2022 Academic Year

Course Curriculum
(Syllabus)

Tohoku University,
Graduate School of Dentistry

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(Master's Course)

Curriculum policy

The Graduate School of Dentistry formulates and implements the curriculum based on the following policy in order to enable students to achieve the aims of the Diploma Policy.

(1) Provide specialized and transdisciplinary courses in dental science, dental care, and oral health, as well as an educational environment that enables students to focus on research for their master's thesis and other purposes.
(2) Provide opportunities to develop the high ethical standards expected of researchers and sophisticated professionals, opportunities to learn about the latest advances in Japanese/international dental science research and dental care technologies, and practical opportunities enabling students to acquire communication skills and advanced specialized techniques.
(3) Clearly define the standards for evaluating academic progress, and appropriately conduct exams and research reviews based on the student's master's thesis, etc.

Diploma Policy

The Graduate School of Dentistry confers master's degrees to students who have successfully achieved the following aims.

(1) Be able to carry out specialized research in one's field or engage in a high-level specialized occupation with a broad perspective and leveraging specialized knowledge and advanced technology in dental science, dental care, oral health, and other such disciplines.
(2) Be able to contribute to the improvement of health and welfare by addressing societal and scholarly needs regarding dental science, dental care, and oral health with high ethical standards and a firm sense of responsibility.
(3) Possess an international perspective and communication skills, and be able to apply them to dissemination of one's specialized research findings, or to one's high-level specialized occupation.

(Doctoral Course)

Curriculum policy

The Graduate School of Dentistry formulates and implements the curriculum based on the following policy in order to enable students to achieve the aims of the Diploma Policy.

(1) Facilitate the acquisition of sophisticated knowledge and skills in specialized fields and transdisciplinary domains by providing specialized and transdisciplinary courses necessary for dental science research, and having students develop abundant expertise in dental science, dental care, and oral health, and write a dissertation based on that expertise.
(2) Provide opportunities to develop the high ethical standards and leadership necessary for engaging in research, and opportunities in Japan and abroad to learn about and report the latest findings in cutting-edge research.
(3) Clearly define the standards for evaluating academic progress, and appropriately conduct exams and research reviews based on the student's doctoral dissertation, thematic research results, etc.

Diploma Policy

The Graduate School of Dentistry confers doctoral degrees to students who successfully achieve the following aims.

(1) Be able to complete independent, original, and transdisciplinary research in dentistry using one's abundant expertise and high-level specialized knowledge and skills.
(2) Be able to contribute to the advancement of society and scholarship by carrying out next-generation research as a leader in dentistry who tackles societal and scholarly challenges with original ideas, high ethical standards, and a firm sense of responsibility.
(3) Be able to lead dental research in Japan and abroad by utilizing one's international perspective and communication skills, and by disseminating world-class research findings.

2. Completion Requirements and Registration Procedures

I. Master's Course

Characteristics of courses

1. Fundamental Dentistry
   It is possible to receive instruction from all faculty members of the Graduate School of Dentistry. The Graduate School of Dentistry has a widely diverse faculty, with members specializing in dentistry and dental care. Guidance is also available from faculty members of donated courses and cooperative courses. Students can learn how to solve problems and conduct research according to their own interests and problems, and can develop and expand what they have learned during their undergraduate education to dentistry.

   Course content:
   Students can learn a wide range of topics in dentistry. In addition, a variety of curricula are available to suit individual backgrounds.

   Main career paths after graduation:
   - Enter the doctoral program of the Graduate School of Dentistry
   - Medical, pharmaceutical, and food-related companies, medical equipment development companies, government offices (especially in the medical field), etc.

2. Oral Health Science
   The Japanese government has introduced a "community-based comprehensive care system," a system for realizing cooperation and collaboration among multiple professions in the community in order to realize a society in harmony with the community. Oral health is known to be related to many systemic diseases and to have important social effects. The Graduate School of Dentistry is conducting research activities in collaboration with local governments, and has prepared practical research opportunities for this purpose.

   Course content:
   Students learn practical methods of analyzing data collected from the local community, and are able to select lectures on related national systems and research methods.

   Major career paths after completion:
   - Enter the doctoral program of the Graduate School of Dentistry
   - Health care administrators in local governments
   - Medical institutions, nursing care facilities, etc.

3. Medical Engineering
   The Graduate School of Dentistry has been developing equipment and technologies that apply engineering techniques to dentistry through interdisciplinary joint research with inside and outside the university. In addition, we are also leading the development of applications using artificial

intelligence technology. Through participation in the development of innovative products using these new technologies, students will be able to acquire basic research and technology.

Course content:
Students will develop a variety of equipment and technologies through collaboration with the Institute for Materials Research and Graduate School of Engineering at Tohoku University, Tokyo Institute of Technology, medical device companies and certification organizations, and IT companies. Students will acquire basic research skills and knowledge that will allow them to experience some of these cutting-edge technologies.

Main career paths after graduation:
- Enter the doctoral program of the Graduate School of Dentistry
- Medical, pharmaceutical, and food-related companies, medical device development companies, government offices (especially in the medical field), etc.
- Research and development institutions, medical institutions, nursing care facilities, etc.

4. Food and Eating Science

The Graduate School of Dentistry has conducted research on taste disorders, which are common among elderly people, and has collaborated with food companies on the development of food products and their public evaluation, as well as with the Center for Feeding and Swallowing in the clinical department. Some of our faculty members are involved in food safety in Japan and the Pharmaceuticals and Medical Devices Agency. Many of our faculty members are involved in food in a broad sense. In this course, students can take a wide range of courses from basic food development to clinical knowledge related to feeding and swallowing, and promote regulatory science research on "medicine and food as the same source" and "medicine and food as the same source."

