School of Physics & Astronomy

Important Entry Information: Entry to first year is the standard entry route, and the route which can provide the broadest education, and which can give most flexibility in final choice of degree. Students who are aiming for a degree in Physics or Astrophysics and who enter with good Advanced Highers or A-levels or equivalent in Physics and Mathematics may apply for an accelerated entry route to the programme, which can reduce the length of the BSc Honours programme to three years and the MPhys programme to four years. The special Physics and Astronomy (Gateway) first year allows subsequent progression to the second year of all the single-honours degree programmes in the School, and the joint degrees with the School of Mathematics.

Entry to Honours

BSc. Students who attain an average of grade 11.0 or above at the first sitting in each of the requisite 2000-level module combinations and who meet all other programme requirements will be given automatic offers of entry into Honours programmes*.

Students permitted automatic entry to Honours* will only be permitted to trail one module to a maximum of 30 sub-honours

credits into Honours.

*Apart from students on Integrated Masters degrees.

This School also allows 'Qualified Entry to Honours' as defined in: **Entry to Honours**

MPhys or MSci. Students who attain an average grade of 15 or above at the first sitting in each of the requisite 2000-level combinations, and who meet all the other programme requirements will be permitted automatic entry into MPhys or MSci Honours programmes. It is not permitted to trail any modules or credits in to the start of the honours programme in Integrated Masters degrees.

BSc Honours

The general requirements are 480 credits over a period of normally four years (and not more than five years) or part-time equivalent, of which the final two years form an approved Honours programme of 240 credits, of which 90 credits are at 4000 level and at least a further 120 credits at 3000 and/or 4000 levels.

MPhys Honours

The general requirements are 600 credits over a period of normally five years (and not more than six years) or part-time equivalent, of which the final three years form an approved Honours programme of at least 360 credits, of which 120 credits are at 5000 level and at least 210 credits are at 3000 and/or 4000 levels.

MSci Honours

The general requirements are 600 credits over a period of normally five years (and not more than six years) or part-time equivalent, of which the final three years form an approved Honours programme of at least 360 credits, of which 120 credits are at 5000 level and at least 210 credits are at 3000 and/or 4000 levels.

Study Abroad: In the case of students who spend part of the Honours programme on a recognised Study Abroad scheme, the Programme Requirements will be amended to take into account overseas courses which are approved by the relevant St Andrews School in the Learning Agreement.
(see www.st-andrews.ac.uk/studyabroad/outgoingstudents/AcademicInformation/).

Accreditation: All the BSc, MSci, and MPhys Honours degrees described in this section of the catalogue are accredited by the UK Institute of Physics.

Physics & Astronomy - Programme Requirements - 2016/7 - August 2016

Astrophysics - Single Honours BSc

First Year:	80 credits: AS1001 **and** MT1002 **and** PH1011 **and** PH1012.
	(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)
	Other 1000-level modules to give at least 120 credits for the year.
Second Year:	120 credits: Grade 11 or better in AS2001 **and** an average grade of 11 or better in PH2011 **and** PH2012 with passes in both; **and** an average grade of 11 or better in MT2501 **and** MT2503 with passes in both
Third Year:	105 credits: AS3013 **and** PH3007 **and** PH3012 **and** PH3014 **and** PH3061 - PH3062 **and** PH3080 **and** PH3081;
	15 credits: AS4010 (either Third Year or Fourth Year – any necessary equivalent credits to be selected in the year AS4010 not taken - with the approval of the Adviser of Studies.)
Fourth Year:	45 credits: AS4103 **and** PH4041;
	30 credits: AS4011 - AS4012, AS4015, AS4025, PH4031
	45 further credits: AS3000 - AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies.

In total, at least 210 credits must be achieved at 3000 and 4000 level with at least 90 of these at 4000 level.

Astrophysics - Single Honours BSc
Direct entry to second year for approved candidates with 120 advanced standing credits

Second Year:	At least 75 credits: AS1101 **and** Grade 11 or better in [AS2001 **or** AS2101] **and** an average of grade 11 or better in PH2011 **and** PH2012 with passes in both
	30 credits: MT2501 **and** MT2503 with passes in each and an average of grade of 11 or better
	Passes in additional modules if necessary to get at least 120 credits.
Third Year:	105 credits: AS3013 **and** PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081;
	15 credits: AS4010 (either Third Year or Fourth Year – any necessary equivalent credits to be selected in the year AS4010 not taken - with the approval of the Adviser of Studies.)
Fourth Year:	45 credits: AS4103 **and** PH4041;
	30 credits: AS4011 - AS4012, AS4015, AS4025, PH4031
	45 further credits: AS3000 - AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies.

