Advanced and Comprehensive Studies on Chemical Hazard Control 2023

ケミカルハザード対策専門家特論

&

Mechanism, Assessment and Remediation of Environmental Pollution 2023

環境汚染の調査と評価・修復の実践

&

Animal Poisoning　動物の中毒

One Health Frontier Graduate School of Excellence
&
KAMPAI project

Class and Course Outline

1. Aim（目的）

As a result of the man's production activities, hazards from chemicals discharged into the environment threat human/animal health and ecosystems. People living today's modern lifestyles of convenience have a duty to pass safe living environments on to future generations.

Health hazards from chemicals are often activated at the interface between humans and animals, only manifesting themselves after they have gradually spread. To protect our environment from hazards and realize the One World - One Health ideal, it is imperative to detect minute changes and abnormalities at this interface so that appropriate preventive measures can be taken.

This course is aimed at fostering expert who can capture the essence of chemical hazards and their effects on human/animal and ecosystems and exercise leadership in promoting research and education in their respective areas and controlling hazards with the abilities to gain an overview of problems from a global perspective, under the concept of One Health.

人間の活動に伴い、環境中に放出される化学物質は年々増え、その有害性は、人・動物の健康や生態系を脅かしています。化学物質はヒトの現在での生活に大きな恩恵をもたらしますが、その一方で、安全な生活環境を次世代に引き継ぐ義務があります。

化学物質による健康被害は、人-(飼育)動物の生活から広がってから顕在化します。環境を危険から守り、「One World One Health」を実現するためには、この界面での変化や異常を検知し、適切な予防措置を講じることが不可欠です。

今回紹介する授業では、ケミカルハザードの本質とヒト・動物・生態系への影響を捉え、One Health のコンセプトのもとでグローバルな視点で問題を俯瞰できる能力を養い、各専門分野においてリーダーシップを発揮できる専門家を養成することを目的としています。

2. Class Design（授業デザイン）

The course provides lecture and practical class on Field Toxicology, Risk Management including Environmental Toxicology, Epidemiology, Risk Assessment, Food Safety. Our subject includes new concept of Forensic Toxicology and Shelter Medicine.
This course also provides methodology of chemical / toxicological analyses such as LC/MS (Liquid Chromatography-Mass spectrometry for drugs, pesticides and endogenous compounds such as hormones), GC/MS (Gas Chromatography Mass spectrometry for environmental pollutants such as PCBs, DDTs) and ICP/MS (Inductively Coupled Plasma Mass Spectrometry for metals, trace elements), and GIS (Geographic Information System, using spatial or geographic data) training.
In silico analyses will also be provided on Docking Simulation and Multiple Factor Analyses of Information Science, which are useful for your research.
In addition, you can study on the basic sciences such as Wildlife Science, Pathology, Molecular Toxicology, Immunotoxicology, Pharmacology.
This course provides Comprehensive Studies on Chemical Hazard Control.

本コースでは、フィールド毒性学、環境毒性学を含むリスク管理、疫学、リスク評価、食品安全について講義と実習を行います。また、法医学毒性学やシェルターメディシンの新しい概念を取り入れた授業も行います。
まさらに、薬物、農薬、ホルモンなどの内因性化合物の LC/MS（液体クロマトグラフィー質量分析）、PCB、DDT などの環境汚染物質の GC/MS（ガスクロマトグラフィー質量分析）、ICP/MS（誘導結合プラズマ質量分析）、GIS（地理情報システム、空間または地理データを使用）トレーニングなどの化学/毒性分析の方法論を提供します。
また、研究に役立つドッキングシミュレーションや情報科学の多因子解析など、インシリコ解析も行われます。
そして、野生生物学、病理学、分子毒性学、免疫毒性学、薬理学などの基礎科学についても学ぶことができます。

当該授業は、化学物質のハザードを総合的に修学するコースです。

All graduate students can freely attend each class of interest.

You can also take the Chemical Hazard Control Expert certification exam once you complete the "course" and complete all subjects, briefly described in following paragraph 3.
また、「コース」を修了し、次項 3 で簡単に説明するすべての科目を修了すると、次項

のケミカルハザード対策専門家認定試験を受験することができます。

3. Chemical Hazard Control Expert Certification

If you complete the course subjects, examination will be given to allow comprehensive evaluation of program participants' research and education achievements in chemical hazard-related fields and related abilities, including those relevant to the design of chemical hazard control measures. A subject will be announced in advance, and participants will submit a short essay and make an oral presentation on the subject. The chemical hazard certifying committee will comprehensively evaluate these essays and presentations to determine whether individuals have passed the examination or not.

ケミカルハザード対策専門家特論の授業コース修了者には、授業の試験とは別に、エキスパート証明のための試験を受けることができます。小論文やインタビュー（発表形式）の審査を経て、合格者には証明証が発行されます。

If you are interested in the Chemical Hazard Control class or have any questions about classes, please contact us at the contact details below.
授業にご興味のある方でご質問のある方は、下記のお問い合わせ先までご連絡ください。

CONTACT

COURSE COORDINATOR

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Graduate School of Veterinary Medicine &
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Course Schedule

URL for Online class: (Zoom system) Meeting No. : PW：
https://

※Click on the QR code to jump to the Webex class meeting room.

KAMPAI
- Mechanism, Assessment and Remediation of Environmental Pollution

Advanced and Comprehensive Studies on Chemical Hazard Control (CHCE)
- CHC-I: Field Toxicology & Risk Analysis
- CHC-II: Chemical Analyses
- CHC-III: Basic Conservation Medicine
- CHC-IV: Environmental Remediation and Diagnostic Techniques
- CHC-V: GIS and satellite remote sensing
- CHC-VI: Informatics

International Conservation Medicine to fostering the next generation of human resources to serve as a bridge between Africa and Japan (IVCMEP)
- IVCMEP: Conservation Medicine I
- IVCMEP: Conservation Medicine II
- IVCMEP: Interdisciplinary / Intercultural Studies (Lab Rotation)

Recurrent Education for Toxicology
- Animal Poisoning and Analysis I
- Animal Poisoning and Analysis II

Advanced Environmental Toxicology
- Advanced Environmental Toxicology

2023		8:45-10:15	10:30-12:00	13:00-14:30	14:45-16:15	16:30-18:00	**OnDemand**	**IVCMEP**	**Remark**
								IVCMEP pre	
								IVCMEP pre	
14-Jul	Fri							Arrival	
15-Jul	Sat							Conservation Medicine I	
16-Jul	Sun							Conservation Medicine I	
17-Jul	Mon							Conservation Medicine I	
18-Jul	Tue	Ishizuka Guidance for Chemical Hazard (Online & Grad room 3 #418)	Nimaco & Yohannes Environ Toxicol (Online & Grad room 3 #418)	Nimaco & Yohannes Environ Toxicol (Online & Grad room 3 #418)	Nimaco Food Safety (Online & Grad room 3 #418)		Isoda Risk Analysis ondemand	Conservation Medicine I	
19-Jul	Wed		Hirose GIS (Online (partially) and Grad room 3 #418)	Hirose GIS (Online (partially) and Grad room 3 #418)	Hirose GIS (Online (partially) and Grad room 3 #418)		Uchida, Understanding Plants and Soils (Glo Food Res) ondemand	Conservation Medicine I	
20-Jul	Thu	Hirose GIS (Online (partially) and	Hirose GIS (Online (partially) and	Hirose GIS (Online (partially) and	Hirose GIS (Online (partially) and		Hiwatari Impact Evaluation of Development	Conservation Medicine I	

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		Grad room 3 #418)	Grad room 3 #418)	Grad room 3 #418)	Grad room 3 #418)		Program (Ecomonic) ondemand		
21-Jul	Fri	Hirose GIS (Online (partially) and Grad room 3 #418)	Hirose GIS (Online (partially) and Grad room 3 #418)	Hirose GIS (Online (partially) and Grad room 3 #418)	Hirose GIS (Online (partially) and Grad room 3 #418)		Toyoda, Environ Radioactivity and health hazard (Env. Sci.) ondemand	Conservation Medicine I	
22-Jul	Sat							Conservation Medicine I	
23-Jul	Sun							Conservation Medicine II	
24-Jul	Mon	Takeda Docking Simulation (Online & Grad room 3 #418)	Takeda Docking Simulation (Online & Grad room 3 #418)	Takeda Docking Simulation (Online & Grad room 3 #418)	Takeda Docking Simulation (Online & Grad room 3 #418)		Tohyama, Health Science (Health Sci) ondemand	Conservation Medicine II	
25-Jul	Tue	Takeda Docking Simulation (Online & Grad room 3 #418)	Takeda Docking Simulation (Online & Grad room 3 #418)	Takeda Docking Simulation (Online & Grad room 3 #418)	Takeda Docking Simulation (Online & Grad room 3 #418)		Igarashi, Remediate mine sites (Eng. School) ondemand	Conservation Medicine II	
26-Jul	Wed	Eguchi Basic &Multivariate Analysis (Online & Grad room 3 #418)	Eguchi Basic &Multivariate Analysis (Online & Grad room 3 #418)	Eguchi Basic &Multivariate Analysis (Online & Grad room 3 #418)	Eguchi Basic &Multivariate Analysis (Online & Grad room 3 #418)			Conservation Medicine II	
27-Jul	Thu		Otsuguro Pharmacology (Online & Grad room 3 #418)	Tanaka Veterinary Forensics (Online & Grad room 3 #418)	Tanaka Veterinary Forensics (Online & Grad room 3 #418)			Conservation Medicine II	
28-Jul	Fri	Tsubota Wildlife Toxicology & Ecotoxicology (Online & Grad room 3 #418)	Kimura Toxicol Pathology (Online & Grad room 3 #418)	Ohashi Immune Toxicol (Online & Grad room 3 #418)	Ohashi Immune Toxicol (Online & Grad room 3 #418)			Conservation Medicine II	
29-Jul	Sat							Returning	
30-Jul	Sun								
31-Jul	Mon			Takahashi Remote Sensing (Online & Grad room 3 #418)	Takahashi Remote Sensing (Online & Grad room 3 #418)				
1-Aug	Tue	Kamiya Environ Remediation	Kamiya Environ Remediation	Takahashi Remote Sensing	Takahashi Remote Sensing				

		(Online & Grad room 3 #418)	(Online & Grad room 3 #418)	(Online & Grad room 3 #418)	(Online & Grad room 3 #418)				
2-Aug	Wed	Nimako & Yared Environ Toxicol (Grad room 3 #418)	Nimako & Yared Environ Toxicol (Grad room 3 #418)	Nimako & Yared Environ Toxicol (Grad room 3 #418)	Nimako & Yared Environ Toxicol (Grad room 3 #418)				
3-Aug	Thu	Nimako & Yared Environ Toxicol (Grad room 3 #418)	Nimako & Yared Environ Toxicol (Grad room 3 #418)	Nimako & Yared Environ Toxicol (Grad room 3 #418)	Nimako & Yared Environ Toxicol (Grad room 3 #418)				
4-Aug	Fri	Envision GIS&Ecology (Grad room 3 #418)	Envision GIS&Ecology (Grad room 3 #418)	Envision GIS&Ecology (Grad room 3 #418)	Envision GIS&Ecology (Grad room 3 #418)				
5-Aug	Sat								
6-Aug	Sun								
7-Aug	Mon	Envision GIS&Ecology (Grad room 3 #418)	Envision GIS&Ecology (Grad room 3 #418)	Envision GIS&Ecology (Grad room 3 #418)	Envision GIS&Ecology (Grad room 3 #418)				
8-Aug	Tue	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)				
9-Aug	Wed	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)				
10-Aug	Thu	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)	Ikenaka & Nakayama, Anal Chem & Toxicol (Prac room #217)				
11-Aug	Fri								
12-Aug	Sat								
13-Aug	Sun								
14-Aug	Mon	Ichii Experimental Molecular Toxicology (Prac room 1 #202 face-to-face only)	Ichii Experimental Molecular Toxicology (Prac room 1 #202 face-to-face only)	Ichii Experimental Molecular Toxicology (Prac room 1 #202 face-to-face only)	Ichii Experimental Molecular Toxicology (Prac room 1 #202 face-to-face only)				
15-Aug	Tue								

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16-Aug	Wed								
17-Aug	Thu								
18-Aug	Fri								
19-Aug	Sat								
20-Aug	Sun								
21-Aug	Mon	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Isoda Event-based-survey (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Isoda Event-based-survey (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Isoda Event-based-survey (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)				
22-Aug	Tue	Isoda Rapid Risk Assessment (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning II (Online & Prac room 2 #217)	Isoda Rapid Risk Assessment (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning II (Online & Prac room 2 #217)	Isoda Rapid Risk Assessment (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning II (Online & Prac room 2 #217)	Isoda Rapid Risk Assessment (Lecture Room#2) Group Work, face to face only Ikenaka & Ishizuka, Animal Poisoning II (Online & Prac room 2 #217)				
23-Aug	Wed	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)				
24-Aug	Thu	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)	Ikenaka & Ishizuka, Animal Poisoning I (Online & Prac room 2 #217)				
25-Aug	Fri								
26-Aug	Sat								

- Grad room 2-3: Seminar Room 2-3 for Graduate (Main Building of Faculty of Veterinary Medicine, 4F)
  第 2-3 大学院演習室：獣医学研究院本館 4 階
- Prac room 1-4: Practical Class Room (Main Building of Faculty of Veterinary Medicine, 2F)
  第 2-4 実習室：獣医学研究院本館2階（第4実習室は E 棟）
- Lec Room 1-3: Lecture Room 1-3 (Lecture Room 2 and 3 are located at the Lecture Building of Faculty of Veterinary Medicine, 1F.)
  3講義室：第一講義室は本館1階、第2-3講義室は講義棟1階

NOTES:

The location of the classroom may change depending on the circumstances. In that case, you will be notified in advance. In addition, face-to-face classes may be replaced with online classes depending on the status of infectious diseases. Ally course students can also participate.

状況により、教室の場所が変更になる場合があります。その場合は、事前にお知らせします。また、感染症の状況により、対面授業からオンライン授業に変更する場合があります。卓越大学院 Ally コースも同様です。

After completing the Chemical Hazard Experts course, you will have an exam of the course and if you pass, you will receive a "certificate of completion". If you want to participate in the "expert certification" exam for chemical hazard control, you need to submit the application in advance.

ケミカルハザードエキスパートコース修了後、コースの試験を行い、合格すると「修了証」をお渡しします。これとは別に、ケミカルハザード対策専門家認定試験に参加する場合は、事前に申請書を提出する必要があります。

You can take part in individual classes that interest you, but the following classes may limit the number of participants in order to conduct the practical training. Please note that we will recruit in advance.

