东北大学秦皇岛分校本科课程教学大纲

一、课程基本信息

<table>
<tr><td>开课单位</td><td colspan="3">东北大学悉尼智能科技学院</td><td>课程代码</td><td colspan="5">3100213044</td></tr>
<tr><td>中文名称</td><td colspan="8">计算机图形学</td></tr>
<tr><td>英文名称</td><td colspan="8">Computer Graphics</td></tr>
<tr><td>总学时</td><td>32</td><td>理论学时</td><td>32</td><td>实验学时</td><td>0</td><td>上机学时</td><td>0</td><td>设计学时</td><td>0</td><td>课外学时</td><td>0</td></tr>
<tr><td>学　分</td><td>2</td><td colspan="10"></td></tr>
<tr><td>课程类型</td><td colspan="8">☐理论课程　☑理论（含实验）课程　☐实践类课程</td></tr>
<tr><td>课程类别</td><td colspan="8">□通识类　☑学科基础类　□专业方向类　□实践类</td></tr>
<tr><td>适用专业</td><td colspan="8">计算机科学与技术</td></tr>
<tr><td>先修课程</td><td colspan="8">《智能数据分析导论》《C++程序设计基础》</td></tr>
<tr><td>建议开课学期</td><td colspan="8">☐1-1 ☐1-2 ☐2-1 ☐2-2 ☑3-1 ☐3-2
☐4-1 ☐4-2 ☐5-1 ☐5-2 ☐*（代表每学期都开设）</td></tr>
<tr><td>考核方式</td><td colspan="3">□考试 ☑考查</td><td>成绩分制</td><td colspan="4">☑百分制 □五级制 □二级制</td></tr>
<tr><td>使用教材</td><td colspan="8">《计算机图形学及其实践教程》，黄静，
机械工业出版社，ISBN：9787111503842</td></tr>
<tr><td>参考书
及教学资源</td><td colspan="8">Fundamentals of Computer Graphics, 4th Edition
by Steve Marschner, Peter Shirley
Publisher(s): A K Peters/CRC Press
ISBN: 9781315360201</td></tr>
<tr><td>其他说明</td><td colspan="8">无</td></tr>
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二、课程简介

中文描述

随着现代计算机技术的飞速发展，计算机图形学已成为计算机科学中最活跃的分支之一，广泛应用于游戏开发、电影制作、虚拟现实、计算机辅助设计制造等多个领域，具有良好的发展前景。

《计算机图形学》课程是计算机科学与技术专业的重要专业课，它旨在为学生打下坚实的计算机图形学理论基础，并通过实践操作培养学生的算法理解与设计能力。课程覆盖了计算机图形学有关领域的基本概念、发展历程、关键技术以及最新进展。学生将学习基本图形的生成算法、几何变换、模型与纹理、曲线和曲面构造等核心知识，理解并掌握图形学中的数学工具及其在工程应用中的有关算法。通过课程学习，学生能够掌握计算机图形学的基本原理，了解图形处理单元的工作方式。熟悉常用图形库和开发工具，掌握常见图形算法和数据结构，理解并掌握相关模型、映射、线面构造，具备初步的图形仿真能力。

课程注重培养学生的创新思维和实践能力，通过丰富的实践作业，课程使学生亲身体验图形学相关技术的实现过程，理解计算机图形学在中国与全球的发展趋势，提升解决实际问题的能力，为后续深造及职业生涯的长远发展奠定坚实基础。同时，课程还融入了课程思政元素，引导学生将个人成长与行业、社会发展有机结合，培育学生的工匠精神，引导学生将个人成长与行业、社会发展有机联系。

English Description

With the rapid development of modern computer technology, Computer Graphics has become one of the most active branches in Computer Science, widely used in various fields such as game development, film production, virtual reality, computer-aided design and manufacturing, and it holds great promise for future development.

The subject is a significant specialized subject in Computer Science and Technology. It aims to provide students with a solid theoretical foundation in Computer Graphics and cultivate their algorithmic understanding and design capabilities through practical operations. The subject covers the basic concepts, development history, key technologies, and latest advancements related to Computer Graphics. Students will learn core knowledge such as basic graphics generation algorithms, geometric transformations, models and textures, curve and surface construction, and comprehend and master the mathematical tools in graphics and their related algorithms in engineering applications. Through the subject, students will be able to grasp the fundamental principles of Computer Graphics, understand the working mechanisms of Graphics Processing Units (GPUs), become familiar with common graphics libraries and development tools, master common graphics algorithms and data structures, comprehend and grasp relevant models, mappings, and line and surface constructions, and possess initial graphics simulation capabilities.