In total at least 210 credits must be achieved at 3000 and 4000 level with at least 90 of these at 4000 level.

Astrophysics – Single Honours Integrated Masters MPhys

First Year:	80 credits: AS1001 **and** MT1002 **and** PH1011 **and** PH1012.
	(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)
	Other 1000-level modules to give at least 120 credits for the year
Second Year:	At least 105 credits: a credit-weighted mean grade of 15 or better in [AS2001 or AS2101], ~~**and** an average grade of 15 or better in~~ PH2011 **and** PH2012 with passes in each~~both~~; **and** an average grade of 15 or better in MT2501 **and** MT2503 with passes in both. *Additional credits if needed to give at least 120 credits for the year.*
Third Year:	105 credits: AS3013 **and** PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081;
	15 credits: AS4010 (either Third Year or Fourth Year – any necessary equivalent credits to be selected in the year AS4010 not taken - with the approval of the Adviser of Studies.)
Fourth Year:	60 credits: AS4011 **and** AS4012 **and** PH4038 **and** PH4041;
	30 credits in two of: AS4015, AS4025, PH4031;
	At least 30 further credits, which may include ID4001.
Fifth Year:	60 credits: AS5101;
	At least 30 credits: AS5001 - AS5003;

Further credits: AS3000 - AS4099, PH3000 - PH4109, PH5000 - PH5099 or modules in other subjects with the approval of the Adviser of Studies, to a total of at least 360 across Third, Fourth and Fifth Years, of which at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Astrophysics – Single Honours Integrated Masters MPhys
Direct entry to second year for approved candidates with 120 advanced standing credits

Second Year:	At least 110 credits: AS1101 **and** **a credit-weighted mean** grade of 15 or better in [AS2001 **or** AS2101], ~~**and** an average of grade 15 or better in~~ PH2011 **and** PH2012 with passes in each~~both~~; **and** an average of grade 15 or better in MT2501 **and** MT2503 with passes in both. *Additional modules if needed to give at least 120 credits over the year*
Third Year:	105 credits: AS3013 **and** PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081; 15 credits: AS4010 (either Third Year or Fourth Year – any necessary equivalent credits to be selected in the year AS4010 not taken - with the approval of the Adviser of Studies.)
Fourth Year:	60 credits: AS4011 **and** AS4012 **and** PH4038 **and** PH4041; 30 credits in two of: AS4015, AS4025, PH4031; At least 30 further credits which may include ID4001.
Fifth Year:	60 credits: AS5101; At least 30 credits: AS5001 - AS5003; Further credits: AS3000 - AS4099, PH3000 - PH4109, PH5000 - PH5099 or modules in other subjects with the approval of the Adviser of Studies, to a total of 360 across Third, Fourth and Fifth Years, of which at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Physics - Single Honours BSc

First Year:	60 credits: PH1011 **and** PH1012 **and** MT1002. *(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)* *Additional credits to a total of at least 120*
Second Year:	90 credits: PH2011 **and** PH2012 both passed with an average of grade 11 or better; **and** an average of grade 11 or better in MT2501 and MT2503 with passes in both. *Additional credits to a total of at least 120*
Third Year:	105 credits: PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081 **and** PH3101; 15 credits: AS3000 - AS4999, PH3000 - PH4109, MT3501, or modules in other subjects or levels with the approval of the Adviser of Studies.
Fourth Year:	75 credits: PH4039 **and** PH4041 **and** PH4105 **and** PH4111; 45 further credits: AS3000 - AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies.

In total, at least 210 credits must be achieved at 3000 and 4000 level with at least 90 of these at 4000 level.

Physics - Single Honours BSc
Direct entry to second year for approved candidates with 120 advanced standing credits

Second Year:	90 credits: PH2011 **and** PH2012 passed with an average of grade 11 or better; **and** an average of grade 11 or better in MT2501 **and** MT2503 with passes in both. *Additional credits to a total of at least 120*
Third Year:	105 credits: PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081 **and** PH3101; 15 credits: AS3000 - AS4999, PH3000 - PH4109, MT3501, or modules in other subjects or levels with the approval of the Adviser of Studies.
Fourth Year:	75 credits: PH4039 **and** PH4041 **and** PH4105 **and** PH4111; 45 further credits: AS3000 - AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies.

