國立彰化師範大學
物理學系博士班畢業條件表暨課程架構表
(112學年度入學學生適用)

National Changhua University of Education

Graduation Requirements and Course Structure for PhD Program of Physics

(Applicable for students in 112 academic year)

列印日期(Print Date:2024/11/19)

一.系必修課程

Ⅰ.Department Required Courses

課程名稱 Course Name	學分/學時 Credit(s) / Hour(s)	年級 Grade	學期 Semester
專題討論(一) Seminar I	1/2	1	1
專題討論(二) Seminar II	1/2	1	2
論文指導(一) Thesis Supervision I	3/0	2	1
論文 Thesis	0/0	2	2
論文指導(二) Thesis Supervision II	3/0	2	2

二.系選修課程

Ⅱ.Department Elective Courses

課程名稱 Course Name	學分/學時 Credit(s) / Hour(s)	年級 Grade	學期 Semester
獨立研究(一) Individual Studies I	3/0	1	1
電磁波系統與元件技術(上) Techniques of Systems and Components for Electromagnetic Waves (I)	3/3	1	1
半導體雷射 Semiconductor Lasers	3/3	1	1
統計力學(一) Statistical Mechanics I	3/3	1	1
固態物理(一) Solid State Physics I	3/3	1	1
物理教育專論 Special Topics in Physics Education	3/3	1	1
物理教育研究法 Research Methods in Physics Education	3/3	1	1
高等物理教育研究法 Advanced Research Methods in Physics Education	3/3	1	1
質的資料分析 Qualitative data Analysis	3/3	1	1
量子力學(一) Quantum Mechanics I	3/3	1	1
反射式液晶顯示器 Reflective Liquid Crystal Displays	3/3	1	1
統計力學(二)	3/3	1	1

Statistical Mechanics II			
奈米電子學(一) Nano-Electronics I	3/3	1	1
電動力學(一) Electrodynamics I	3/3	1	1
奈米結構製程(一) Fabrication Processes for Nanostructure I	3/3	1	1
物理教育專題(一) Project in Physics Education I	3/3	1	1
教育統計(一) Educational Statistics I	3/3	1	1
物理教育論文寫作(一) Physics Education Academic Writing I	3/3	1	1
科學概念發展與分析 Development and Analysis of Science Concepts	3/3	1	1
表面物理與技術 Surface Physics and Techniques	3/3	1	1
熱電物理特論(一) Special Topics in Thermoelectric I	3/3	1	1
高等物理數學(一) Advanced Mathematical Methods in Physics I	3/3	1	1
半導體製程 Semiconductor Manufacturing Technology	3/3	1	1
半導體奈米結構光學 Optical Properties of Semiconductor Nanostructures	3/3	1	1
低維度半導體物理 Physics of Semiconductors in Low Dimensions	3/3	1	1
奈米材料(一) Nano-Materials I	3/3	1	1
物理教學改革與研究 Innovation and Research in Physics Teaching	3/3	1	1
物理專題(一) Individual Studies in Physics I	3/3	1	1
物理光學 Physical Optics	3/3	1	1
凝態物理特論 Special Topics in Condensed-matter Physics	3/3	1	1
高等量子力學 Advanced Quantum Mechanics	3/3	1	1
量子場論 Quantum Field Theory	3/3	1	1
渦流動力學 Vortex Dynamics	3/3	1	1
奈米電子專題研究 Special Topics on Nano-electronics	3/3	1	1
光纖通訊 Fiber Communications	3/3	1	1
光電半導體特論 Special Topics in Optoelectronic Semiconductors	3/3	1	1
太陽電池學特論 Special Topics in Solar Cells	3/3	1	1
非線性光學 Nonlinear Optics	3/3	1	1
多體物理(一)	3/3	1	1

Many-body Physics I			
有機半導體物理 Organic Semiconductor Physics	3/3	1	1
光譜學 Spectroscopy	3/3	1	1
科學概念改變研究 Research in Science Conceptual Development	3/3	1	1
電漿物理(一) Plasma Physics I	3/3	1	1
天文物理導論 Introduction to Astrophysics	3/3	1	1
材料模擬科學導論(一) Material Simulation Science I	3/3	1	1
應用量子力學(一) Applied Quantum Mechanics I	3/3	1	1
獨立研究(二) Individual Studies II	3/0	1	2
電磁波系統與元件技術(下) Techniques of Systems and Components for Electromagnetic Waves (II)	3/3	1	2
光電子學 Optoelectronics	3/3	1	2
物理課程與教學研究 Research in Physics Curriculum and Instruction	3/3	1	2
電腦在物理教育上的應用 Applications of Computer in Physics Education	3/3	1	2
中小學科學課程研究 Research Methods in Science Education	3/3	1	2
半導體物理 Semiconductor Physics	3/3	1	2
半導體表面與界面 Semiconductor Surfaces and Interfaces	3/3	1	2
電腦模擬 Computer Simulation	3/3	1	2
低溫物理 Low Temperature Physics	3/3	1	2
非線性力學特論 Special Topics in Nonlinear Dynamics	3/3	1	2
基本粒子物理 Elementary Particle Physics	3/3	1	2
雷射原理與應用 Principles and Applications of Lasers	3/3	1	2
磁性物理特論 Special Topics in the Physics of Magnetism	3/3	1	2
奈米結構製程(二) Processes for Nanostructure Fabrication II	3/3	1	2
質的研究法 Qualitative Research	3/3	1	2
教育統計(二) Educational Statistics II	3/3	1	2
固態物理(二) Solid State Physics II	3/3	1	2
奈米電子學(二) Nano-Electronics II	3/3	1	2