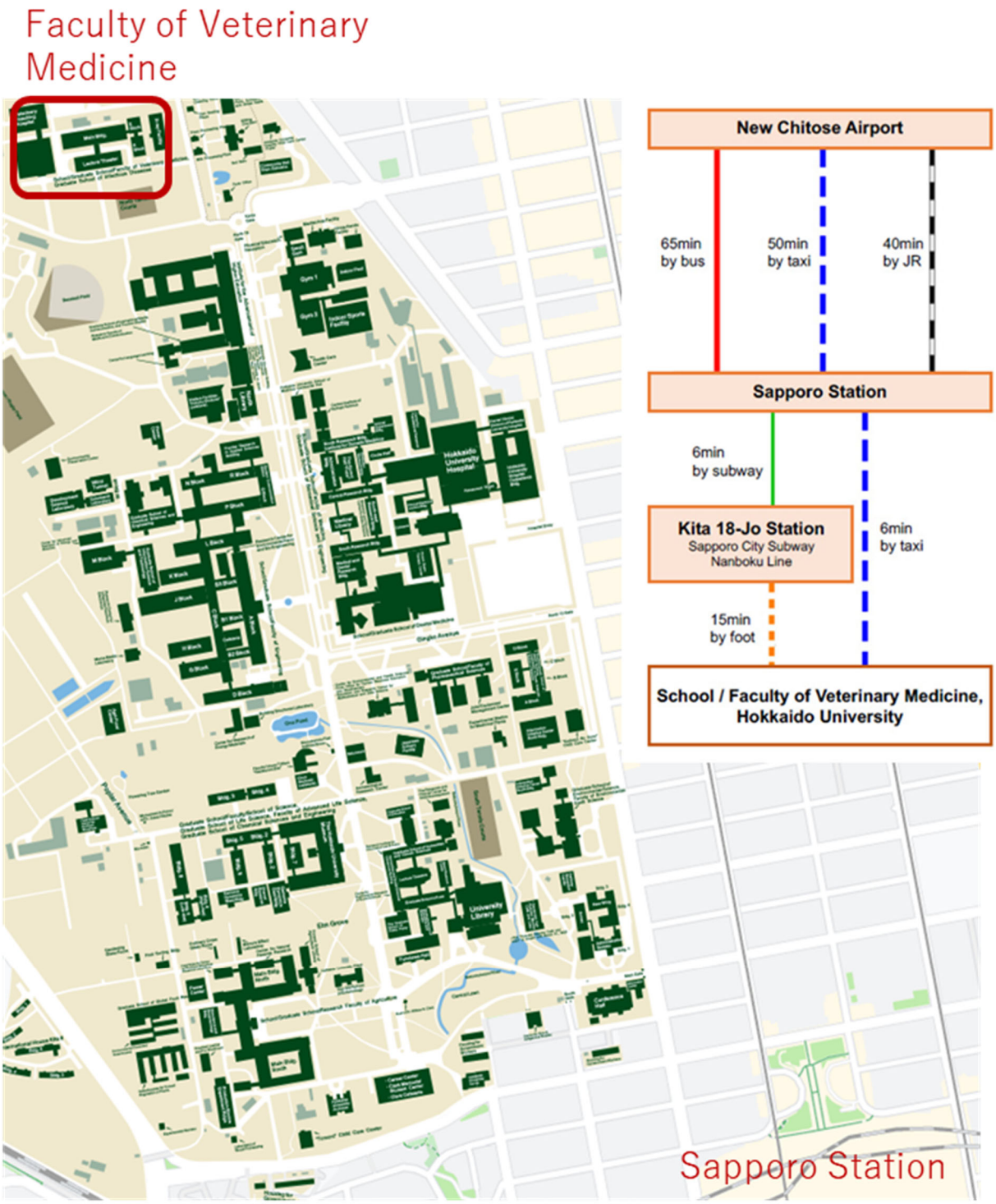
興味のある授業に個別に参加することも可能ですが、以下の授業は実習を行うため、参加人数を制限する場合があります。あらかじめご了承の上、履修ください。

- GIS (Geographic Information System) Basics and Practices
- Analytical Chemistry / Toxicology.

The following lessons use computers, so please bring your laptop.
- Docking Simulation (Chemical Hazard VI)
- Multiple Factor Analysis: Basics and Practices (Chemical Hazard VI)
- GIS (Geographic Information System) Basics and Practices (Chemical Hazard V, Mechanism, Assessment and Remediation of Environmental Pollution

以下の授業はパソコンを使用しますので、ノートパソコンをご持参ください。
- Docking Simulation (ケミカルハザード対策専門家特論 VI)

- Multiple Factor Analysis: Basics and Practices (ケミカルハザード対策専門家特論 VI)
- GIS(地理情報システム)実習(ケミカルハザード対策専門家特論 V および環境汚染の調査と評価・修復の実践)



Lecturers and Class Keywords 1.

Advanced and Comprehensive Studies on Chemical Hazard Control I-V

ケミカルハザード対策専門家特論！～V

The environmental pollution problem is a global issue and efforts from various fields are necessary. Especially veterinary medicine is a field where bridges between humans and animals, ecosystems. Under the concept of "One Health", to prevent chemical hazards occurring around the world, we set up a specialist course I-V on chemical hazard countermeasures for the purpose of human resource development.