In total, at least 210 credits must be achieved at 3000 and 4000 level with at least 90 of these at 4000 level.

Physics - Joint Honours BSc

Physics and one of: Computer Science, Logic & Philosophy of Science [L], Mathematics, Philosophy.

[L] Not available to entrants from 2015/16 due to renaming of degree programme.

Physics element of Physics - Joint Honours BSc (except Joint with Mathematics):

First Year:	60 credits: PH1011 **and** PH1012 **and** MT1002.
	(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)
	Requirements for the other subject, and if necessary additional credits to total of 120
Second Year:	90 credits: PH2011 **and** PH2012 both passed with an average of grade 11 or better; **and** an average of grade 11 or better in MT2501 **and** MT2503 with passes in both.
	Requirements for the other subject
Third Year:	60 credits: PH3007 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081.
Fourth Year:	15 credits: PH3012;
	15 credits: PH4040;
	30 credits: PH4111 (unless one of PH4796, CS4098, CS4796, PY4698, PY4699, PY4794 is taken);
	Further credits may be taken from AS3000 - AS4999, PH3000 - PH4109, ID4001 or modules in other subjects with the approval of the Adviser of Studies.

In total, 240 credits must be achieved at 3000 and 4000 level with at least 90 of these at 4000 level.

Physics and Mathematics - Joint Honours BSc:

First Year:	60 credits: PH1011 **and** PH1012 **and** MT1002.
	(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)
	Additional credits if needed up to 120
Second Year:	60 credits: PH2011 **and** PH2012 both passed with an average of grade 11 or better;
	30 credits: MT2501 and MT2503
	30 credits: in one of either (MT2502 and MT2505) or (MT2506 and MT2507) passed with an average grade of 11 or better in the four 2000-level MT Modules
Third Year:	45 credits: PH3007 **and** PH3061 **and** PH3062 **and P**H3080;
	For those who took MT2502 and MT2505 in second-year: 45 credits: MT3502 **and** MT3505 **and** PH3081
	For those who took MT2506 and MT2507 in second-year: 30 credits: MT3504 **and** (MT3503 **or** MT3506)
	Further credits to a total of 120 credits: Normally chosen from PH and MT Honours modules.
Fourth Year:	45 credits: PH3012 **and** PH4039 **and** PH4040
	15 or 30 credits: MT4599 **or** PH4111 or PH4796
	Further credits to a total of 120 credits: usually chosen from PH and MT Honours modules and ID4001

In total, 240 credits must be achieved at 3000 and 4000 level with at least 90 of these at 4000 level. At least 100 credits must be from PH or AS modules and at least 100 credits from MT modules. ID4001 taken in the respective school counts towards the totals for PH/AS or MT.

Physics – Single Honours Integrated Masters MPhys

First Year: 60 credits: PH1011 **and** PH1012 **and** MT1002.

(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)
Additional credits to give at least 120 total

Second Year: 90 credits: PH2011 **and** PH2012 with passes in both with an average of grade 15 or better; **and** an average of grade 15 or better in MT2501 **and** MT2503.
Additional credits to give at least 120 total

Third Year: 105 credits: PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081 **and** PH3101;

15 credits: AS3000 - AS4999, PH3000 - PH4109, MT3501, (usually PH3074) or modules in other subjects or levels with the approval of the Adviser of Studies.

Fourth Year: 60 credits: PH4038 **and** PH4039 **and** PH4041 **and** PH4105;

15 credits: PH3074, if not taken in Third Year;

Further credits: AS3000 – AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies, to a total of 120 credits for the Year.

Fifth Year: 60 credits: PH5101;

60 credits: AS5000 - AS5999, PH5000 - PH5099.

In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Physics – Single Honours Integrated Masters MPhys
Direct entry to second year for approved candidates with 120 advanced standing credits

Second Year: 90 credits: PH2011 **and** PH2012 passed with an average of grade 15 or better; **and** an average of grade 15 or better in MT2501 **and** MT2503 with passes in both.