The subject emphasizes cultivating students' innovative thinking and practical abilities. Through a wealth of practical assignments, the subject enables students to personally experience the implementation process of Computer Graphics-related technologies and enhance their problem-solving skills. Meanwhile, the subject also incorporates ideological and political elements, guiding students to integrate personal growth with industry and societal development, fostering social responsibility and professional ethics.

三、课程目标

1、知识目标：

1-1. 理解计算机图形学的应用领域及发展趋势、数学工具在计算机图形学中的应用。

Understand the application areas and development trends of computer graphics, as well as the application of mathematical tools in computer graphics.

1-2. 掌握使用图形学与数学方法实现图形表示、生成、处理的相关算法与工具。

Master the relevant algorithms and tools for graphic representation, generation, and processing using graphics and mathematical methods.

1-3. 掌握使用计算机实现图形显示，进行图形计算、处理的相关原理与技术。

Master the principles and techniques related to graphic display, computation, and processing implemented by computers.

2、能力目标：

2-1. 理解计算机处理图形的整体过程，掌握图像表示、几何变换等概念。

Understand the overall process of computer graphic processing and grasp concepts such as image representation and geometric transformation.

2-2. 理解渲染技术和效果的实现原理、掌握光照模型、着色等概念和技术。

Understand the principles of rendering techniques and effects, and grasp concepts and techniques such as lighting models and shading.

2-3. 掌握常用的计算机图形学算法与工具，提升理解能力、设计能力、实践能力。

Master computer graphics algorithms & tools to enhance understanding, design, and practical abilities.

3、德育/素养目标：

3-1. 树立工匠精神，注重精益求精，培养诚实守信、勤奋努力的品质。

Cultivate a craftsmanship spirit, fostering qualities of continuous improvement, honesty, trustworthiness, diligence, and hard work.

3-2. 将个人成长与行业、产业、社会发展有机联系，具备社会责任感。

Connect personal growth with industry and societal development and possess social responsibility.

3-3. 强化美学素养与跨学科沟通能力，促进计算机图形学领域的跨学科交流与合作。

Strengthen aesthetic literacy and interdisciplinary communication skills to promote cooperation.

表 1 课程目标与毕业要求的对应关系

毕业要求	指标点	课程目标	关联性（H/M/L）
1、工程知识：能够将数学、自然科学、工程基础和专业知识用于解决复杂工程问题。	指标点 1-3：了解本专业涉及相关行业的发展趋势以及相关产业的运营模式，具备在本专业相关领域进行工程设计、技术创新的能力。	1-1 3-1 3-2	L
2、问题分析：能够应用数学、自然科学和工程科学的基本原理、方法和手段，识别、表达、并通过文献研究分析复杂工程问题，以获得有效结论。	指标点 2-1：专业知识掌握扎实，了解中国和世界经济领域及其研究的最新动态和发展趋势；能够应用数学、自然科学和工程科学的基本原理、方法和手段，分析、识别、表达本专业相关的复杂工程问题；	1-2 1-3 2-1 2-2 3-2	H

3、设计/开发解决方案：能够设计针对复杂工程问题的解决方案，设计满足特定需求的系统、单元或流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。	指标点 3-1：能够设计针对本专业相关复杂工程问题的解决方案，能够设计和开发实现特定功能、满足特定需求的计算机、软件或网络系统；	1-2 1-3 2-2 2-3	M
	指标点 3-2：能够对不同设计方案进行比较和优化，在工作各环节中具有创新意识；	1-1 1-3 2-3 3-3	M

四、主要教学内容

（一）理论教学

第 1 章 计算机图形学概论 An Intro to Computer Graphics（支撑课程目标 1-1、2-1、2-2）

【1】知识点：

1-1 计算机图形学的基本概念与研究内容。

Basic concepts and research contents of computer graphics.

1-2 计算机图形学的应用领域。

Application areas of computer graphics.

1-3 计算机图形学中的热点问题与发展趋势。

Hot topics and development trends in computer graphics.