Course content:
Students can choose from a wide variety of courses, such as taste disorders and dysphagia related to elderly people and how to treat or mitigate the disorders, as well as regulatory science, with topics such as food development and evaluation of safety and efficacy.

Major career paths after graduation:
- Enter the doctoral program of the Graduate School of Dentistry
- Food products and related companies, etc.

Completion Requirements

To complete the master's degree program of Tohoku University Graduate School of Dentistry, the student must take at least 2 years of course work, earn at least 30 credits (18 compulsory credits and 12 elective credits) from the classes shown in Appendix 1 of the syllabus, submit a master's thesis that

adheres to the research guidance, successfully defend the thesis, and pass the final examination.

Registration Procedures

1. Compulsory courses
   (1) The student must take “Introduction to Dentistry,” “Introduction to Clinical Dentistry,” and “Tour of Dental Clinic,” according to the class schedule in the first year.
   (2) The student must take “Dental Science” under the guidance of the student’s chief supervisor in the second year.
   (3) The student must take “Courses for Master’s Thesis Preparation” under the guidance of the student’s chief supervisor in the first and second year. In the first year, credits will be given for taking “Research Foundations Course,” submission of “Research Theme Selection Summary” and acquiring special knowledge during this process.

2. Basic Technical Courses in Dental Sciences
   The student must take at least three elective courses (at least 3 credits in total; 1 credit/course) that must be elected in the first or second year.

3. Elective courses
   The student must take at least six elective courses (12 credits).
   For "Medical ethics and Social ethics," "Innovative dentistry," "Introduction to physical anthropology" and "Oral Care Program for Cancer Patients," the number of credits is low at one credit each, so six other courses must be taken to fulfill the completion requirement.
   The students are required to consult with their chief supervisor before taking "Immune Regulation and Oral Immunity" and "Geriatric Oral Science,” which are cooperative courses.
   Graduate School Common Courses are elective courses, but are not included in the 12 credits required for completion. The offered courses might change from year to year. Therefore, please confirm them before taking them.

4. Class Implementation
   The timing and timetable of classes will be determined through individual consultation with the instructor in charge of the class.

5. Recommended courses in each department
   A registration example is shown for each course in the table below.

Course Subject	credit	Fundarmental Dentistry	Oral Health Science	Medical Engineering	Food and Eating Science
Compulsory courses					
Introduction to Dentistry	2	○			
Introduction to Clinical Dentistry	1	○			
Tour of Dental Clinic	1	○			
Dental Science	4	○			
Special Training Course for Master's Thesis Preparation	7	○			
Basic Technical Courses in Dental Sciences					
Oral Ecology and Biochemistry	1	○			○
Oral Microbiology	1	○			○
Oral Molecular Bioregulation	1	○			○
Periodontology and Endodontology	1	○			○
Operative Dentistry	1	○		○	
International Oral Health	1		○		○
Dental and Digital Forensics	1	○			
Preventive Dentistry	1	○	○		○
Pediatric Dentistry	1	○			○
Craniofacial Anomalies	1	○			
Orthodontics and Dentofacial Orthopedics	1	○			
Oral Physiology	1	○			○
Dental Pharmacology	1	○			○
Oral Pathology	1	○			
Dental Informatics and Radiology	1	○		○	
Oral and Maxillofacial Surgery	1	○			
Dento-oral Anesthesiology	1	○			
Comprehensive Dentistry	1	○			
Oral and Craniofacial Anatomy	1	○			
Craniofacial Development and Tissue Biology	1	○			
Dental Biomaterials	1	○		○	
Craniofacial Function Engineering	1	○		○	
Advanced Prosthetic Dentistry	1	○		○	
Molecular and Regenerative Prosthodontics	1	○		○	
Aging and Geriatric Dentistry	1	○	○		○
International Collaborative and Innovative Dentistry	1	○		○	○

Course Subject	credit	Fundarmental Dentistry	Oral Health Science	Medical Engineering	Food and Eating Science
Basic Technical Courses in Dental Sciences					
Co-Creative Dentistry	1	○		○	○
Community Oral Health Science	1		○		○
Oral Cancer Therapeutics	1	○			
Dental Nuclear Medicine and Radiology	1	○			
Bio-Dental Engineering	1	○		○	
Elective courses					
Oral Biology	2	○			
Oral Pathophysiology	2	○			
Biomaterials for Regenerative Medicine	2	○		○	
Introduction to Digital Engineering in Dentistry	2	○		○	
Food Science	2				○
International Oral Health	2		○		○
Social Dentistry	2		○		○
Comprehensive Dentistry	2	○			
Oral Health Care for Children and Adolescents	2	○			○
Oral Restoration	2	○		○	
Stomatognathic Function	2	○			
Dentistry for Disabled	2	○			
Geriatric Dentistry	2	○	○		
Dental Infection Control	2	○			
Oral and Maxillofacial Reconstruction	2	○		○	
Digital Engineering in Dentistry	2	○		○	
Disaster Dental Science	2	○	○		
Environment Dental Science	2	○	○		
Immune Regulation and Oral Immunity	2	○			
Geriatric Oral Science	2	○			
Oral Health Science	2		○		
Medical ethics and Social ethics	1	○	○	○	○
Innovative dentistry	1	○	○	○	○
Introduction to physical anthropology	1	○			
Oral Care Program for Cancer Patients	1	○	○		○

II. Doctoral Course

Characteristics of courses

1. Interface Oral Health Science (IOHS) Course
   This course is based on "Interface Oral Health Science (IOHS)," a new concept for the next generation of dentistry advocated by the Graduate School of Dentistry, and is aimed at improving the level of dentistry and dental care through innovation in dentistry with the keywords of cultivating "international knowledge" and "fusion knowledge" through interdisciplinary fusion and international collaboration. This graduate school education program is aimed at improving the level of dentistry and dental care through innovation, mainly by studying and researching the contents of each field of dentistry, and offering a degree in either Japanese or English.

