MSc Technical Leadership (non-apprenticeship route)

Specification: Postgraduate

Information for learners: the programme specification is the definitive document summarising the structure and content of your degree programme. It is reviewed and updated every year as part of Keele's Annual Programme Review process. The document aims to clarify to potential and current learners what you can expect from the study of the subject over the course of your programme.

Please note that this programme specification applies to learners starting the programme from **September 2022** onwards.

Names of programme(s):	MSc Technical Leadership with specialism in Analytical Science *(non-apprenticeship route)*
Mode of study:	Part-time
Framework of Higher Education Qualification (FHEQ) level of final award:	Level 7
Duration:	Two years part-time

External Examiner(s) names: http://www.keele.ac.uk/qa/externalexaminers/

1. What is the philosophy of the Programme?

Main Aims and Distinctiveness of the Programme:

The MSc in Technical Leadership programme is also used to deliver the Research Scientist apprenticeship standard, approved in May 2019. The broad purpose of the occupation is someone who is primarily involved in planning, leading and conducting experiments and analysing results, either with a definite end use, for example to develop new products, processes or commercial applications, or to broaden scientific understanding in general. As such, learners on the non-apprenticeship route will be provided with a unique professional combination of both scientific and technical leadership, giving a clear sense of purpose and driving strategic intent. Upon graduation, they can then expect to lead on business critical projects - managing the design and implementation of such projects both internally and externally, disseminating findings to internal and external stake-holders and making strategic recommendations based upon the findings of the project. They will be able to take into account new scientific methods and breakthroughs, identifying longer-term opportunities and risks. They will be able to effectively collaborate with both

industry and academia, working in multidisciplinary teams, to apply results of research and develop new techniques, products or practices. They will be responsible for developing ethical, innovative research practices and programmes with the ability to deliver results. They become a role model, with responsibility for those in senior positions and significant organisational budgets. In their daily work, an person in this occupation will interact with a wide range of individuals and teams. This is due to the varied work and leadership roles that the individual undertakes through their work. This means that these varied interactions require them to communicate across businesses and industries and lead on ensuring scientific information is communicated in efficient ways

Learners will benefit through the programme from the expertise of staff at Keele University in analytical chemistry, management and business skills, as well as from the distinctive scientific interests of the professional partners.

The programme is delivered in two stages: the first year comprises studying 5 taught modules:

- MAN-40158: Leading Teams (30 credits) / blended delivery
- MAN-40160: Project & Processes (30 credits) / blended delivery
- PHY-40029: Data Analysis (15 credits) / blended delivery
- CHE-40044: Research Communication (15 credits) / blended delivery
- R&D (30 credits): in Analytical Science (CHE-40042) / 2-week residential

The programme capitalises on Keele's interdisciplinary heritage and combines advanced technical science modules with bespoke content from the Keele Business School to develop the technical leaders of the future. It is delivered over a two-year period.

In the second year, learners undertake an extended work-place project (CHE-40046: Work Project: 60 credits) at their placement provider's premises, with the continuous support of the Keele academic staff.

Although the Knowledge, Skills and Behaviours (KSBs) are not a requirement here for the non-apprenticeship route, the MSc in Technical Leadership was mapped entirely against the standard of the Research Scientist apprenticeship and as such the KSBs are met within the programme and will additionally be complemented with engagement from employers with the learning and group discussions of apprentices and non apprentices in the (virtual) classroom.

In addition to the development of discipline-specific research and technical skills, learners will be supported in enhancing key professional and employability skills through developing critical thinking, innovation, reflective writing, autonomous learning and written and oral presentation skills; all vital skills for future employment, lifelong learning and continued professional development irrespective of the learner's wishes for a given career path.

The programme has been designed with a University-wide vision to learning and teaching: 3 Schools across 2 Faculties, along with the Keele Institute for Innovation and Teaching Excellence, have been involved in the course design, in partnership with employers, using the CoDesignS framework, which makes the programme particularly distinctive in the UK Higher Education Sector. The programme title encompasses this distinctive conjunction of management for technical science.

This programme will prepare the Technical Leaders of 2023 onwards, in posts such as Senior Technical Managers, Senior Scientific Managers, and Senior Project Managers.

The broad educational aims of the programme are given here according to three generic categories:

KNOWLEDGE (as stated in the original Research Scientist Standards)

K1 Subject specific knowledge: A deep and systemic understanding of a named / recognised scientific subject as found in an industrial setting, such as biology, chemistry or physics, found in the nuclear, food manufacture, pharmacology or energy production sectors, at a level that allows strategic and scientific decision making, while taking account of inter relationships with other relevant business areas / disciplines.

K2 Management, leadership and effective communication. Organisation objectives and where their role contributes to the success achievement of these objectives. How to communicate effectively with a wide range of senior leaders across different departments, up and down the supply chain, within their own team. Advanced mixed media communication, such as presentations, report writing (technical and non-technical) negotiation and influencing. Leadership within a team of multi discipline specialists at different levels across the organisation, ensuring a shared vision and commitment to success. Effective project management as used in their employer's environment with regard to quality, cost and time. The employer's organisational structure and where their own role fits.

K3 Ethics, regulation and registration: All current relevant national and international regulations needed to carry out the role. This will include scientific regulation, health and safety and laboratory safe practice, anti-bribery and anti-corruption. Ethical scientific practice and the employer's processes and procedures surrounding professional conduct. How to identify, record, mitigate and manage risk. The impact of failure and how to manage risk on the business. The benefits of equality of diversity in the workplace.

K4 Research methodologies: Methodologies appropriate to the sector and how to formulate and apply a hypothesis. Appropriate application of scientific process. The unpredictability of research projects and the need to adapt and adjust daily planning needs to accommodate new developments.

K5 Data analysis and evaluation: Statistical analysis techniques, numerical modelling techniques and how they are applied in context. How to interpret and categorise data to make informed and objective decisions against the goals and targets of the project. How to evaluate and interpret the data and associated analysis against company objectives.

K6 Data management: How to safely store and handle data in line with national and international data protection and cyber security regulations that apply to the role. How to manage and store data in line with employer processes and security approach. How to create an appropriate data management plan.

K7 Entrepreneurial and enterprise: How to consider a multi solution approach to the objective in the key stages of a project. Market analysis awareness (SWOT / PESTLE / feasibility studies) and how to assess the impact of the project on the business. Intellectual property rights as they apply to the role and specific projects. Value for money and the ability to use market analysis to make go / no go decisions.

K8 Development of self and others: The importance of continuing professional development and how to maintain their own specialist knowledge in an ever-evolving environment. How to effectively coach and mentor colleagues, peers or team members to address identified skills gaps, using appropriate

methods. How to upskill non-technical colleagues to enable them to complete their own role as needed.