【2】学习目标：

2-1 理解计算机图形学的基本概念及其在计算机科学中的地位。

Understand the basic concepts of computer graphics and its position in computer science.

2-2 掌握计算机图形学的主要研究内容与应用领域。

Master the main research contents and application areas of computer graphics.

2-3 了解计算机图形学的用用，当前的热点问题与发展趋势。

Know the current applications, hot topics and development trends in computer graphics.

【3】重点内容：

3-1 计算机图形学的基本定义，包括其研究目标与核心问题。

Definition of computer graphics, including its research objectives and core issues.

3-2 计算机图形学的主要应用领域，如娱乐、医疗、教育等。

Major application areas of computer graphics, such as entertainment, medical, education, etc.

3-3 计算机图形学中的关键技术与发展方向，包括渲染技术、建模技术等。

Key technologies and development directions in computer graphics, including rendering techniques, modeling techniques, etc.

【4】难点内容：

4-1 深入理解计算机图形学中的渲染管线与真实感图形生成技术。

Deep understanding of the rendering pipeline and realistic image generation techniques in computer graphics.

4-2 探讨计算机图形学在虚拟现实与增强现实等新兴领域的应用挑战。

Explore the application challenges of computer graphics in emerging fields such as virtual reality and augmented reality.

【5】思政案例：

5-1 计算机图形学在文化遗产保护与数字化重建中的应用，体现技术的人文价值。

Application of computer graphics in cultural heritage preservation and digital reconstruction, highlighting the humanitarian value of technology.

第 2 章 图形学系统基本构成 Graphics System & Basic Primitives（支撑课程目标 1-2、1-3、3-1）

【1】知识点：

1-1 图形软件与发展历程。

Development and of computer graphics software.

1-2 基本概念，包括刷新率、像素、点距、分辨率、帧缓冲区等。

Basic concepts such as refresh rate, pixels, dot pitch, resolution, frame buffer, etc.

1-3 基本图元的生成算法。

Algorithms for generating basic primitives.

【2】学习目标：

2-1 理解计算机图形学系统的构成及其工作原理。

Understand the composition and working principles of computer graphics systems.

2-2 掌握计算机图形学中的基本概念，并能解释其在图形显示中的作用。

Master the basic concepts in computer graphics and explain their roles in graphics display.

2-3 理解基本图元的生成算法。

Understand algorithms for generating basic primitives.

【3】重点内容：

3-1 计算机图形学系统的组成，包括硬件与软件部分。

Composition of computer graphics systems, including hardware and software components.

3-2 图形显示中的基本概念，如刷新率、像素等，及其对图形质量的影响。

Basic concepts in graphics display, such as refresh rate and pixels, and their impact on graphics quality.

3-3 基本图元（如点、线、圆）的生成算法，包括其数学原理与应用。

Algorithms for generating basic primitives (such as points, lines, circles), including their mathematical principles and applications.

【4】难点内容：

4-1 深入理解扫描转换过程中的细节处理，如抗锯齿技术。

Deep understanding of detail handling in scan conversion, such as anti-aliasing techniques.

4-2 掌握并应用复杂的直线与圆的生成算法，如中点圆算法与 Bresenham 直线算法。

Master and apply complex algorithms for line and circle generation, such as the midpoint circle algorithm and the Bresenham line algorithm.

4-3 探讨基本图元生成算法在三维图形学与实时渲染中的应用与优化。

Explore the application and optimization of basic primitive generation algorithms in 3D graphics and real-time rendering.

【5】思政案例：

5-1 计算机图形学在教育与科普中的创新应用，推动科学知识与技术的普及。

Innovative applications of computer graphics in education and science popularization, promoting the dissemination of scientific knowledge and technology.

5-2 实时图形渲染技术在虚拟现实产业中的发展，及其对现代多媒体产业的影响。

The development of real-time graphics rendering technology in virtual reality industry, and its impact on the modern multi-media industry.

第 3 章 多边形扫描与二维视图 Polygon Scan & 2D Viewing（支撑课程目标 1-3, 2-2, 3-2）

【1】知识点：

1-1 多边形扫描转换与二维视图的基本概念。

Basic concepts of polygon scan conversion and 2D viewing.

1-2 光栅图形的抗锯齿技术。

Raster graphics' anti-aliasing techniques.

1-3 多边形的扫描转换与区域填充算法。

Polygon scan conversion and region filling algorithms.

