BENG(HONS) ADVANCED MANUFACTURING

Institute of Engineering, Computing and Advanced Manufacturing

Academic Level:	6	**Credits:**	360
UCAS Code:			
Awarding Body:	University of Cumbria		
Delivery Site:	Barrow-In-Furness Campus		
Programme Length:	Standard full-time registration period is 3 years with a maximum registration period of 7 years.		
Mode of Delivery:	Face-to-face		
Pattern of Delivery:	Full time This programme may also be made available on an infill part-time basis at the discretion of the academic programme leader. In such cases, you will study modules alongside the full-time cohort(s) that are running at the time		
	Total weeks of study:	24 weeks	
	Delivery pattern:	2x 12 week semesters	
	Standard semester dates:	Yes	
Programme Webpage:	https://www.cumbria.ac.uk/study/courses/undergraduate/beng-hons-advanced-manufacturing/		

Entry Criteria
The University's standard criteria for admissions apply. Please refer to the Applicant Information pages of the University website for more information. For APL, please refer to the University website. Detailed criteria for admission to this programme can be found on the programme webpage.

PROGRAMME AIMS AND OUTCOMES

Programme Aims

By the end of this programme learners will be able to:

1. Play a meaningful role in manufacturing companies through a combination of technical, commercial, and social awareness.
2. Apply a substantial grounding in engineering principles, mathematics, manufacturing processes and manufacturing technologies to the resourceful solution of complex problems in a commercial environment.
3. Use creativity to innovate new products, processes or systems that meet a range of societal, business and user needs.
4. Operate in a responsible and ethical manner, helping to ensure the benefits of innovation and progress are shared equitably without compromising the natural environment
5. Have the ability and confidence to use a range of engineering tools, techniques and methods to reach substantiated conclusions.
6. Use transferable skills to solve problems individually and in teams, and gain employment in a wide variety of professions, and thereby make a valuable contribution to society.

Programme Outcomes – Knowledge and Understanding

The programme provides opportunities for you to develop and demonstrate the following:

After 120 credits of study (CertHE) you will be able to demonstrate:

K1. Apply knowledge of mathematics, statistics, natural science, and engineering principles to well-defined problems.

K2. Analyse well-defined problems using your results to reach substantiated conclusions.

K3. Find and use technical literature and other sources of information to address well-defined problems.

K4. Apply a systematic approach to the solution of well-defined problems.

K5. Evaluate the environmental and societal impact of manufacturing engineering processes.

K6. Apply ethical principles and recognise the need for students and engineers to exercise their responsibilities ethically.

K7. Identify, evaluate, and mitigate the effects of uncertainty associated with a well-defined project, and risk-assess your activities competently.

K8. Exercise judgement and personal responsibility for the security of data.

K9. Recognise the importance of equality, diversity and inclusion in the classroom and the workplace.

After 240 credits of study (DipHE) you will be able to demonstrate:

K10. Apply knowledge of mathematics, statistics, natural science and engineering principles to broadly-defined problems.

K11. Analyse broadly-defined problems using different approaches to reach substantiated conclusions.

K12. Select and use technical literature and other sources of information to address broadly-defined problems.

K13. Apply a systematic approach to the solution of realistic problems.

K14. Evaluate the environmental and societal impact of manufacturing engineering processes, systems, and technologies.

K15. Make meaningful ethical choices by identifying ethical concerns.

K16. Identify, evaluate, and mitigate risks associated with a particular project or activity.

K17. Adopt a sensible approach to the mitigation of security risks.

K18. Recognise the responsibilities, benefits, and importance of supporting equality, diversity and inclusion.

After 360 credits of study (BA/BSc/BEng Hons) you will be able to demonstrate:

K19. Creatively apply mathematics, statistics, natural science, and engineering principles knowledge to solve complex manufacturing problems. Some of this knowledge will be at the forefront of manufacturing engineering, materials processing, or digital technologies.

K20. Analyse complex problems to reach substantiated conclusions using the first principles of mathematics, statistics, natural science, and engineering principles.

K21. Select and critically evaluate technical literature and other sources of information to address complex problems.