Additional credits if necessary to give a total of at least 120

Third Year: 105 credits: PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081 **and** PH3101;

15 credits: AS3000 - AS4999, PH3000 - PH4109, MT3501, (usually PH3074) or modules in other subjects or levels with the approval of the Adviser of Studies.

Fourth Year: 60 credits: PH4038 **and** PH4039 **and** PH4041 **and** PH4105;

15 credits: PH3074, if not taken in Third Year;

Further credits: AS3000 – AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies, to a total of 120 credits for the Year.

Fifth Year: 60 credits: PH5101;

60 credits: AS5000 - AS5999, PH5000 - PH5099.

In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Physics and Astronomy (Gateway) BSc or MPhys

First Year: 120 credits to include: PH1011, PH1012, PH1501 (unless bypassed due to maths qualifications), PH1502, PH1503, MT1002.

In subsequent years, students follow the programme requirements for the relevant degree programme onto which they progress at the start of second year.

Physics and Chemistry - Joint Honours Integrated Masters MSci

First Year: 100 credits: CH1401 **and** CH1402 **and** MT1002 **and** PH1011 **and** PH1012.

(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)

(Permission may be granted for suitably-qualified students to be exempted from PH1011 and/or PH1012 and to take some 2000-level PH credits in First Year, thus reducing the credit load in second year towards 120.)

Second Year: 60 credits: CH2501 **and** CH2701 -with an average of grade 15 or better.

60 credits: PH2011 **and** PH2012 - with an average of grade 15 or better with passes in both

30 credits: an average of grade 15 or better in (MT2501 **and** MT2503 with passes in both)

Third or Fourth Year* (Chemistry):

120 credits: CH3431 **and** CH3441 **and** CH3512 **and** CH3514 **and** CH3615 **and** CH3712 **and** CH3717 **and** CH3721 **and** CH4715 and CH4716 and CH4717.

Third or Fourth Year* (Physics):

120 credits: PH3007 **and** PH3012 **and** PH3061 **and** PH3062 **and** PH3082 **and** PH3101 **and** PH4039 **and** PH4041 **and** PH4043.

Fifth Year: **EITHER**

60 credits: PH5101;

15 further credits in one of: PH5000 - PH5999;

30 credits in three of: CH5518, CH5711 - CH5715, CH5717;

15 further credits: CH5000 - CH5999, PH5000 - PH5999.

OR

50 credits from CH5441;

30 credits: PH5000 - PH5999;

30 credits: CH5518, CH5711 - CH5715, CH5717;

10 further credits: CH5000 - CH5999, PH5000 - PH5999.

* Normally students will take the Chemistry modules in Junior Honours and the Physics modules in Senior Honours, students should take advice from the two Schools.

Other information: This course does not have RSC accreditation, but does have IOP accreditation.

Theoretical Physics – Single Honours Integrated Masters MPhys

First Year: 60 credits: PH1011 **and** PH1012 **and** MT1002.

(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)

Additional credits as required to get at least 120

Second Year: 60 credits: PH2011 **and** PH2012 with an average of grade 15 or better with passes in both

30 credits: an average of grade 15 or better in MT2501 **and** MT2503 with passes in both - Additional credits if necessary to give at least 240 total pre-honours

Third Year: 105 credits: PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081 **and** PH4038;

15 credits: MT3501

Fourth Year: 60 credits: PH4028 **and** PH4039 **and** PH4032 **and** PH4041;

Further credits: AS3000 – AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies, to a total of 120 credits for the Year.

Fifth Year: 75 credits: PH5004 **and** PH5103;

At least 15 credits: PH5002, PH5003, PH5011, PH5012.

Further credits: AS5000 - AS5999, PH5000 - PH5099, to a total of 120 credits for the Year.

In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Theoretical Physics – Single Honours Integrated Masters MPhys

Direct entry to second year for approved candidates with 120 advanced standing credits

Second Year:	60 credits: PH2011 **and** PH2012 passed with an average of grade 15 or better.
	30 credits: average grade of 15 or better in [MT2501 **and** MT2503 with passes in both] -
	Additional credits as required to get at least 120.
Third Year:	105 credits: PH3007 **and** PH3012 **and** PH3014 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH3081 **and** PH4038;
	15 credits: MT3501.
Fourth Year:	60 credits: PH4028 **and** PH4039 **and** PH4032 **and** PH4041;
	Further credits: AS3000 – AS4999, PH3000 - PH4109, ID4001 or modules in other subjects or levels with the approval of the Adviser of Studies, to a total of 120 credits for the Year.
Fifth Year:	75 credits: PH5004 **and** PH5103;
	At least 15 credits: PH5002, PH5003, PH5011, PH5012.
	Further credits: AS5000 - AS5999, PH5000 - PH5099, to a total of 120 credits for the Year.

