Nottingham Trent University Course Specification

	Basic Course Information	
1.	Awarding Institution:	Nottingham Trent University
2.	School/Campus:	School of Science & Technology / Clifton Campus
3.	Final Award, Course Title and Modes of Study:	MSci (Honours) Physics, FT/SW
4.	Normal Duration:	4 years FT, 5 years SW
5.	UCAS Code:	F311

6. Overview and general educational aims of the course

Physics is concerned with the observation, understanding and prediction of natural phenomena and the behaviour of man-made systems. It is both a theoretical and practical discipline that continually evolves. Studying physics at university brings benefits that last a lifetime, and knowledge and skills that are valuable outside of physics.

This MSci physics course addresses the more general and fundamental topics of physics in the first year, and then provides a selection of more advanced topics in later years. You will develop investigative, experimental, mathematical, computational and other transferable skills. The fourth year project develops your research skills. It is a broad-based course that will help to make you numerate, articulate and eminently employable. Institute of Physics accreditation has been granted for the course.

The fundamental topics covered are classical and quantum mechanics, wave phenomena, electromagnetism, optics, thermodynamics and properties of matter. These areas are applied to such topics as condensed matter and medical imaging in later years.

Opportunities exist to engage with a range of advanced concepts and applications, drawing upon the specialist expertise of the staff.

MSci Physics can be studies as a fulltime course of 4 years duration, or as a 5 year sandwich course with a placement year between study years 2 and 3 or 3 and 4.

In summary, the course aims to:

- Provide you with an enjoyable and worthwhile educational experience in the field of physics.
- Produce graduates with theoretical knowledge and practical skills relevant to physics.
- Prepare you for a wide range of employment within the broad area of physics, as well as for postgraduate studies.
- Recruit students from a variety of academic backgrounds and to encourage and assist them to realise their academic potential and enhance their employment and career opportunities.
- Facilitate your personal development through the acquisition and use of a wide range of transferable skills.
- Generate an environment that is both caring and supportive in terms of both pastoral and academic aspects of university life.
- Allow you to benefit from a wide range of teaching methods and broaden your learning experience.

7. **Course outcomes**

Course outcomes describe what you should know and be able to do by the end of your course if you take advantage of the opportunities for learning that we provide.

Knowledge and understanding

By the end of the course you should be able to:

1. Demonstrate an understanding of most of the fundamental laws and principles of physics, along with their application to a variety of areas of the subject, some of which are at, or are informed by, the forefront of the discipline. (B)
2. Plan and carry out, under supervision, an experiment or investigation, critically analyse the results, and draw valid conclusions. You should be able to evaluate the level of uncertainty in their results, understand the significance of error analysis, and be able to compare their results with expected outcomes, theoretical predictions, or with published data. (B)
3. Solve advanced problems in physics using appropriate mathematical tools. You should be able to identify the relevant physical principles, translate problems into mathematical statements, and apply their knowledge to obtain order-of-magnitude or more precise solutions as appropriate. (B)
4. Use mathematical and computational techniques and analysis to model physical behaviour. You should be able to interpret mathematical descriptions of physical phenomena.
5. Communicate complex scientific ideas, the conclusions of an experiment, investigation or project, concisely, accurately and informatively to a range of audiences. (B)
6. Apply a comprehensive working knowledge of a variety of experimental, mathematical and/or computational techniques applicable to current research within physics. (B)
7. Employ experimental skills, showing competent use of specialised equipment, the ability to recognise appropriate pieces of equipment, and to quickly master the use of new techniques and equipment. (B)
8. Make effective use of IT skills at the level needed for project work; for example, a familiarity with a programming language, simulation software, or the use of mathematical packages for manipulation and numerical solution of equations. (B)

(B) Indicates outcomes having specific reference to Quality Assurance Agency benchmark statements.

