

复变函数与积分变换

教学大纲

Complex Variable Function and Integral Transformation

Subject Syllabus

一、课程信息 Subject Information

课程编号: Subject ID	3100111001	开课学期: Semester	3
课程分类: Category	公共基础 GF	所属课群: Section	专业基础 MF
课程学分: Credit Points	2	总学时/周: Total Hours/Weeks	32/8
理论学时: LECT. Hours	32	实验学时: EXP. Hours	0
PBL 学时: PBL Hours	0	实践学时/周: PRAC. Hours/Weeks	0
开课学院: College	东北大学 悉尼智能科技学院	适用专业: Stream	通信工程 CE
课程属性: Pattern	必修 Compulsory	课程模式: Mode	自建 NEU
中方课程协调人: NEU Coordinator	刘立卿 Liu Liqing	成绩记载方式: Result Type	百分制 Marks
先修课程: Requisites	高等数学建模（一），高等数学建模（二） Advanced mathematical modeling (I), Advanced mathematical modeling (II)		
英文参考教材: EN Textbooks	James Ward Brown, Complex Variables and Applications(7th edition) 机械工业出版社 Yunying Gai, Yuming Xing, Functions of a Complex Variable and Interal Transforms, 科学出版社, 2007		
中文参考教材: CN Textbooks	西安交通大学高等数学教研室编：《复变函数》（第四版），高等 教育出版社，1996 张元林：《积分变换》（第六版），高等教育出版社，2019		
教学资源: Resources	https://www.08nm.com/c_38.html		
课程负责人(撰写人): Subject Director		提交日期: Submitted Date	单击或点击此处输 入日期。
任课教师(含负责人): Taught by	刘立卿 Liqing Liu		
审核人: Checked by	韩鹏	批准人: Approved by	史闻博
		批准日期: Approved Date	单击或点击此处输 入日期。

二、教学目标 Subject Learning Objectives (SLOs)

注：毕业要求及指标点可参照悉尼学院本科生培养方案，可根据实际情况增减行数

Note: GA and index can be referred from undergraduate program in SSTC website. Please add/reduce lines based on subject.

<p>整体目标: Overall Objective</p>	<p>复变函数与积分变换是运用复变函数的理论知识解决微分方程和积分方程等实际问题的一门课程，同时是通信工程专业必修的数学基础课。其知识内容主要包括复变函数的定义、连续性、解析函数的概念与判定准则、几个初等函数、复变函数的积分、级数、留数、Fourier 变换、Laplace 变换等方面的内容。复变函数与积分变换既能简化计算，又能体现明确的物理意义，在许多领域有广泛应用，如电气工程、通信与控制、信号分析与图像处理、机械系统、流体力学、地质勘探与地震预报等工程技术领域。通过本课程的学习，学生不仅可以掌握复变函数与积分变换的基础理论及工程技术中的常用数学方法，为后续有关课程的学习奠定了必要的数学基础，而且培养学生抽象思维能力、逻辑推理能力、空间想象能力和科学计算等能力，培养学生勤学笃行意识和创新实践精神，厚植学生四个自信和家国情怀。</p> <p>Complex variable function and integral transformation is a course to solve practical problems such as differential equations and integral equations by using the theoretical knowledge of complex variable function. It is also a compulsory basic mathematics course for communication engineering majors. Its knowledge content mainly includes the definition of complex variable function, continuity, the concept and judgment criteria of analytical function, several elementary functions, integral, series, residue, Fourier transform, Laplace transform and so on. Complex variable function and integral transformation can not only simplify calculation, but also reflect clear physical significance. They are widely used in many fields, such as electrical engineering, communication and control, signal analysis and image processing, mechanical system, hydrodynamics, geological exploration and earthquake prediction. Through the study of this course, students can not only master the basic theory of complex variable function and integral transformation and the common mathematical methods in engineering technology, lay a necessary mathematical foundation for the study of subsequent relevant courses, but also cultivate students' abstract thinking ability, logical reasoning ability, spatial imagination ability and scientific calculation ability, Cultivate students' awareness of diligent study and practice and innovative practice spirit, and cultivate students' four self-confidence and feelings of family and country.</p>	
<p>(1) 专业目标: Professional Ability</p>	<p>1-1</p>	<p>了解区域与复变函数的概念。 Recognize the concepts of region and complex variable function. 理解复变函数的极限和连续的概念。 Understand the concept of limit and continuity of complex variable function. 掌握复数的各种表示方法及其运算。</p>