K22. Apply an integrated or systems approach to solving complex and realistic problems for which no single solution exists.

K23. Evaluate the environmental and societal impact of a combination of manufacturing processes and technologies and minimise adverse effects.

K24. Identify and analyse ethical concerns and make reasoned, ethical choices informed by professional codes of conduct.

K25. Use a risk management process to identify, evaluate and mitigate risks associated with a particular project or activity.

K26. Adopt a holistic and proportionate approach to the mitigation of security risks.

K27. Adopt an inclusive approach to engineering practice and recognise the responsibilities, benefits, and importance of supporting equality, diversity, and inclusion.

Programme Outcomes – Skills and other Attributes

The programme provides opportunities for you to develop and demonstrate the following:

After 120 credits of study (CertHE) you will be able to demonstrate:

S1. Use appropriate computational and analytical techniques to solve well-defined problems recognising the limitations of the methods employed.

S2. Contribute to the design of solutions for well-defined technical problems that meet business, customer or user needs as appropriate. Consider applicable health and safety, cultural, societal, and environmental matters, codes of practice and industry standards within the design process.

S3. Safely use practical laboratory and workshop skills to investigate well-defined problems.

S4. Select and apply appropriate materials, equipment, engineering technologies and processes to plan and undertake well-defined work programmes.

S5. Recognise the need for quality management systems within manufacturing engineering operations.

S6. Apply engineering management principles, commercial context, and project management knowledge to manufacturing engineering contexts.

S7. Be able to take the initiative in individual work and function effectively when working with a team.

S8. Communicate effectively with technical and non-technical audiences using a range of techniques.

S9. Plan and record self-learning and improve performance.

After 240 credits of study (DipHE) you will be able to demonstrate:

S10. Use appropriate computational and analytical techniques to model broadly-defined problems.

S11. Design solutions for broadly-defined problems that meet a combination of user, business, and customer needs as appropriate. This will involve considering applicable health and safety, diversity, inclusion, cultural, societal and environmental matters, codes of practice and industry standards.

S12. Select and use appropriate practical laboratory and workshop skills to investigate broadly-defined problems.

S13. Select and apply appropriate materials, equipment, engineering technologies and processes to design problems or manufacturing processes.

S14. Recognise the need for quality management systems and continuous improvement in the context of broadly- defined problems.

S15. Apply knowledge of engineering management principles, commercial context, and project management.

S16. Function effectively as an individual and a team member or leader.

S17. Communicate effectively with technical and non-technical audiences.

S18. Plan and record self-learning and development as the foundation for lifelong learning/CPD.

After 360 credits of study (BA/BSc/BEng Hons) you will be able to demonstrate:

S19. Select and evaluate technical literature and other sources of information to address complex problems.

S20. Design solutions for complex manufacturing problems that balance a combination of societal, user, business and customer needs. This will involve considering health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice, and industry standards.

S21. Use practical laboratory and workshop skills to investigate complex problems.

S22. Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.

S22. Discuss the role of quality management systems and continuous improvement in complex manufacturing contexts.

S24. Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters, including intellectual property rights, to manufacturing problems that include the supply chain.

S25. Function effectively as an individual and a team member or leader.

S26. Communicate effectively on complex engineering matters with technical and non- non-technical audiences.

S27. Plan and record self-learning and development as the foundation for lifelong learning/CPD.

PROGRAMME FEATURES

Programme Overview

Manufacturing engineering is a fascinating subject. Look around at all the things you are surrounded by – everything that you use, wear, and eat was brought to you by the skills of manufacturing engineers. The BEng (Hons) Advanced Manufacturing degree is a modern course that blends the technical focus of engineering with environmental awareness, management principles and leading-edge IT skills. While your study of manufacturing engineering encompasses a wide range of topics, the emphasis remains on developing solutions to engineering problems using new technologies through innovation and creativity.

Manufacturing is a fast-paced and constantly developing global industry. To ensure that your degree is future-proof, we have developed the course to meet the Engineering Council's most recent 'Accreditation of Higher Education' standard (AHEP4). Your degree was also designed in collaboration with BAE Systems to embed all the employability skills and commercial awareness you will need to launch a successful career.