Skills, qualities and attributes

By the end of the course you should be able to:

1. Use laboratory equipment commonly employed in physics in a safe and competent manner.
2. Demonstrate good written and oral communication skills and present information in a clear and concise manner. (B)
3. Use appropriate IT packages/systems effectively for the analysis of data and the retrieval of information. (B)
4. Plan work with minimal supervision and be able to work effectively as part of a team or independently. (B)
5. Apply problem solving skills effectively and efficiently to both problems with a well-defined solution and those that are open ended. (B)
6. Find, critically evaluate and manage information.
7. Manage your own learning and make use of appropriate texts and other learning resources. (B)
8. Explain what constitutes unethical scientific behaviour, and conduct your work, and especially your research activities, in an ethical manner.

8. Teaching and Learning Methods

Material is introduced through lectures and directed reading. You will be expected to progressively take more responsibility for your own learning at each level: associated with this process is a class contact time that diminishes from level one to level four. Understanding is consolidated through laboratory work, seminars, and private study.

A subset of the core modules covers the fundamental physical laws in greater depth at each level. These laws are applied in other modules and project work. Mathematical skills are acquired within dedicated modules and are subsequently applied and reinforced in the other physics modules. The final year project is used to integrate material and to make the knowledge functional. It also serves to introduce research methodology and prepare students for research and development activities in the future.

All modules have a site on NOW, the Nottingham Trent University Online Workspace. NOW lists important information on each module, such as the syllabus, teaching schedule and assessment details. Some sites also store lecture notes, past examination papers and provide links to other internet sites, which are useful for that particular module.

9. Assessment Methods

Broadly speaking, most modules are assessed by both examination and some form of coursework, with the overall balance between these two types of assessment being roughly equal at Level 4, but progressively shifting slightly in favour of examinations from Level 5 to Level 6, at which point a typical ratio is 60% examination to 40% coursework.

Physics is a discipline which is amenable to many types of assessment, and the philosophy of the teaching team is that the assessment strategies used within a particular module are chosen to be the most appropriate for that aspect of study. Often two or more different types of assessment are grouped together under a general heading, e.g. a "Portfolio" may include a range of tasks designed to demonstrate the acquisition of numerous skills.

Listed below are the main types of assessment that you will experience on the BSc Physics course:

(a) Formal Laboratory Report
This assesses your ability to carry out a laboratory experiment and report on the findings in a scientific manner, discussing assumptions, error margins, conclusions, etc.

(b) Laboratory Notebook Entry
These encourage you to produce a contemporaneous record of laboratory activities, with suitable graphs, etc. A subset of the laboratory notebook entries will be expanded to form the formal laboratory reports.

(c) Formal Examination
These are used to assess your knowledge base and ability to integrate material under time constraints. Most are traditional closed book papers, but a small number may be revealed or open-book papers.
(d) Journal-Style Article

These test your ability to produce clear and accurate reports of investigations that you have carried out, in the style favoured by the major international physics journals.

(e) Oral Presentation
This assesses your oral communication skills and presentation skills using PowerPoint. Some of these are individual talks, whilst others are group presentations.

(f) Project
The project, carried out in the final year, tests your ability to design and implement an extended programme of work, and communicate the findings in a report written in an appropriate scientific manner.

(g) Literature Review
This forms part of the project and assesses your ability to find, evaluate and manage information.

(h) Poster
This also forms part of the project and tests your ability to condense your findings and present them in a visual format. You will also be expected to answer questions on the project based on the poster, as a means of assessing your oral communication skills.

(i) Problem Based Assignment
These assess your ability to apply mathematical and computational techniques to problems in physics.

(j) Class Tests
These are short tests, taken in the normal timetabled module slot. In some modules these are either open-book or partially revealed tests. Again they assess your knowledge base under timed conditions.

