课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	**课程名称 Course Title**	**医用大学物理 Physics for Health Sciences**
2.	**授课院系 Originating Department**	南方科技大学伦敦国王学院医学院 SUSTech-KCL School of Medicine
3.	**课程编号 Course Code**	JEIS101
4.	**课程学分 Credit Value**	4
5.	**课程类别 Course Type**	通识必修课程 General Education (GE)Required Courses
6.	**授课学期 Semester**	秋季 Fall
7.	**授课语言 Teaching Language**	英文 English
8.	**授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）**	Min Ding, Department of Earth and Space Sciences, dingm@sustech.edu.cn,
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	待公布 To be announced
10.	**选课人数限额(可不填) Maximum Enrolment （Optional）**	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
学时数 Credit Hours	64				64

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 N/A
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 N/A

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

Physics for Health Sciences aims to provide a thorough understanding of fundamental physics concepts, including mechanics, fluid dynamics, thermodynamics, electromagnetism, waves, sound, and modern physics. It focuses on applying these principles to medical technologies and physiological processes, enhancing problem-solving and critical thinking skills. The course/module emphasizes the importance of accurate measurements, understanding thermodynamic processes, fluid dynamics, electricity and magnetism, and wave and sound principles. Additionally, it covers modern physics concepts and the analysis of radiation and its effects, equipping students with the knowledge to integrate physics into their future medical practice.

16. 预达学习成果 Learning Outcomes

By the end of this course/module, students will have a strong understanding of fundamental physics concepts, including mechanics, fluid dynamics, thermodynamics, electromagnetism, waves, sound, and modern physics. They will be adept at applying these principles to various scientific and practical scenarios, demonstrating enhanced problem-solving and critical thinking skills. Students will be proficient in interpreting and analysing data, accurately measuring and converting units, and understanding the principles of heat transfer, fluid flow, and electrical and magnetic fields. Additionally, they will grasp the basics of modern physics, including relativity and quantum theory, and understand the principles and safety considerations of radiation, preparing them for advanced study and interdisciplinary collaboration in their future careers.

17. 课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Chapter 1: Introduction, Measurement, Estimating (6 hours)

1. Introduction to Physics in Health Sciences
2. How Science Works
3. Models, Theories, and Laws
4. Measurement and Uncertainty; Significant Figures
5. Units, Standards, and the SI System
6. Converting Units
7. Order of Magnitude: Rapid Estimating
8. *Dimensions and Dimensional Analysis (optional)*

Chapter 2: Kinematics (8 hours)

1. Reference Frames and Displacement
2. Average Velocity
3. Instantaneous Velocity
4. Acceleration
5. Motion at Constant Acceleration
6. Solving Problems
7. Freely Falling Objects
8. *Variable Acceleration; Integral Calculus (optional)*
9. Vectors and Scalars
10. Addition of Vectors—Graphical Methods
11. Subtraction of Vectors, and Multiplication of a Vector by a Scalar
12. Adding Vectors by Components
13. Unit Vectors
14. Vector Kinematics
15. Projectile Motion
16. Solving Problems Involving Projectile Motion
17. Relative Velocity

Chapter 3: Fluid Dynamics (8 hours)

1. Properties of Fluids
2. Density and Specific Gravity
3. Pressure in Fluids
4. Atmospheric Pressure and Gauge Pressure
5. Pascal's Principle
6. Measurement of Pressure; Gauges and the Barometer
7. Buoyancy and Archimedes' Principle
8. Fluids in Motion; Flow Rate and the Equation of Continuity
9. Bernoulli's Equation
10. Applications of Bernoulli's Principle: Torricelli, Airplanes, Baseballs, Blood Flow

Chapter 4: Thermodynamics (8 hours)

1. Temperature and Heat
2. Thermal Equilibrium and the Zeroth Law of Thermodynamics
3. Thermal Expansion
4. The Ideal Gas Law
5. Heat Transfer: Conduction, Convection, Radiation

6. The First Law of Thermodynamics
7. The Second Law of Thermodynamics

Chapter 5: Electricity and Magnetism (12 hours)

1. Static Electricity; Electric Charge and Its Conservation
2. Electric Charge in the Atom
3. Insulators and Conductors
4. Induced Charge; the Electroscope
5. Coulomb's Law
6. The Electric Field
7. Electric Field Calculations for Continuous Charge Distributions
8. Field Lines
9. Electric Fields and Conductors
10. Electric Potential Energy and Potential Difference
11. Capacitors and Dielectrics
12. Electric Current and Ohm's Law
13. Resistance and Resistivity
14. Kirchhoff's Rules
15. Magnetic Fields
16. Electromagnetic Induction and Faraday's Law

Chapter 6: Waves and Sound (8 hours)

1. Wave Properties
2. Types of Waves: Transverse and Longitudinal
3. Energy Transported by Waves
4. Sound Waves and Their Properties
5. Intensity of Sound: Decibels

Chapter 7: Modern Physics (8 hours)

1. Introduction to Quantum Physics
2. Atomic and Nuclear Physics
3. Radioactivity and Nuclear Reactions
4. Photon Theory of Light and the Photoelectric Effect
5. Wave-Particle Duality

Chapter 8: Radiation and Medical Imaging (6 hours)

1. Types of Radiation
2. Radiation Sources and Detection
3. X-rays and Computed Tomography (CT)
4. Magnetic Resonance Imaging (MRI) and Ultrasound
5. Radiation Therapy
6. Safety and Protection

以上课程信息可能根据实际授课需要或在课程优化之后产生变动。如对课程有任何疑问，请联系授课教师。
The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

18. 教材及其它参考资料 Textbook and Supplementary Readings

南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Physics for Scientists and Engineers with Modern Physics, 5th edition, Douglas C. Giancoli

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance	weekly	10		
课堂表现 Class Performance	weekly	5		
小测验 Quiz	monthly	15		
课程项目 Projects				
平时作业 Assignments	Bi-weekly	20		
期中考试 Mid-Term Test	Mid-term	20		
期末考试 Final Exam	Final	30		
期末报告 Final Presentation				
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)				

20. 记分方式 GRADING SYSTEM

√ A. 十三级等级制 **Letter Grading**
☐ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. **本课程设置已经过以下责任人/委员会审议通过**
This Course has been approved by the following person or committee of authority

The course has been reviewed and approved by the JEI New Course Review Panel Meeting (新课程审核小组会议纪要)
It is a fundamental physics course/module required by the BMS curriculum. The instructor is competent and has experience teaching the course/module, and the course content and Syllabus are appropriate for the BMS curriculum. The required teaching facility is available.
The teaching materials were reviewed. Their political, ideological, scientific and applicability meet the requirements of the JEI, and no issues are observed in their political standpoint and value orientation.

Signature of the Executive Dean: Date: