

BTEC Higher Nationals in Automotive Engineering

Course Overview

This **Course Information** document gives centres advice and recommendations on how to plan, design and structure the programme, which will enable them to manage and implement the Edexcel BTEC Higher National qualifications in Automotive Engineering.

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1.0 INTRODUCTION

This guidance gives centres advice and recommendations which will enable them to manage and implement the Edexcel BTEC Higher National qualifications in Automotive Engineering.

The Higher National awards operate within Edexcel's overall policy, and national control of standards is ensured by requiring organisations to work within these guidelines and to follow approval and verification procedures. Within the required structure, centres can design programmes that are tailored to meet the specific needs of employers and students.

This second phase of Higher National Engineering development also includes units and guidance which address other sectors of engineering, namely Aerospace, Manufacturing, Plant and Process.

This guidance should be read in conjunction with the current issue of the *BTEC Policy Framework* and *Qual Forms*, which contain the general requirements for approval to run any Edexcel programme.

1.1 About this guidance

This guidance replaces the 1987 Higher National qualifications in Engineering Guidelines 07-058-7 and the 1991 Motor Vehicle Studies Guidelines and unit Specifications 07-050-1.

Within the broad title (Automotive Engineering), centres can design programmes that are tailored to meet specific needs and areas of coverage. New submissions leading to the named Edexcel BTEC Higher National Certificates and Diplomas must be validated using these new guidelines. Centres currently approved under the 1991 guidance will be allowed a transition period onto the new programmes. Whilst all centres must gain approval under this new guidance for programmes beginning **September 2000**, it is recommended that centres implement the new guidelines sooner than this to comply with the 3rd edition of the SARTOR which comes into force from 1999.

1.2 Rationale

Edexcel Higher National provision in Engineering is designed to provide:

- national qualifications, with detailed common standards recognisable to centres, students and employers
- guidance for centres with their own quality assurance procedures
- a focus on practical knowledge and skills
- a common core of study
- the opportunity to preserve and build on existing good practice
- compatibility with feeder qualifications
- a response to changing training and educational needs
- a preparation for employment
- progression to degree programmes

- flexible approaches within a national framework
- unit grading.

1.3 Aims

Higher National programmes in Engineering should be designed to meet one or more of the following aims:

- to provide preparation for a range of technical and management careers in automotive engineering
- to provide specialised studies which are directly relevant to individual vocations and professions in which students are currently working or in which they intend to seek employment
- to enable students to make an immediate contribution in employment
- to provide flexibility, knowledge, skills and motivation as a basis for progression to graduate and postgraduate studies
- to develop a range of skills and techniques, personal qualities and attitudes essential for successful performance in working life.

1.4 Professional recognition

The Higher National qualifications in Engineering have been developed with career progression and recognition by professional bodies in mind. It is essential that students gain the maximum benefit from their programme of study. Consequently we have added value to their qualification by acquiring recognition from the Engineering Council and its nominated bodies. The following list is a sample of professional bodies who recognise the Edexcel BTEC Higher Nationals which are designed to comply with the Engineering Council's new SARTOR regulations:

- Institute of Road Transport Engineers
- The Institute of Automotive Engineer Assessors
- The Institution of Incorporated Engineers in Electronic, Electrical and Mechanical Engineering
- Institution of Engineering Designers
- Institution of Incorporated Executive Engineers.

Further details of professional body recognition and exemptions are contained in the publication *BTEC Professional Recognition*.

1.5 Related qualifications

Through the study of the core and relevant option units students will cover much of the underpinning knowledge, skills and understanding for the relevant NVQ level 4 units in Engineering and Project Management.

The overall structure of OSCEng Higher Level Standards: Functiona; Map, and an illustration of how the BTEC Higher National units link to these standards are provided in Annex D.

2.0 PLANNING THE PROGRAMME

Any centre wanting to run a Higher National programme in Engineering should consider:

- the needs of the market in terms of individual students, local or regional employers and sponsoring agents
- the requirement for recognition by engineering professional institutions, in particular the Engineering Council, as specified in Standards and Routes to Registration (see Annex A for current recognition of Edexcel BTEC Higher Nationals)
- the structure, content, delivery and assessment methods which will be needed to achieve programme outcomes in a motivating way
- whether they wish to add centre-devised option units
- the student's employment background and work-based learning programmes to enhance delivery and relevance
- the review mechanisms needed to ensure programmes take account of changing needs
- progression to degrees, NVQs and professional qualifications.