(k) Synoptic Portfolio Assessment
A synoptic assessment brings together knowledge and skills acquired across the entire degree. You will start thinking about your Portfolio in tutorials in your first year and continue through into second year. In your final year, this continued work will be assessed as part of the *Professional Physicist* module and will contain a wide range of evidence highlighting your progress as a physicist

There are a number of pieces of work that are not formally assessed but which do form a valuable part of your learning experience. For example, in many modules you will be issued with seminar problem sheets, and you will be expected to tackle these for yourself before the answers are provided, either in class or online.

10. Course structure and curriculum

Each academic year you will study 120 credit points (cp) of modules:

Level 4
Ideas of Motion: From Galileo to Einstein (20cp)
Matter: Evidence for Quantisation (20cp)
Concepts of Astronomy & Cosmology (20cp)
Introduction to Laboratory Software (20cp)
Laboratory Instrumentation and Physics Skills (20cp)
Mathematical Techniques (20cp)

Level 5
Fundamental Forces (20cp)
Thermal & Environmental Physics (20cp)
Optics & Semiconductors (20cp)
Digital Techniques (20cp)
Ionising Radiation & Non-Invasive Imaging (20cp)
The Quantum World (20cp)

Level 6
Core modules:
Condensed Matter (20cp)
Advanced Experimental Techniques (20cp)
General Relativity (20cp) or Advanced Quantum Mechanics & Quantum Computing (20cp)*
Laboratory Interfaces & Control (20cp)
Plus two optional modules from:
Physics & Technology of Nuclear Reactors (20cp)
Cosmology: Theory & Observation (20cp)
Stars & Galaxies (20cp) or Nuclear Materials Science (20cp)
Note: the last 2 modules listed are Level 5 and you may only take one of them to go with the appropriate Level 6 option in order to pursue a particular theme.

Level 7
MSci Research Project (60cp)
Professional Physicist (20cp)
Two modules from:
Medical Imaging (20cp)
Imaging Matter: From Atoms to Galaxies (20cp)
The 21st Century Scientist (20cp)
Current Topics in Physics (20cp)
Advanced Quantum Mechanics & Quantum Computing (20cp) or General Relativity (20cp)*

* The modules "General Relativity" and "Advanced Quantum Mechanics & Quantum Computing" run in alternate years and do so at both Level 6 and Level 7. This makes it possible for you to study both topics during your degree.

In order to be awarded an MSci honours degree, you must successfully complete 120cp at each level, thereby totalling 480cp. Students who do not obtain enough credit points may be eligible for one of the following awards: Certificate of Higher Education (120 cp); Diploma of Higher Education (240 cp); Ordinary degree (300 cp); or Honours degree (360 cp).

In order to proceed onto the third year of the MSci course a student should have passed all of the second year modules without referral and have achieved an average grade of at least a Low 2.1. Students not achieving this standard, but satisfying the requirements for entry onto the final year of the BSc (H) Physics course, will transfer to that course.

The MSci classification depends wholly on the modules in Years 3 & 4, these years being weighted equally. Your final degree classification will be determined by either the

weighted arithmetic mean of the contributing grade points (grade point average, GPA), or by the majority grade, whichever results in the higher outcome. Your majority grade is determined by establishing the highest degree classification at which more than half of your contributing credits have been achieved.

MSci Degree Classifications based on GPA:

First		GPA $\geq$ 12.5
Upper Second	(2:1)	GPA 9.5 – 12.4
Lower Second	(2:2)	GPA 6.5 – 9.4

Due to the common first year curriculum of most of the physics degree courses, transfer to the second year of BSc (H) Physics, BSc (H) Physics with Astrophysics, and BSc Physics (H) with Nuclear Technology is possible upon successful completion of Level 4. Students who successfully complete Level 5 of MSci Physics can also transfer to the third year of the BSc Physics (H) course if they wish to do so.

11. Admission to the course

For current information regarding all entry requirements for this course, please see the 'Applying' tab on the NTU course information web page.