2. CAMPUS Asia plus in Dentistry (CA^{+}inD) Course
   In this course, universities in East Asia and ASEAN will collaborate to establish and spread dental education and research and dental care (Asian dentistry) based on Asian standards that meet the environment and needs of Asia, through dental education based on international joint education in "Interdisciplinary, Industry–academia–government collaboration" with the aim of strengthening global development capabilities. This graduate education program aims at nurturing global leaders who will lead dental care and oral health in Asia from various perspectives that can contribute to the establishment and spread of dental education and research and dental care (Asian dentistry) based on Asian standards that meet the environment and needs of Asia through international joint education based on field collaboration and industry–academia–government collaboration.

Completion Requirements

1. IOHS Course
   Students who intend to complete the IOHS Doctoral Course in this Graduate School must be enrolled for four years or more in the same course, must acquire 30 or more credits from course subjects (9 or more credits from “Lectures in Dental Sciences,” 6 or more credits from “Seminars in Dental Sciences,” 6 or more credits from “Technical Courses in Dental Sciences,” and 9 credits from “Courses for Thesis Preparation”), and after receiving the required research guidance, must submit a Doctoral dissertation and pass a dissertation review as well as a final examination.

2. CA+inD Course

Students who intend to complete the CA+inD Doctoral Course in this Graduate School must be enrolled for four years or more in the same course, must acquire 30 or more credits from course subjects (3 or more credits from "Lectures in Dental Sciences," 2 or more credits from "Seminars in Dental Sciences," 6 or more credits from "Technical Courses in Dental Sciences," and 19 credits of compulsory courses including "Courses for Thesis Preparation"), and after receiving the required research guidance, must submit a Doctoral dissertation and pass a dissertation review as well as a final examination.

Registration Procedures

1. "Courses for Thesis Preparation" confer specialized knowledge, and allow the conducting of independent research relevant to preparation of the Doctoral dissertation under guidance from an academic advisor in the field to which the graduate student belongs (for which 1 credit is awarded in the 1st year, 4 in the 2nd year, and 4 in the 3rd year, for a total of 9 credits).

   No set curriculum exists for the instruction received for preparing the dissertation because it will differ for each graduate student depending on the contents and stage of their research. However, in their first year, students shall receive one credit for attending Introduction to Research, presenting at theme selection meetings, and acquiring specialized knowledge in connection with these activities. Details related to theme selection meetings will be provided at a later date.

   Students shall be awarded eight credits for participating in "journal club," clinical conferences, research seminars, research progress reports and medical examinations held individually in each department, and acquiring specialized knowledge by attending and presenting at academic conferences from their second through third year.

   Fourth-year students shall publish the research results they have obtained up to that point in their Doctoral theses. In cases where the Graduate School Committee judges a student enrolled for two or more years to have performed outstanding research, and to be ahead of schedule in their research progress, that student might be permitted to submit a Doctoral thesis based on credits they are expected to obtain in their third year.

2. Students must register for the following subjects from "Lectures in Dental Sciences," "Seminars in Dental Sciences," and "Technical Courses in Dental Sciences," including at least one subject offered by the academic division with which the student is affiliated.

(1) IOHS Course

Lectures in Dental Sciences: 3 classes (9 credits in total) or more
Seminars in Dental Sciences: 3 classes (6 credits in total) or more
Technical Courses in Dental Sciences: 3 courses (6 credits in total) or more

(2) CA+inD Course

Lectures in Dental Sciences: 1 class (3 credits in total) or more
Seminars in Dental Sciences: 1 class (2 credits in total) or more
Technical Courses in Dental Sciences: 3 courses (6 credits in total) or more

	Course Subject (Credits)							
	Lectures in Dental Sciences		Seminars in Dental Sciences		Technical Courses in Dental Sciences		Courses for Thesis Preparation	
Ecological Dentistry	Oral Ecology and Biochemistry	3	Oral Ecology and Biochemistry	2	Oral Ecology and Biochemistry	2	Ecological Dentistry (1) (2) (3)	9
	Oral Microbiology	3	Oral Microbiology	2	Oral Microbiology	2		
	Oral Molecular Bioregulation	3	Oral Molecular Bioregulation	2	Oral Molecular Bioregulation	2		
	Periodontology and Endodontology	3	Periodontology and Endodontology	2	Periodontology and Endodontology	2		
	Operative Dentistry	3	Operative Dentistry	2	Operative Dentistry	2		
Community Social Dentistry	International Oral Health	3	International Oral Health	2	International Oral Health	2	Community Social Dentistry (1) (2) (3)	9
	Dental and Digital Forensics	3	Dental and Digital Forensics	2	Dental and Digital Forensics	2		
	Preventive Dentistry	3	Preventive Dentistry	2	Preventive Dentistry	2		
	Pediatric Dentistry	3	Pediatric Dentistry	2	Pediatric Dentistry	2		
	Craniofacial Anomalies	3	Craniofacial Anomalies	2	Craniofacial Anomalies	2		
	Orthodontics and Dentofacial Orthopedics	3	Orthodontics and Dentofacial Orthopedics	2	Orthodontics and Dentofacial Orthopedics	2		
Disease Management Dentistry	Oral Physiology	3	Oral Physiology	2	Oral Physiology	2	Disease Management Dentistry (1) (2) (3)	9
	Dental Pharmacology	3	Dental Pharmacology	2	Dental Pharmacology	2		
	Oral Pathology	3	Oral Pathology	2	Oral Pathology	2		
	Dental Informatics and Radiology	3	Dental Informatics and Radiology	2	Dental Informatics and Radiology	2		
	Oral and Maxillofacial Surgery	3	Oral and Maxillofacial Surgery	2	Oral and Maxillofacial Surgery	2		
	Dento-oral Anesthesiology	3	Dento-oral Anesthesiology	2	Dento-oral Anesthesiology	2		
	Comprehensive Dentistry	3	Comprehensive Dentistry	2	Comprehensive Dentistry	2		
Rehabilitation Dentistry	Oral and Craniofacial Anatomy	3	Oral and Craniofacial Anatomy	2	Oral and Craniofacial Anatomy	2	Rehabilitation Dentistry (1) (2) (3)	9
	Craniofacial Development and Tissue Biology	3	Craniofacial Development and Tissue Biology	2	Craniofacial Development and Tissue Biology	2		
	Dental Biomaterials	3	Dental Biomaterials	2	Dental Biomaterials	2		
	Craniofacial Function Engineering	3	Craniofacial Function Engineering	2	Craniofacial Function Engineering	2		
	Advanced Prosthetic Dentistry	3	Advanced Prosthetic Dentistry	2	Advanced Prosthetic Dentistry	2		
	Molecular and Regenerative Prosthodontics	3	Molecular and Regenerative Prosthodontics	2	Molecular and Regenerative Prosthodontics	2		
	Aging and Geriatric Dentistry	3	Aging and Geriatric Dentistry	2	Aging and Geriatric Dentistry	2		
Innovative Liaison Dentistry	International Collaborative and Innovative Dentistry	3	International Collaborative and Innovative Dentistry	2	International Collaborative and Innovative Dentistry	2	Innovative Liaison Dentistry (1) (2) (3)	9
	Co-Creative Dentistry	3	Co-Creative Dentistry	2	Co-Creative Dentistry	2		