- Course I provides class on Field Toxicology & Risk Analysis (Assessment, Management and Communication).
- Course II provides methodology of chemical analyses such as LC/MS, GC/MS and ICP/MS.
- Course III provides Comprehensive Studies on Chemical Hazard Control.
- The Course IV is the classes on Environmental Remediation.
- Course V is a course on GIS (Geographic Information Systems) and remote sensing.
- The Course VI is on silico (computer) analyses of the data.

環境汚染問題は地球規模の問題であり、さまざまな分野からの取り組みが必要です。獣医学は人と動物、生態系をつなぐ架け橋となる分野です。この授業では、「One Health」のコンセプトのもと、世界中で発生するケミカルハザードを予防するため、人材育成を目的にケミカルハザード対策専門コース I～V を設置しました。

- コース Ⅰ では、フィールド毒性学とリスク分析（アセスメント、マネジメント、コミュニケーショ ン）を学びます。
- コース II では、LC/MS、GC/MS、ICP/MS などの化学分析の方法論を学びます。
- コース III では、化学物質の危険有害性制御に関する総合的な研究を行います。
- コース IV は、環境修復に関する授業です。
- コース V は、GIS（地理情報システム）とリモートセンシングに関する授業です。
- コース VI は、in silico の授業で、ケミカルハザードに関する情報をコンピューターを用いて解析します。

1) Advanced and Comprehensive Studies on Chemical Hazard Control I: Field Toxicology & Risk Analysis
ケミカルハザード対策専門家特論Ⅰ フィールド毒性学とリスクアナリシス

In this class, students will learn about basic toxicology, environmental toxicology, risk analysis (risk assessment, risk management, and risk communication), food safety, and hygiene. As an emerging field, you will also study about forensic veterinary medicine and shelter medicine. Participants will learn from experts in the field how to control hazards when they become apparent and how to respond to them.

この授業では、基礎毒性学、環境毒性学、リスク分析(リスク評価、リスク管理、リスクコミュニケーション)、食品安全学、衛生学について学びます。また、新興分野として法医学獣医学、シェルターメディスンについても学びます。ハザードが顕在化した際のコントロール方法、ハザードへの対応方法などを、その分野の専門家から学びます。

Orientation & Introduction to Toxicology
The basic principle of toxicology is that all chemicals are toxic. In this course, you will learn the basics of toxicology, such as how toxicity is caused and how it is evaluated.

Mayumi ISHIZUKA
Professor, Faculty of Veterinary Medicine, Hokkaido University

Forensic Toxicology & Shelter Medicine
Forensic veterinary medicine is a recently established discipline that is closely related to animal welfare. In this class, students will learn the basics of shelter medicine, disaster veterinary medicine, and forensic veterinary medicine, which have not yet become widespread in Japan.
Aki TANAKA
Assistant Professor, Nippon Veterinary and Life Science University

Food Safety
Food safety is an even more important social issue. In this class, students will learn what factors can cause threats to food safety and a wide range of topics related to food safety, including chemical substances and microorganisms.

Motohiro HORIUCHI
Professor, Faculty of Veterinary Medicine, Hokkaido University

Risk Analysis
Risk analysis consists of risk assessment, risk management, and risk communication. In this class, you will learn the basics of risk analysis and what you should do as a professional when a hazard actually occurs.
Keywords: Event-Based- Survey, Rapid Risk Assessment
Norikazu Isoda
Associate Professor, Research Center for Zoonosis Control, Hokkaido University

Ecotoxicology/Food Safety

Collins NIMAKO
Invited lecturer from Ghana

Ecotoxicology

Analytical Chemistry & Toxioclogy
Yared Beyene YOHANNES
Invited lecturer from Ethiopia

With chemical substances being released into the environment on a daily basis, environmental toxicology and ecotoxicology are important research fields for the "One Health" concept. It is even said that there is no longer an uncontaminated environment on earth. Students will learn the basics and applications of how to evaluate the possible effects and toxicity of various chemical substances that we consume every day.

日々、化学物質が環境中に放出される中、環境毒性学や生態毒性学は「One Health」を考える上で重要な研究分野となっています。もはや地球上に汚染されていない環境は存在しないとさえ言われている。私たちが日常的に摂取しているさまざまな化学物質について、その影響や毒性の可能性を評価する方法の基礎と応用を学びます。

2) Advanced and Comprehensive Studies on Chemical Hazard Control II: Chemical Analyses
ケミカルハザード対策専門家特論 II　化学分析

In this class, students will learn how to analyze chemical substances. Students will learn state-of-the-art analytical techniques such as high-performance liquid chromatography-mass spectrometry (LC-MS), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), gas chromatography-mass spectrometry (GC-MS), and stable isotope mass spectrometry. Students will learn to actually analyze physiologically active substances and environmental chemicals in a practical training format. In classroom lectures, students study the principles of instrument analysis, how to handle and think about data, and how to perform calculations.