This programme aims to incrementally increase your subject knowledge alongside your academic development through active learning. Your tutors will mentor and support you in applying your new skills in problem- and project-based modules. The new concepts and methods you will learn at each level of study will be linked by 'design', which is the creative application of technical subjects to solve a constrained problem

- At Level 4, the emphasis is on helping you become independent in your learning. You will design engineering artefacts through standardised engineering science and mathematics application. You will be introduced to the fundamental principles of engineering science and solve well-defined problems.
- At Level 5, the emphasis is on building your confidence. Problems become more broadly defined and can involve various factors and constraints. In performing your analysis, and developing your designs, you will draw on your new knowledge from across levels 4 and 5.
- At Level 6, engineering problems become complex. You will be creative and resourceful in applying engineering science and new technologies to resolve wide-ranging problems and conflicting requirements and constraints. You will work on real-world projects, and your solutions will have immediate commercial value.

The University of Cumbria has a mission to foster the social and economic development of the communities to which we belong. To support the advanced manufacturing cluster of engineering industries located around Barrow-in-Furness, the University and BAE Systems signed a strategic partnership which includes the development of this Advanced Manufacturing degree. You will study

in a new, purpose built 22 500 square feet building in the Barrow Learning Quarter Campus, just next-door to BAE's laboratories and test facilities where the Institute conducts research and student projects. The research activities at the Barrow Campus will enrich and influence curriculum development and provide opportunities for you to co-create new knowledge alongside your tutors.

The involvement of regional, national, and international engineering businesses runs throughout the course via a series of industry touchpoints where you will gain practical experience of manufacturing engineering whilst learning how technical engineering is applied in the real world. Touchpoints are embedded into every module to keep you updated with current and developing trends in manufacturing engineering. Our approach means that this programme also provides a suitable platform for you to enter employment within other areas of engineering, manufacturing, or business, or to proceed to specialised postgraduate programmes including MSc and PhD

Learning and Teaching

As a student at the University of Cumbria, you are part of an inclusive learning community that recognises diversity. You will have opportunities to learn by interacting with others in a collegiate, facilitative, and dynamic learning environment. Teaching, assessment, and student support will allow equal and equitable opportunities for you to optimise your potential and develop autonomy.

We seek to create a stimulating and innovative community of learning, whether encountered on campus or at a distance, on placement or in the workplace. Facilitated by our expert practitioner staff, you will experience a learning environment that is well equipped, flexible, and stimulating.

Learning and Teaching

This programme's underlying philosophy is for you to be an active participant in your learning, so we deliver much of our teaching in flipped-classroom mode, which can be thought of as doing the lesson at home and the homework in class. You study the taught material in the Virtual Learning Environment (VLE) in your own time and at your own pace before attending in-person learning activities. These include classroom sessions that are based around problem-solving tutorials and seminar discussions to develop your knowledge. Workshops and laboratories sessions are also used to develop your skills, which includes study skills, research methods, critical and analytical abilities, and your ability to manage your time and plan your work. The subject matter in this programme is divided into modules, which are typically 20 credits long. Regardless of the teaching methods used, 20 credits equates to 200 hours of study. Some of this is allocated to teaching activities, with the balance being allocated to private study.

To integrate your new knowledge and skills, you will undertake a series of design projects throughout your degree. These project modules are conducted in a simulated professional environment, and will help you consider the broader societal, ethical, commercial, and environmental context of manufacturing engineering. At levels 4 and 5, you will undertake a series of short and focused engineering projects, where you will work as part of a team under the guidance of a tutor. At level 6 you will undertake the capstone Integrated Engineering Project, which is a significant and independent work where you will investigate a topic of your choice. You will need to be both creative and analytical in your solution to real-world engineering problems.

