grade in order to progress onto the second year.

After successful completion of all first-year modules, student/s may choose to transfer from Electrical Engineering pathway to other different level 4 pathways (including Manufacturing if applicable, and /or General Engineering, Aircraft Maintenance Engineering and other pathways). The transfer is done after successful interview.

#### **Completion of the Award**

For the Electrical Engineering pathway, students take the four mandatory core units, one specialist units and an additional three optional units. In total, eight units studied must be completed in the correct combination with a minimum grade of a Pass in all units in order to complete and achieve the award.

To achieve the HNC level 4 qualification, students must achieve 120 credits of completed units in the correct combination with a minimum grade of a Pass in all units.

#### **Module Descriptors**

##### **Unit 4001: Engineering Design**

The aim of this unit is to introduce learners to the methodical steps that engineers use in creating functional products and processes; from a design brief to the work, and the stages involved in identifying and justifying a solution to a given engineering need.

##### **Unit 4002: Engineering Maths**

The aim of this unit is to develop learner' skills in the mathematical principles and theories that underpin the engineering curriculum. Learners will be introduced to mathematical methods and statistical techniques in order to analyse and solve problems within an engineering context.

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**Unit 4003: Engineering Science**

This unit introduces learners to the fundamental laws and applications of the physical sciences within engineering and how to apply this knowledge to find solutions to a variety of engineering problems.

**Unit 4004: Managing a Professional Engineering Project (Pearson set)**

This unit introduces learners to the techniques and best practices required to successfully create and manage an engineering project designed to identify a solution to an engineering need. While carrying out this project learners will consider the role and function of engineering in our society, the professional duties and responsibilities expected of engineers together with the behaviours that accompany their actions.

**Unit 4015: Automation, Robotics and Programmable Logic Controllers (PLCs)**

The word automation was not used until the 1940s and it originated in the automotive manufacturing sector as a method designed to reduce labour costs and improve the quality, accuracy and precision of the finished products. The products we purchase today may have never been touched by human hands and we all benefit from a reduction in costs and improvement in quality. The aim of this unit is to investigate how Programmable Logic Controllers (PLCs) can be programmed to successfully implement automated engineering solutions.

**Unit 4019: Electrical and Electronic Principles**

This unit forms the foundation for any qualification in the field. The physical principles themselves build initially from our understanding of the atom, the concept of electrical charge, electric fields, and the behaviour of the electron in different types of material. This understanding is readily applied to electric circuits of different types, and the basic circuit laws and electrical components emerge. Another set of principles is built around semiconductor devices, which become the basis of modern electronics. An introduction to semiconductor theory leads to a survey of the key electronic components, primarily different types of diodes and transistors. Electronics is very broadly divided into analogue and digital applications. The final section of the unit introduces the fundamentals of these, using simple applications. Thus, under analogue electronics, the amplifier and its characteristics are introduced. Under digital electronics, voltages are applied as logic values, and simple circuits made from logic gates are considered.

**Unit 4022: Fundamentals of Thermodynamics and Heat Engines**

This unit introduces students to the operational characteristics of amplifier circuits, the types, and effects of feedback on a circuit performance, and the operation, application of oscillators. They will also be introduced to semiconductor devices and circuits, the use of electronics manufacturers' data to analyse the performance of circuits and devices, the application of testing procedures, and use the findings of the tests to evaluate their operation..

**Unit 4034: Computer Aided Design and Manufacture (CAD/CAM)**

This unit introduces learners to all the stages of the CAD/CAM process and to the process of modelling components using CAD software specifically suitable for transferring to CAM software.

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## 4.Support for Students and Their Learning

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Student progression on course is supported both by subject tutors and central College services and includes:

- An induction programme introducing new students to the subject of study, higher level skills that need to be developed, and the college facilities (including the library, IT facilities, staff and other students).
  - College and course/ module handbooks available in print and electronic format on Moodle.
  - Personal and academic support is integrated in teaching provided by supportive and accessible tutors.
  - A modern library equipped with both electronics and non-electronics books, reading materials, and ICT equipment. The library can lend laptops to the students upon request.
  - Study skills sessions integrated in programme.
  - Computer laboratories with specialist facilities for computer networking and multimedia computing.
  - Workshops and laboratories including wind tunnel, flight simulator, automation, and material testing
  - Study skills sessions integrated in programme and organised on a regular basis;
  - High specification computers with appropriate educational software.
  - Planned visits and speakers
  - Access to counsellors and support for students with special needs.
  - Written assignment / assessment feedback (normally provided with 2 weeks of assessment submission).
  - Access to course section and college wide sections on the college's intranet Moodle
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## 5.Criteria for Admission

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### Entry Requirements:

4 GCSEs grade C/4 or above, to include Maths and English, plus Pearson BTEC Level 3 Diploma in Engineering, or a minimum of 2 A-levels in relevant subjects.