SKILLS (as stated in the Research Scientist Standards)

S1 Scientific Knowledge: Apply a range of advanced, new and emerging practical and experimental skills appropriate to the role (e.g. chemical synthesis, bio analysis, computational modelling).

S2 Data Collection and Reporting: Capture and evaluate data critically drawing a logical conclusion, e.g. Case Report Forms, Data Management Plans, Data Review Plans, edit checks and User Acceptance Testing Plans.

S3 Commercial and Business Issues: Identify issues, including intellectual property and the commercial demands of the business environment. Understand the scientific objectives of work undertaken and its relevance to the organisation.

S4 Communication Skills: Write extended reports and critique others' work across a range of documentation, e.g. protocols, consent forms and scientific reports. Deliver oral presentations and answer questions about their work and/or the work of their team. Utilise interpersonal skills, communication and assertiveness to persuade, motivate and influence. Discuss work constructively and objectively with colleagues, customers and others; respond respectfully to and acknowledge the value of alternate views and hypothesis.

S5 Project Management and Leadership: Generate effective project plans to include management of scope, schedules, budget and risk. Organise resources, budgets, tasks and people. Co-ordinate team activities to meet project requirements and quality processes. Adapt scientific strategy/delivery to be consistent with requirements. e.g. client, regulatory, ethical, geographic.

S6 Critical Thinking: Conceptualise, evaluate and analyse information to solve problems.

S7 Research and dissemination: Frame research questions and methodology drawing from current sources e.g. literature and databases. Produce intellectual insight and innovations in their own discipline to be shared with colleagues, peers and wider stakeholders internal and external to the business.

S8 Developing others: Apply a range of coaching and mentoring techniques with colleague's peers and team members, selecting the correct method to suit the situation and the person being coached / mentored.

BEHAVIOURS (as stated in the Research Scientist Standards)

B1 Team Working: Collaboration, influence, and respect for others

B2 Flexibility and Adaptability: Responsiveness to change, adjusting to different conditions, technologies, situations and environments.

B3 Integrity and Reliability: Respect for the confidentiality of individuals and company information. An intrinsic ethical stance to all aspects of day to day activities. Reputation of trust internally and externally.

B4 Management of Expectations of senior management, study sponsors, vendors, investigational sites and key opinion leaders.

B5 Accountability: For self and others to ensure that actions are in the best interest of affected parties.

B6 Planning, Prioritisation and Organisation: Effective time management

B7 Continuing Professional Development (CPD): Accountability of own and others development needs, undertaking CPD. Curiosity of science and proactively develops knowledge to ensure that scientific and business decisions are based on strong science.

Intended Learning Outcomes of the Programme and Employability:

Subject-specific Knowledge, Understanding and Skills

Subject-specific knowledge in the MSc Technical Leadership is structured from two perspectives:

i. Firstly, the breadth and substance of the science strand and its applications spanning across various disciplines (chemistry, environmental science or biochemistry for example) and then the knowledge and understanding of numerous specific techniques (e.g. mass-spectrometry), and this embedded in the understanding of leadership and management skills in a 21st century organisation.

ii. Secondly, the extended research training which takes place in the workplace, requires the knowledge and broad understanding of key concepts of the organisation in which the project takes place, as well as technical knowledge.

The programme will enable all learners to:

1. Describe and critically assess a wide range of instrumental and other techniques relevant to analytical science and subsequently use them competently with regard to quality assurance issues, taking into account the inherent limitations of the given practical activities.
2. Engage effectively with the research literature within analytical science (including regulations and methods validation), and use it to advance their understanding.
3. Demonstrate professional competency in practical work and critical analysis of the resulting experimental data to draw valid conclusions, through for instance setting-up examples of standard instrumentation (including calibration or quality control).
4. Describe and explain appropriate methods for data analysis and interpretation and apply these to experimental datasets of varying complexity, using a selection of appropriate software, databases and other digital resources.
5. Work safely and effectively in the laboratory and manage risk assessments and other practices in a competent fashion, maintaining accurate and relevant records of their work.
6. Be responsible for managing different streams of work and leading on/designing and carrying out trails of process and procedures and Translation of science to action. Alongside also designing, developing, implementing and evaluating these business changes

Generic, Intellectual and Transferrable Skills, including Employability Skills and Attitudes

Graduates from this programme will be able to:

1. Understand and handle scientific literature relevant to their chosen research area and introduce the processes of research planning through the development of a detailed research proposal.
2. Engage with and carry out a variety of science communication activities and select appropriate means for a specific audience, such as presenting at conferences, academic writing, outreach activities.

3. Audit their personal research skills and act upon the outcomes to enhance these skills and subsequently tackle and solve problems with confidence and independence, and act autonomously in planning and implementing tasks at a professional or equivalent level.
4. Competently plan, organise and manage a programme of independent experimental work, and to demonstrate self-direction, dedication and originality to independent learning.
5. Understand the need to comply with local health and safety rules, and the necessity for risk assessment and the health and safety issues relevant to the laboratory research work.
6. Promote an integrated approach to theoretical knowledge, understanding and practical implications of the scientific work alongside personal thoughts and experiences, and show originality in the application of new knowledge.

The Keele Approach to Education:

Keele University identifies attributes that characterise its graduates due to its distinctive curriculum. The programme's structure, content, delivery and intended learning outcomes are designed to enable learners to develop these attributes, balancing specialist and expert knowledge with a broad outlook and independent approach. The programme is strongly aligned with the key aspects of Keele's distinctive curriculum: interdisciplinarity, sustainability, internationality and employability.

• Analytical Science is inherently interdisciplinary as they utilise techniques and methodologies, mostly originating from the chemical and life sciences, and apply them to the identification, quantification and characterisation of substances and materials of relevance to a wide-range of contexts from the (bio)medical and pharmaceutical to the environmental and engineering.

• Awareness of sustainability is central to the work of laboratory scientists is no exception. Analytical and life scientists need to ensure their organisations, facilities and practices conform to good sustainability guidelines, including the life-cycle of instrumentation, and energy and resource efficient laboratory infrastructure and practices. Analytical and life scientists contribute strongly to the monitoring of products and the environment to ensure the safety of living organisms and the sustainability of our environment.

• Analytical Science includes international activities and industrial and academic partners across globe collaborate and interact both in research and in professional practice. Because methods and standards may vary amongst laboratories, there is always a need to spread standardisation of scientific methods and procedures in order to enhance quality standards and methods validation.