	Course Subject (Credits)							
	Lectures in Dental Sciences		Seminars in Dental Sciences		Technical Courses in Dental Sciences		Courses for Thesis Preparation	
Community Oral Health Science	Community Oral Health Science	3	Community Oral Health Science	2	Community Oral Health Science	2	Community Oral Health Science (1) (2) (3)	9
Molecular Pathogenesis of Oral Tumor	Oral Cancer Therapeutics	3	Oral Cancer Therapeutics	2	Oral Cancer Therapeutics	2	Molecular Pathogenesis of Oral Tumor (1) (2) (3)	9
	Dental Nuclear Medicine and Radiology	3	Dental Nuclear Medicine and Radiology	2	Dental Nuclear Medicine and Radiology	2		
Bio-Dental Engineering	Bio-Dental Engineering	3	Bio-Dental Engineering	2	Bio-Dental Engineering	2	Bio-Dental Engineering (1) (2) (3)	9
Immune Regulation and Oral Immunity*	Immune Regulation and Oral Immunity*	3	Immune Regulation and Oral Immunity*	2	Immune Regulation and Oral Immunity*	2	Immune Regulation and Oral Immunity* (1) (2) (3)	9
Geriatric Oral Science*	Geriatric Oral Science*	3	Geriatric Oral Science*	2	Geriatric Oral Science*	2	Geriatric Oral Science* (1) (2) (3)	9

*Joint lecture: Consult with the head instructor before registering.

3. Elective courses are not included in the 30 credits required for completion.
Students who choose the Tumor specialized dentist course must take "Advanced course Clinical Oncology I (3 credits)," "Advanced course Clinical Oncology II (3 credits)," "Advanced course Clinical Oncology III (3 credits)," for a total of 9 credits.
Graduate School Common Courses offered might change from year to year. For that reason, please confirm them before taking them.

4. Earning Credits

(1) A maximum of three subjects can be taken per year in each of Lectures in Dental Sciences, Seminars in Dental Sciences, and Technical Courses in Dental Sciences.

(2) Credit can be earned in Lectures in Dental Sciences, Seminars in Dental Sciences, and Technical Courses in Dental Sciences up until the student's third year. A student can also take one or two courses over two to three years; for example, a student can take six credits in Lectures in Dental Sciences and two credits each in Seminars in Dental Sciences and Technical Courses in Dental Sciences during their first year, three credits in Lectures in Dental Sciences and two credits each in Seminars in Dental Sciences and Technical Courses in Dental Sciences during their second year, and then take two credits each in Seminars in Dental Sciences, and Technical Courses in Dental Sciences during their third year. Tables of average credit acquisition per academic year are presented below.

Example for IOHS Course

	1st Year	2nd Year	3rd Year	4th year	Total
Courses for Thesis Preparation	1	4	4		9
Lectures in Dental Sciences	9				9
Seminars in Dental Sciences	4	2			6
Technical Courses in Dental Sciences	2	4			6
Total Credits	16	10	4		30

Example for CA+inD Course

	1st Year	2nd Year	3rd Year	4th year	Total
Courses for Thesis Preparation	1	4	4		9
CA+inD Compulsory Subject	3	3	3	1	10
Lectures in Dental Sciences	3				3
Seminars in Dental Sciences	2				2
Technical Courses in Dental Sciences	2	4			6
Total Credits	11	11	7	1	30

III. Course Registration Procedure

Students must submit their course registration to the Educational Affairs Section in elective courses and “Basic Technical Courses in Dental Sciences” for the Master's Program and “Lectures in Dental Sciences,” “Seminars in Dental Sciences,” “Technical Courses in Dental Sciences” and elective courses for the Doctoral Program by the designated date. Details of the notification will be explained at the orientation.

IV. Period of Enrollment

However, with respect to the period of study at school, if a student is recognized as someone who has achieved an excellent research result in accordance with rules established separately by the Graduate School Committee, then a student need only study for one year or longer for Master’s Course, for three years or longer for Doctoral Course.