1-4 二维观察过程。

2D observation process.

【2】学习目标：

2-1 理解多边形扫描转换在计算机图形学中的基础作用。

Understand the fundamental role of polygon scan conversion in computer graphics.

2-2 掌握光栅图形抗锯齿技术的原理与应用。

Master the principles and applications of raster graphics' anti-aliasing techniques.

2-3 熟练掌握多边形扫描转换与区域填充算法的实现。

Be proficient in implementing polygon scan conversion and region filling algorithms.

2-4 了解二维观察过程。

Know about the 2D observation process.

【3】重点内容：

3-1 多边形扫描转换的基本概念及其在图形渲染中的重要性。

Concepts of polygon scan conversion and its importance in graphics rendering.

3-2 光栅图形抗锯齿技术的实现方法，如 MSAA、SSAA 等。

Implementation methods of raster graphics' anti-aliasing, such as MSAA, SSAA, etc.

3-3 多边形扫描转换算法，包括扫描线算法的使用。

Polygon scan conversion algorithms, including the scan-line algorithm.

【4】难点内容：

4-1 分析不同抗锯齿技术对抗图形锯齿效果的影响与性能。

Analyze of different anti-aliasing techniques on combating graphical aliasing.

4-2 探讨多边形裁剪算法在处理复杂场景时的优化策略。

Explore optimization strategies for polygon clipping algorithms when dealing with complex scenes.

【5】思政案例：

5-1 图形处理技术在科学计算与工程仿真中的应用、在推动产业升级中的作用。

Applications of geometric transformations and graphics processing technology in scientific computing and engineering simulation, emphasizing their role in promoting industrial upgrading.

第 4 章 图形变换与三维投影 Transformation, 3D Projection （支撑课程目标 2-2, 2-3, 3-1）

【1】知识点：

1-1 基本几何变换。

Basic geometric transformations.

1-2 3D 复合变换与观察过程、坐标系的确定。

3D composite transformation & observation process; determination of coordinate system.

1-3 基本几何变换操作。

Specific operations of basic geometric transformation.

【2】学习目标：

2-1 理解基本几何变换在计算机图形学中的作用与应用。

Understand the role & applications of basic geometric transformations in computer graphics.

2-2 掌握 3D 复合变换的原理与方法。

Master the principles and methods of 3D composite transformation.

2-3 了解 3D 观察过程及观察坐标系的确定方法。

Know the 3D observation process and how to determine the observation coordinate system.

2-4 熟练掌握基本几何变换的具体操作。

Be proficient in the specific operations of basic geometric transformations.

【3】重点内容：

3-1 基本几何变换的概念、性质及其在图形学中的重要性。

Concepts, properties, and importance of basic geometric transformations in computer graphics.

3-2 3D 复合变换的实现步骤与应用实例。

Implementation steps and application examples of 3D composite transformation.

3-3 3D 观察过程的原理，包括观察坐标系的建立与变换。

Principles of the 3D observation process, including the establishment and transformation of the observation coordinate system.

3-4 基本几何变换的数学表达与计算方法。

Mathematical expressions and calculation methods for basic geometric transformations.

【4】难点内容：

4-1 3D 复合变换中矩阵运算的原理与应用。

Principles and applications of matrix operations in 3D composite transformation.

4-2 观察坐标系的确定方法及其在 3D 图形渲染中的应用。

Method of determining observation coordinate system and its application in 3D graphics rendering.

4-3 基本几何变换在图形处理中的应用与优化策略。

Application & optimization strategies of basic geometric transformations in graphics processing.

【5】思政案例：

5-1 3D 技术在虚拟现实与增强现实中的应用，探讨其对现代科技与社会生活的影响。

Application cases of 3D projection and observation technology in VR/AR, exploring their impact on modern technology and social life.

第 5 章 真实感渲染 Realistic Rendering （支撑课程目标 1-1, 2-1, 2-2, 2-3, 3-2, 3-3）

【1】知识点：

1-1 计算机图形学中的光照模型。

Light models in computer graphics.

1-2 计算机图形学中的曲线与曲面表示。

Curve and surface modeling in computer graphics.

1-3 三维表示与真实渲染技术。

Techniques of 3D objects representation and realistic rendering.

【2】学习目标：

2-1 理解光照模型在计算机图形学中的作用与应用。

Understand the role and application of light models in computer graphics.