この授業では、化学物質の分析方法について学びます。高速液体クロマトグラフィー質量分析計（LC-MS）、誘導結合プラズマ質量分析計（ICP-MS）、ガスクロマトグラフ質量分析計（GC-MS）、安定同位体質量分析計などの最先端の分析技術を学びます。実習では、生理活性物質や環境化学物質を実際に分析することを実習形式で学びます。座学では、機器の分析原理、データの扱い方・考え方、計算の仕方などを学びます。

Analytical Chemistry & Toxicology
Yoshinori Ikenaka
Associate Professor, Faculty of Veterinary Medicine, Hokkaido University

Analytical Chemistry & Toxioclogy
Shouta MM NAKAYAMA
Assistant Professor, Faculty of Veterinary Medicine, Hokkaido University

Analytical Chemistry & Toxioclogy
Collins NIMAKO
Invited lecturer from Ghana

Analytical Chemistry & Toxioclogy
Yared Beyene YOHANNES
Invited lecturer from Ethiopia

In your own research, have you ever wished you could analyze chemicals...peptides...or know the amount of bioactive substances? In this class, you will learn how to analyze a wide range of chemical substances, using LC-MS, ICP-MS, GC-MS, etc.

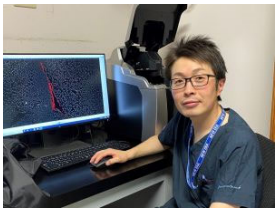
ご自身の研究において、化学物質が分析できたら・・・ペプチドが分析できたら・・・生理活性物質の量がわかったら・・・と思われたことはありませんか？この授業では、LC-MS、ICP-MS、GC-MS などを用いて、様々な化学物質の分析方法を学びます。

3) Advanced and Comprehensive Studies on Chemical Hazard Control III: Comprehensive Studies on Chemical Hazard Control
ケミカルハザード対策専門家特論 III　保全医学基礎論

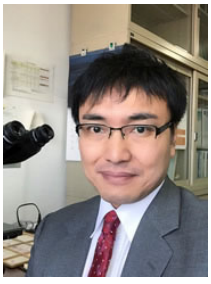
In this class, you will learn the basic knowledge required for chemical hazard control and conservation medicine. Students will be asked to study ecology, anatomy, molecular toxicology, pharmacology, pathotoxicology, and immunotoxicology. Most of these are taught in a lecture format, but some classes incorporate practical exercises. The practicals will include learning about microscopy, virtual slide technology, and patch clamping. What you learn in this class will be useful not only in chemical hazard control, but also in many other areas of research.

この授業では、ケミカルハザード対策と保全医学に必要な基礎知識を学びます。生態学、解剖学、分子毒性学、薬理学、病理毒性学、免疫毒性学などを修学していただきます。この授業のほとんどは講義形式で行われますが、実習を取り入れた授業もあります。実習では、顕微鏡観察、バーチャルスライド技術、パッチクランプなどを学びます。この授業で学んだことは、ケミカルハザード対策だけでなく、他の多くの研究分野でも役に立つことでしょう。

Wildlife Toxicology / Ecotoxicology
Conservation medicine is a new discipline that began in the 2000s. In this class, experts in wildlife and ecology will lecture on the relationship between human activities, chemicals released into the environment, and wildlife.
Keyword: wildlife medicine, conservation medicine, ecology
Toshio TSUBOTA
Professor, Faculty of Veterinary Medicine, Hokkaido University



Experimental Molecular Toxicology
Students will learn the basics of histological evaluation of the effects of chemical substances from a molecular biological perspective.
Keyword: Effects of chemicals/drugs on organ morpho-function
Osamu Ichii
Associate Professor, Faculty of Veterinary Medicine, Hokkaido University



Toxicologic Pathology
Pathological analysis provides the basic and important data needed to investigate pathological conditions and their causes in humans and animals. Students will learn the basics of how histological images are affected by chemicals and other factors
Keyword: pathology
Takashi Kimura
Professor, Faculty of Veterinary Medicine, Hokkaido University

Pharmacology
Students will learn about pharmacology as the basis for the effects of chemical substances on humans and animals.
Keyword: pharmacology
Ken-ichi Otsuguro
Professor, Faculty of Veterinary Medicine, Hokkaido University

Immunotoxicology
Immunotoxicity is one of the most common effects of chemicals, which can also cause mass deaths directly or indirectly. Many chemicals are known to act on the immune system, and this class will cover a wide range of topics from the basics of immunology to immunotoxicology.
Keyword: immunology, infectious disease
Kazuhiko Ohashi
Professor, Faculty of Veterinary Medicine, Hokkaido University

GIS and Ecotoxicology
In this class, students will practice ecology using a variety of tools. Methods of ecological investigation, such as satellite data and SNS, are shifting to the use of IT tools. We will invite researchers from NPOs that are on the cutting edge of ecological research to conduct this class.

Keyword: ecology, survey, IT tool

Osamu Hasegawa
Researcher, ENVISION

GIS and Ecotoxicology
In this class, students will practice ecology using a variety of tools. Methods of ecological investigation, such as satellite data and SNS, are shifting to the use of IT tools. We will invite researchers from NPOs that are on the cutting edge of ecological research to conduct this class.