2.1 Access

The fundamental principles of Edexcel's policy are:

- qualifications should be available to everyone who is capable of reaching the required standards
- qualifications should be free from barriers which restrict access and progression
- equal opportunities exist for all.

Nevertheless it is the responsibility of the centre to recruit with integrity. Centres should therefore:

- provide applicants with appropriate information and advice
- identify applicants' needs
- select on the basis of each applicant's previous qualifications and experience.

Edexcel BTEC Higher National programmes are intended primarily for those who are in, or plan to enter, employment and who have reached the minimum age of 18. Students who enter with at least one of the following qualifications are likely to benefit more readily from the programme:

- an Advanced GNVQ (eg in Engineering or Manufacturing)
- an Edexcel BTEC National Certificate or Diploma in an engineering discipline
- at least one GCE A level pass, with appropriate supporting passes at GCSE grades A, B or C in an appropriate science or technology subject.

For some Higher National programmes more specific requirements are normally expected (eg prior study in a particular field, or more focused additional GNVQ units). Previous achievements may be recognised through the Accreditation of Prior Learning (APL). This was introduced by BTEC in 1990 to ensure that outcomes achieved by an applicant, whether

through experience or through other qualifications, can be identified, authenticated and accredited against the qualification specification without the need for repetition. Any student able to demonstrate that all the requirements for one or more units are met should be credited with that achievement and be eligible for certification.

No time limit is placed by Edexcel on the completion of an individual programme, up to the normal Edexcel registration period of five years (which is itself renewable). Students may, if they wish, take only parts of a qualification for separate accreditation and certification.

3.0 PROGRAMME DESIGN AND STRUCTURE

In order to achieve the programme aims, centres should devise a structured learning experience to deliver the qualification outcomes.

3.1 Programme design

Centres are encouraged to anticipate change and, where appropriate, to combine disciplines which may have been disparate and unconnected in the past.

Although units are designed to be free-standing, centres are encouraged to be innovative and to design programmes which allow integration and flexibility within and across the unit-based outcomes.

Option units have been designed to enable centres to develop programmes of study which focus on Design, Manufacture and Service of Automotive products.

Progression opportunities now exist for students who wish to move on to first-degree level studies with entry, dependent on qualifications and/or experience, direct to the second or third year. Centres are urged to respond positively to such initiatives, and to work closely with degree-awarding institutions to promote the ease of transfer from one learning programme to another. To help facilitate this, centres need to base their programmes of study on learning experiences which are broadly compatible with the first and/or second years of degree study, while maintaining the essential characteristics of Higher National qualifications.

The Higher National Engineering programme will normally be designed to last for two years, although the programme for individual students may vary from this.

Programme design and delivery should reflect the balance of skills and knowledge needed to perform engineering tasks competently. Centres should take care to balance and integrate theory and practice, to ensure that the qualification supports both career prospects and educational progression.

The core is mandatory and common to both the Higher National Certificate and Diploma. It provides a foundation for developing specialisms through choosing appropriate option units. In order to provide a particular focus, centres may choose units contained in this publication or other appropriate existing Edexcel or centre-devised units.

Licensed centres wishing to use the named award titles must design the programme(s) within the specified structure.

3.2 Unit design

The Higher National qualifications consist of standard unit templates which include clearly defined outcomes and content, robust assessment criteria and clear grading criteria ensuring standards, credibility and rigour.

The qualifications consist of units which have a notional level indicator of H1 or H2, indicating the relative intellectual demand, complexity and depth of study, and learner autonomy.

At **H1 level** the emphasis is on the application of knowledge, skills and understanding; use of conventions in the field of study; use of analytical skills and selection and organisation of information.

At **H2 level** the emphasis is on application and evaluation of contrasting ideas, principles, theories and practices; greater specialism in the field by study; and an increasing independence in systematic enquiry and analysis.

In designing programmes of study to fulfil progression arrangements centres have flexibility in selecting appropriate combinations of H1 and H2 units for the option pathways.