• Analytical Science graduates are first and foremost scientists, with a broad scientific knowledge and skills. They are problem-driven, experienced in calling upon the concepts, understanding and practices derived from the core sciences, to solve problems related to identifying and quantifying substances often at very low levels of concentration. They then have to interpret their findings and report to an educated but often non-scientific audience such as business managers, government agencies or the legal profession. Such skills are appropriate and highly sought-after in most scientific occupations outside the immediate analytical arena. In this way, this programme develops key employability skills for a broad range of scientific professions, as well as for other roles within science- based businesses and organisations.

'*Your Keele Journey – the Keele Approach to Education*' is the name given to the package of additional opportunities offered to students alongside their academic programmes. It provides you with an opportunity to design your individual student experience, in order to develop your knowledge, skills, attitudes and values and enhance your talents so you can make a difference to your world.

Your Keele journey will give you the opportunity to benefit from the highest quality research-informed academic experience. We will offer you the support that you need to make the most of your education. The skills and attributes you develop will help to make you highly employable and able to make informed career choices about your future.

We will also support you to become well-informed about the issues surrounding the sustainability of our planet's natural systems and its inhabitants, so that you can use your knowledge and skills to create a more sustainable world. As a Keele student, you will join an international academic community, and we will help you to play your part in a globalised society. As a Keele graduate we want you to leave us clear about who you are and what you want to be, and be equipped to achieve your goals. It's little wonder the Keele educational approach is considered an amazing foundation for life. It's the Keele difference. You can find more information on the Keele Approach to Education here: https://www.keele.ac.uk/study/undergraduate/mykeelejourney/

2. How is the Programme taught?

Learning & Teaching Methods:

The mode of delivery follows Keele's Strategic Vision for Education, using a tailored blended approach to online learning, mixing asynchronous and synchronous teaching sessions, with face-to-face delivery for the 2-week residential of intensive R&D practical work in the summer, robustly rooted with pre-and post-sessional webinars. The exact nature of the academic content of the R&D module will be defined, through questionnaires, by the prior knowledge that the learners will bring to the class. It will allow a bespoke learning experience embedded in group participation and engagement with the learners, but also with employers (e.g. involved in hosting work-based projects)

The programme is delivered through a variety of learning and teaching activities:

- Lectures, including those from external speakers.
- Workshops, run with small groups of students, mixing both taught and practical sessions.
- Oral presentations
- Poster presentations
- Group / team work
- Practical laboratory work
- Literature research tasks
- Directed reading
- Independent study
- Independent research project carried out in a work-place laboratory
- Use of e-learning / the Keele Learning Environment (KLE, Blackboard) and MS Teams
- One-on-one meetings /discussions with individual research supervisors

The teaching team is conscious that learners come to learning with their own knowledge, skills and behaviours shaped from their previous study and employment history. As such, **it is absolutely crucial to place the learners at the centre of the learning experience**, and the teaching team will make sure that within the taught components of the course, there is a strong focus on student-led learning and research (with support from teaching staff and engagement from employers) to help develop independent research skills and technical skills. All learnrs are expected to engage in independent study for the duration of the programme.

Achievement of the Stated Outcomes:

Year 1 will focus not only on generic research skills such as academic writing, critical paper evaluations, reviewing literature, data analysis and presentation skills (alongside specific knowledge and skills in analytical science, including focusing on methodology in their chosen area or work), but also on project design and leadership management, with an emphasis on self-development and that of others, as well as on how to work successfully in a regulated environment. This should adequately prepare the learner for their work-based project in Year 2.

In **Year 2**, the learner will continue to develop skills in research design and leadership management alongside undertaking the year-long work-based project. This project will allow learners to develop advanced research, practical and analytical skills, and provide an opportunity to work alongside industrial partners. This provides excellent project management training within the specialist area and allows a range of employability skills to be not only developed but also significantly enhanced. In addition, learners will develop and be able to apply those generic and specific skills obtained in Year 1 to the work place.

The lectures describe, explain and map out the academic content of modules as well as engendering and developing an enthusiasm for analytical science. Through examples and case studies discussed in the lectures, students develop critical skills in reviewing ideas, principles and applications. Informal small group discussions, which provide occasional support to material discussed in lectures, and workshops, have a dual role: firstly, in enabling students to apply theoretical ideas to new problems and secondly, to allow the tutor to provide formative feedback on the students' learning during these activities.

Analytical Science is a laboratory-based discipline and practical work is closely tied to the lectures thus enabling learners to gain competence and confidence in the investigation and analysis of (biological) materials, using laboratory instrumentation as well as developing a critical awareness of the range of techniques available, their capabilities and limitations. Students working in the laboratory quickly gain an understanding of health and safety issues, manage risk assessments, maintaining accurate and informative laboratory notes and working with others in a safe and productive fashion.

In working with laboratory data, students develop skills and confidence in data analysis, the use of software tools and databases and in communicating the outcomes of such work in the form of reports, oral presentations and as a conference poster to a variety of audiences. They will also develop skills in working within small groups of various sizes in laboratory mini-projects.

By engaging in literature research tasks and through directed reading, students will advance their own understanding of the discipline, develop critical abilities, appreciate the limitations of information and assess the merits of contrasting theories, explanations and strategies. Through working on all assignments, learners will develop organisational skills, efficient working practices and the ability to meet appropriate deadlines.

Through project work, students will research, devise, plan, execute and report on an original investigation within the discipline either as an individual or as part of a team. They will work safely in the laboratory and engage in ethical, honest and acceptable practices throughout. The supervisor meetings will provide guidance and support throughout the project. Also, as a preparation to the project work, the student will be familiarised with the context of industrial marketing, competitiveness and cost-effective approaches.

Throughout the programme students will undertake independent study that will require them to develop an adaptable and flexible approach to study, work and work-life balance. They will need to work towards identified targets for their own academic development, take responsibility for their own learning and thereby develop confidence in their own understanding and acquire a self-critical attitude to their own work and achievements. Consequently, each student will develop practices which will enable them to engage with on-going professional development throughout their careers.

The Keele Learning Environment (KLE), alongside the use of the Microsoft Teams platform, will provide a virtual resource to support learning and teaching activities, enhance student development and provide a forum for the exchange of ideas and discussion of issues that may arise during programme delivery. This includes posting learning resources for the modules on which they teach; these include lecture notes, module and laboratory handbooks, problem sheets, web-links to external resources, assignment briefs, assignment feedback and in some cases quizzes. Many staff also use the KLE for electronic submission of work, marking and feedback.