Under some circumstances, such as the student being employed, the Graduate School Council of this Graduate School might grant permission to take an educational program over a planned, fixed period that exceeds the standard course term (two years for the Master’s Course, four years for the Doctoral Course) upon request. Those enrolling under this system are called "Long-term Course Students," and must pay the total tuition fees equal to those paid by students who complete their studies within normal year limits.

In principle, students are required to apply for the long-term course student system at the time of enrollment, but students are allowed to apply for a change during their enrollment when unavoidable circumstances are acknowledged.

Unavoidable circumstances might include changes in work conditions because of orders from an employer, etc. First, the possibility of a leave of absence is considered, and only when there is no prospect of completing the course in the normal course format even after a leave of absence has been approved after individual examination. For relevant details, please contact the Educational Affairs Section.

3. About foreign student dentistry clinical inspection simulation training

In this graduate course, I perform dentistry clinical inspection simulation training for a foreign student. Since it is very useful training in order that this may study basic dentistry, the foreign student needs to participate at any cost.

Although this training carries out a summer closure period mainly, since it carries out also during the winter closure when it can never participate, participate in either at any cost.

In addition, I connect a concrete schedule each time.

4. The Division for Interdisciplinary Advanced Research and Education

(Master's Course)

Tohoku University Division for Interdisciplinary Advanced Research and Education is a post-graduate educational organization that supports the training of world-class young researchers with outstanding knowledge and creative "integrated intelligence" by blending different specialties to pioneer and study new research fields. Division for Interdisciplinary Advanced Research and Education aims to supplement and enhance the functions of existing graduate schools and institutes by establishing 5 new multi-disciplinary research fields based on the organic coordination of outcomes from 12 global COE programs and by training world-class young researchers.

To be selected as a master's research trainee at the Division, the student must earn at least 6 credits specified by the Division in the first year of the master's program at the Graduate School of Dentistry, and apply for the selection screening of the Division at the end of the first year. Selected students will be eligible to receive scholarships and other grants for paper submissions and attendance at scientific meetings and international conferences from the second year. In principle, Master's research trainees will be selected from among students who plan to pursue doctoral degrees.

(Doctoral Course)

The Tohoku University Division for Interdisciplinary Advanced Research and Education is an educational organization of the graduate school which strives to open new fields of research by combining different fields, and use the knowledge obtained from this process to encourage the development of young world-class researchers who possess outstanding intellect, creativity, and an education in "comprehensive knowledge." This Division is organically connected to the thirteen 21st century COE Programs, allowing it to address various new multidisciplinary research areas. By furthering the development of young, world-class researchers, it complements the functions of the university's existing graduate schools and research institutes.

Students wishing to become Doctoral research institute students should apply at the end of the first year of their Doctoral course and undergo the prescribed selection process. Selected students will receive a scholarship award starting the second year of their Doctoral course and receive financial aid for costs related to their thesis, academic societies, and attending international academic conferences. They will also be able to receive aid for research expenses commensurate with their research plan and for international internships. Graduate students must take the assigned course in Oral Health Science (see syllabus) of this Division. In this course, students will study Oral Health Science through a combination with dentistry, engineering, and material sciences.

For more information about The Division for Interdisciplinary Advanced Research and Education, please check the following website

The Division for Interdisciplinary Advanced Research and Education website
http://www.iiare.tohoku.ac.jp/en/

5. Joint Lectures

I. Immune Regulation and Oral Immunity (joint lecture)

The Tohoku University Graduate School of Dentistry is promoting "Interface Oral Health Science" as the next step in dentistry. One area of this research is the host/parasite interface; our program, focused on the Oral Biology course, is one of the most advanced area in Japan.

The oral immune response is crucial to understanding biological defenses, and inflammations of the salivary glands and oral mucosa caused by irregularities in the immune response have a large impact on the patient's quality of life. This course addresses their regulation and control.

This University has a basic agreement with the National Center for Global Health and Medicine (http://www.imcj.go.jp/rese/top/index.html) through which it is promoting understanding and control of oral diseases related to immune response, and planning the joint course in Immune Regulation and Oral Immunity (syllabus TBD) taught by researchers from this institute in order to foster highly specialized professionals.

II. Geriatric Oral Science (joint lecture)

Due to the aging of the Japanese population, research and education aimed at building a foundation for serving the elderly has become critical. However, currently universities have not adequately established groundwork for research in geriatric sciences, let alone in geriatric oral science. In response to these trends in Japanese society, the creation of a foundation for geriatric oral science and the fostering of professionals capable of creating and applying knowledge in this field are pressing issues.

This University has a basic agreement with the National Center for Geriatrics and Gerontology (http://www.nils.go.jp/) through which it is promoting geriatric oral science research, and planning the joint course in "Geriatric Oral Science" (syllabus TBD) taught by researchers from this institute in order to foster highly specialized professionals.

III. Quantum Biology and Molecular Imaging Educational course

This course is a joint venture of the graduate schools of medicine, dentistry, pharmaceutical science and engineering. It is based in the Tohoku University Cyclotron and Radioisotope Center, and National Institute of Radiological Sciences. Backed by a track record of research results, the course aims to foster molecular imaging researchers through an interdisciplinary education and research system. The Tohoku University Graduate School of Dentistry is engaged in research on molecular imaging in the field of dentistry, and is striving to create researchers and medical professionals capable of utilizing PET. Master and Doctoral Students belonging to the School of Medicine, Graduate School of Dentistry, Graduate School of Pharmaceutical Sciences, or School of Engineering can take this course.

IV. Tumor specialized dentist course

Since it contributes to local cancer medical treatment, it is a course aiming at training the dentist (oral surgeon) well versed in the diagnosis and the cure for cancer of the mouth.