All units are designed to recognise the importance of the development of skills through the integration of **Common Skills**.

3.3 Centre choice of units

Centres applying to offer Higher National qualifications may include, in the option pathways their own choice of units. This flexibility is limited to a total of **4 units** at the Diploma level and up to **2 units** at the Certificate level.

Centre choice may be based on:

- appropriate units from other Higher National vocational areas
- proposals for units submitted to Edexcel to meet regional needs
- appropriate language units.

Centre choice of units must demonstrate their contribution to the coherence of the qualification and will be subject to approval.

3.4 Language units

Development work on revised language guidance is currently underway. Updated language units will be available for September 1998.

3.5 Programme structure

The qualification comprises:

- **core units:**
 - there are six core units which are common to the Higher National Certificate and Higher National Diplomas
- **option units**, which may be selected from:
 - specific clusters relevant to students specialising in Automotive Design, Manufacture, Service and Maintenance
 - a cluster of units which are applicable to more than one specialism
 - appropriate centre-devised option units.

All programmes must include the development and assessment of Common Skills as detailed in the *Common Skills and Core Themes General Guidance* (May 1992). Other guidance and

help for Common Skills development can be found in *Common Skills and Core Themes Implementation Guidance* (May 1992). For a summary of Common Skills outcome statements, see Annex B.

In addition to the Edexcel-devised option units, centres may wish to seek approval for other options which offer additional specialisation, further breadth, and/or meet local needs. These centre-devised units have to be submitted to Edexcel as part of the approval system. A clear justification for their need must be provided (including consultation with employers or professional bodies). They must be specified in the same format as the Edexcel-devised core and option units (see *Unit structure*).

To ensure flexibility combined with national standards and rigour, it will be possible to combine vocational areas of study (for example, a programme combining core and option units from Engineering and Business to produce an HN in Engineering and Business). For the Diploma, such combined programmes must use ten units (including core units) from the main vocational area and six units from the other vocational area. For the Certificate there must be six units (including core units) from the main vocational area and four from the other vocational area. All combination programmes must go through our normal approval procedure and be submitted for approval.

Higher National programmes are structured in the following way:

- an HND has a unit value of 16, comprising 6 core and 10 option units
- an HNC has a unit value of 10, comprising 6 core and 4 option units
- All HN programmes now have standard unit templates which include clearly defined outcomes and content, robust assessment criteria and clear grading criteria ensuring standards, credibility and rigour.

The tables on the following pages show the minimum requirements for the engineering qualifications, and illustrate possible programme structures for the four engineering specialisms covered in Phase 2 development.

	HIGHER NATIONAL CERTIFICATE	HIGHER NATIONAL DIPLOMA
Core H Level Units	Business Management Techniques Analytical Methods for Engineers Engineering Science Project Mechanical Principles Vehicle Engineering Principles	
Common Skills	In 7 areas *	
Option Units (specific clusters relevant to student's specialism)	4	10
Total Value of units at Level H	10	16
Engineering Applications ** EA1 & EA2	EA1 must be completed by the end of the course EA2 must be fully integrated in the course	

Figure 1. Minimum requirements for the HN Automotive Engineering qualification

Health, safety and environmental issues are important and must be incorporated throughout HN Engineering programmes.

* See Annex B for a summary of Common Skills outcome statements.

** See Annex C for a description of Engineering Applications.

Figure 2. Illustration of programme structures for the four Phase 2 Engineering specialisms