12. Support for Learning

New entrants will experience a minimum of a 3 day induction period at the commencement of their first academic year. Induction will inform you of:

- Student Support Services at University, School and Course level;
- University policies and procedures on academic systems;
- Personal development planning;
- Timetable issues, room allocations and location;
- University, School and Course Handbooks;
- Enrolment procedures;
- Computing, IT and Library services;
- Health and Safety procedures.

All students are allocated a personal tutor on arrival, and you will have the opportunity to meet with them at a social event held as part of the induction events. Although you are free to visit your personal tutor whenever the need should arise, there will also be six meetings in your first year that will be instigated by your tutor. This will give you the opportunity to discuss how you think you are doing on the course, and discuss any marks that are available.

The physics section operates an open door policy and you are welcome to discuss academic problems linked to a specific module with the lecturer concerned.

The year tutor or the course leader can also be contacted to discuss any issues that you might have.

Academic staff can be contacted by e-mail, telephone, letter, or in person.

The university also has a Virtual Learning Environment called NOW (Nottingham Trent University Online Workspace). General information concerning the curriculum, module specifications, timetables, assessment schedules, etc. are available on the course sites, whereas module sites give syllabus details, assessment details, and frequently lecture material. This is an important educational aid whose use is steadily expanding.

Students with disabilities ranging from dyslexia to more serious problems are aided by the Student Support Services in the learning process.

The Clifton Library houses a reasonable number of physics textbooks, and has access to a reasonable number of relevant periodicals, many in electronic form. Library & Learning Resources (LLR) staff offer support for your learning needs. Both group and individual sessions are available to enable you to use the library resources to the full.

13. Graduate destinations / employability

By the end of the course you will have developed a range of transferable skills, making you more attractive to potential employers.

Graduates in physics are needed in industry where their training in the methodology of physics equips them for positions in engineering, management and administration in a wide range of jobs with a strong technological bias.

A proportion of graduates continue their studies at either masters or PhD level.

There is a shortage of qualified physics teachers in schools, which is not being met by the available graduates.

The emphasis on project work in the final year of the course means that you have the skills to follow a career in research and development.

The University Employability Team helps you find suitable employment. It offers sessions on such topics as interview technique and filling in application forms, and well as having psychometric tests available to see what type of jobs suit your personality.

14. Course standards and quality

The course teaching team takes day-to-day responsibility for managing the physics cluster of courses. The design and delivery of the course are under the control of the courses committee. This committee has student representatives on it, who are elected by other students. The role of the student representatives is to gather feedback from fellow students, write a report, and present this at the courses committee. Student reps can also bring any concerns of students to the courses manager, enabling problems to be dealt with in a timely manner.

Towards the end of each module, academic staff gather student feedback and this is reported on in the module leader's report. For those modules exhibiting exceptional results, the module leaders' reports are used to evidence the Interim Course Report (ICR) which is written annually. The ICR is considered at a meeting of the School of Science & Technology's Academic Standards & Quality Committee, where any issues arising are noted and the actions taken to alleviate them are reported back.

The School operates a peer observation of teaching policy, whereby all lecturers are seen regularly in a teaching capacity by other lecturers within the teaching team. Suggestions for improvements are made, and other members of staff informed of good practices.

At the design stage of the course, the outcomes are aligned to those suggested by the Quality Assurance Agency for Higher Education.

The team of External Examiners reports annually on the standards and quality of the course.

The MSci(H) Physics course is accredited by the Institute of Physics. To achieve this accreditation, the curriculum, the teaching staff, the facilities and the assessments have to achieve certain standards. Every four years the course is reaccredited to ensure that standards have been maintained.

15. Assessment regulations

This course is subject to the University's Common Assessment Regulations (located in its Academic Standards and Quality Handbook). Any course specific assessment features are described below:

16. Additional Information

Collaborative partner(s):	None
Course referenced to national QAA Benchmark Statements:	The QAA descriptors for a qualification at MSci level in Physics & Astronomy have informed the design of this course.
Course recognised by:	Institute of Physics
Date implemented:	October 2019
Any additional information:	