6. 2022-2023 Academic Calendar

Description	Schedule
Entrance Ceremony for April 2022 entrants	6-Apr. 2022
Orientation for April 2022 entrants	6-Apr. 2022
1st semester classes	Apr.—Sep. 2022
Course Registration for April 2022 entrants	Mid Apr. 2022
Student Health Check	May 2022
Preliminary Review (Doctoral students who expect program completion in Sep. 2022)	Apr. 2022
Research Theme Selection Meetings (Doctoral students who enrolled in Oct. 2021)	May 2022
Deadline for submission of thesis/dissertation (Students who expect program completion in Sep. 2022)	31-May 2022
Anniversary of University's founding	22-Jun 2022
Graduate School Entrance Examinations (1st)	Mid Jul. 2022
Deadline for Preliminary Review Application (Doctoral students who expect program completion in March 2023)	Late Aug. 2022
Final Examination (Students who expect program completion in Sep. 2022)	Aug 2022
Orientation for October 2022 entrants	Early Oct. 2022
2nd semester classes (up to Winter Vacation)	Oct.—Dec. 2022
Course Registration for October 2022 entrants	Mid Oct. 2022
Preliminary Review (Doctoral students who expect program completion in Mar. 2023)	Oct. 2022
Research Theme Selection Meetings (Doctoral students who enrolled in Apr. 2022)	Sep.—Oct. 2022
Deadline for submission of thesis/dissertation (Students who expect program completion in Mar. 2023)	Early Dec. 2022
Graduate School Entrance Examinations (2nd)	Mid Dec. 2022
2nd semester classes (after Winter Vacation)	Jan.—Mar. 2023
Deadline for Preliminary Review Application (Doctoral students who expect program completion in Sep.2023)	Late Feb. 2023
Final Examination (Students who expect program completion in Mar. 2023)	Jan. 2023
Commencement Ceremony	Mar. 24 ,2023

*This calendar is provisional. There may be changes to the schedule.

7. Educational Goals and Class Plan by Subject (Master's Course)

Compulsory courses

Course Subject	Dental Science		Instructor (○: Main Instructor)	○Chief Supervisor
Credits	4		Subject No.	
Day/ time of classes	The times of classes will be decided in consulting with student.	Place	Conducted in various fields	
Object and Summary of Classes	Students acquire specialized knowledge in their field through lectures, exercises, and practical training.			
Goal of Study	To be able to acquire specialized knowledge in their field and apply it to their own research.			
Class Contents and Progress Schedule	Based on instructions of the Chief Supervisor.			
Preparation and Review	Based on instructions of the Chief Supervisor.			
Text/ Materials/ References etc.	Based on instructions of the Chief Supervisor.			
Evaluation Method	Based on instructions of the Chief Supervisor.			
Comments				
Class Registration	Registration is not required for this course.			

Course Subject	Special Training Course for Master's Thesis Preparation (Research Foundations Course)		Instructor (○: Main Instructor)	○Chief Supervisor
Credits	7		Subject No.	DDE-DEN 611
Day/ time of classes	The time of classes will be decided in consultation with students.	Place	"Research Foundations Course" and APRIN research ethics education through e-learning. Others are conducted in various fields.	
Object and Summary of Class	Students learn the basics of conducting research as a graduate student by taking the "Research Foundations Course" course, promote their research under the guidance of their chief supervisor to write their master's thesis, and prepare for the presentation of their master's thesis (thesis review and final examination).			
Goal of Study	To have ability to acquire basic information necessary to conduct research as a graduate student, acquire specialized knowledge, and complete a master's thesis.			
Class Contents and Progress Schedule	In the first semester of the first year, students are required to take the following e-learning courses as part of the "Basic Graduate School Research" course, as well as the APRIN Research Ethics Course. Introduction: GIO/SBO of Basic Graduate School Research 1. Manners of Research: What is Research? 2. How to be a graduate student: What it means to be a graduate student 3. Career path starting from graduate school 4. Beginning of Research (1) Management of reagents, management of liquid waste (2) Genetic recombination experiment (3) RI experiments (4) Clinical research ethics (5) Precautions for using the internet (6) Animal experiments 5. About harassment 6. Alcohol and Tobacco The above information is tentative and will be explained in detail at the orientation. From the second semester of the first year, this course will be conducted according to instructions of the field to which you belong.			
Preparation and Review	Students are required to prepare lectures/ lessons to achieve the lecture goals.			
Text/ Materials/ References, etc.	In "Research Foundations Course" we will distribute "How to be a Researcher," "About Laboratory Notebooks," and "For the Healthy Development of Science" (Green Book). Other information will be provided by your chief supervisor. The Lab (https://www.jst.go.jp/kousei_p/measuretutorial/mt_lab.html)			
Evaluation Method	"Research Foundations Course" will be evaluated by a report. The other lectures and lessons will be evaluated by the chief supervisor in consideration of the research attitude, research progress, and master's thesis.			
Comments				
Class Registration	Registration is not necessary for this course.			

Basic Technical Courses in Dental Sciences

Course Subject	Basical Technical Courses in DentalSceiences: OralEcology and Biochemistry		Instructor (○: Main Instructor)	○Nobuhiro Takahashi Jumpei Washio Gen Mayanagi Yuki Abiko
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Division of Oral Ecology and Biochemstry 8th floor in Building A	
Object and Summary of Class	The aim of this training course is to obtain and master the experimental technique for the studies on oral ecosystem, oral biofilm and oral diseases (e.g., dental caries, periodontal diseases and halitosis), as well as oral cancer, which is performed in the Division of Oral Ecology and Biochemistry. Students who take this course may learn basic biochemical methods and molecular biological methods, furthermore, advanced experimental technique on oral plaque biofilm.			
Goal of Study	To obtain the basic experimental techniques (biochemical and molecular biologic techniques) and the advenced experimental techmiques that are necessary for your study.			
Contents and Progress Schedule of the Class	1 Basic biochemical methods (e.g., Spectrophotometric analysis) 2 Molecular biological methods(e.g., Polymerase Chain Reaction) 3 How to use anaerobic chamber 4 Advanced experimental technique on oral plaque biofilm 5 Metabolic activity measuring method (e.g., pH stat system) 6 Metabolome analysis method (e.g., HPLC) Along the research thema of the individual, a necessary item will be selected.			
Preparation and review	Before taking this course, please get the instruction about what to prepare. In addition, it is desirable to review well after taking the course.			
Text/Materials/References etc.	N/A			
Evaluation Method	Evaluation will be done based on yout attendance and submitted reports			
Comments	Attention：This course intends for graduate students engaging in the study in our laboratory as a general rule.			
Class Registration	Students should contact the following before registration. Prof. Nobuhiro Takahashi OEB@dent.tohoku.ac.jp			