An Access to Higher Education Certificate in Engineering awarded by an approved further education institution may be considered, depending on the grades.

Applicants with existing level 4/5 qualifications may be eligible for some Accreditation for Prior Learning (APL) which can be discussed on an individual basis.

Mature students, over the age of 21, with a suitable background and experience may be accepted without formal qualifications.

Applicants with an international equivalent of the above entry qualifications.

Offer of a place is conditional on a successful interview for all applicants.

Normally, the course enrolls students who have reached the minimum age of 18.

## 6.Progression

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After successful completion of the HNC with an overall Merit grade and also commendation from the academic staff, students can progress onto the second year of the Foundation degree Electrical & Electronic Engineering programme and/or with the higher/degree apprenticeship at Solihull College and University Centre. It may be possible for a student to progress onto other pathways (including BSc (Hons) Degree in Aircraft Maintenance Engineering, and others) within Solihull College and University Centre and/or other local higher education institutions.

Following successful completion of the Foundation Degree at Solihull College and University Centre, student may progress onto the BSc (Hons) top-up degree in Electrical & Electronic Engineering at Solihull College and University Centre.

Alternative routes may be available within Solihull College and University Centre and other local universities or colleges on degree programmes or HND programmes.

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## 7. Evaluating the Quality of Teaching and Learning

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Evaluation of the Standards of Teaching and Learning is undertaken using the results of the following documents;

- Student feedback questionnaires, both initial impressions and the spring survey
- Module review forms completed by students at the end of every module and summarised by the course leader.
- Student representations made through the HE Student Council.
- Action areas fed by the above to the course based Annual Monitoring report.
- Findings of the peer teaching observation scheme and recommendations for improvement that are made
- Quality Audit of the programme undertaken by Dean of Higher Education & Curriculum Development and an external observer.
- External Verifiers report and audit of assessed work

Students have the opportunity to comment on the quality of the programme in the following ways

- Submitting module evaluation questionnaires which are shared in team meetings and relevant actions raised are included in the Annual Monitoring Review.
- Student Representatives volunteer from each group to bring forward the views of their colleagues informally.

The ways in which the quality of this programme is checked, both inside and outside the college, are:

- External Examiners, who produce an annual report which is available to view on Moodle and also results in an action plan for the following academic year.
  - Annual module review in the form of student evaluations which are discussed in a team meeting
  - Periodic programme review to identify best practice and invite employers to contribute to the design of the programmes.
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## 8.Regulation of Assessment

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- The programme is the subject of an Annual Monitoring Report (AMR) the last section of which is a Quality Improvement Plan (QIP), written by the course leader with help and input from the teaching and tutoring team this is passed to the Head of School for audit and from them to the quality unit for further audit and acceptance as part of the College plan.
- Assessment rules and regulations and quality standards are those that are laid down in the Quality standards requirements of the College Academic Board.
- Assessment and assessment vehicles are regulated by the internal verification system for each programme which is itself audited by the quality unit within the College and also by the External Verifier appointed by Edexcel.
- External verification of assessment and of the provision and standards of teaching are regulated by Pearson BTEC and their quality unit, the programme has to seek approval for continuance every 5 years. Their requirements are monitored annually by the visit and report of their appointed external verifier (Standards Verifier)
- Also the programme is the subject of periodic review by QAA, ensuring that national benchmarks are met throughout the programme.

