

登録コード	HS130400	開講年度	2026				
授業題目	エネルギー・デバイス材料工学特論					担当教員	杉本 渉 他
英文授業名	Materials Engineering for Energy Devices					副担当	小嶋 隆幸・亀山 達矢・新堀 佳紀
単位数	2	講義期間	通年(集中)	曜日・時限	集中・不定期	対象学生	全学年
				授業形態	講義	備考	
信大コンピテンシー	該当						
(1)授業の達成目標/Course objectives	ディプロマポリシー・授業で得られる「学位授与の方針」要素					⇔	(授業の達成目標)
	2026HS初, 2025HS初, 2024HS初, 2023HS初						
	【専攻】理工学系分野における課題の本質を見抜き解決方法を見出す洞察力					⇔	Obtain knowledge on energy-related materials and devices and be able to use such knowledge to conduct research.
(2)詳細/Detailed information	The assessment of current topics in materials chemistry for energy related devices is covered in this course, with emphasis on inorganic, organic, polymers, and/or inorganic-organic hybrid materials.						
(3)授業の概要/Overview of course	This course covers a variety of topics concerning nanomaterials for electrochemical energy conversion and storage and for catalytic reactions. The following will also be discussed: characterization and synthesis of nanomaterials and various devices such as electrochemical power sources (batteries, electrochemical capacitors, fuel cells) and/or devices based on photochemistry, actuators, etc.						
(4)授業計画/Course plan	Below is a typical model schedule. Details will be decided based on skills and background of registered participants. A. Inorganic and hybrid materials (Wataru Sugimoto) A1. Topics in inorganic and hybrid materials A2. Synthesis and structure A3. Characterization techniques A4. State-of-the-art nanomaterials A5. Applications 1: fuel cells A6. Applications 2: batteries and supercapacitors A7. Applications 3: photo(electro)chemical energy conversion B. Metallic materials as catalysts (Takayuki Kojima) B1. Topics in metallic catalyst materials B2. Electronic structures B3. Geometric structures B4. Alloys and intermetallic compounds B5. Synthesis techniques B6. Characterization techniques B7. Applications of advanced alloys for catalytic reactions C. Semiconductor nanomaterials (Tatsuya Kameyama) C1. Physical properties of semiconductor nanomaterials C2. History and synthesis C3. Analysis I: Spectroscopy C4. Analysis II: Structure C5. Analysis III: Photoelectrochemistry C6. Functions and applications C7. Surface and interface chemistry D. Ligand-protected metal nanoclusters (Yoshiki Niihori) D1. Introduction of nanoclusters D2. Atomically-precise synthesis D3. Structural Characterization D4. Optical properties D5. Functionalization D6. Application (1): Catalyst D7. Application (2): Photosensitizer						
(5)成績評価の方法/Grading/evaluation method	ACTIVITIES (PERCENTAGES) In-class excercises (30%) Out-of class assignments (30%) Term Written Paper (20%) Term Oral Presentation (20%)						
(6)成績評価の基準/Grading/evaluation criteria	Grades will be marked based on degree of activities. Credit will be applied to students who understands at least 60% of the contents of the class.						

(7)事前事後学習の内容/Prep and review work	
(8)履修上の注意/Notes	After registering for this class, it is your responsibility to contact at least one of the course faculty for instructions. Wataru Sugimoto (Tel: 0268-21-5455, wsugi(at)shinshu-u.ac.jp) Takayuki Kojima (Tel: 0268-21-5485, tkojima(at)shinshu-u.ac.jp) Tatsuya Kameyama (Tel: 0268-21-5584, kame(at)shinshu-u.ac.jp) Yoshiki Niihori (Tel: 0268-21-5585, niihori(at)shinshu-u.ac.jp)
(9)質問,相談への対応/Questions and requests for advice	Question will be accepted at any time. Wataru Sugimoto (Tel: 0268-21-5455, wsugi(at)shinshu-u.ac.jp) Takayuki Kojima (Tel: 0268-21-5485, tkojima(at)shinshu-u.ac.jp) Tatsuya Kameyama (Tel: 0268-21-5584, kame(at)shinshu-u.ac.jp) Yoshiki Niihori (Tel: 0268-21-5585, niihori(at)shinshu-u.ac.jp)
(10)授業の形式/Course format	
【教科書/Textbook(s)】	none designated
【参考書/Reference work(s)】	Fundamentals of Materials for Energy and Environmental Sustainability Editors:David S. Ginley, David Cahen, Cambridge University Press, ISBN:9781107000230