物理教育專題(二) Project in Physics Education II	3/3	1	2
自旋電子學 Spintronics	3/3	1	2
量子力學(二) Quantum Mechanics II	3/3	1	2
物理教育論文寫作(二) Physics Education Academic Writing II	3/3	1	2
測驗與評量研究 Research of Educational Testing and Measurement	3/3	1	2
探究教學理論與實務 Inquiry Teaching Theory and Practice	3/3	1	2
熱電物理特論(二) Special Topics in Thermoelectric II	3/3	1	2
高效能計算 High Performance Computing	3/3	1	2
固態光學 Solid State Optics	3/3	1	2
半導體光學 Semiconductor Optics	3/3	1	2
自旋電子學專題 Special Topics on Spintronics	3/3	1	2
低維度磁結構物理 Physics of Magnetic Structures in Low Dimension	3/3	1	2
奈米材料(二) Nano-Materials II	3/3	1	2
物理專題(二) Individual Studies in Physics II	3/3	1	2
幾何光學 Geometrical Optics	3/3	1	2
光電半導體元件 Optoelectronic Devices	3/3	1	2
量子場論專題 Special Topics in Quantum Field Theory	3/3	1	2
液晶光學 Liquid-Crystal Optics	3/3	1	2
多體物理(二) Many-body Physics II	3/3	1	2
原子核物理 Nuclear Physics	3/3	1	2
電漿物理(二) Plasma Physics II	3/3	1	2
固態物理導論(一) Introduction to Solid State Physics I	3/3	1	2
固態物理導論(二) Introduction to Solid State Physics II	3/3	1	2
材料模擬科學導論(二) Material Simulation Science II	3/3	1	2
顯示光學 Display optics	3/3	1	2
應用量子力學(二) Applied Quantum Mechanics II	3/3	1	2
專題討論(三) Seminar III	1/2	2	1

雷射物理 Laser Physics	3/3	2	1
科學史與物理教育 History of Science and Physics Education	3/3	2	1
古典力學 Classical Mechanics	3/3	2	1
半導體物理與元件 Semiconductor Physics and Device	3/3	2	1
半導體物理特論 Special Topics in Semiconductor Physics	3/3	2	1
超導體物理 Superconductivity	3/3	2	1
X光繞射專題 Special Topics on X-ray Diffraction	3/3	2	1
原子與分子物理 Atomic and Molecular Physics	3/3	2	1
相對論 Relativity	3/3	2	1
冷原子物理特論 Special Topics in Ultracold Atomic Physics	3/3	2	1
群論與物理 Group Theory and Physics	3/3	2	1
半導體雷射特論 Special Topics in Semiconductor Lasers	3/3	2	1
物理教材教法研究 Seminar in Methods and Materials for Teaching the Physics	3/3	2	1
計算物理 Computational Physics	3/3	2	1
物理教學活動設計(一) Activity Design in Physics Education I	3/3	2	1
遠距教學研究 Research in Distance Instruction	3/3	2	1
軟物質物理 Soft Matter Physics	3/3	2	1
磁性物理 Physics of Magnetism	3/3	2	1
物理專題(三) Individual Studies in Physics III	3/3	2	1
材料物理特論(二) Special Topics in the Physics of Materials II	3/3	2	1
高等教育統計(一) Advanced Educational Statistics I	3/3	2	1
物理教育專題(三) Individual Studies in Physics Education III	3/3	2	1
科學學習心理學 Psychology of Science Learning	3/3	2	1
高等固態物理特論 Special Topics in Advanced Solid State Physics	3/3	2	1
液晶光學特論 Special Topics in Liquid-Crystal Optics	3/3	2	1
物理數學特論 Special Topics in the Mathematical Methods for Physics	3/3	2	1
量子光學 Quantum Optic	3/3	2	1

