

2025 年度シラバス

科目分類/Subject Categories			
学部等/Faculty	/大学院工芸科学研究科（博士前期課程）： /Graduate School of Science and Technology (Master's Programs)	今年度開講/Availability	/有：/Available
学域等/Field	/独立専攻：/Fibro/BBM	年次/Year	/1～2年次：/1st through 2nd Year
課程等/Program	/先端ファイブ科学専攻：/Master's Program of Advanced Fibro-Science	学期/Semester	/秋学期：/Fall term
分類/Category	/授業科目：/Courses	曜日時限/Day & Period	/集中：/Intensive

科目情報/Course Information				
時間割番号 /Timetable Number	65119926			
科目番号 /Course Number	65160216			
単位数/Credits	2			
授業形態 /Course Type	講義：Lecture			
クラス/Class				
授業科目名 /Course Title	科学的思考：Scientific Thinking			
担当教員名 / Instructor(s)	/桑原 教彰/(Merel Lefevre)：KUWAHARA Noriaki/Merel Lefevre			
その他/Other	インターンシップ実施科目 Internship	国際科学技術コース提供科目 IGP	PBL 実施科目 Project Based Learning	DX 活用科目 ICT Usage in Learning
	実務経験のある教員による科目 Practical Teacher			
科目ナンバリング /Numbering Code	M_AF6311			

授業の目的・概要 Objectives and Outline of the Course	
日	The aim of this course is to teach the students to think and act in a scientific and critical way, also outside their academic field of expertise. We start with theoretical introductory lessons, in which the principles of critical thinking are introduced and the various pitfalls of the human brain are explored. The students learn from examples why we are susceptible to irrational beliefs, and how intelligent people can make mistakes. Then they learn to apply the principles within the field and beyond in daily life. Techniques from statistics, logics, argumentation theory and probability theory are provided to support the thinking processes. Students learn to reflect on the fallibility of the human brain, acknowledging their own ignorance, and the importance of openness of mind.
英	The aim of this course is to teach the students to think and act in a scientific and critical way, also outside their academic field of expertise. We start with theoretical introductory lessons, in which the principles of critical thinking are introduced and the various pitfalls of the human brain are explored. The students learn from examples why we are susceptible to irrational beliefs, and how intelligent people can make mistakes. Then they learn to apply the principles within the field and beyond in daily life. Techniques from statistics, logics, argumentation theory and probability theory are provided to support the thinking processes. Students learn to reflect on the fallibility of the human brain, acknowledging their own ignorance, and the importance of openness of mind.

学習の到達目標 Learning Objectives	
日	Develop the ability to analyze information using statistics, logic, argumentation, and probability theories. Learn why humans are prone to irrational beliefs and the causes behind it. Understand the importance of acknowledging one's ignorance and being open to new ideas.

英	Develop the ability to analyze information using statistics, logic, argumentation, and probability theories. Learn why humans are prone to irrational beliefs and the causes behind it. Understand the importance of acknowledging one's ignorance and being open to new ideas.
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学習目標の達成度の評価基準 / Fulfillment of Course Goals (JABEE 関連科目のみ)

日	
英	

授業計画項目 Course Plan

No.		項目 Topics	内容 Content
1	日	Critical thinking 1	• definition and relevance
	英	Critical thinking 1	• definition and relevance
2	日	Critical thinking 2	• basic principles and rules of thumb
	英	Critical thinking 2	• basic principles and rules of thumb
3	日	Critical thinking 3	• thinking errors and other mechanisms that form the basis of erroneous views: the limitations of intuition and memory, heuristics, thinking patterns, group pressure, cognitive dissonance, confirmation bias
	英	Critical thinking 3	• thinking errors and other mechanisms that form the basis of erroneous views: the limitations of intuition and memory, heuristics, thinking patterns, group pressure, cognitive dissonance, confirmation bias
4	日	Critical thinking 4	• characteristics / recognition of unreliable information and influencing
	英	Critical thinking 4	• characteristics / recognition of unreliable information and influencing
5	日	Critical thinking 5	• the correct assessment of social sources of knowledge (authority, expertise)
	英	Critical thinking 5	Critical thinking 5
6	日	Critical thinking 6	• recognizing the importance and application of scientific methods
	英	Critical thinking 6	• recognizing the importance and application of scientific methods
7	日	Critical thinking 7	• self-reflection, acknowledgement of ignorance and the creation of an openness of mind
	英	Critical thinking 7	• self-reflection, acknowledgement of ignorance and the creation of an openness of mind
8	日	Critical thinking 8	• the willingness to revise opinions in the light of new arguments and evidence
	英	Critical thinking 8	• the willingness to revise opinions in the light of new arguments and evidence
9	日	Critical thinking 9	• examples from the field, personal experiences and current events
	英	Critical thinking 9	• examples from the field, personal experiences and current events
10	日	Statistical methods 1	• The world is not dependent on the way we look at it, but how we see the world is: concepts such as population, tests at random, estimates, distribution, probability, reliability, bias
	英	Statistical methods 1	• The world is not dependent on the way we look at it, but how we see the world is: concepts such as population, tests at random, estimates, distribution, probability, reliability, bias
11	日	Statistical methods 2	• statistical tests • efficient design of experiments
	英	Statistical methods 2	• statistical tests • efficient design of experiments
12	日	Argumentation skills	• the most important forms of argument and logical principles • common fallacies and thinking errors
	英	Argumentation skills	• the most important forms of argument and logical principles • common fallacies and thinking errors
13	日	Application to scientific integrity	definition and aspects of careful, reliable, verifiable, impartial and independent conduct of research
	英	Application to scientific integrity	definition and aspects of careful, reliable, verifiable, impartial and independent conduct of research
14	日	Group work	Students reflect in groups on the topics that were introduced and apply the learned

	英	Group work	principles. Students reflect in groups on the topics that were introduced and apply the learned principles.
15	日	Project	Students reflect on the topics that were introduced in the lectures or through guided self-study, and provide examples in which they apply the theory of these topics.
	英	Project	Students reflect on the topics that were introduced in the lectures or through guided self-study, and provide examples in which they apply the theory of these topics.

履修条件 Prerequisite(s)	
日	
英	

授業時間外学習（予習・復習等） Required study time, Preparation and review	
日	Initial competences: • Basic knowledge of engineering sciences
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教科書／参考書 Textbooks/Reference Books	
日	Scientific Thinking, by Robert M. Martin, Broadview Press, ISBN 9781770482296 Redefining Scientific Thinking for Higher Education, Editors: Murtonen, Mari, Balloo, Kieran (Eds.) , ISBN 978-3-030-24217-6 The Nature of Scientific Thinking, by Faye, J. ,
英	Scientific Thinking, by Robert M. Martin, Broadview Press, ISBN 9781770482296 Redefining Scientific Thinking for Higher Education, Editors: Murtonen, Mari, Balloo, Kieran (Eds.) , ISBN 978-3-030-24217-6 The Nature of Scientific Thinking, by Faye, J. ,

成績評価の方法及び基準 Grading Policy	
日	End-of-term evaluation and continuous assessment Examination methods in case of periodic evaluation during the first examination period: Report Examination methods in case of periodic evaluation during the second examination period: Report Examination
英	End-of-term evaluation and continuous assessment Examination methods in case of periodic evaluation during the first examination period: Report Examination methods in case of periodic evaluation during the second examination period: Report Examination

留意事項等 Point to consider	
日	Teaching language is English. Teaching method: Guided self-study, group work, lecture, project, seminar, self-reliant study activities Intensive course
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