HKU Physics Department
Major In Physics (Intensive) Consultation Document

9 Aug 2018

Background:

While the curriculum structure of all the current majors in the BSc curricula is well-known for its flexibility to cater the increasingly diversified needs of students and the society, we have been receiving demand and comment from students, teaching staffs and external examiners to increase the minimum number of credits for a science major from the current 96 to 144 so that students could better prepare themselves for postgraduate studies as well as jobs that require deep discipline specific knowledge. Students also generally believe that those taking, say, at least 50% more courses than the required minimum in ones' major should somehow be highlighted in their transcript. The Science Faculty and the Physics Department have been reflecting these comments to the University; and we believe that it is the right time to consult stakeholders (including current BSc and BSc&BEd undergraduates, postgraduates, alumni, employers and Friends of the Department) on the possibility of offering a Major In Physics (Intensive) [or the physics intensive major for short] in addition to the existing physics major. The existing Major In Physics [or physics major for short], which requires students to take a minimum of 96 credits of relevant courses in physics and science, will continue to offer flexibility to students such as taking various combinations of double majors and receiving a broad university education. Our proposed physics intensive major, in contrast, requires students to take at least 144 credits of relevant physics and science courses so that their efforts in digging wide and deep in physics can be properly recognized. In fact, several departments in the Science Faculty have already put forward to the University or have been consulting their stakeholders on similar intensive major proposals in their disciplines. We remark that the physics major curriculum reform, which has consulted our stakeholders last year and recent passed the Faculty Board, will be implemented in phase starting Sep 2018. That reform is in a nutshell about a change in teaching pedagogy by adopting the "teaching the skill set first" approach. Our proposed physics intensive major will be taught in the same approach. In brief, the major difference is the minimum required number of physics courses. The physics intensive major proposal below was put forward by the Curriculum Development and Management Committee (CDMC) of the Physics Department and passed in the most recent Staff Meeting of the Department on in 30 May 2018. You are welcome to submit your views to the Department (email: physdept@hku.hk with subject "Intensive Major Consultation") by 8 Oct 2018 (Tue). You are also welcome to attend our curriculum reform consultation meeting held on 21 Sep 2018 (Fri) from 5:30pm to 6:30pm in Room 522, Chong Yuet Ming Physics Building to know more about the proposed reform and to express your opinions. You may also contact the chair of the CDMC, Prof. H. F. Chau (email: hfchau@hku.hk), for inquiry about this proposed intensive major. Subject to your support, we will submit our finalized proposal to the Science Faculty and then the Academic Board of the University for approval.

Highlights of the proposed Major In Physics (Intensive) and the keeping of the current Major In Physics:

1. The Major In Physics (Intensive) better reflects the effort of those students who have taken at least 144 credits of physics courses (that Is, at least 50% more than the minimum requirement of the physics major). Those who graduate in this major will have "BSc Major In Physics (Intensive)" printed on their transcripts.
2. At the same time, the physics major is kept to allow maximum flexibility for students who want a broader university education as well as for those who want to do a double major.

3. Both the physics and physics intensive majors will be taught using the recently adopted "teach the skill set first" philosophy.
4. Following the recommendation of the external examiner to allow an exposure to modern computational physics techniques as early as possible, we plan to introduce an introductory level course "Introductory Computational Physics" no later than the academic year 2020-2021. This course will be added to the list of disciplinary elective courses in both the physics major and physics intensive major.
5. The physics intensive major is designed as a super-set of the physics major to ease switching from one major to the other during the course of study. In particular, the two science foundation courses and the capstone requirement are present in both the physics and physics intensive majors. Similarly, one has to fulfill the same University requirements on languages and common core courses in order to graduate in either major.
6. Physics major and physics intensive major cannot be declared at the same time.

Timeline of implementation:

We propose to implement this new major starting the first semester of the academic year 2019-2020.

The proposed curriculum structure of the Major In Physics (Intensive):

Major in Physics (Intensive)

2019

Objectives:

The Major in Physics (Intensive) aims to provide students with a strong foundation on the subject in breadth and depth. It covers a wide range of core areas which provides the intensive preparation to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge and competencies in physics and research experience plus the training of analytical thinking, quantitative reasoning, and problem solving methods during their studies. Graduates are expected to be well-prepared for further studies in physics and related disciplines and to pursue careers in scientific or technical fields.

