

## 2022 Akita University Faculty of Medicine Syllabus

<b>Category</b>	: 基礎医学アドバンストコース
<b>Course Title</b>	: Cell Physiology - Cardiovascular Electrophysiology
<b>Eligible Students</b>	: grade 2 Elective Course
<b>Code</b>	: 71564005
<b>Schedule</b>	: week 30 ~ week 30
<b>Credits</b>	: 1

### 1. Lead Instructor

Kyoichi Ono (Professor, Department of Cell Physiology, 6069)

### 2. Instructors

Kyoichi Ono (Professor, Department of Cell Physiology, 6069)

Yosuke Okamoto (Lecturer, Department of Cell Physiology, 6070)

### 3. Course Description Outline(Course Objectives)

Summary: In the first half of the week, we will observe the response of cardiomyocytes to various stimuli, using virtual cells that reproduce the excitability and contraction of cardiomyocytes on a computer, and consider the underlying mechanism. The second half introduces the topics on myocardial excitement.

Aim: Virtual cells faithfully reproduce the excitability and contractility of cardiomyocytes and, using them, it is possible to obtain results that are almost the same as experiments with actual cells. Students will participate in discussions in small groups, summarize the experimental results, and proceed with consideration. As a result, problem-solving ability, presentation ability, and communication ability can be cultivated.

### 4. Textbook/Reference Books

「標準生理学」医学書院

「心筋細胞イオンチャネル」倉智嘉久著 文光堂

「心筋細胞の電気生理学」山下武志著 メディカルサイエンスインターナショナル

### 5. Assessment

Attendance, reports, presentations

### 6. Out of Class Study/Message

- We will proceed with lectures and exercises according to the materials distributed on the day.
- We will explain the software on the first day. Since the software used in the practice will be distributed to those who wish, the students can install it on their own personal computer (Windows) and perform the training.
- It may be changed slightly depending on the schedule of the instructor.

Topics and Contents of class, Course Objectives						
	Class Date	Period	Class Format	Topics and Contents of class, Course Objectives	Instructors	Class Room
1	11 / 28 (Mon)	1-2	Lecture	Theme: Introduction of virtual cells We will outline myocardial excitability and explain how to conduct experiments using virtual cells and how to write reports.	Kyoichi Ono	基礎棟 5階共用室
2	11 / 28 (Mon)	3-4	Exercise	Theme: Normal action potentials Using virtual cells, the action potentials of ventricular myocytes and sinoatrial node cells are observed, and the action potential parameters are measured. Confirm the basic properties of cardiomyocytes, such as the all-or-none law and the refractory period, with virtual cells.	Kyoichi Ono	基礎棟 5階共用室
3	11 / 28 (Mon)	5-6	Exercise	Theme: Response of myocardial excitability to changes in extracellular fluid Observe the changes in cardiomyocyte excitability when the extracellular fluid ion concentration (Na, K, Ca) is changed, and discuss the obtained changes.	Kyoichi Ono	基礎棟 5階共用室
4	11 / 28 (Mon)	7-8	Exercise	Theme: Response of myocardial excitability to changes in extracellular fluid Continue the exercise.	Kyoichi Ono	基礎棟 5階共用室
5	11 / 28 (Mon)	9-10	Discussion	Theme: Comprehensive discussion and report writing After giving a presentation about the obtained results, a general discussion will be held.	Kyoichi Ono	基礎棟 5階共用室
6	11 / 29 (Tue)	1-2	Exercise	Theme: Role of various ionic currents in action potentials Response of myocardial excitability to changes in the amplitudes of various ionic currents are observed.	Kyoichi Ono	基礎棟 5階共用室
7	11 / 29 (Tue)	3-4	Exercise	Theme: Role of various ionic currents in action potentials Continued.	Kyoichi Ono	基礎棟 5階共用室
8	11 / 29 (Tue)	5-6	Exercise	Theme: Role of various ionic currents in action potentials Continued.	Kyoichi Ono	基礎棟 5階共用室
9	11 / 29 (Tue)	7-8	Exercise	Theme: Role of various ionic currents in action potentials Continued.	Kyoichi Ono	基礎棟 5階共用室
10	11 / 29 (Tue)	9-10	Discussion	Theme: Role of various ionic currents in action potentials After giving a presentation about the obtained results, a general discussion will be held.	Kyoichi Ono	基礎棟 5階共用室
11	11 / 30 (Wed)	1-2	Exercise	Theme: Effects of bioactive substances on cardiac excitability We will observe and discuss changes in myocardial excitability when noradrenaline and acetylcholine are administered.	Kyoichi Ono	基礎棟 5階共用室
12	11 / 30 (Wed)	3-4	Exercise	Theme: Effects of bioactive substances on cardiac excitability Continued.	Kyoichi Ono	基礎棟 5階共用室
13	11 / 30 (Wed)	5-6	Exercise	Theme: Pharmacology We will observe changes in myocardial excitability when various drugs are administered, and consider the targets of action of the drugs.	Kyoichi Ono	基礎棟 5階共用室

Topics and Contents of class, Course Objectives						
	Class Date	Period	Class Format	Topics and Contents of class, Course Objectives	Instructors	Class Room
14	11 / 30 (Wed)	7-8	Exercise	Theme: Pharmacology Continued.	Kyoichi Ono	基礎棟 5 階共用室
15	11 / 30 (Wed)	9-10	Discussion	Theme: Comprehensive discussion and report writing After giving a presentation about the obtained results, a general discussion will be held.	Kyoichi Ono	基礎棟 5 階共用室
16	12 / 1 (Thu)	1-2	Exercise	Theme: Creation of biological pacemaker cells We will conduct an experimental study using virtual cells on how to make spontaneous active ventricular muscles.	Kyoichi Ono	基礎棟 5 階共用室
17	12 / 1 (Thu)	3-4	Exercise	Theme: Creation of biological pacemaker cells Continued.	Kyoichi Ono	基礎棟 5 階共用室
18	12 / 1 (Thu)	5-6	Discussion	Theme: Creation of biological pacemaker cells Give a presentation and general discussion.	Kyoichi Ono	基礎棟 5 階共用室
19	12 / 1 (Thu)	7-8	Lecture	Theme: Introduction of the latest research 1 Introducing the latest academic papers on myocardial excitability. Read original papers.	Yosuke Okamoto	基礎棟 5 階共用室
20	12 / 1 (Thu)	9-10	Lecture	Theme: Introduction of the latest research 2 Continued.	Yosuke Okamoto	基礎棟 5 階共用室
21	12 / 2 (Fri)	1-2	Lecture	Theme: Introduction of the latest research 3 Continued.	Yosuke Okamoto	基礎棟 5 階共用室
22	12 / 2 (Fri)	3-4	Lecture	Theme: Introduction of the latest research 4 Continued.	Yosuke Okamoto	基礎棟 5 階共用室
23	12 / 2 (Fri)	5-6	Self learning	Theme: Report creation In the afternoon of the final day, we will create a report of the experiments using virtual cells conducted during this week.	Yosuke Okamoto	基礎棟 5 階共用室
24	12 / 2 (Fri)	7-8	Self learning	Theme: Report creation Continued.	Yosuke Okamoto	基礎棟 5 階共用室
25	12 / 2 (Fri)	9-10	Self learning	Theme: Report creation Continued.	Yosuke Okamoto	基礎棟 5 階共用室