Course Coding(科目ナンバー)	Year/Semester/Term(年度・学期)	Faculty Offering Course(時間割所属・時間割コード)	Eligible Student Year(開講年次)	Credits(単位数)	Weekday and Period(曜日・時限)
RDM7-007-79-2	2026whole year	Graduate School of Medical Sciences (20080)	1, 2, 3, 4	2	others

Course Title(Theme)(科目名(講義題目))	Instructor(s)(担当教員)
Developmental and Regenerative Medicine(B7)	NISHINAKAMURA Ryuichi, OKAE Hiroyuki, YABUKI Yasushi, MIHARADA Kenichi, NAKAMURA Akira, NODA Taichi, ERA Takumi, OKI Shinya, ONO Yusuke, NIWA Hitoshi, KOGA Saori, TAKEO Toru, ARIMA Yuichiro, KOBAYASHI Akio

Goals with their ratio(学修成果とその割合)

1.Advanced expert knowledge, skill and research capability ‥‥50% 2.Profound inter-disciplinary knowledge ‥‥25% 3.Global perspective and ability to take initiative action ‥‥20% 4.Social leadership drive ‥‥5%

Type of Class(授業の形態)	Lecture
Teaching Method(授業の方法)	PowerPoint will be used in the lectures, and active participation in the discussion is encouraged.
Course Goals(授業の目的)	Developmental and regenerative medicine aims at curing diseases by revealing molecular mechanisms of organ development. In this course, you learn basic concepts and techniques used in this filed, including knockout mice, which have now become essential for any area of research. This course serves as introductory for those in the Developmental and Regenerative Researcher Program, and will also be useful for those in other programs, as you obtain essential knowledge on genetic engineering techniques.
Course Learning goals(学修目標)	【A level (A水準)】 Master basic concepts and techniques used in this filed, and is able to explain the disease mechanisms and treatments based on the knowledge. 【C level (C水準)】 Master basic concepts and techniques used in this filed, and is able to understand the disease mechanisms and treatments.
Course Outline(授業の概要)	(1) Establishment and application of stem cells including ES and iPS cells; (2) Reproductive engineering including in vitro fertilization, freezing of embryos and sperms, embryo transfer, intracytoplasmic sperm injection, and nuclear transfer; (3)　Genome editing technology and knockout mice; (4) Maintenance and differentiation of stem cells; (5) Placental development and fetomaternal relationship; (6) Organ development and disease including the kidney, liver, pancreas, muscle, neuron, gonad, blood, heart and vasculature; (7) Regenerating organs from stem cells

Details for Individual Classes(各回の授業内容)

No.(回)	Date(月日)	Class Theme(授業テーマ)	Brief Outline of Class(内容概略)
1		Ryuichi NISHINAKAMURA【eE-0】	Overview & Kidney development
2		Toru TAKEO【eE-0】	Reproductive engineering
3		Taichi NODA【eE-0】	Generation of genetically modified mice and their application
4		Hitoshi NIWA【eE-0】	Molecular basis of embryonic stem cells I
5		Hitoshi NIWA【eE-0】	Molecular basis of embryonic stem cells II
6		Takumi ERA 【eE-0】	iPS cells, their applications for the medicine
7		Hiroaki OKAE 【eE-0】	Pregnancy in mammals
8		Kenichi MIHARADA【eE-0】	Fetal-maternal crosstalk: maternal metabolism and fetal development
9		Yuichiro ARIMA【eE-0】	Differentiation, Maturation, and Regeneration of the Heart and Blood Vessels
10		Saori KOGA【eE-0】	Development of the blood system
11		Akio KOBAYASHI 【eE-0】	Development of the urogenital system
12		Akira NAKAMURA 【eE-0】	germ cell formation: preformation and epigenesis
13		Yusuke ONO【eE-0】	Muscle development and regeneration
14		Yasushi YABUKI【eE-0】	iPS cells and neurodegeneration
15		Shinya OKI 【eE-0】	Bioinformatics in developmental biology

Estimated out-of-class study time	60 hrs
Required Textbook(テキスト)	
Reading List(参考文献)	・ “Developmental Biology, 12th edition” by Barresi MJF& Gilbert S 2019. ・ “Essential Developmental Biology, 4th edition” by Slack JMW &Dale L.,Blackwell Publishing 2021 ・ “Manipulating the Mouse Embryo: A Laboratory Manual, 4th edition” by Nagy A., Gertsenstein M., Vintersten K., Behringer R., Cold Spring Harbor Laboratory Press, 2014. ・ “Larsen’s Human Embryology, 5th edition”by Shoenwolf GC, Bleyl SB, Brauer PR, Francis-West PH. Churchill Livingstone, 2014.
Enrollment Conditions(履修条件)	
Assessment Methods and Criteria(評価方法・基準)	The students' understanding will be evaluated on the basis of papers and quizzes related to the topics dealt with in class to be scored from 0 to 100. Final grades will be based on the average score of the papers and quizzes, as well as the final report and active participation in class discussions.
Language Used in	English

Instruction(使用言語)	English
Textbook/Material Language(教科書・資料の言語)	Combination of Japanese and English
Course Based on Practical Work Experience(実務経験を活かした授業)	Not applicable