		Master various representation methods and operations of complex numbers.
	1-2	<p>了解复变函数的导数及复变函数解析的概念;了解调和函数与解析函数的关系。</p> <p>Recognize the derivative of complex variable function and the concept of complex variable function analysis; Recognize the relationship between harmonic function and analytical function.</p> <p>理解指数函数、三角函数、对数函数及幂函数的定义及它们的主要性质(包括在单值区域中的解析性)。</p> <p>Understand the complex function, understand the definitions of exponential function, trigonometric function, logarithmic function and power function and their main properties (including analyticity in single valued region).</p> <p>掌握复变函数解析的充要条件;从解析函数的实(虚)部求其虚(实)部的方法。</p>
	1-3	<p>了解闭路变形原理。</p> <p>Recognize the principle of closed-circuit deformation.</p> <p>理解复变函数积分的定义,解析函数无限次可导的性质。</p> <p>Understand the definition of complex variable function integral and analyze the infinite derivative of function.</p> <p>掌握柯西—古萨基本定理;复合闭路定理,柯西积分定理,和高阶导数公式,解析函数与调和函数的关系。</p> <p>Master the basic Cauchy theorem; Compound closed-circuit theorem, Cauchy integral theorem, and higher-order derivative formula, the relationship between analytical function and harmonic function.</p>
	1-4	<p>了解复数项级数收敛、发散及绝对收敛等概念;幂级数收敛圆的概念。</p> <p>Recognize the concepts of series convergence, divergence and absolute convergence of complex terms; The concept of power series convergence circle.</p> <p>理解幂级数在收敛圆内一些基本性质;简单的幂级数收敛半径的求法。</p> <p>Understand some basic properties of power series in convergent circle; A simple method for finding the convergence radius of power series.</p> <p>掌握将解析函数在一点展开为泰勒级数,熟记的麦克劳林展开式,并能利用它们将一些简单的解析函数展开为幂级数;掌握将函数在圆环域展开为洛朗级数的间接法。</p> <p>Master the expansion of analytical functions into Taylor series at one point and the familiar Maclaurin expansion, and can use them to expand some simple analytical functions into power series; Master the indirect method of expanding the function into Laurent series in the ring domain.</p>

	1-5	<p>了解函数在无穷远点的性态，会用留数求一些实积分。 Recognize the behavior of the function at infinity, and be able to find some real integrals with residues.</p> <p>理解留数的概念。 Understand the concept of residue.</p> <p>掌握判断孤立奇点的类型，极点处留数的求法；留数定理；用留数求闭曲线积分的方法。 Master the method of judging the type of isolated singularity and finding the residue at the pole; Residue theorem; The method of calculating closed curve integral with residue.</p>
	1-6	<p>了解 Fourier 积分。 Understand Fourier integral.</p> <p>理解单位脉冲函数，卷积和卷积定理。 Understand unit pulse function, convolution and convolution theorem.</p> <p>掌握 Fourier 变换的概念；掌握 Fourier 变换的线性性质、位移性质、微分性质、积分性质。 Master the concept of Fourier transform; Master the linear, displacement, differential and integral properties of Fourier transform.</p>
	1-7	<p>了解 Laplace 变换的概念。 Understand the concept of Laplace transform.</p> <p>理解 Laplace 逆变换定理(海维赛德展开式), Laplace 变换的卷积定理, Laplace 变换的线性性质、位移性质、微分性质、积分性质。 Understand the inverse Laplace transform theorem (haverside expansion), the convolution theorem of Laplace transform, and the linear, displacement, differential and integral properties of Laplace transform.</p> <p>掌握某些常见函数(例如指数函数、$\sin kt$, $\cos kt$, $\delta(t)$)的变换公式,并会查表求象函数和象原函数.会用 Laplace 变换解常系数线性微分方程及方程组。 Master the transformation formulas of some common functions (such as exponential function and $\sin kt$, $\cos kt$, $\delta(t)$), and be able to look up the table to find the image function and image primitive function. Be able to use Laplace transformation to solve linear differential equations and equations with constant coefficients.</p>
(2) 德育目标: Essential Quality	2-1	<p>理解复变分析知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the complex analysis in depicting the practical engineering problems.</p>
	2-2	<p>让学生通过学习，掌握事物发展规律，通晓天下道理，丰富</p>