	Aerospace Engineering	Manufacturing Engineering	Plant and Process Engineering	Automotive Engineering
C O R E	Business Management Techniques Analytical Methods for Engineers Engineering Science Engineering Design Project Aircraft Systems Principles	Business Management Techniques Analytical Methods for Engineers Engineering Science Engineering Design Project Planning & Scheduling Principle	Business Management Techniques Analytical Methods for Engineers Engineering Science Engineering Design Project Plant & Process Principles	Business Management Techniques Analytical Methods for Engineers Engineering Science Mechanical Principles Project Vehicle Engineering Principles
	Plus Common Skills (7 Areas) Engineering Applications EA1 & EA2			
O P T I O N	Introduction to Aerodynamics	Manufacturing Processes	Plant Technology	Computer Applications in Motor Industry
	Further Aerodynamics	Introduction to Machine Tools	Plant Maintenance & Management	Fault Diagnosis & Repair
	Automatic Flight Control Systems	Advanced Machine Tools	Applications of Pneumatic & Hydraulics	Vehicle Electrical & Electronic Systems
	Measurement & Testing	Manufacturing Electronic products	Industrial Plant Services	Vehicle Microprocessor Systems
	Communication & Navigation	Advanced Computer-Aided Design Techniques	Computer-Aided Plant Design	Advanced Vehicle Technology
	Aircraft Fluid Systems	Material Handling	Plant Operation & Performance	Plan & Co-ordinate Vehicle Maintenance
	Further Aircraft Fluid Systems	Industrial Engineering	Energy Management	Vehicle Damage Assessment
	Aircraft Structural Integrity	Purchasing for Engineering Manufacture	Health & Safety and Risk Assessment	Accident Reconstruction
	Aircraft Propulsion Technology	Advanced Manufacturing Technologies	Condition Monitoring & Fault Diagnosis	Vehicle Parts Management
	Integrated Flight Instrument Systems	CAD/CAM	Quality Assurance & Management	Managing Work of Team & Individuals
	Gas Turbine Science	Computer-Aided Machining	Purchasing for Engineering Manufacture	Further Analytical Methods for Engineers
	Electrical, Electronic & Digital Principles	Further Analytical Methods for Engineers	Engineering Thermodynamics	Electronics
	Microprocessor Systems	Quality Assurance & Management	Heat Transfer & Combustion	Electronic Computer-Aided Design
	Mechanical Principles	Programmable Logic Controllers	Utilisation of Electrical Energy	Manufacturing Processes
		Robot Technology	Fluid Mechanics	Introduction to Machine Tools

Materials Engineering Engineering Thermodynamics Quality Assurance & Management Further Analytical Methods for Engineers Engineering Mathematics Project Management Manufacturing Processes Computer-Aided Machining Introduction to Machine Tools Advanced Machine Tools CAD/CAM	Statistical Process Control Design for Manufacture Materials Engineering Project Management Vacuum Systems Semiconductor Fabrication Processes Safety and Cleanroom Protocol Silicon & Semiconductor Device Properties Assessment of Semiconductor Devices Electrical & Electronic Principles Electronic Computer-Aided Design Mechanical Principles Health and Safety and Risk Assessment	Vacuum Systems Semiconductor Fabrication Processes Safety and Cleanroom Protocol Silicon & Semiconductor Device Properties Assessment of Semiconductor Devices Further Analytical Methods for Engineers Programmable Logic Controllers Statistical Process Control Electrical & Electronic Principles Project Management Engineering Systems Measurement & Testing Microprocessor Systems Control Systems and Automation	Computer-Aided Machining Engineering Design Robot Technology Design for Manufacture Advanced Machine Tools CAD/CAM Programmable Logic Controllers Statistical Process Control Project Management Materials Engineering Materials Handling Industrial Engineering Managing Quality & Customer Interface
<p>Six Core Units Plus Four Option Units from the appropriate list for each HNC Six Core Units Plus Ten Option Units from the appropriate list for each HND</p>			

3.6 Unit structure

All units are defined in terms of ‘guided learning hours’. This means ‘all times when a member of staff is present to give specific guidance towards the qualification or module being studied on a programme. This includes lectures, tutorials and supervised study in, for example, open learning and learning workshops. It does not include hours where supervision or assistance is of a general nature and is not specific to the nature of the students.’

Each unit requires approximately 60 guided learning hours.

Each unit is a set of learning outcomes, with associated content, measures and guidance. To achieve the unit all outcomes must be met by the student. Each unit is specified in the following way:

- unit title, value, level, code
- description of unit – a description of the overall purpose of the unit
- unit outcomes – what the student must achieve in the unit
- content – an indication of the depth and breadth of knowledge, skills and understanding that should be provided to support the achievement of the outcomes
- assessment criteria – statements of what the student must be able to do, know or understand to achieve each outcome
- guidance – on generating evidence, links, resources, delivery etc.

Centre-devised units must be specified in an outcome format, similar to that of the Edexcel-devised core and option units and included in the submission for approval.