Your tutors are all active researchers and use their experience in working on leading edge projects to make sure that you are up-to-date with the latest developments in advanced manufacturing. Tutors will support your learning in person, via email, and through other communication channels as appropriate. At first, your tutors will act as guides and mentors, but over time, you will become more independent in how you direct your learning and your approach to problem-solving. So that teaching can be inclusive, accessible, practical, relevant, and contextualised, several different learning and teaching methods are used:

Lectures convey knowledge and concepts. You will learn from the lecture content and from different approaches to the organisation and presentation of material. Lectures are typically first presented on the VLE so you can review the material at your own pace. They can be textual, can include video and audio material, screencasts, or presentations with voice-over. You are expected to engage with this content before attending other scheduled teaching activities. Some traditional format lectures will be used when they are delivered by a guest speaker or else deal with administrative matters

Tutorials represent most of your contact time and are always delivered face-to-face. Tutorial classes usually involve small groups but could be given on an individual basis. The critical element is the interaction between you, your tutor, and your peers as you solve problems and test your knowledge. Tutorials will help you to identify and articulate problems in your understanding, seek help and receive formative feedback on your work. Tutorials are interactive and you should be prepared to contribute to the discussion.

Laboratories are practical activities which can involve equipment, the computer, or both. They allow you to explore the theory described in lectures, develop hands-on skills, and to test your understanding of engineering concepts. You will also gain experience in using specialist equipment.

Computing Workshops are supervised workshops held in the computer lab to give you practical experience using specialist engineering software in design or analysis work. You will also be able to

develop your ICT skills using your own devices, but the University will provide any software you need. You will also have access to computer laboratories outside of scheduled teaching activities.

Practical Workshops are used for practically orientated modules and seek to develop specific hands-on abilities. These workshops allow you to propose solutions to engineering problems and manufacture your designs. Using a self-made physical artefact will help you evaluate the outcomes of your design process. You will learn to be self-critical and to reflect on your work. Due to the potentially hazardous nature of the workshop, your work will be supervised until you reach a defined level of competence.

Seminars tend to be student-led and are used to explore concepts in greater depth. You will be required to engage in background reading and other forms of research, then to present and discuss your findings with your peers. You will develop a wide range of transferable skills in finding and evaluating information and communicating an idea.

Group Work is crucial to a successful career in engineering, so your degree provides many teamwork opportunities that simulate a professional engineering workplace. You will learn how to organise and structure collective or cooperative work processes and how to work in different roles, including leadership.

Guided Independent Study is a vital extension of formal teaching methods and an essential and substantial part of your degree. You will be expected to underpin the taught content by private study and to utilise all available resources. At first, you will be mentored and supported in learning how to learn. As you progress through your degree, you will become more independent and increasingly expected to source new information to supplement the teaching materials provided by your tutor.

Industry Touchpoints are included within every module and are intended to give you practical experience of how taught content relates to real-world engineering. In some modules, guest speakers will deliver some part of the content where they have expertise. In other modules, engineering businesses will host a field trip, provide a project topic, a case study, or help to judge a student competition. Touchpoints can also include opportunities for you to gain professional certification alongside your degree.

Assessment

Summative and Formative Assessment

A variety of assessment methods have been built into this programme to support different learning styles and preferences. Assessment is either formative or summative. Formative assessment

relates to your developing work and offers feedback on your progress. Summative assessment relates to your finished work and contributes to your module grade. Assessment deadlines are spread throughout the academic year to help you manage your workload.

Summative assessment is via coursework or exam, and many modules use a combination of both. The types of coursework you will complete reflect the tasks you will perform in employment, such as written reports, oral and graphical presentations, demonstration of manufactured products and computer-based assignments. Where a group submits coursework, the tutor will modify the overall mark to reflect your contribution. This can be done by identifying your work within the report or by peer assessment, where team members grade each other. Examinations are always unseen and performed under time-controlled conditions. The question type can be multiple choice, problem-solving or essay-style. Your tutor will explain the exact details of your assessment and provide copies of the marking scheme, so you will know what is expected. As a rule of thumb, you should allocate 20% of your time to preparing for coursework and exams.

All modules include formative assessment to support your academic development as an independent learner. The exact type will depend on the module and will be explained to you by your tutor. In general formative assessment is based on an ongoing dialogue between you and your tutors. You will be encouraged to set personal goals and to reflect on your progress. Most modules will provide supplementary material on the VLE, which you can use to gauge your knowledge and understanding of the module material.