		<p>学识，增长见识，塑造品格，努力成为德智体美劳全面发展的社会主义建设者和接班人。</p> <p>Let students master the law of development of things, understand the truth of the world, enrich their knowledge, increase their knowledge, shape their character, and strive to become socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor.</p>
	2-3	<p>展示本专业在新时代中国特色社会主义建设中的成就和当前要解决的重大课题。</p> <p>Display the achievements of this major in the construction of socialism with Chinese characteristics in the new era and the major issues to be solved at present.</p>
	2-4	<p>注重科学思维方法的训练和科学伦理的教育，培养学生探索未知、追求真理、勇攀科学高峰的责任感和使命感。</p> <p>Pay attention to the training of scientific thinking methods and the education of scientific ethics, and cultivate students' sense of responsibility and mission to explore the unknown, pursue the truth and climb the peak of science.</p>

课程教学目标与毕业要求的对应关系 Matrix of GA & SLOs

毕业要求 GA	指标点 GA Index	教学目标 SLOs
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 1-1：掌握数学、自然科学、工程基础和专业基础知识，并使用其建立正确的数学、物理学等模型以解释复杂工程问题；	1-1 到 1-7 2-1,2-2
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：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；	1-1 到 1-7 2-2,2-3
	指标点 2-2：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，针对实际复杂工程问题设计针对性的技术方案，并综合运用文献、科学理论和技术手段予以解决。	
4、研究：能够基于科学原理并采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。	指标点 4-2：能够结合本专业对实验数据进行分析与解释，设计并优化实验方案，并通过信息综合得到合理有效的结论。	1-1 到 1-7 2-2, 2-3, 2-4

三、教学内容 Content (Topics)

注：以中英文填写，各部分内容的表格可根据实际知识单元数量进行复制、扩展或缩减

Note: Filled in both CN and EN, extend or reduce based on the actual numbers of knowledge unit

(1) 理论教学 Lecture

知识单元序号: Knowledge Unit No.	1	支撑教学目标: SLOs Supported	1-1, 2-1, 2-2
知识单元名称 Unit Title	复数与复变函数 Complex and complex variable function		
知识点: Knowledge Delivery	复数及其代数运算与几何表示 Complex and its algebraic operation and geometric representation		
	复数的乘幂与方根 Power and square root of complex		
	区域 The region		
	复变函数 Complex variable function		
	复变函数的极限和连续性 Limitation and continuity of complex variable function		
学习目标: Learning Objectives	了解: Recognize	区域与复变函数的概念 The concept of region and complex variable function	
	理解: Understand	复变函数的极限和连续的概念 The concept of limitation and continuity of complex variable function	
	掌握: Master	复数的各种表示方法及其运算 Various expressions and operations of complex	
德育目标 Moral Objectives	<p>2-1 理解复变分析知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the complex analysis in depicting the practical engineering problems.</p> <p>2-2 让学生通过学习, 掌握事物发展规律, 通晓天下道理, 丰富学识, 增长见识, 塑造品格, 努力成为德智体美劳全面发展的社会主义建设者和接班人。 Let students master the law of development of things, understand the truth of the world, enrich their knowledge, increase their knowledge, shape their character, and strive to become socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor.</p>		
重点: Key Points	复数的各种表示方法及相应的运算; 区域与连通性; 复变函数的极限 Various representation methods and corresponding operations of complex; the region and connectivity; the limitation of complex function		
难点: Focal points	扩充复球面; 复数开方和多值函数 Extended complex sphere; Complex root and multi valued function		