2-2 掌握曲线与曲面的基本概念及其在计算机图形学中的表示方法。

Master the basic concepts of curves and surfaces and their representation in computer graphics.

2-3 理解三维对象的表示方法及其在计算机图形学中的重要性。

Understand the representation of 3D objects and its importance in computer graphics.

2-4 掌握真实感渲染的基本原理与技术。

Master the principles and techniques of realistic rendering.

【3】重点内容：

3-1 光照模型的基本概念与分类，包括环境光、漫反射、镜面反射等。

Concepts and classifications of light models, including ambient, diffuse, and specular lighting.

3-2 曲线与曲面的表示方法，如参数方程等。

Representation methods for curves and surfaces, such as parametric equations.

3-3 三维对象的表示方法，包括多边形网格等。

Representation methods for 3D objects, including polygon meshes.

3-4 真实感渲染技术，如光照计算、纹理映射、阴影处理等。

Techniques for realistic rendering, such as lighting calculations, texture mapping & shadow handling.

【4】难点内容：

4-1 理解光照模型中的复杂光照效果。

Understand complex lighting effects in light models

4-2 曲线与曲面的高级建模技术，如细分曲面等。

Advanced modeling techniques for curves and surfaces, such as subdivision surfaces.

4-3 真实感渲染中的高级技术，如光线追踪、辐射度方法等。

Advanced techniques in realistic rendering, such as ray tracing and radiosity methods.

【5】思政案例：

5-1 先进三维建模在医疗领域的应用案例，如手术模拟等，展现其对社会的积极影响。

Application cases of computer graphics in the medical field, such as surgical simulation, showcasing its positive impact on society.

五、教学安排与学时分配

本课程以课堂教学为主，辅以实验教学与丰富的线上学习资源。课堂教学内容围绕计算机图形学的基本概念、基本理论、基本原理和实践操作展开，深入探讨计算机图形学的光照模型、曲线与曲面建模、三维对象表示及真实感渲染等核心知识点。课程秉承立德树人的根本任务，以培养德智体美劳全面发展的社会主义建设者和接班人为总目标。在教学过程中充分利用线下课堂、线上教学资源和思政案例，通过理论知识的传授、实验实践的操作以及价值观的引导，旨在厚植学生的家国情怀和强国理念，强化学生的计算机图形学基础知识、提升实践技能和创新精神，帮助学生树立正确的人生观、世界观和价值观。

学时分配如表 3 所示。

This subject is primarily based on classroom teaching, supplemented by experimental teaching and abundant online learning resources. The classroom teaching content revolves around the basic concepts, theories, principles, and practical operations of computer graphics, delving deeply into core knowledge points such as lighting models, curve and surface modeling, 3D object representation, and realistic rendering in computer graphics. The subject adheres to the fundamental task of fostering virtue through education, with the overall goal of cultivating socialist builders and successors who are comprehensively developed in ethics, intellect, physique, aesthetics, and labor. In the teaching process, the subject fully utilizes offline classrooms, online teaching resources, and ideological and political cases. Through the imparting of theoretical knowledge, experimental and practical operations, as well as the guidance of values, it aims to foster students' patriotic sentiments and the concept of strengthening the country, enhance their fundamental knowledge of computer graphics, elevate their practical skills and innovative spirit, and help them establish correct outlooks on life, the world, and values.

The class hour allocation related information is shown in Table 3.

表 3 学时分配表

讲　　课　　内　　容		学时				
		讲课	实验	上机	设计	课外
第 1 章	计算机图形学概论 An Intro to Computer Graphics	4	0	0	0	0

第 2 章	图形学系统基本构成 Graphics System & Basic Primitives	8	0	0	0	0
第 3 章	多边形扫描与二维视图 Polygon Scan & 2D Viewing	8	0	0	0	0
第 4 章	图形变换与三维投影 Transformation, 3D Projection	8	0	0	0	0
第 5 章	真实感渲染 Realistic Rendering	4	0	0	0	0
小计		32	0	0	0	0
总计	32					

六、教学方法

1、理论结合实践：先讲解计算机图形学基本原理与技术，再通过作业提升学生实践能力。Combine theory with practice: Firstly, explain the basic principles and techniques of computer graphics, and then improve students' practical ability through assignments.