Learning Outcomes:

By the end of this programme, students should be able to:

PLO 1 : identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2 : have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3 : analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4 : communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5 : apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combination:

Major in Physics
Minor in Physics

Required courses (144 credits)

1. Introductory level courses (72 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111	Scientific method and reasoning (6)
SCNC1112	Fundamentals of modern science (6)

Disciplinary Core Courses (48 credits)

PHYS1150	Problem solving in physics (6)
PHYS2055	Introductory relativity (6)
PHYS2150	Method in physics I (6)
PHYS2155	Method in physics II (6)
PHYS2250	Introductory mechanics (6)
PHYS2255	Introductory electricity and magnetism (6)
PHYS2261	Introductory heat and thermodynamics (6)
PHYS2265	Introductory quantum physics (6)

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

COMP1117	Computer programming (6) *
MATH1013	University mathematics II (6)
PHYS1650	Nature of the universe (6)
PHYS2160	Modern astronomy (6)
PHYS2650	Introductory Computational Physics (6)
STAT1603	Introductory statistics (6)

2. Advanced level courses (66 credits)

Disciplinary Core Courses (36 credits)

PHYS3150	Theoretical physics (6)
PHYS3350	Classical mechanics (6)
PHYS3351	Quantum mechanics (6)
PHYS3450	Electromagnetism (6)
PHYS3550	Statistical mechanics & thermodynamics (6)
PHYS3760	Physics laboratory (6)

Disciplinary Electives (30 credits)

At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

List A

PHYS3151	Machine learning in physics (6)
PHYS3650	Observational astronomy (6)
PHYS3653	Astrophysics (6)
PHYS3660	Astronomy laboratory (6)
PHYS3750	Laser and spectroscopy (6)
PHYS3850	Physical optics (6)
PHYS3851	Atomic and nuclear physics (6)
PHYS4150	Computational physics (6)
PHYS4151	Data analysis and modeling in physics (6)
PHYS4351	Advanced quantum mechanics (6)
PHYS4450	Advanced electromagnetism (6)
PHYS4551	Solid state physics (6)
PHYS4652	Planetary science (6)
PHYS4653	Cosmology (6)
PHYS4654	General relativity (6)
PHYS4655	Interstellar medium (6)
PHYS4656	Advanced astrophysics (6)
PHYS4850	Particle physics (6)
PHYS7350	Graduate classical mechanics (6)
PHYS7351	Graduate quantum mechanics (6)

PHYS7450	Graduate electromagnetism (6)
PHYS7550	Graduate statistical mechanics (6)
PHYS7750	Nanophysics (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

PHYS3999	Directed studies in physics (6)
PHYS4966	Physics internship (6)
PHYS4999	Physics project (12)

Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

6. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.

7. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.

8. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.

9. Those who want to specialize in the theoretical physics theme should pass any four of the following

courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, PHYS7550 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.

10. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.

11. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

12. For COMP1117, it is subject to further discussion with the Department of Computer Science.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.

The curriculum structure of the current Major In Physics as reference:

Major in Physics

2018

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1 : identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2 : have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3 : analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4 : communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5 : apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combination:
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111	Scientific method and reasoning (6)
SCNC1112	Fundamentals of modern science (6)

Disciplinary Core Courses (24 credits)

PHYS2250	Introductory mechanics (6)
PHYS2255	Introductory electricity and magnetism (6)
PHYS2261	Introductory heat and thermodynamics (6)
PHYS2265	Introductory quantum physics (6)

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

PHYS1150	Problem solving in physics (6)
PHYS2055	Introductory relativity (6)
PHYS2150	Methods in physics I (6)
PHYS2155	Methods in physics II (6)

2. Advanced level courses (42 credits)

Disciplinary Electives (42 credits)

At least 24 credits selected from courses in List A:

List A

PHYS3150	Theoretical physics (6)
PHYS3350	Classical mechanics (6)
PHYS3351	Quantum mechanics (6)
PHYS3450	Electromagnetism (6)
PHYS3550	Statistical mechanics & thermodynamics (6)
PHYS3760	Physics laboratory (6)

Plus at least 18 more credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in Lists A and B and those courses not selected to fulfill the capstone requirements.