Course Subject	Basic Technical Cpurses in Dental Sciences: Oral Molecular Bioregulation		Instructor (○: Main Instructor)	○Shunji SUGAWARA Toshinobu KUROISHI Hiroyuki TADA
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Oral Molecular Bioregulation	
Object and Summary of Class	[Aims] Master the basics of Western blotting, and utilized the skills in the research.			
Goal of Study	Understand the principle of Western blotting, master the method of Western blotting, and apply the method for your reserch.			
Contents and Progress Schedule of the Class	[Contents] 1. Master the basic principles of Western blotting (Sugawara) 2. Learn the skills of Western blotting (Kuroishi) 3. Discuss the application of research (Sugawara and Kuroishi)			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the course.			
Text/Materials/References etc.	Handout will be ditributed beforhand.			
Evaluation Method	By presence and report.			
Comments	N/A			
Class Registration	Students should contact the following before registration. Prof. SUGAWARA shunji.sugawara.d5@tohoku.ac.jp			

Course Subject	Basic Technical Course in Dental Sciences: Periodontology and Endodontology		Instructor (○: Main Instructor)	○ Satoru Yamada Eiji Nemoto and others
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners	
Object and Summary of Class	Learning of experimental skill required for the research in periodontology, endodontology and the related fields.			
Goal of Study	Learning of experimental skill required for the research in periodontol-ogy, endodontology and the related fields			
Contents and Progress Schedule of the Class	1 Cell culture 2 ELISA 3 RT-PCR and Real-time PCR 4 Western blotting 5 Flow cytometry 6 Basic technique in animal experiments (mouse and rat)			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Provide materials if needed			
Evaluation Method	By presence and reports			
Comments				
Class Registration	Students should contact the following before registration. Prof. Satoru Yamada satoruy@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Conservative Dentistry		Instructor (○: Main Instructor)	○ Masahiro Saito Keisuke Handa
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	Consult with learners	Place	Staff Room of Division of Conservative Dentistry	
Object and Summary of Class	To understand the regeneration therapy, basic knowledge of the cell transplantation are required. In this lecture, we will teach how to perform cell transplantation using porcine model.			
Goal of Study	1) Basic knowledge of the cell culture 2) Basic knowledge of the stem cell transplantation 3) Basic knowledge of the periodontal disease model 4) Basic knowledge of the apical periodontitis mode			
Contents and Progress Schedule of the Class	1 Basic knowledge of the cell culture 2 Basic knowledge of the stem cell transplantation 3 Basic knowledge of the periodontal disease model. 4 Basic knowledge of the apical periodontitis model			
Preparation and review				
Text/Materials/References etc.	No Text is prepared.			
Evaluation Method	Attendance and Report			
Comments				
Class Registration	Students should contact the following before registration. Dr.HANDA khanda@dent.tohoku.ac.jp			