Keyword: ecology, survey, IT tool

Tsuyosi Yoshida
Researcher, ENVISION

GIS and Ecotoxicology
In this class, students will practice ecology using a variety of tools. Methods of ecological investigation, such as satellite data and SNS, are shifting to the use of IT tools. We will invite researchers from NPOs that are on the cutting edge of ecological research to conduct this class.

Keyword: ecology, survey, IT tool

Tomomi Kudo
Researcher, ENVISION

4) Advanced and Comprehensive Studies on Chemical Hazard Control IV: Environmental Remediation
ケミカルハザード対策専門家特論 IV　環境修復

In this class, students will learn the skills and knowledge necessary for environmental restoration, including green chemicals. Environmental remediation is taught in the form of exercises.

この授業では、グリーンケミカルをはじめとする環境修復に必要な技術や知識を学びます。環境修復は演習形式で学びます。

Environmental Remediation
Keywords: Green Chemicals, Environmental Remediation

Yuichi Kamiya
Professor, Faculty of Environmental Earth Science,
Hokkaido University

New diagnostic technologies opened up by remote sensing
Keywords: diagnostic technology, remote sensing

Yukihiro Takahashi
Professor, Space Mission Center (SMC)
Creative Research Institution (CRIS)
Hokkaido University

Environmental remediation is a technology that restores a polluted environment. In this class, students will learn about green chemicals and other methods of environmental remediation.

環境修復とは、汚染された環境を修復する技術です。この授業では、グリーンケミカルをはじめとする環境修復の方法について学びます。

Remote sensing technology can be an important tool for various researches. In this class, experts who have actually created and flown nano-satellites into space will teach "New diagnostic technologies opened up by remote sensing".

リモートセンシング技術は、様々な研究のための重要なツールとなりえます。この授業では、実際に超小型衛星を作り、宇宙に飛ばした専門家が「リモートセンシングが拓く新しい診断技術」を教えます。

5) Advanced and Comprehensive Studies on Chemical Hazard Control V: GIS and satellite remote sensing
ケミカルハザード対策専門家特論Ⅴ :GIS とリモートセンシング

In this class of Chemical Hazard V, students will learn hands-on Geographic Information System (GIS) and remote sensing technology, which can be applied to various fields such as epidemiological, environmental, ecological, and land use surveys, through lectures and practical training.

この「ケミカルハザード Ⅴ」の授業では、疫学・環境・生態・土地利用調査などさまざまな分野で応用できる地理情報システム(GIS)とリモートセンシング技術を、講義と実習を通して実践的に学びます。

Basic and practices of GIS
Keyword: Geographic Information System, Satellite, Mapping

Kazuyo HIROSE
Researcher, Japan Space Systems

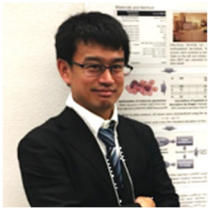
Now a day, GIS (Geographic Information System) and remote sensing technologies are essential for the field research activities. Your research data can be analyzed in conjunction with the environment data, such as topography, vegetation, soil type, water environment, wildlife habitat, urban environment and human economic activity. Through this hands-on training for 3 days, you will learn how to acquire and analyze GIS and satellite data.

今や GIS(地理情報システム)やリモートセンシングの技術は、フィールドでの研究活動には欠かせないものとなっています。地形、植生、土壌の種類、水環境、野生生物の生息地、都市環境、人間の経済活動などの環境データと連動して、実際の研究データを解析することができます。3 日間の実習を通して、GIS や衛星データの取得方法、解析方法を学びます。

6) Advanced and Comprehensive Studies on Chemical Hazard Control VI: Informatics
ケミカルハザード対策専門家特論 VI :インフォマティックス

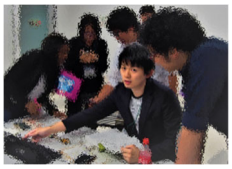
This class will be a computer-based in silico class. Students will learn how to predict and calculate how to simulate the binding of biomolecules to chemical molecules. It will be useful for many researches because you will learn from the assembly of protein three-dimensional structures.
Also, have you ever had trouble figuring out how to handle and analyze the large number of data obtained from epidemiological studies, omics, and other comprehensive analyses? In this class, you will learn how to put together diverse data such as epidemiological surveys and more than tens of thousands of omics data such as molecular biology.

この授業は、コンピュータを使った insilico 解析の授業になります。生体分子と化学分子との結合や化学物質の動態をどのように予測し、どのようにシミュレートするかを計算する方法を学びます。タンパク質の立体構造の組み立てから学ぶので、多くの研究に役立つでしょう。
また、疫学調査やオミックスなどの総合的な解析で得られる大量のデータをどのように扱い、解析すればよいのか困ったことはありませんか？この授業では、疫学調査などの多様なデータ、分子生物学などの数万を超えるオミックスデータをどのようにまとめるかを学びます。



Basic and Multivariate Analysis: Basics and Practices
This course provides guidance from the basics to practice on what to do when analyzing large amounts of factors such as metabolomics and epidemiological studies.
Keywords: Data analysis, Data visualization, Reproducible data analysis, R

Akifumi Eguchi
Assistant Professor, Chiba University



Computational Toxicology
Basic of Molecular Docking
Simulates affinity and interaction between molecules. Students will learn how to create protein 3D structures for simulation and how to calculate ligand affinity in docking simulation.
Keywords: protein 3D structures, Molecular docking, receptor, Structure prediction, AlphaFold2, Molecular dynamics

Kazuki Takeda
Assistant Professor, Kitasato University

Lecturers and Class Keywords 2.