List B

PHYS3151	Machine learning in physics (6)
PHYS3650	Observational astronomy (6)
PHYS3653	Astrophysics (6)
PHYS3660	Astronomy laboratory (6)
PHYS3750	Laser and spectroscopy (6)
PHYS3850	Physical optics (6)
PHYS3851	Atomic and nuclear physics (6)
PHYS4150	Computational physics (6)
PHYS4151	Data analysis and modeling in physics (6)
PHYS4351	Advanced quantum mechanics (6)
PHYS4450	Advanced electromagnetism (6)
PHYS4551	Solid state physics (6)
PHYS4652	Planetary science (6)
PHYS4653	Cosmology (6)
PHYS4654	General relativity (6)
PHYS4655	Interstellar medium (6)
PHYS4656	Advanced astrophysics (6)
PHYS4850	Particle physics (6)
PHYS7350	Graduate classical mechanics (6)
PHYS7351	Graduate quantum mechanics (6)
PHYS7450	Graduate electromagnetism (6)
PHYS7550	Graduate statistical mechanics (6)
PHYS7750	Nanophysics (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

PHYS3999	Directed studies in physics (6)
PHYS4966	Physics internship (6)
PHYS4999	Physics project (12)

Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

7. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.

8. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.

9. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.

10. Those who want to specialize in the theoretical physics theme should pass any four of the following courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum

mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, PHYS7550 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.

11. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.

12. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.

Proposed slightly revised curriculum structure of the Major In Physics:

Major Title	Major in Physics
Offered to students admitted to Year 1 in	**2018**

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject without compromising the flexibility of choosing courses within this major or reading another major. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1 : identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

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PLO 3 : analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4 : communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5 : apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combination:
Major in Physics (Intensive)
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111	Scientific method and reasoning (6)
SCNC1112	Fundamentals of modern science (6)

Disciplinary Core Courses (24 credits)

PHYS2250	Introductory mechanics (6)
PHYS2255	Introductory electricity and magnetism (6)
PHYS2261	Introductory heat and thermodynamics (6)
PHYS2265	Introductory quantum physics (6)

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

PHYS1150	Problem solving in physics (6)
PHYS2055	Introductory relativity (6)
PHYS2150	Methods in physics I (6)
PHYS2155	Methods in physics II (6)
PHYS2160	Introductory Computational Physics (6)

2. Advanced level courses (42 credits)

Disciplinary Electives (42 credits)

At least 24 credits selected from courses in List A:

List A

PHYS3150	Theoretical physics (6)
PHYS3350	Classical mechanics (6)
PHYS3351	Quantum mechanics (6)
PHYS3450	Electromagnetism (6)
PHYS3550	Statistical mechanics & thermodynamics (6)
PHYS3760	Physics laboratory (6)

Plus at least 18 more credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in Lists A and B and those courses not selected to fulfill the capstone requirements.

List B

PHYS3151	Machine learning in physics (6)
PHYS3650	Observational astronomy (6)
PHYS3653	Astrophysics (6)
PHYS3660	Astronomy laboratory (6)
PHYS3750	Laser and spectroscopy (6)
PHYS3850	Physical optics (6)
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PHYS4150	Computational physics (6)
PHYS4151	Data analysis and modeling in physics (6)
PHYS4351	Advanced quantum mechanics (6)
PHYS4450	Advanced electromagnetism (6)
PHYS4551	Solid state physics (6)
PHYS4652	Planetary science (6)
PHYS4653	Cosmology (6)
PHYS4654	General relativity (6)
PHYS4655	Interstellar medium (6)
PHYS4656	Advanced astrophysics (6)
PHYS4850	Particle physics (6)
PHYS7350	Graduate classical mechanics (6)
PHYS7351	Graduate quantum mechanics (6)
PHYS7450	Graduate electromagnetism (6)
PHYS7550	Graduate statistical mechanics (6)
PHYS7750	Nanophysics (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:	
PHYS3999	Directed studies in physics (6)
PHYS4966	Physics internship (6)
PHYS4999	Physics project (12)

Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

7. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.

8. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.

9. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.

10. Those who want to specialize in the theoretical physics theme should pass any four of the following

courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, PHYS7550 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.

11. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.

12. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.

Prof H F Chau
Chair of the CDMC

And

Prof M H Xie
Head of Physics Department