知识单元序号: Knowledge Unit No.	2	支撑教学目标: SLOs Supported	1-2, 2-1, 2-3
知识单元名称 Unit Title	解析函数 Analytic function		
知识点: Knowledge Delivery	复变函数的导数, 解析函数的概念 Derivative of complex function, concept of analytic function		
	函数解析的充要条件		

	Necessary and sufficient conditions for analytic function	
	解析函数与调和函数的关系 The relationship between analytic function and harmonic function	
	初等函数:指数函数,对数函数,乘幂 与幂函数; 三角函数 Elementary function: exponential function, logarithmic function, power and power function; trigonometric function	
学习目标: Learning Objectives	了解: Recognize	复变函数的导数及复变函数解析的概念 The derivative of complex variable function and the concept of complex variable function analysis
	理解: Understand	调和函数与解析函数的关系 The relationship between analytic function and harmonic function
	掌握: Master	复变函数解析的充要条件, 指数函数、三角函数、对数函数及幂函数的定义及它们的主要性质 Necessary and sufficient conditions for analytic function, the concept and nature of exponential function, logarithmic function, power and power function; trigonometric function
德育目标 Moral Objectives	2-1 理解复变分析知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the complex analysis in depicting the practical engineering problems. 2-3 展示本专业在新时代中国特色社会主义建设中的成就和当前要解决的重大课题。 Display the achievements of this major in the construction of socialism with Chinese characteristics in the new era and the major issues to be solved at present.	
重点: Key Points	复变函数的导数; 函数解析的充要条件; 解析函数与调和函数的关系; 初等函数 Property the derivative of complex variable function; The necessary and sufficient conditions of function analysis; The relation between analytic function and harmonic function; Elementary function	
难点: Focal points	解析函数的判别 Discrimination of analytic functions	

知识单元序号: Knowledge Unit No.	3	支撑教学目标: SLOs Supported	1-3, 2-2, 2-4
知识单元名称 Unit Title	复变函数积分 Integral of complex function		
知识点: Knowledge Delivery	复变函数积分的概念 The concept of complex function integral		
	柯西-古萨基本定理: Cauchy-Gusa basic theorem		
	基本定理的推广—复合闭路定理 Generalization of the fundamental theorem compound closed circuit theorem		
	柯西积分公式: Cauchy integral formula		
	解析函数的高阶导数 Higher order derivatives of analytic functions		

	解析函数与调和函数的关系 The relationship between analytic function and harmonic function	
学习目标: Learning Objectives	了解: Recognize	复变函数积分的性质, 解析函数无限次可导的性质 The properties of the integral of the function of complex variable and the properties of the infinitely differentiable analytic function
	理解: Understand	高阶导数公式, 解析函数无限次可导的性质 Higher order derivative formula, the property of infinite derivative of analytic function
	掌握: Master	复变函数积分的定义, 柯西积分定理, 会求复变函数的积分 The definition of function integral of complex variable, Cauchy integral theorem, can find the integral of function of complex variable
德育目标 Moral Objectives	2-2 让学生通过学习, 掌握事物发展规律, 通晓天下道理, 丰富学识, 增长见识, 塑造品格, 努力成为德智体美劳全面发展的社会主义建设者和接班人。 Let students master the law of development of things, understand the truth of the world, enrich their knowledge, increase their knowledge, shape their character, and strive to become socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor. 2-4 注重科学思维方法的训练和科学伦理的教育, 培养学生探索未知、追求真理、勇攀科学高峰的责任感和使命感。 Pay attention to the training of scientific thinking methods and the education of scientific ethics, and cultivate students' sense of responsibility and mission to explore the unknown, pursue the truth and climb the peak of science.	
重点: Key Points	柯西-古萨基本定理; 复合闭路定理; 柯西积分公式; 高阶导数公式 Cauchy-Gusa basic theorem; Compound closed circuit theorem; Cauchy integral formula; Higher order derivative formula	
难点: Focal points	复变函数积分的概念; 多连通区域上的柯西积分定理; 解析函数的无穷可微性 The concept of function integral of complex variable; Cauchy integral theorem on multi connected domain; Infinite differentiability of analytic functions	