Teaching staff:

The teaching and research staff that deliver and support the programme come from three different Schools across Keele University:

Keele Business School:	https://www.keele.ac.uk/kbs/
School of Life Sciences:	https://www.keele.ac.uk/lifesci/
School of Chemical & Physical Sciences:	https://www.keele.ac.uk/scps/

There are additional guest lecturers from the industrial and business sectors. The academic staff from both the Faculty of Natural Sciences and the Faculty of Humanities and Social Sciences at Keele teaching on this programme have expertise and interests within the various aspects of the programme. Most academic staff are active researchers and many have a distinguished track record in publication, the generation of grant income, industrial collaborations and as research journal reviewers. Several staff have particular interests in the development of teaching and learning methods and some are members of, and active in, the professional bodies. A number of staff are Fellows of the Higher Education Academy, have held Keele Teaching and Learning Awards, and some have been awarded the University Teaching Excellence Award. Additionally, the majority of staff contribute to widening participation and science outreach activities, and have demonstrated innovation and good practice in teaching and learning to take into account the diverse needs of all students.

3. What is the Structure of the Programme?

Module Structure & Credits

The structure of the *MSc in Technical Leadership* programme is part-time and is shown below. It totals 180-credits comprising six modules delivered over six semesters.

The programme comprises six modules: five running entirely in year 1 and one spanning across year 2. The structure of the programme is designed to develop a sound understanding of analytical science techniques and methods, generic research skills (e.g. critical reading, thinking and reflective writing, scientific writing, scientific communication), along with specific research skills (such as laboratory methods and data analysis and interpretation). However, it also encompasses project design, management and leadership skills, within the perspective of a professional setting. The learner develops these skills in year 1 before starting their work-based project in year 2.

In the first year, the student will learn about how to manage Project and Processes in the context of a laboratory environment, with both the Business School and scientists from the Faculty of Natural Sciences as well as 21st century techniques of Research Communication, whether to a lay audience or to a scientific community. The teaching staff will take the learner through techniques of Data Analysis to extract confidently the important scientific information off the project work. Through a 2-week residential, the Research &

Development module will teach the learner about the latest on their topic of interest, designed to give hands-on experience on key laboratory techniques. Finally, the student will learn about Leading Teams with the Business School at Keele. The 2nd year is devoted to a work-place project which will allow the learner to plan and execute a laboratory research project with confidence and independence and act autonomously in planning and implementing tasks at a professional or equivalent level, with support from the placement provider but also from an academic supervisor providing advice on all academic aspects of the project.

MSc in Technical Leadership: Programme Structure				
	MAN-40160 Project & Processes	30 credits Y1 Sem1	KBS	1-day synchronous teaching + online delivery
	PHY-40029 Data Analysis	15 credits Y1 Sem 1	SCPS	1-day synchronous teaching + online delivery
	CHE-40044 Research Communication	15 credits Y1 Sem 1	SCPS	1-day synchronous teaching + online delivery
CHOICE	CHE-40042 R&D Analytical	30 credits Y1 Sem 1	SCPS	2-w face-to-face + online
CHOICE	LSC-40069 R&D Biomed		SLS	
	MAN-40158 Leading Teams	30 credits Y1 Sem 1	KBS	1-day synchronous teaching + online delivery
	CHE-40046 Work Project	60 credits Y2	SCPS	in workplace + online delivery

The Placement Allocation

A number of industrial placements will be available each academic year. Students will apply for a set number of placements and will indicate their order of preference. If the **student's employer** is unable to provide an appropriate placement then instead, the student is expected to carry out their placement at Keele University with industrial input. Students will be informed of the outcome of the selection process as soon as possible. Students who have been unsuccessful in gaining an industrial placement will undertake a research project at Keele University.

There may be **additional living costs** associated with the industrial project placement part of this programme which would depend on the nature and location of the placement and the individual circumstances and choices of the student. These would be discussed with the course tutor prior to enrolment. There would also be general costs for text books, inter-library loans, photocopying and printing, for example.

Learning Outcomes & Assessments for the MSc Technical Leadership

The Mapping of the Knowledge, Skills, Behaviours as given in the Standard of the Research Scientist Apprenticeship (May 2019) against the modules and assessments of the MSc in Technical Leadership are given

below to illustrate the distinctive nature of this programme in the UK Higher Education Sector. Indeed, the programme title encompasses this distinctive conjunction of management for technical science :

KNOWLEDGE								
What is required for occupational competence? (as listed in the standard)	A deep and systemic understanding of a named / recognised scientific subject as found in an industrial setting, such as biology, chemistry or physics, found in the nuclear, food manufacture, pharmacology or energy production sectors, at a level that allows strategic and scientific decision making, while taking account of inter relationships with other relevant business areas / disciplines	Organisation objectives and where their role contributes to the success achievement of these objectives. How to communicate effectively with a wide range of senior leaders across different departments, up and down the supply chain, within their own team. Advanced mixed media communication, such as presentations, report writing (technical and non-technical) negotiation and influencing. Leadership within a team of multi discipline specialists at different levels across the organisation, ensuring a shared vision and commitment to success. Effective project management as used in their employer's environment with regard to quality, cost and time. The employers organisational structure and where their own role fits.	All current relevant national and international regulations needed to carry out the role. This will include scientific regulation, health and safety and laboratory safe practice, anti-bribery and anti-corruption. Ethical scientific practice and the employers processes and procedures surrounding professional conduct. How to identify, record, mitigate and manage risk. The impact of failure and how to manage risk on the business. The benefits of equality of diversity in the workplace	Methodologies appropriate to the sector and how to formulate and apply a hypothesis. Appropriate application of scientific process. The unpredictability of research projects and the need to adapt and adjust daily planning needs to accommodate new developments.	Statistical analysis techniques, numerical modelling techniques and how they are applied in context. How to interpret and categorise data to make informed and objective decisions against the goals and targets of the project. How to evaluate and interpret the data and associated analysis against company objectives	How to safely store and handle data in line with national and international data protection and cyber security regulations that apply to the role. How to manage and store data in line with employer processes and security approach. How to create an appropriate data management plan.	How to consider a multi solution approach to the objective in the key stages of a project. Market analysis awareness (SWOT / PESTLE / feasibility studies) and how to assess the impact of the project on the business. Intellectual property rights as they apply to the role and specific projects. Value for money and the ability to use market analysis to make go / no go decisions.	The importance of continuing professional development and how to maintain their own specialist knowledge in an ever evolving environment. How to effectively coach and mentor colleagues, peers or team members to address identified skills gaps, using appropriate methods. How to upskill non-technical colleagues to enable them to complete their own role as needed.
How is this to be delivered (specify relevant modules)	•CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based Project	•MAN-40160: Project & Processes •MAN-40158: Leading Teams •CHE-40044: Research Communication	•MAN-40158: Leading Teams •MAN-40160: Project & Processes •CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science	•CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science	•PHY-40029: Data Analysis	•MAN-40160: Project & Processes	•MAN-40160 Project & Processes •CHE-40046: Work-based Project	•MAN-40158: Leading Teams •All
Principal forms of assessment (of the competency) used and/or how and where it will be evidenced and formatively assessed	•Professional Competency in the Laboratory •Workplace communication •Presentation of Project Progress •Extended Work-Based Project	•Oral Communication (individual) •Executive Report •Oral Communication (Group) •Executive Report directly relevant to the work place •Research Communication	•Oral Communication (individual) •Executive Report •Oral Communication (Group) •Executive Report directly relevant to the work place •Professional Competency in the Laboratory	•Professional Competency in the Laboratory •Workplace communication	•Numerical analysis directly relevant to work place	•Oral Communication •Executive Report	•Oral Communication •Executive Report •Presentation of Project Progress •Extended Work-Based Project	•Oral Communication (Group) •Executive Report directly relevant to the work place •Reflective Portfolio (against the VITAE framework for CHE-40044 and CHE-40042 or LSC-40069).
If any of the Knowledge requirements are to be met by on-the-job learning, rather than within the programme, please indicate which elements and how this will be managed and monitored	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria)	On the job learning (This will be supported by the work mentor evaluation against a check list the successful practice of leadership in the work context, against a check list the successful pratice of research communication in the work place -incl. an awareness of societal impact, potential beneficiaries, potential sources of funding)	On the job learning (This will be supported by the work mentor evaluation against a check list the successful practice of leadership in the work context and also sn evaluation of professional competency against a completeness and feasibility criteria).	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria)	On the job learning (This will be supported by the work mentor evaluation - which will include an awareness of the statistical relevance of the data set and evaluation for instance).	On the job learning (This will be supported by the work mentor evaluation against a check list for the successful practice of leadership in the work context).	On the job learning (This will be supported by the work mentor evaluation against a check list the successful practice of leadership in the work context).	On the job learning (This will be supported by the work mentor evaluation against a check list the successful practice of leadership in the work context).