Standards Verifiers (External Examiners) are appointed by Pearson

The role of Standards Verifier is that of moderator. In order to do this they check and review:

- action points from previous reports
  - Centre assessment policy and boards
  - effectiveness of assignments and internal verification
  - the maintenance and audit of assessment records
  - student registration and certification claims
  - student support and review
  - areas of good practice
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## 9.Enhancement

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- An action plan is provided in each annual programme report and progress in achieving enhancements is reviewed annually.
  - Good practice in teaching and learning is developed and disseminated through staff development workshops and through participation in internal verification of completed student work.
  - Staff development activities are discussed at annual appraisal interviews and are actively encouraged to develop their professional practice and industrial experience.
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## 10. Programme Resources

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The following are the key resources available to support the delivery of the programme:

- Advanced Manufacturing Centre
- Materials Laboratory
- CAD/CAM Software
- PLC Software
- Engineering Workshop
- Mechatronics Workshop
- Electrification Workshop

### Student Employability

This programme is part of Solihull College and University Centre's commitment to meeting the needs of local, national and international employers by delivering a diverse range of educational models including part-time and work-based study for learners drawn from non-traditional backgrounds in addition to internal progressions from FE vocational programmes.

**As part of this commitment, the HNC Electrical & Electronic Engineering programme will:**

1. Support students by providing professional, impartial advice and guidance to enable students to make considered career decisions before and during their studies to prepare them for future employment and development by:
  - identifying the skills needed for progression into employment,
  - enhancing their existing employment prospects.
2. Provide subject-related resources and information on local, national and international labour markets;
3. Be responsive to the needs of employers in order to maximise students' employability and career progression prospects;
4. Include study skills which will improve students' academic writing and research capabilities to enable further study and facilitate career progression;
5. Support equality and diversity, and minimise barriers to learning, as described in the college's Equality Policy which can be found on the website under Mission and Policies.
6. Ensure that employers play a key part in module content, course design and assessment criteria by formally seeking their views through individual employer meetings and meetings with industry groups, and the use of a specialist employer service researcher to help to ensure that the course content meets industry expectations and requirements;

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

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The UK-Spec Learning Outcomes are covered in the programme as follows (definition of UK-Spec Learning Outcomes can be found, for example, in the IET handbook of Learning outcomes <http://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC%20third%20edition%20%281%29.pdf>)

### **1. Academic literacy**

Learners are expected to have academic literacy of:

- 1.1. Mechanical Engineering and Electrical & Electronic Engineering, so that they are able to demonstrate the knowledge and understanding to deal with well-established, and with some depth, facts, concepts, principles & theories relevant to Mechanical and Electrical & Electronic Engineering, within a broad engineering subject base
- 1.2. Complexity within Mechanical and Electrical & Electronic Engineering systems, informed by literature & resources which are largely prescribed (UK-SPEC A1, A2: Output P4i, P5i).
- 1.3. The inter-relationships of health & safety, design, engineering science & applications, analytical & mathematical techniques, environmental considerations & sustainability,

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<sup>1</sup> The definition of UK-Spec Outputs can be found, for example, in the IET handbook of Learning outcomes [http://www.theiet.org/academics/accreditation/policy-guidance/handbook\\_lo.cfm](http://www.theiet.org/academics/accreditation/policy-guidance/handbook_lo.cfm)

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systems, management and economic factors in relation to Mechanical and Electrical & Electronic Engineering (Output US2i, D1i, S1i, S2i, S3i, S4i, P6i).

## **2. Research literacy**

Learners are expected to have research literacy so that they can:

- 2.1. Apply aspects of relevant facts, concepts, principles & theories relevant to Mechanical and Electrical & Electronic Engineering issues to their subject and / or professional work areas (UK-SPEC A1, A2: Output US1i, US2i, S1i, P6i).
- 2.2. Make and justify decisions relevant to design, manufacture, use and decommissioning of Electrical & Electronic equipment and / or plant including preventative measures which are specified and predictable; and produce an action plan, where appropriate, supported by pertinent evidence (UK-SPEC A2, B2: Output E1i, E3i, D3i, D4i, D5i).
- 2.3. With guidance, in relation to the field of Mechanical and Electrical & Electronic Engineering and within specified parameters, explain key engineering principles and identify their relevance and significance to Mechanical and Electrical & Electronic Engineering and justify their application to specific problems which are specified and produce a coherent line of argument supported by relevant evidence (UK-SPEC B1: Output E1i, E2i, E3i, P4i).
- 2.4. Identify, explain and use appropriate practical and laboratory skills with the appropriate selection of experimental and investigative techniques (Output P1i, P2i).
- 2.5. Identify, access, use, explain and evaluate information / data which is relevant from a range of sources (Output P4i).
- 2.6. Set milestones within a given plan and implement plan to achieve several objectives (UK-SPEC C1: Output S2i).