知识单元序号: Knowledge Unit No.	4	支撑教学目标: SLOs Supported	1-4, 2-3, 2-4
知识单元名称 Unit Title	级数 Series		
知识点: Knowledge Delivery	复数项级数 Series of complex terms		
	幂级数 Power series r		
	泰勒级数 Taylor series		
	洛朗级数 Laurent series		
学习目标:	了解:	复数项级数收敛、发散及绝对收敛等概念, 幂级数收	

Learning Objectives	Recognize	敛圆的概念 The concept of convergence, divergence and absolute convergence of complex series, and the concept of convergence circle of power series
	理解: Understand	简单的函数在其孤立奇点附近展开为罗朗级数的间接法 An indirect method to expand a simple function into a Laurent series near its isolated singular point
	掌握: Master	简单的幂级数收敛半径的求法, 一些函数的麦克劳林展开式 Simple power series convergence radius of the solution, some functions of McLaughlin expansion
德育目标 Moral Objectives	<p>2-3 展示本专业在新时代中国特色社会主义建设中的成就和当前要解决的重大课题。 Display the achievements of this major in the construction of socialism with Chinese characteristics in the new era and the major issues to be solved at present.</p> <p>2-4 注重科学思维方法的训练和科学伦理的教育, 培养学生探索未知、追求真理、勇攀科学高峰的责任感和使命感。 Pay attention to the training of scientific thinking methods and the education of scientific ethics, and cultivate students' sense of responsibility and mission to explore the unknown, pursue the truth and climb the peak of science.</p>	
重点: Key Points	收敛半径的求法; 复变函数展成泰勒级数; 复变函数展成洛朗级数 The solution of convergence radius; The function of complex variable is expanded into Taylor series; Expansion of complex function into Laurent series	
难点: Focal points	级数在收敛区间端点的敛散性, 利用间接方法将函数展开成洛朗级数 The function is expanded into Laurent series by indirect method	

知识单元序号: Knowledge Unit No.	5	支撑教学目标: SLOs Supported	1-5, 2-2, 2-3
知识单元名称 Unit Title	留数 Residue		
知识点: Knowledge Delivery	可去奇点、极点、本性奇点、函数的零点及极点的关系 The removable singularities, poles, essential singularities and the relations among the zeros of functions and poles		
	留数: 留数的定义及留数定理, 留数的计算规则 Residue: the definition of residue and residue theorem, residue calculation rules		
学习目标: Learning Objectives	了解: Recognize	留数的概念 The concept of residue	
	理解: Understand	扩充复平面上的留数定理 Residue theorem on extended complex plane	
	掌握: Master	极点处留数的求法; 留数定理; 用留数求围道积分的方法	

		The solution of residue at the pole; Residue theorem; A method of finding contour integral by residue
德育目标 Moral Objectives	2-2 让学生通过学习, 掌握事物发展规律, 通晓天下道理, 丰富学识, 增长见识, 塑造品格, 努力成为德智体美劳全面发展的社会主义建设者和接班人。 Let students master the law of development of things, understand the truth of the world, enrich their knowledge, increase their knowledge, shape their character, and strive to become socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor. 2-3 展示本专业在新时代中国特色社会主义建设中的成就和当前要解决的重大课题。 Display the achievements of this major in the construction of socialism with Chinese characteristics in the new era and the major issues to be solved at present.	
重点: Key Points	The judgment method of singularity and pole; Using residue theorem to calculate residue	
难点: Focal points	扩充复平面上的留数定理; 利用留数定理计算几种类型的实积分 The residue theorem on the complex plane is extended; Using residue theorem to calculate several types of real integrals	