SKILLS	S1 Scientific Knowledge	S2 Data Collection and Reporting	S3 Commercial and Business Issues	S4 Communication Skills	S5 Project Management and Leadership	S6 Critical Thinking	S7 Research and dissemination	S8 Developing others
What is required for occupational competence? (as listed in the standard)	Apply a range of advanced, new and emerging practical and experimental skills appropriate to the role (e.g. chemical synthesis, bio analysis, computational modelling).	Capture and evaluate data critically drawing a logical conclusion, e.g. Case Report Forms, Data Management Plans, Data Review Plans, edit checks and User Acceptance Testing Plans.	Identify issues, including intellectual property and the commercial demands of the business environment. Understand the scientific objectives of work undertaken and its relevance to the organisation.	Write extended reports and critique others' work across a range of documentation, e.g. protocols, consent forms and scientific reports. Deliver oral presentations and answer questions about their work and/or the work of their team. Utilise interpersonal skills, communication and assertiveness to persuade, motivate and influence. Discuss work constructively and objectively with colleagues customers and others; respond respectfully to and acknowledge the value of alternate views and hypothesis.	Generate effective project plans to include management of scope, schedules, budget and risk. Organise resources, budgets, tasks and people. Co-ordinate team activities to meet project requirements and quality processes. Adapt scientific strategy/delivery to be consistent with requirements. e.g. client, regulatory, ethical, geographic.	Conceptualise, evaluate and analyse information to solve problems.	Frame research questions and methodology drawing from current sources e.g., literature and databases. They can produce intellectual insight and innovations in their own discipline to be shared with colleagues, peers and wider stakeholders internal and external to the business.	Apply a range of coaching and mentoring techniques with colleague's peers and team members, selecting the correct method to suit the situation and the person being coached / mentored.
How is this to be delivered (specify relevant modules)	•CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based project	•PHY-40029: Data Analysis •CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based project	•MAN-40160: Project & Processes •CHE-40046: Work-based Project	•CHE-40044: Research Communication •MAN-40158: Leading Teams •CHE-40046: Work-based Project	•MAN-40160: Project & Processes •CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based Project	•CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based Project	•CHE-40044: Research Communication •CHE-40046: Work-based Project	•MAN-40158: Leading Teams
Principal forms of assessment (of the competency) used and/or how and where it will be evidenced and formatively assessed	•Professional Competency in the Laboratory •Workplace communication •Presentation of Project Progress •Extended Work-Based Project	•Numerical analysis directly relevant to work place •Oral Communication •Extended Work-Based Project	•Oral Communication •Executive Report •Presentation of Project Progress •Extended Work-Based Project	•Literature Review •Oral Communication (Group) •Executive Report directly relevant to the work place •Extended Work-Based Project	•Oral Communication •Executive Report •Professional Competency in the Laboratory •Extended Work-Based Project	•Oral communication •Professional Competency in the Laboratory •Extended Work-Based Project	•Literature Review •Extended Work-Based Project	•Oral Communication (Group) •Executive Report directly relevant to the work place
If any of the Skills requirements are to be met by on-the-job learning, rather than within the programme, please indicate which elements and how this will be managed and monitored	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria)	On the job learning (This will be supported by the work mentor evaluation -which will include an awareness of the statistical relevance of the data set and evaluation for instance).	On the job learning (This will be supported by the work mentor evaluation against a check list for the successful pratice of research communication in the work place - incl. an awareness of societal impact, potential beneficiaries, potential sources of funding as well as the work-based project itself)	On the job learning (This will be supported by the work mentor evaluation against a check list for the successful pratice of research communication in the work place - incl. an awareness of societal impact, potential beneficiaries, potential source of funding, an evalutation against a check list the successful practice of leadership in the work context as well as work-based project itself)	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria, the successful practice of leadership in the work context, as well as the work-based project itself)	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria, as well as the work-based project itself)	On the job learning (This will be supported by the work mentor evaluation against a check list for the successful pratice of research communication in the work place -incl. an awareness of societal impact, potential beneficiaries, potential sources of funding as well as the work-based project	On the job learning (This will be supported by the work mentor evaluation against a check list for the successful practice of leadership in the work context).