## **3. Critical self-awareness and personal literacy**

Learners are expected to have critical self-awareness and personal literacy so that they can:

- 3.1. Undertake prescribed independent study techniques and their application to work-based learning including the setting of goals, managing time appropriately and prioritising tasks, and review personal performance to ensure that work is completed in a timely manner.
- 3.2. In relation to the professional work area, operate effectively in situations that are largely straightforward and predictable within practical / employment / work contexts requiring the exercise of personal responsibility and/or decision-making as evidenced by work-based learning in the application of underlying concepts and principles of Mechanical and Electrical & Electronic Engineering in routine and novel situations (UK-SPEC C1, C2, E2: Output D3i, P3i, P4i).
- 3.3. In relation to the learner's professional area and with clear guidance / support, participate effectively in appropriate collaboration with people from other disciplines / professions (UK-SPEC C3, D3: Output P3i).
- 3.4. For a given situation and audience, communicate knowledge and understanding appropriate to the level in an appropriate written, verbal or visual format in a way that is appropriate for the purpose, topic and situation and in such a way as to demonstrate understanding to academic, specialist and non-specialist audiences (UK-SPEC D1: Generic Output).

## **4. Digital and information literacy**

Learners are expected to have digital and information literacy so that they can:

- 4.1. With guidance, in relation to academic and practical work, convey information which has some complexity in written/spoken English which is accurate and clear in terms of grammar / syntax / vocabulary-choice / style and use academic conventions appropriately for the purpose, topic, situation and audience and also reference a range of different types of sources accurately in line with guidance provided (Generic Output).
- 4.2. Select and use specified IT applications and strategies as appropriate for guided purposes and tasks and the retrieval of information (Output E2i, P1i).
- 4.3. Solve straightforward contextual, qualitative and numerical problems by identifying, explaining and selecting appropriate approaches to use and also evaluate both the approaches and solutions to the problem (Output E2i, E3i).
- 4.4. Critically evaluate the validity and implications of information relevant to Mechanical and Electrical & Electronic Engineering and their work practice (Generic Output).

## **5. Active citizenship**

Learners are expected to have active citizenship so that they can:

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- 5.1. With guidance, in relation to the field of Mechanical and Electrical & Electronic Engineering and within specified parameters, identify and explain issues related to health and safety, design, engineering science & applications, analytical & mathematical techniques, environmental considerations & sustainability, systems, management and economic factors (UK-SPEC E2, E3: Output E4i, D1i, D2i, D5i, S4i).
  - 5.2. With guidance, in relation to the field of Mechanical and Electrical & Electronic Engineering and within specified parameters, evaluate and critically analyse Electrical & Electronic equipment and systems and make suggestions to improve the design life, performance and efficiency and justify decisions about the management of Electrical & Electronic equipment and systems and also related technologies (UK-SPEC B3, C4: Output E1i, E2i, E3i, E4i, D4i, D5i, P7i).
  - 5.3. Demonstrate respect for the perspective of other disciplines / professions and be able to identify the potential contribution of own and other professions / disciplines to the area of practice and describe the purpose of these disciplines / professions and their role within a multidisciplinary team (UK-SPEC C3, D3: Output P3i).
  - 5.4. In relation to Engineering, with clear guidance & support, appropriately work effectively within the boundaries imposed by ethical and legal issues (including standards & codes) and demonstrate respect for the ethical and legal boundaries of other disciplines (UK-SPEC E1, E2: Output S4i, S5i, P3i, P5i).
  - 5.5. Demonstrate the learning ability needed to undertake further training, develop existing skills, and acquire new competences that will enable them to assume significant responsibility within organisations (UK-SPEC A1, E4: Generic Output).
  - 5.6. Reflect, selecting from a range of suggested approaches and techniques, and seek and use feedback to inform reflection on and analysis of own strengths, limitations & performance and identify their implications (UK-SPEC D3: Generic Output)
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