Mechanism, Assessment and Remediation of Environmental Pollution

環境汚染の調査と評価・修復の実践

The environmental pollution problem is a global issue and efforts from various fields are necessary. However, effects of anthropogenic activities such as environmental pollution do not immediately catch the attention of the general public and are not easily brought under control. To resolve this global and growing issue, contributions from various research filed are necessary, e.g., health science, social science and technologies for environmental remediation. In this course, professors of faculties of agriculture, veterinary medicine, engineering, economics and business, health science and environmental earth science, and specialist of GIS research are jointed to provide basic knowledge in each field in the omnibus classes.
※Please note that the GIS classes are scheduled far apart.

環境汚染問題は地球規模の問題であり、さまざまな分野からの取り組みが必要です。しかし、環境汚染のような人為的な活動の影響は、すぐに一般市民の目に留まるものではなく、容易にコントロールできるものではありません。この地球規模かつ深刻な問題を解決するためには、健康科学、社会科学、工学など、さまざまな研究分野の貢献が必要です。本講座では、農学院、獣医学院、工学院、経済経営学院、保健科学院、地球環境科学院の教授陣と GIS 研究の専門家が連携し、オムニバス形式で各分野の基礎知識を提供します。
※GIS の授業は日程が離れているのでご注意ください。

Health Science
Keyword: Health science, Maternal Health

Harukazu Tohyama
Professor, Faculty of Health Science, Hokkaido University

Environmental Radioactivity and health hazard: to get your own robust gauge of the risk
Keyword: Environmental inorganic geochemistry

Kazuhiro Toyoda
Associate Professor, Graduate School of Environmental Sciences, Hokkaido University

Impact Evaluation of Development Program
Keyword: development economics

Masato Hiwatari
Associate Professor, Faculty of Economics and Business, Hokkaido University

How do we remediate abandoned mine sites?
Keyword: Environmental remediation

Toshifumi Igarashi
Professor, Faculty of Engineering, Hokkaido University

Understanding Plants and Soils - in relation to environmental pollutions
Keyword: Introduction to Basic and environmental toxicology, and fate of xenobiotics in our body.

Yoshitaka Uchida
Associate Professor, Faculty of Agriculture,
Hokkaido University

Basic and practices of GIS
Keyword: Geographic Information System, Satellite, Mapping

Kazuyo HIROSE
Researcher, Japan Space Systems

Lecturers and Class Keywords 3.

Animal Poisoning and Analysis I & II

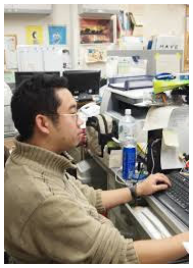
動物の中毒 I&II

This class is a related class to the Veterinary Forensics class. Although this course is designed for working (adult) students, it can be taken by students of Hokkaido University and other universities. Students will learn about the mechanisms of poisoning by chemical substances, methods of appraisement, and methods of analyzing and analyzing chemical substances.

この授業は、「法獣医学」の関連授業です。社会人向けの授業ですが、もちろん、北海道大学や他大学の学生でも受講することができます。化学物質による中毒のメカニズム、鑑定方法、化学物質の分析・解析方法について学びます。

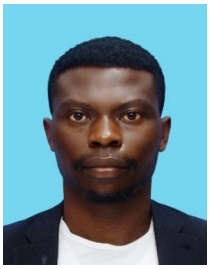
Poisoning
Mayumi ISHIZUKA
Professor, Faculty of Veterinary Medicine, Hokkaido University

Veterinary Forensics
Aki TANAKA
Assistant Professor, Nippon Veterinary and Life Science University



Analytical Chemistry & Toxioclogy
Shouta MM NAKAYAMA
Assistant Professor, Faculty of Veterinary Medicine, Hokkaido University

Analytical Chemistry & Toxicology
Yoshinori Ikenaka
Associate Professor, Faculty of Veterinary Medicine, Hokkaido University



Ecotoxicology

Collins NIMAKO
Invited lecturer from Ghana

Ecotoxicology

Yared Beyene YOHANNES
Invited lecturer from Ethiopia

Lecturers and Class Keywords 4.

International Conservation Medicine to fostering the next generation of human resources to serve as a bridge between Africa and Japan (IVCMEP)

Please check Syllabus of this class.
ザンビアとの交流授業です。シラバスの詳細は WEB サイトをご覧ください。
Japanese https://africa.vetmed.hokudai.ac.jp/
Englush https://africa.vetmed.hokudai.ac.jp/en/

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