2、案例分析法：选取实际计算机图形学案例，引导学生分析问题，讨论解决方案，培养学生对课程相关实际科研工作环境的理解、解决实际问题的能力。

Case analysis method: Select actual cases, guide students to analyze the causes of the problems, discuss solutions, and cultivate their ability to solve practical problems.

3、互动式教学：课堂上采用提问、小组讨论等形式，激发学习兴趣，加深对知识点的理解；结合线上平台活动、资源与课堂讨论、实践，提升学习灵活性，促进课程内容的全面理解。

Interactive T&L: Engage students through question-asking and group discussions, utilizing both online platforms and offline classes to promote a comprehensive understanding of the subject matter.

4、课程思政融入：融入课程思政元素、定期更新教学内容，引入最新的技术和发展趋势，让学生紧跟行业步伐、关心社会需求与人民需要，拓宽学科视野。

Incorporate ideological elements, allow students to keep up with industry trends, care about social needs and people's needs, and broaden their disciplinary horizons.

5、引进一流国际资源：丰富学生的学习资源，同时帮助学生提升课程相关领域的英语专业能力，拓宽国际视野，紧跟国际技术发展前沿。

Introduce global resources: Import materials to helps students access international advancements in subject-related technology, fostering a global mindset of the latest developments in the industry.

七、成绩评定

本门课程依据全程监控的理念进行考核。课程考核包括 2 个部分的成绩，分别为平时表现和结课考试。各项成绩四舍五入保留整数，录入教务系统并导出最终成绩单。未尽事宜以学校教务处规定、教学团队以及学院教学指导委员会商定为准。

具体要求及评分方法如下：

This subject is assessed based on the concept of comprehensive monitoring. The subject assessment includes three components: regular performance, experiments, and the final examination. Each score is rounded to the nearest integer, recorded in the educational administration system, and the final transcript is exported. Matters not covered here shall be subject to the regulations of the school's academic affairs office and the agreements reached by the teaching team and the college's teaching guidance committee.

Specific requirements and grading methods are as follows:

1、平时表现：占总成绩的 50%。满分 100 分，根据学生的课堂专注度、作业完成情况和课堂附加表现综合给分。作业视完成情况给分，出现抄袭、雷同等学术不端情况酌情扣分或不得分。教师根据学生参与课堂互动情况酌情给出附加表现分-5~+5 分/次，直接计入平时成绩，计入后的平时成绩如超过 100 分，按 100 分记；如低于 0 分，按 0 分记。无故缺勤 1/3 及以上者，按照学校有关规定取消其考试资格。

Regular Performance: Accounts for 50% of the total score. With a full score of 100 points, grades are given based on students' classroom concentration, Assignment completion, and additional classroom performance. Assignment is graded according to completion, and academic misconduct such as plagiarism or similarities without proper citation may result in deductions or no points. Teachers give additional performance points of -5 to +5 points per instance based on students' participation in classroom interactions, which are directly included in the regular performance score. If the adjusted regular performance score exceeds 100 points, it is recorded as 100 points; if it is below 0 points, it is recorded as 0 points. Students who are absent without reason for 1/3 or more of the classes will be disqualified from the examination according to the relevant school regulations.

2、结课考试：占总成绩的 50%，考核采用试卷（上机）考试的方式进行，满分 100 分。

Final Examination: Accounts for 50% of the total score. The assessment is conducted through a written (or computer-based) examination, with a full score of 100 points.

八、评价与持续改进

课程的评价与持续改进机制：

Subject evaluation and continuous improvement mechanism:

1、教学大纲

Syllabus

考核周期：4 年，修订周期：4 年。

Cycle: 4 years, Revision Cycle: 4 years.

改进措施：课程负责人组织课程团队所有教师讨论后提出改进意见，经教研室主任审核后由教学院长批准。

Improvement Measures: The subject leader organizes all teachers in the subject team to discuss and propose improvement suggestions, which are then reviewed by the director of the teaching and research section and approved by the academic dean.

2、成绩评定考核

Grade Evaluation and Assessment

考核周期：1 学年，评价依据：学生最终成绩综合分析。

Cycle: 1 academic year, Evaluation Basis: Comprehensive analysis of students' final grades.

改进措施：根据学生最终成绩的分布，进行相应的内容调整和优化，并改进教学方法。

Improvement Measures: Adjust and optimize the subject content accordingly based on the distribution of students' final grades and improve teaching methods.

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