In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Theoretical Physics and Mathematics - Joint Honours Integrated Masters MPhys

First Year:	60 credits: PH1011 **and** PH1012 **and** MT1002.
	(Students without prerequisite for MT1002 will take MT1001 in Semester 1.)
	Additional credits as required to reach 120.
Second Year:	60 credits: PH2011 **and** PH2012 passed with an average of grade 15 or better;
	30 credits: MT2501 and MT2503
	30 credits: in one of either (MT2502 and MT2505) or (MT2506 and MT2507) passed with an average grade of 15 or better in the four 2000-level MT modules
Third Year	75 credits: MT3501 **and** PH3007 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH4038
	For those who took MT2502 and MT2505 in second-year: 45 credits: MT3502 **and** MT3505 **and** PH3081
	For those who took MT2506 and MT2507 in second-year: 30 credits: MT3504 **and** (MT3503 **or** MT3506)
	Further credits, if required, to a total of 120 credits: normally chosen from MT and PH Honours modules.
Fourth Year	75 credits: PH3012 **and** PH4028 **and** PH4032 **and** PH4039 **and** PH4040
	Further credits to a total of 120 credits: usually chosen from MT and PH honours modules and ID4001
Fifth Year:	40 or 60 credits: MT5999 **or** PH5103;
	At least 15 credits from: PH5002, PH5003, PH5004, PH5011, PH5012 (unless already taken);
	At least 40 credits: MT5000 - MT5899 (unless already taken in Fourth Year);

Further credits if necessary to a total of at least 145 across Third, Fourth and Fifth Years from 3000 - , 4000 - and 5000 - level MT modules (except that 30 further credits from MT2000 - MT2999 may be substituted).

Further credits if necessary to a total of at least 145 across Third, Fourth and Fifth Years from 3000 - , 4000 - and 5000 - level PH and AS modules (except that 15 further credits from a physics-based ID4001 may be substituted).

In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.

Theoretical Physics and Mathematics - Joint Honours Integrated Masters MPhys
Direct entry to second year for approved candidates with 120 advanced standing credits

Second Year:	60 credits: PH2011 **and** PH2012 passed with an average of grade 15 or better;
	30 credits: MT2501 and MT2503
	30 credits: in one of either (MT2502 and MT2505) or (MT2506 and MT2507) passed with an average grade of 15 or better in the four 2000-level MT modules
Third Year	75 credits: MT3501 **and** PH3007 **and** PH3061 **and** PH3062 **and** PH3080 **and** PH4038
	For those who took MT2502 and MT2505 in second-year: 45 credits: MT3502 **and** MT3505 **and** PH3081
	For those who took MT2506 and MT2507 in second-year: 30 credits: MT3504 **and** (MT3503 **or** MT3506)
	Further credits, if required, to a total of 120 credits: normally chosen from MT and PH Honours modules.
Fourth Year	75 credits: PH3012 **and** PH4028 **and** PH4032 **and** PH4039 **and** PH4040
	Further credits to a total of 120 credits: usually chosen from MT and PH honours modules and ID4001
Fifth Year:	40 or 60 credits: MT5999 **or** PH5103;
	At least 15 credits from: PH5002, PH5003, PH5004, PH5011, PH5012 (unless already taken);
	At least 40 credits: MT5000 - MT5899 (unless already taken in Fourth Year);
Further credits if necessary to a total of at least 145 across Third, Fourth and Fifth Years from 3000 - , 4000 - and 5000 - level MT modules (except that 30 further credits from MT2000 - MT2999 may be substituted).	
Further credits if necessary to a total of at least 145 across Third, Fourth and Fifth Years from 3000 - , 4000 - and 5000 - level PH and AS modules (except that 15 further credits from a physics-based ID4001 may be substituted).	
In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.	

Students still completing degree programmes as defined in previous Course Catalogues should discuss their module selections with their Honours Adviser(s).