BEHAVIOURS	B1 Team Working	B2 Flexibility and Adaptability	B3 Integrity and Reliability	B4 Management of Expectations	B5 Accountability	B6 Planning, Prioritisation and Organisation	B7 Continuing Professional Development (CPD)
What is required for occupational competence? (as listed in the standard)	Collaboration, influence, and respect for others	Responsiveness to change, adjusting to different conditions, technologies, situations and environments.	Respect for the confidentiality of individuals and company information. An intrinsic ethical stance to all aspects of day to day activities. Reputation of trust internally and externally.	of senior management, study sponsors, vendors, investigational sites and key opinion leaders.	For self and others to ensure that actions are in the best interest of affected parties.	Effective time management	Accountability of own and others development needs, undertaking CPD. Curiosity of science and proactively develops knowledge to ensure that scientific and business decisions are based on strong science.
How is this to be delivered (specify relevant modules)	•MAN-400158: Leading Teams	•MAN-400158: Leading Teams •CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based Project •All	•MAN-400158: Leading Teams •MAN-40160: Project & Processes •CHE-40046: Work-based Project	•MAN-400158: Leading Teams •MAN-40160: Project & Processes •CHE-40046: Work-based Project	•MAN-400158: Leading Teams •MAN-40160: Project & Processes •CHE-40046: Work-based Project	•MAN-40160: Project & Processes •CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40044: Research Communication	•MAN-400158: Leading Teams •MAN-40160: Project & Processes •CHE-40042 or LSC-40069: Research & Development either in Analytical Science or in Biomedical Science •CHE-40046: Work-based Project
Principal forms of assessment (of the competency) used and/or how and where it will be evidenced and formatively assessed	•Oral Communication (Group) •Executive Report directly relevant to the work place	•Executive Report directly relevant to the work place •Professional Competency in the Laboratory •Extended Work-Based Project •Reflective Portfolio (against the VITAE framework for CHE-40044 and CHE-40042 or LSC-40069).	•Executive Report directly relevant to the work place •Executive Report •Extended Work-Based Project	•Executive Report directly relevant to the work place •Executive Report •Extended Work-Based Project	•Executive Report directly relevant to the work place •Executive Report •Extended Work-Based Project	•Reflective Portfolio •Reflective Portfolio (against the VITAE framework)	•Oral Communication (Group) •Executive Report directly relevant to the work place •Oral Communication •Executive Report •Reflective Portfolio (against the VITAE framework) •Extended Work-Based Project
If any of the Behaviours requirements are to be met by on-the-job learning, rather than within the programme, please indicate which elements and how this will be managed and monitored	On the job learning (This will be supported by the work mentor evaluation against a check list for the successful practice of leadership in the work context).	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria, the successful practice of leadership in the work context, as well as the work-based project itself and the reflective portfolio)	On the job learning (This will be supported by the work mentor evaluation of the successful practice of leadership in the work context, as well as the work-based project itself)	On the job learning (This will be supported by the work mentor evaluation of the successful practice of leadership in the work context, as well as the work-based project itself)	On the job learning (This will be supported by the work mentor evaluation of the successful practice of leadership in the work context, as well as the work-based project itself)	On the job learning (This will be supported by the work mentor evaluation the reflective portfolio)	On the job learning (This will be supported by the work mentor evaluation of the professional competency in the laboratory against a completeness and feasibility criteria, the successful practice of leadership in the work context, as well as the work-based project itself, and the reflective portfolio)

Exit Routes & Number of Credits

https://www.keele.ac.uk/regulations/regulationc7/

For the purposes of classification (section 15 of Regulation 2A) the threshold marks, relating to the dissertation component of the programme, shall here refer to the 60-credit *Work-based Project* module.

The **Postgraduate Certificate Stage** shall comprise the 60 credits achieved through 30 credits from KBS modules (MAN-) and 30 credits from FNS modules (CHE- LSC- or PHY-):
A **Postgraduate Diploma** may be awarded on completion of 120 credits (60 credits from KBS modules: MAN-, and 30 credits from FNS modules: CHE- LSC- or PHY-).

4. How is the Programme assessed?

Function of the methods of assessment in testing the achievement of stated programme learning outcomes

The specificity of the programme is to work with learners who are acquiring Knowledge, Skills and Behaviours. As such, placement providers will be encouraged to help with the evaluation of such learnings, for all modules, through supporting both the application of the learning and the assessment of completion of learning outcomes during supervisory meetings.

For example, reflection is a key aspect of learning and in all modules but one, each learner produces a Reflective Portfolio of taught sessions and appraises their skills through a skills audit, identifying areas where to apply their newly acquired skills. The Reflective Portfolio promotes an integrated approach to theoretical knowledge, understanding and practical implications of students work alongside the student's personal thoughts and experiences. It feeds into employability skills as reflection is the key tool employed by practicing professionals to evidence the student's professional development. The Reflective Portfolio is an integral part of the programme and strongly linked to the other modules. It will draw from these five modules in key management and leadership skills of Analytical Science. It will also touch upon personal development for the enhancement of research skills through the VITAE scheme (https://www.vitae.ac.uk/), so as to increase employability potential for further career development.

The Literature Review requires students to critically appraise current literature and integrate their new knowledge into a structured, logical review of the field. This will develop the student's information literacy and skills in searching for, selecting and critically evaluating peer-reviewed research literature relevant to their MSc work-based project report, and then synthesising this information into a literature review. Indeed, selecting and reviewing literature and being able to critique information are important skills in ensuring that scientific and business decisions are based on strong science. Feedback will be given via regular seminar/tutorial meetings with the project supervisor helping to develop the student's confidence in discussing and critiquing science and scientific issues.

Oral Presentations, Video Presentations and Poster Presentations demonstrate the ability of the student to present complex concepts and information in a clear and concise manner, to interact and communicate effectively to a wide range of professional environments, including to both scientific and non-scientific audiences.

The Work-based Project Report enables the learner to demonstrate their effective engagement with the research literature across analytical science and use it to advance their understanding. In this way, the assessment may test their awareness of, and engagement with, current methods and techniques within analytical sciences, some of which are at, or informed by, the forefront of the discipline. The assessment enables the learner to present complex concepts and information in a clear and concise manner in writing, and to communicate effectively to a wide range of scientific and professional environments. It demonstrates how the student has taken responsibility for their own learning, has critically assessed a wide range of techniques and methodologies relevant to analytical sciences and used them competently to analyse relevant (bio)materials. It also ensures that the learner has selected and utilised appropriate software, databases and other digital resources for the analysis and interpretation of laboratory data.

Research design and project management are key skills in both academia and industry. The Finances of Processes in "MAN-40160: Project & Processes" as well as the Evaluation of the Societal Impact of the proposed project as developed in "CHE-40044: Research Communication", identifying any key beneficiaries and potential sources of funding, involves an element of reflection along with time management and strategizing of a project. This will introduce the learner to the level of detail and research process needed to successfully compete for funding, whether it be for academia or for industry.