3.7 Common Skills

Currently all Higher National qualifications are required to include Common Skills. These are transferable skills which play an essential role in developing personal effectiveness for adult and working life, and in the application of specific vocational skills. They provide a foundation for continual learning to enable and empower individuals who, inevitably, face a series of choices in work, education and training throughout their life.

As the structure of industry and commerce continues to change more rapidly than ever before, with new products, services, technology, work roles and settings, all employers and employees need these Common Skills to enable them to adapt and respond creatively to change. Consequently the patterns of training and education should reflect the need for a more flexible working population.

All Edexcel qualifications at Higher National level embrace the following skill areas as an essential part of the learning programme:

- Applying Numeracy
- Communicating
- Applying Technology

- Managing and Developing Self
- Working with and Relating to Others
- Managing Tasks and Solving Problems
- Applying Design and Creativity.

Centres may also wish to assess and certificate students in QCA key skills units. Key skills units are available at levels 1 to 5 in six different areas:

- Application of Number
- Communication
- Applying Technology
- Personal Skills: Improving Own Learning and Performance
- Personal Skills: Working with Others
- Problem Solving.

Further information is available in the Edexcel publication Getting Started with Key Skills in Educational and Work-based settings.

4.0 PROGRAMME DELIVERY

Any centre offering a Higher National programme needs to provide:

- clear guidance on the routes and modes of study available and how these are supported
- opportunities to make individual learning contracts with students, to ensure that personal learning objectives are achieved
- learning activities which demonstrably help students to achieve the aims and objectives of the programme
- advice and feedback on students' progress and learning needs throughout the programme.

Those with special needs may require additional support. This could include technical aids or specially devised or adapted methods of assessment, with additional time allowed if necessary.

4.1 Balancing Studies

In preparation for any Higher National Engineering programme, but particularly for an HND, learners with a variety of backgrounds and qualifications need to be given support and access to learning. Centres could use *Balancing Studies*, covering any necessary level N outcomes that would normally have been covered in a GCE A level programme, an Advanced GNVQ in Engineering or in a BTEC National programme in Electrical or Mechanical Engineering, for example Mathematics, Mechanical, Electrical and Electronic Principles.

4.2 Part-time programmes

Part-time programmes present special problems but also special opportunities. Delivery of the programme through assignment programmes based in the student's work environment should be encouraged. The programme team should build on the special opportunities provided by the programme by:

- liaising with employers to ensure a course relevant to the specific needs of the students
- accessing non-confidential data and documents from programme members' workplaces
- visiting sites and properties managed by sponsoring employers
- involving sponsoring employers
- linking with in-house training programmes
- using the variety of programme members' experience of work and life to make the programme relevant and current.

5.0 PROGRAMME MANAGEMENT

Centres will need to demonstrate the effectiveness and efficiency of the way the programme is managed and implemented. They will also need to demonstrate the effectiveness of the quality control systems that are in place to monitor the programme.

Centres should identify an appropriate delivery team, normally headed by a programme manager.

The programme manager has particular responsibility for:

- the effective operation and development of the programme team
- identifying future resource and team development needs
- planning and implementing detailed review and evaluation procedures which incorporate the views of all stakeholders
- providing the link between the programme team, students and the external verifier/examiner.

The programme team have responsibility for:

- implementing recruitment and induction procedures
- implementing equal access and equal opportunities policies
- effective programme design, implementation and assessment strategies
- implementing student support systems
- effective liaison with employers
- implementing quality control systems:
 - monitoring the operation of the programme
 - monitoring student progress
 - implementing review and evaluation procedures.

Given the crucial role that the team has in the delivery of a coherent programme and the demand this may make, strong support from senior staff is essential if the team is to function effectively.

6.0 CRITERIA FOR APPROVAL

New centres will need to be approved. Approved centres wanting to offer Higher National awards need to provide evidence of:

- the qualifications of the members of the programme team
- the relevant occupational experience of members of the programme team and their continuing professional development
- the programme content and the way in which it delivers the outcomes
- the resources and technical support available for the programme
- how the delivery and assessment methods are likely to meet the stated aims of the programme.

For further details on how to become an approved centre, or for the application procedure to offer Higher National qualifications, please contact our Customer Response Centre on 0171 393 4500.