知识单元序号: Knowledge Unit No.	6	支撑教学目标: SLOs Supported	1-6, 2-1, 2-4
知识单元名称 Unit Title	Fourier 变换 Fourier transform		
知识点: Knowledge Delivery	Fourier 积分 Fourier integral		
	Fourier 变换 Fourier transform		
	Fourier 变换的性质 Properties of Fourier transform		
	卷积 Convolution		
学习目标: Learning Objectives	了解: Recognize	Fourier 变换的概念 The concept of Fourier transform	
	理解: Understand	卷积和卷积定理 Convolution and convolution theorem	
	掌握: Master	掌握 Fourier 变换的线性性质、位移性质、微分性质、积分性质 Master the linear property, displacement property, differential property and integral property of Fourier transform	
德育目标 Moral Objectives	2-1 理解复变分析知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the complex analysis in depicting the practical engineering problems. 2-4 注重科学思维方法的训练和科学伦理的教育, 培养学生探索未知、追求真理、勇攀科学高峰的责任感和使命感。 Pay attention to the training of scientific thinking methods and the education of scientific ethics, and cultivate students' sense of		

	responsibility and mission to explore the unknown, pursue the truth and climb the peak of science.
重点: Key Points	傅氏变换的概念及性质, 傅氏变换的计算 The concept and properties of Fourier transform, the calculation of Fourier transform
难点: Focal points	单位脉冲函数的傅氏变换, 广义傅氏变换, 卷积和卷积定理 Fourier transform of unit impulse function, generalized Fourier transform, convolution and convolution theorem

知识单元序号: Knowledge Unit No.	7	支撑教学目标: SLOs Supported	1-7, 2-2, 2-3
知识单元名称 Unit Title	Laplace 变换 Laplace transform		
知识点: Knowledge Delivery	Laplace 变换的概念 The concept of Laplace transform		
	Laplace 变换的性质 Properties of Laplace transform		
	Laplace 逆变换 Inverse Laplace transform		
	卷积 Convolution		
	Laplace 变换的应用 Application of Laplace transform		
学习目标: Learning Objectives	了解: Recognize	Laplace 变换的概念 The concept of Laplace transform	
	理解: Understand	Laplace 逆变换定理(海维赛德展开式), Laplace 变换的卷积定理, Laplace 变换的线性性质、位移性质、微分性质、积分性质 Inverse Laplace transform theorem (haverside expansion), convolution theorem of Laplace transform, linear property, displacement property, differential property and integral property of Laplace transform	
	掌握: Master	某些常见函数(例如指数函数、 $\sin kt$, $\cos kt$)的变换公式, 会用 Laplace 变换解常系数线性微分方程及方程组 The transformation formula of some common functions (such as exponential function, $\sin kt$, $\cos kt$) can use Laplace transformation to solve linear differential equations and equations with constant coefficients	
德育目标 Moral Objectives	2-2 让学生通过学习, 掌握事物发展规律, 通晓天下道理, 丰富学识, 增长见识, 塑造品格, 努力成为德智体美劳全面发展的社会主义建设者和接班人。 Let students master the law of development of things, understand the truth of the world, enrich their knowledge, increase their knowledge, shape their character, and strive to become socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor. 2-3 展示本专业在新时代中国特色社会主义建设中的成就和当前要解决的重大课题。 Display the achievements of this major in the construction of socialism		

	with Chinese characteristics in the new era and the major issues to be solved at present.
重点: Key Points	Laplace 变换与 Laplace 逆变换的计算, 用 Laplace 变换求解微分方程 (组) Calculation of Laplace transform and inverse Laplace transform, using Laplace transform to solve differential equations (Group)
难点: Focal points	Laplace 变换的性质求 Laplace 逆变换 The properties of Laplace transform to find the inverse Laplace transform

四、教学安排 Teaching Schedule

注: 可根据实际情况增减行数

Note: Please add/reduce lines based on subject.