The Context of Competitiveness from the module "MAN-40160: Project & Processes" will enable students (i) to discover key aspects of market-driven science, (ii) to place their newly acquired knowledge within the context of their own project. Indeed, they will ultimately be able to assess which industry(ies) is or could be interested in such a scientific piece of work. The ability to assess who are the main industrial competitors within a given area of analytical science will create new opportunities for the students to deepen their sector understanding and enhance awareness of progression opportunities.

Data Analyses either based on experimental data collected by the student themselves (in the modules "CHE-40042/LSC-40069: R&D" and "CHE-40046: Work-based Project") or given as papers to the student (in the module "PHY-40029: Data Analysis") will enable the learner to analyse relevant (bio)materials and select and utilise appropriate software, databases and other digital resources for the analysis and interpretation of laboratory data. These assessments enable the students to present complex concepts and information in a clear and concise manner in writing, and to communicate effectively to a wide range of scientific and professional environments.

Critical Evaluation of Techniques of choice in the modules "CHE-40042 or LSC-40069: R&D" and "CHE-40046: Work-based Project" will demonstrate how the student has taken responsibility for their own learning, has critically assessed a wide range of techniques and methodologies relevant to analytical sciences to set-up a profile for the given techniques including precision, resolution, type of specimens used, costs associated with the techniques. Such knowledge will be used competently to compare the techniques against one another (advantages / disadvantages) and allow the student to develop a critical awareness as to what analytical methods might be more appropriate within a professional setting.

A full assessment brief is provided within each module handbook. All summative forms of assessment are fully supported by a variety of formative assessment/feedback activities and academic guidance.

Students supported through formative (i.e. non-mark-bearing) assessment

- Tutor-led comments on the work in the laboratory notebook or on calculations encountered in data analysis during laboratory classes
- Tutor feedback and advice on calculations undertaken during problems classes
- Tutor-led discussions on project plans, literature reviews and project results
- Written formative feedback on non-summative laboratory work
- Written formative feedback provided from the tutor reading a draft of a major piece of work such as the dissertation or a project report

5. Specific Programme Regulations

"These regulations supplement the relevant University Regulations which are to be found on the website and in the University Calendar. In the event of a contradiction or other discrepancy between these regulations and University Regulations, the University Regulations shall be authoritative, unless approval has been given by Senate for a variation from the University Regulations."

Specific attendance requirements and sanctions for failure to meet them

Attendance will be monitored. If there is a valid reason for not attending a synchronous/in-situ teaching session then the School Office should be notified as soon as possible. Continued absence from any class or classes is taken very seriously by the University and it may result in a student being withdrawn from the University.

https://www.keele.ac.uk/regulations/regulationb4/

The student must show appropriate engagement with the studies as described in **Regulation C 7** of a Masters degree (see link below).

https://www.keele.ac.uk/regulations/regulationc7/

Appropriate engagement with studies is particularly true for the "CHE-40046 Work-Based Project" module, which require full attendance and engagement from the student during the year long research placement We expect the learners to work 16h00 a week for 46 weeks, or equivalent. Failure to do so would be reported by the project supervisor to the academic supervisor who would then contact the Course Director. The Director would act upon that situation according to the regulation given above, which could lead to the student being withdrawn from University.

International students on Tier 4 visas must check with the Immigration Compliance Team https://www.keele.ac.uk/sas/academicservices/immigration/ prior to undertaking any internship opportunity.

Regulations governing industrial placements

https://www.keele.ac.uk/policyzone/viewbyowner/studentandacademicservices/name,117421,en.php

Learners must do at least 46 weeks for 2 days/week or equivalent of academic work towards their placement. This means that they can work longer if they wish, but there is a **minimum** time period of work which must be met.

Students can negotiate with their Placement Provider as to how and when they fulfill their work placement, as long as the minimum required hours are met during that period. Engagement in the project modules is student-centred and student-led with support provided throughout by the supervisors. Students will be assigned an academic supervisor once they register on the *"CHE-40046 Work-based Project"* module, and this academic supervisor will work with them, and with others in the supervisory team, throughout the course of the research placement experience to ensure that they are fully supported before and during their placement.

Progression

Learners are required to have a satisfactory performance in all modules from Year 1 to progress to Year 2. In the case of module failure, the student will be asked to resubmit coursework or to go through a re-examination, which would take place in between Year and 2, as decided by Keele University. The student will then be released from any re-examination/re-assessment to allow progression to Year 2 if all modules are deemed satisfactory by the Year 1 examination board.

For module failure after re-examination / re-submission, please see point 11.4 of regulation C 7:
https://www.keele.ac.uk/regulations/regulationc7/

6. What are the typical admission requirements for the programme?

It is expected that applicants will already hold an honours degree in a scientific discipline appropriate to the chosen research project area that includes a good basic understanding of analytical science and instrumentation, although each application will be considered on an individual basis. The minimum degree category for entry on to this programme is lower second class degree, in line with the 50% pass mark required for successful completion of this course.

Consideration will be given to candidates who do not meet these criteria, but can evidence appropriate, alternative professional qualifications and/or experience. For more details regarding Recognition of Prior Learning, please visit:
https://www.keele.ac.uk/qa/programmesandmodules/recognitionofpriorlearning/

Applicants who have not had their secondary or tertiary education through the medium of English are expected to have attained the equivalent of an IELTS score of at least 6.5 or above.

Any requests for Recognition of Prior Learning for module exemptions may be made to the Course Director who will consider such requests on an individual basis.

7. How are learners supported on the programme?

The Programme Lead will be responsible for the programme and will hold an introductory session towards the beginning of the programme to provide general guidance and advice on programme delivery and lines of accountability and student support. The Programme Lead will also be available either directly (through appointments) or indirectly via email or KLE / Teams discussion boards for advice on specific problems students may encounter at any point throughout the programme.

Module leaders are available either directly or indirectly via email for module-specific problems. One-to-one meetings can be arranged as necessary for student consultation. It is the responsibility of module leaders to ensure that appropriate feedback is provided to all students regarding both formative and summative assessment. They will ensure that such feedback is of a high quality and delivered in a timely fashion.

Each learner will be appointed a named Personal Tutor from the academic teaching team for pastoral and academic guidance. Personal tutors will meet their students as a group during programme induction and will be available for additional one-to-one consultations as required by the student and will be contactable by email or telephone. Personal tutors will also introduce and promote the University's Personal Development Planning system to further promote and develop student learning. In addition, there will be an independent advisor available to liaise with students, either as a group or individually, on any aspect of the programme or personal development.

Individual Academic Project Supervisors will provide additional academic guidance on research-related issues. A work-based supervisor will be appointed at that workplace. Guidelines are available to ensure that there is appropriate interaction between the learner, the project and academic supervisors, and the learner will remain in contact with their Keele academic supervisor throughout the course of the project.