You will receive feedback on your completed assessments explaining what you did well and what you need to improve. Feedback will always include 'feedforward'. At levels 4 and 5, feedforward will explain where you will next encounter the subject matter or assessment type. At level 6, feedforward will link your work to your future professional practice.

Graduate Prospects

Britain is the 9th largest manufacturing nation in the world, with around 2.7 million people directly employed by the manufacturing sector, contributing over 17% to the UK economy. Closer to home, manufacturing industries represent 25% of Cumbria's economy, employs 13% of the regional workforce and advertises around 2800 job vacancies every year. With increases in automation and the integration of computer technologies, demand for highly skilled manufacturing engineers to fill high pay jobs is increasing. This is why the University of Cumbria launched a degree in advanced manufacturing engineering - to provide graduate opportunities within the communities we serve.

Manufacturing engineers are both analytical and creative thinkers who can operate on their own initiative and work as part of a team. You will be able to use your high levels of technical expertise

to plan, design, optimise and monitor the production process, while aiming to reducing the impact of manufacturing on the environment. Your skills will be sought after in nearly all manufacturing industries, and other numerate and analytical professions.

MODULES

Year 1			
Code	**Title**	**Credits**	**Status**
ADVM4001	Engineering Design	20	Compulsory
ADVM4002	Integrated Engineering 1	20	Compulsory
ADVM4003	Mathematics and Computing	20	Compulsory
ADVM4004	Principles of Materials and Manufacturing	20	Compulsory
ADVM4005	Mechatronic Principles – Electrical	20	Compulsory
ADVM4006	Mechatronics Principles – Mechanical	20	Compulsory
Students exiting at this point with 120 credits would receive a CertHE Advanced Manufacturing			

Year 2			
Code	**Title**	**Credits**	**Status**
ADVM5001	Applied Materials and Manufacturing	20	Compulsory
ADVM5002	Applied Mechatronics – Electrical	20	Compulsory
ADVM5003	Applied Mechatronics – Mechanical	20	Compulsory
ADVM5004	Digital Manufacture	20	Compulsory
ADVM5005	Integrated Engineering 2	20	Compulsory
ADVM5006	Mathematics and Modelling	20	Compulsory
Students exiting at this point with 240 credits would receive a DipHE Advanced Manufacturing			

Year 3

Code	Title	Credits	Status
ADVM6001	Advanced Manufacturing Systems	20	Compulsory
ADVM6002	Advanced Materials and Production Technologies	20	Compulsory
ADVM6003	Advanced Automation and Control	20	Compulsory
ADVM6004	Integrated Engineering Project	40	Core
ADVM6005	Operations Management	20	Compulsory

Students exiting at this point with 300 credits would receive a BSc Advanced Manufacturing

Students exiting at this point with 360 credits would receive a BEng(Hons) Advanced Manufacturing

Students exiting at this point with 360 credits who have exceeded the compensation limit of 30 credits would receive a BSc(Hons) Advanced Manufacturing

Additional Module Information

Where a student has not succeeded in their programme, they will not be permitted to re-register on the same programme.

To progress to the next level of study, you must pass all assessments within each module, all modules at every level and maintain an overall average mark of at least 40%.

Key to Module Statuses

Core modules	Must be taken and must be successfully passed.
Compulsory modules	Must be taken although it may possible to condone/compensate as a marginal fail (within the limits set out in the Academic Regulations and provided that all core or pass/fail elements of module assessment have been passed).

Timetables

Timetables are normally available no less than four weeks before the start of Semester 1. Please note that while we make every effort to ensure timetables are as student-friendly as possible, scheduled learning can take place on any day of the week.

This programme may also be made available on an infill part-time basis at the discretion of the academic programme leader. In such cases, you will study modules alongside the full-time cohort(s) that are running at the time

ADDITIONAL INFORMATION

Student Support

The Student Enquiry Point is a simple way to contact Student Services. Using the Student Enquiry Point tile on the Student Hub you can submit an enquiry to any of the Student Services teams, which includes:

- Careers and Employability
- Chaplaincy for faith and spiritual wellbeing
- Mental Health and Wellbeing
- Digital Skills
- Disability and Specific Learning Difficulty (SpLD)
- International Student Support
- Library
- Money Matters
- Safeguarding
- Skills@Cumbria
- Sports and Fitness Facilities
- University Student Accommodation

As a student at the University of Cumbria you automatically become a member of the Students' Union. The Students' Union represents the views and interests of students within the University.