教学内容 Teaching Content	学时(周) Hour(Week)			
	理论 LECT.	实验 EXP.	课外实践 PBL	集中实践 PRAC.
复数与复变函数 Computer Networks and the Internet	2			
解析函数 Application Layer	4			
复变函数积分 Transport Layer	6			
级数 The Network Layer: Data Plane	6			
留数 The Network Layer: Control Plane	6			
Fourier 变换 The Link Layer	4			
Laplace 变换 Application of Modern Computer Network Tools	4			
总计 Total	32			

五、教学方法 Teaching Methodology

注: 可根据实际情况增减行数或修改内容

Note: Please add/reduce lines or revise content based on subject.

勾选 Check	教学方法与特色 Teaching Methodology & Characters
<input checked="" type="checkbox"/>	多媒体教学: 基于信息化设备的课堂教学 Multi-media-based lecturing
<input checked="" type="checkbox"/>	实践能力传授: 理论与行业、实际案例相结合 Combining theory with industrial practical problems
<input checked="" type="checkbox"/>	课程思政建设: 知识讲授与德育相结合

	Knowledge delivery with ethic education
<input checked="" type="checkbox"/>	PBL 教学: 问题驱动的分组学习与交流 Problem-based learning
<input type="checkbox"/>	其他:单击或点击此处输入文字。 Other:单击或点击此处输入文字。

六、成绩评定 Assessment

注: 可根据实际情况增减行数或修改内容

Note: Please add/reduce lines or revise content based on subject.

考核环节: Assessment Content	平时 Behavior	环节负责人: Director	刘立卿
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	50
考核方式: Measures	<p>(1) 出勤: 本门课程的所有环节均要求学生参与并签到, 不得缺勤。出勤成绩占总成绩的 15%, 无故缺勤 4 次及以上者, 取消本门课程的考试资格。</p> <p>(1) Attendance: students are required to participate in all links of this course and sign in without being absent. Attendance accounts for 15% of the total score. Those who are absent from work for 4 times or more without reason will be disqualified from the examination of this course.</p> <p>(2) 课堂表现: 以学生平时课堂表现、课堂教师随机提问是否积极等情况综合评定, 占总成绩的 5%。</p> <p>(2) Classroom performance: it is comprehensively evaluated based on the students' usual classroom performance and whether the teachers' random questions are positive, accounting for 5% of the total score.</p> <p>(3) 作业: 本门课程有 3 次课内作业, 要求学生必须独立完成并在规定时间提交。作业成绩占总成绩的 30%, 每次作业占 10%。未按时提交作业或作业有抄袭(雷同)现象的, 该次作业成绩按零分计。</p> <p>(3) Homework: there are 3 in class assignments for this course. Students are required to complete them independently and submit them within the specified time. The homework achievement accounts for 30% of the total score, and each homework accounts for 10%. If the homework is not submitted on time or there is plagiarism (similar) in the homework, the score of the homework is calculated as zero.</p>		

考核环节: Assessment Content	期末 Final	环节负责人: Director	刘立卿
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	50

考核方式: Measures	考试, 2 小时答题及 10 分钟读题时间。 Examination, two hours and ten minutes reading time.
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七、改进机制 Improvement Mechanism

注: 未尽事宜以教学团队以及学院教学指导委员会商定为准。

Note: Matters not covered in this file shall be determined by TAB of SSTC, NEU.

教学大纲改进机制 Subject Syllabus Improvement Mechanism			
考核周期(年): Check Period (YR)	4	修订周期(年): Revise Period (YR)	4
改进措施: Measures	课程负责人根据课程教学内容与人才培养目标组织课程团队讨论并修改教学大纲, 报分管教学工作副院长审核后由执行院长批准。 The subject coordinator shall be responsible for the syllabus discussion and improvement, and the revised version shall be submitted to deputy dean (teaching affairs) for reviewing then to executive dean for approval.		
成绩评定改进机制 Assessment Improvement Mechanism			
考核周期(年): Check Period (YR)	1	修订周期(年): Revise Period (YR)	1
改进措施: Measures	课程负责人根据课程教学内容、课堂教学效果以及成绩分布, 对课程教学方法和成绩评定环节进行改进, 并同步优化评定办法。 The subject coordinator shall revise the syllabus based on the teaching content, effect and result distribution while optimize the assessment measures.		