All learners are entitled and encouraged to make use of all central university services, including the Keele Postgraduate Association.

The learner cohort will also be represented on the Student:Staff Voice Committee (SSVC) and they will be eligible to represent the taught Postgraduate (PGT) students on the School of Chemical and Physical Sciences Education Committee, if elected to do so by their peers.

8. Learning Resources

The programmes will be taught (when possible) in modern teaching rooms across the University which are equipped with computers, internet access and projection equipment. Otherwise, students will take advantage of Microsoft Teams to access synchronous and asynchronous teaching sessions, organised in breakout rooms for small group activities when required.

Practical research training in the "CHE-40042: R&D in Analytical Science" module will be undertaken in appropriate teaching and research laboratories within the School of Chemical and Physical Sciences or the School of Life Sciences respectively.

Individual module handbooks will provide a recommended reading list, which comprise a range of electronic multi–media resources that will be accessed through KLE / MS Teams. Discussion boards available on KLE / Teams may also be used to enhance student the student experience, learning and support during the period of engagement and provide a forum for the exchange of ideas and discussion of issues that arise.

The programme will be supported by a number of guest speakers working within Analytical Science who will give (online) presentations at research group meetings, School meetings, appropriate research Faculty meetings or society meetings. Learners are encouraged to make full use of the opportunities these activities present by engaging with the professionals or contacting them later through email to answer any questions they may have on their particular area of expertise or general career advice.

The analytical laboratories are fully equipped with multiple sets of FTIR spectrometers, UV-VIS spectrometers, fluorescence spectrometers, HPLC and GC-MS instrumentation, an NMR spectrometer (with probes for both solid- and liquid-state), an Inductively-Coupled Plasma Optical Emission Spectrometer (ICP-OES), and Raman microscope or biochemistry, immunology, haematology and transfusion science instrumentation. *MSc in Technical Leadership* learners also have access to XRD (powder and single crystal diffraction), XRF and a scanning electron microscope (with EDX analysis) but also a range of electron microscopes (SEM and TEM) within the Faculty. Further specialised instrumentation can be found within the research laboratories either at Keele University or within the premises of the industrial partners.

The Library has many resources for Analytical Science, both on campus and online. Further information about the library can be found at: https://www.keele.ac.uk/library/. To access online library services off campus learners will need their Keele e-mail address. Students will be encouraged to build a research profile on professional sites, which are useful networking tools and sources of published peer-reviewed literature.

Learners will have access to IT Services who are responsible for the support of all staff and students undertaking academic computing tasks.

9. Other learning opportunities

Learners can opt, or be recommended by their academic supervisor (where practical and possible), to attend lectures, seminars and practical sessions on appropriate Analytical Science modules on an informal basis in addition to the modules they are taking for their degree. This may be useful for further developing key skills in their area of Analytical Science.

10. Quality management and enhancement

The MSc Technical Leadership Course Management Committee, which comprises all academic staff teaching on the programmes and student representation, is responsible for the day-to-day management of the programmes and reports to the Head of School of Chemical & Physical Sciences.

To ensure that the MSc programmes maintain the highest possible standards and ensures the effective management and continuous enhancement of the quality of learning and teaching, the following procedures are employed:

- Student evaluation of teaching: students have the opportunity to evaluate each module and the programme as a whole. Data from the evaluations is reported at regular course management committee meetings.
- Student Staff Voice Committee: this is an integral part of the monitoring and review procedures and provides a valuable source of management data for the programme team.
- School Education Committee (SEC) meetings: the Programme Committee reports to the School of Chemical and Physical Sciences Education Committee. Both committees meet on a regular basis and the SEC is responsible for the continual reviewing and monitoring of quality management and enhancement procedures and activities across the School.

- Peer observation of teaching: the staff responsible for delivering the programme undertake regular peer observation of teaching that is used to identify teaching strengths and areas of development.
- Annual Programme Review; individual modules and the programme as a whole are reviewed and enhanced every year. A range of data is used to inform the annual programme review, it comprises student evaluations, external examiners report and internal programme review and monitoring data.
- The programme will be run in accordance with all applicable policies and will be reviewed as part of the Internal Quality Audit for the School of Chemical and Physical Sciences, which takes place once every five years.
- All programmes in the Faculty of Natural Sciences are supported by a Dean of Education.
- The School of Chemical & Physical Sciences currently holds a Bronze Athena Swan award – the Athena Swan Charter (https://www.ecu.ac.uk/equality-charters/athena-swan/) promotes best practice in academia in terms of life/work balance and promotes the support of women in STEM subjects. Some of the staff teaching on the *MSc in Technical Leadership* programme are members of the School Athena Swan committee.

External Examiners, experienced academics from other Universities are appointed by Senate to each programme. The external examiner has access to all module mark sheets, marked assessments when they visit Keele for the final examination board.

During their earlier visit, the external examiner talks to groups of students about their projects and any other issues related to their academic experience that he or they wish to raise for discussion. At no point does the external examiner individually assess or appraise any student.

The external examiner's duties involve approving assessments, checking that marking has been carried out consistently and within the regulations, advising on changes to programme content and writing an annual report. Schools share the reports with students, usually in SSLC meetings, and you can find the latest reports, along with a response from the School, here:

http://www.keele.ac.uk/qa/externalexaminers/reportsandresponses/

11. The principles of programme design

The MSc Technical Leadership programme builds from the successful industrial collaborations between Keele University and several national or international industries. The associations developed provide an excellent framework in which to train students in those generic and science specific skills that would increase their employability in the area of research and/or industry. In addition, it gives students an opportunity to contribute to the further development of the collaborative links between Keele and its industrial partners.

The programme described in this document has been drawn up with reference to, and in accordance with the guidance set out in, the following documents:

a. UK Quality Code for Higher Education, Quality Assurance Agency for Higher Education:
http://www.qaa.ac.uk/quality-code
b. QAA Subject Benchmark Statements:
Master's degrees in Chemistry (2019) https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/subject-benchmark-statement-chemistry.pdf?sfvrsn=1af2c881_4
Master's degrees in Business and Management (2015) https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-business-and-management-15.pdf?sfvrsn=1997f681_16
c. Keele University Regulations and Guidance for Students and Staff: http://www.keele.ac.uk/regulations

12. Programme Version History

Version History	Date	CHANGES / NOTES
Date first created (if known)	August 26th 2020	
Date last reviewed / revised	January 14th 2022	
Last reviewed by	Chrystelle Egger	
Date last approved at SEC		Validation
Date last approved at FEC		