The Students' Union is led by a group of Student Representatives who are elected by students in annual elections. They also support approximately 400 Student Academic Reps within each cohort across the entire University. The Students' Union represent the views of their cohort and work with academic staff to continuously develop and improve the experience for all University of Cumbria students. You can find out more about who represents you at www.ucsu.me.

You can email at any time on studentvoice@cumbria.ac.uk.

Course Costs

Tuition Fees

Course fees can be found here: course fees

The following course-related costs are included in the fees:

Use of all practical equipment and PPE

Additional Costs

The following course-related costs are not included in the fees:

No additional costs identified

Exceptions to the Academic Regulations

This programme operates in accordance with the University's Academic Regulations and Academic Procedures and Processes with the following permitted exceptions due to the requirements of the Engineering Council's Compensation and Condonement Policy, which is relevant to the accreditation of engineering programmes through Institution of Engineering Technology (IET).

The Policy wording (as supplied by the Engineering Council) is given below. In terms of the permitted exceptions, point 4 is accommodated by designating the Integrated Engineering Project as Core. Point 3 will need to be taken into consideration and applied at all Examination Boards where this programme (or any students enrolled on this programme) are under consideration.

Compensation and Condonement wording

Many UK universities' examination board rules include some allowance for compensation or condonement[1] of limited failure in one or more modules, where this is compensated by a stronger performance across the programme as a whole. Paragraph 23 of the Registration Code of Practice requires accrediting institutions to consider the awarding institution's regulations regarding progression. They may impose constraints on an accreditation decision as a result of this.

The Engineering Council defines compensation as: "The practice of allowing marginal failure (ie not more than 10% below the nominal pass mark) of one or more modules and awarding credit for them, often on the basis of good overall academic performance."

The Engineering Council defines condonement as: "The practice of allowing students to fail and not receive credit for one or more modules within a degree programme, yet still qualify for the award of the degree."

In the consideration of the accreditation of undergraduate and postgraduate engineering degree programmes:

1. Evidence that all AHEP learning outcomes are met by all variants of each programme must be provided before accreditation can be granted.
2. No condonement of modules delivering AHEP learning outcomes is allowed.
3. A maximum of 30 credits in a bachelors or integrated Masters degree programme can be

compensated, and a maximum of 20 credits in a Masters degree other than the integrated Masters degree.

4. Major individual and group-based project modules must not be compensated.
5. The minimum module mark for which compensation is allowed is 10% below the nominal module pass mark (or equivalent if a grade-based marking scheme is used).

The key consideration in the rules above is to ensure that graduates of accredited engineering degree programmes have met all the programme learning outcomes specified in the Engineering Council's AHEP (Accreditation of Higher Education Programmes) specification.

[1] *There are no consistent definitions of the terms 'compensation' and 'condonement' across UK universities, and they are often confused. The Engineering Council therefore adopts a similar definition to that used by QAA and HEA, and, for the avoidance of doubt, includes this definition in this statement*

External and Internal Benchmarks

QAA Benchmark Statement: Engineering (2019)

AHEP 4th Edition (2020)

IET Academic Information Pack

UoC Strategic Plan

UoC Learning, Teaching and Assessment Strategy

UoC Academic Regulations and Academic Procedures and Processes

Disclaimer

This programme has been approved (validated) by the University of Cumbria as suitable for a range of delivery modes, delivery patterns, and delivery sites. This level of potential flexibility does not reflect a commitment on behalf of the University to offer the programme by all modes/patterns and

at all locations in every academic cycle. The details of the programme offered for a particular intake year will be as detailed on the programme webpage: https://www.cumbria.ac.uk/study/courses/undergraduate/beng-hons-advanced-manufacturing/