磁性氧化物專題(一) Special Topics in Magnetic Oxides I	3/3	2	1
專題討論(四) Seminar IV	1/2	2	2
高等物理教育專論 Advanced Special Topics in Physics Education	3/3	2	2
科技論文導讀 Introduction to Scientific Reading	3/3	2	2
科技論文寫作 Introduction to Scientific Writing	3/3	2	2
光電半導體元件特論 Special Topics in Optoelectronic Semiconductor Devices	3/3	2	2
電動力學(二) Electrodynamics II	3/3	2	2
物理教學活動設計(二) Activity Design in Physics Education II	3/3	2	2
認知心理學專論 Cognitive Psychology	3/3	2	2
高分子物理 Polymer Physics	3/3	2	2
高等物理數學(二) Advanced Mathematical Methods in Physics II	3/3	2	2
發光材料與應用 Luminescent Materials and Applications	3/3	2	2
發光二極體特論 Special Topics in Light-Emitting Diodes	3/3	2	2
科學教育專題 Introduction to Theory and Practice in Science Education	3/3	2	2
科學教育專題特論 Special Topics on Themes and Issues in Science Education	3/3	2	2
物理專題(四) Individual Studies in Physics IV	3/3	2	2
材料物理特論(一) Special Topics in the Physics of Materials I	3/3	2	2
高等教育統計(二) Advanced Educational Statistics II	3/3	2	2
物理教育專題(四) Individual Studies in Physics Education IV	3/3	2	2
半導體表面與界面特論 Special Topics in Semiconductor Surface and Interfaces	3/3	2	2
幾何與拓樸在物理中的應用 Applications of Geometry and Topology in Physics	3/3	2	2
積體光學 Integrated Optics	3/3	2	2
傅氏光學 Fourier Optics	3/3	2	2
生物物理 Biological Physics	3/3	2	2
量子資訊特論 Special Topics in Quantum Information Theory	3/3	2	2
量子光學特論 Special Topics in Quantum Optics	3/3	2	2
高等粉末X光繞射專題 Special Topics in Advanced Powder X-ray Diffraction	3/3	2	2

有機發光二極體 Organic Light-Emitting Diodes	3/3	2	2
粉末X光繞射結構鑑定 Structural Determination from Powder X-ray Diffraction	3/3	2	2
磁性氧化物專題(二) Special Topics in Magnetic Oxides II	3/3	2	2

三.先修科目
Ⅲ.Prerequisite Courses

先修課程 Prerequisite Course	後修課程 Subsequent Course

四.畢業條件
Ⅳ.Graduation Requirements

1. 最低畢業學分數為20學分，包含必修2學分、選修18學分，不含「論文指導(一)(二)」6學分及教育學分；凡註冊後應至少修習一門科目(含論文)，否則應辦理休學。已修畢最低畢業學分數而論文尚在撰寫中者，次學年起每學期必須選修「論文」。
2. 於碩士班時，已修習過博士班開設之專業領域選修課程相同且未納入碩士班畢業學分數內者，若成績審查通過得以依學校規定申請抵免。
3. 凡選修本系博士班及光電科技研究所博士班所開設課程(不限學期)，一律可採認為畢業學分數。
4. 修業年限：至少兩年，至多七年(不含休學期間)。
5. 入學後，三年內（不計休學期間）須通過資格考(含一般生及在職生)，未於期限內通過者，報請學校予以退學。資格考試規定依本系「博士班博士學位資格考試施行細則」辦理。
6. 博士班研究生於取得博士學位前，必須發表(或被接受)至少二篇以上(含)之論文，其中至少一篇為第一作者(不計指導教授及共同指導教授)，並依本系訂定之「博士班修業規定」修業。
7.研究生應於申請學位考試前修習通過於「臺灣學術倫理教育資源中心」(https://ethics.nctu.edu.tw/)網路教學平台之「學術研究倫理教育」課程等相關規定。
8.本校學生修習遠距教學課程，其修習學分(含抵免學分)總數以不超過畢業總學分之二分之一為限。

1. The minimum graduation credit of the department is 20 credits, including 2 required credits and 18 elective credits. Thesis Supervision (1) (2) 6 credits and education credits are not counted as graduation credits, and those who should take at least one subject (including thesis) after registration, otherwise they should be suspended. Those who have completed the minimum number of graduation credits and are still working on their thesis are required to take the " Thesis Supervision " in each semester from the next academic year.
2. If students have taken elective doctoral courses in the same professional field during their master's program, and these courses have not been regarded as their master's degree graduation credits, they may apply for a waiver based on the institution's regulations after grades examination.
3. All courses offered by the doctoral programs of this department and the Graduate Institute of Photonics, regardless of the semester, can be regarded as graduation credits.
4. The duration for the completion of the doctoral degree is no less than two academic years and no more than seven academic years (excluding periods of voluntary suspension).
5. It is required for students (including both full-time and part-time) to advance to PhD candidates before the end of the 3rd academic year (excluding periods of voluntary suspension). Otherwise, students will be terminated from the doctoral program. The regulations for the qualifying examination are governed by the department's "Doctoral Qualifying Examination Implementation Rules."
6. To qualify for the doctoral degree, doctoral students must publish (or have accepted) at least two SCI journal articles, being the first author on at least one of these articles (excluding the advisor and co-advisor). Additionally, students must comply with the " Requirements and Course Outline for NCUE Physics Doctoral Degree".
7. Graduate students should study the relevant regulations of the "Academic Research Ethics Education" course of the "Taiwan Academic Ethics Education Resource Center"

(https://ethics.nctu.edu.tw/) online teaching platform before applying for the degree examination.
8. The total credits from online courses (including waived credits) cannot exceed half of the graduation credits.