Course Subject	Basic Technical Courses in DentalSciences: Dental Public Health		Instructor (○: Main Instructor)	○Ken Osaka Jun Aida
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	First Term Thursday /1-2nd period	Place	The seminar room of the department	
Object and Summary of Class	The aims of this lecture are: □ To learn dental health system of Japan as well as other countries. □ To learn the framework of global cooperation in health field.			
Goal of Study				
Contents and Progress Schedule of the Class	Content of class: ・To comprehend the current situation dental health system in the world. ・To learn about the appropriate technology in cooperation with developing countries. ・To learn about the present state and future role of the Japanese social insurance system.			
Preparation and review				
Text/Materials/References etc.	Instruct at the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. Ken Osaka ken.osaka.e5@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Dental and Digital Forensics	Instructor (○: Main Instructor)	○ Toshihiko SUZUKI Moe KOSAKA Yuka HATANO
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	The aim of this course is to acquire the techniques to identify the bones of the human skeleton.		
Goal of Study	Lerners should be able to: ・Identify the human unbroken bones ・Estimate the biological age of a skeleton ・Estimate the sex of a akeleton		
Contents and Progress Schedule of the Class	1 Identification of human bones: Cranial bones 2 Identification of human bones: Postcranial bones 3 Sex estimation of a skeleton 4 Age estimation of a skeleton		
Preparation and review	In order to achive the learning goals of the course, students need self-study according to the contents and progress of the course.		
Text/Materials/References etc.	Textbooks are not specified. Other recommended readings will be provided in the class.		
Evaluation Method	Grading will be based on participation and practical skills test.		
Comments	Alternative training materials might be provided according to the background of students.		
Class Registration	Students should contact the following before registration. Assoc. Prof. Toshihiko SUZUKI suzk@anat.dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Preventive Dentistry		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Naoko TANDA
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Preventive Dentistry	
Object and Summary of Class	[Aims] Aims are to learn the skills of public health and preventive dentistry for promoting the motivation toward the oral health in the social activity.			
Goal of Study	To understand environmental assessments To understand health assessments To evaluate oral health assessments To evaluate risk assessments of oral diseases To understand preventive measure by application of fluoride			
Contents and Progress Schedule of the Class	[Contents] Basic technical training #1 (in January) ・Environmental measurement ・Measurement of atmospheric pollution ・Water quality measurement ・Anthropometric Basic technical training #2 (in July) ・Diagnostic method of early caries lesions ・Oral hygiene method ・Oral Examination method ・Application of fluoride ・Caries-activity test and hemoccult test ・Examination method of periodontal condition			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	Attendance and reports.			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Pediatric Dentistry	Instructor (○: Main Instructor)	○Sastoshi Fukumoto Aya Yamada Kan Saito Yuriko Maruya
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	Jun, Oct (Fri 1st and 2nd period)	Place	suspense
Object and Summary of Class	Purpose of this course is learning the culture methods of dental epithelium and mesenchyme to analyze their differentiation.		
Goal of Study	To culture dental tissues and understand the molecular mechanism of tooth and salivary gland development		
Contents and Progress Schedule of the Class	1 Culture and evaluation of dental epithelial and mesenchymal cells proliferation. 2 Isolation of mRNA from dental epithelial and mesenchymal cells. 3 Culture of tooth germ and salivary gland from embryonic day 13 mouse. 4 Protein purification of enamel matrix from postonatal day 7 mouse.		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Attendance record and reports		
Comments	Please confirm the schedule of course		
Class Registration	Students should contact the following before registration. Prof. Satoshi Fukumoto fukumoto@dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Craniofacial Anomalies	Instructor (○: Main Instructor)	○Kaoru IGARASHI, and others
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The 2nd semester, Thursday, The 4th clas	Place	Seminar & Training Room of Division of Craniofacial Anomalies
Object and Summary of Class	To learn various examinations and analyses that are necessary for diagnosis, treatment planning, and treatment evaluation of craniofacial anomalies and jaw deformity.		
Goal of Study	To be able to do diagnosis, treatment planning, and treatment evaluation of craniofacial anomalies and jaw deformity.		
Contents and Progress Schedule of the Class	1 Various radiographic examinations 2 Roentgenographic cephalometric analyses 3 Examinations of various oral functions 4 Other examinations and analyses		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Assigned textbooks on orthodontics and orthognathic surgery		
Evaluation Method	By presence and report		
Comments	Day/time and place of this class are flexible. Consult with instructors.		
Class Registration	Students should contact the following before registration. Prof. IGARASHI kaoru.igarashi.a3@tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Orthodontics and Dentofacial Orthopedics	Instructor (○: Main Instructor)	○Hideki Kitaura Itaru Mizoguchi Toimohiro Fukunaga
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consult-ing with student.	Place	Labolatory room of orthodontics
Object and Summary of Class	The purposes of this course are to study orthodontic diagnosis and basic experimental studies about biological reactions during orthodontic treatment.		
Goal of Study	The goals of this course are to understand orthodontic diagnosis, including examination, inspection and analysis, and to obtain basic experimental techniques for basic studies about biological reactions during orthodontic treatment.		
Contents and Progress Schedule of the Class	1 Cell culture (PDL cells and osteogenic cells) 2 Animal experiment (mouse, rat, dog, etc.) 3 In situ hybridization 4 Immunohistocemistry and Confocal leser microscopy 5 Acquisition of materials for orthodontic diagnosis 6 Cephalometric and dental-cast analyses 7 3D analysis of jaw movement 8 Medical statistical analysis		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Text/Materials/References will be given timely to student.		
Evaluation Method	Attendance and reports		
Comments	No other comments		
Class Registration	Students should contact the following before registration. Associate Prof. Hideki Kitaura hkitaura@m.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Oral Physiology	Instructor (○: Main Instructor)	○Junichi Nakai Keiko Ando Mirei Chiba Takaaki Kudo
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Oral Physiology
Object and Summary of Class	Object: The object of this class is to learn the physiological techniques that are needed for the investigation of the funtion of human body including the oral function. Summary of class: To understand the basics of physiological techniques and to master how to apply them to the research.		
Goal of Study	General instructive objective: to understand experimental methods of oral physiology. Specific behavioral objectives are to understand : ① Methodology of anesthesia of animals ② Methodology of tissure and cell cultures ③ Methodology of reserch for human subjects ④ Methodology of gene recombination experiments ⑤ Methodology of tissue sections ⑥ Methodology of data aquisition and analysis		
Contents and Progress Schedule of the Class	1 Methodology of anesthesia of animals 2 Methodology of tissure and cell cultures 3 Methodology of reserch for human subjects 4 Methodology of gene recombination experiments 5 Methodology of tissue sections 6 Methodology of data aquisition and analysis		
Preparation and review	It is important to review what you learnt in the lesson. Make sure to do a lot of review.		
Text/Materials/References etc.	Materials will be provided as appropriate.		
Evaluation Method	By attendance and reports		
Comments			
Class Registration	Students should contact the following teaching staff before registration. Professor Junichi Nakai (Email: junichi.nakai.a5@tohoku.ac.jp)		

Course Subject	Basic Technical Courses in Dental Sciences: Dental Pharmacology		Instructor (○: Main Instructor)	○Minoru WAKAMORI Takashi NAKAMURA Kaori TAKAHASHI Motohide HORI Norihiro KATAYAMA Kentaro ARAKI
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Mol. Biol. & Biochem. Room in Lab. of Pharmacol.	
Object and Summary of Class	This course is designed to help students master molecular biological, electrophysiological and pharmacological techniques which enable them to perform their thesis works by themselves.			
Goal of Study	The goal of this course is to master the following techniques to do experiments by themselves.			
Contents and Progress Schedule of the Class	1 Mammalian cell culture 2 PCR analysis 3 Cloning method and sequence analysis 4 Gene transfection 5 Patch-clamp techniques 6 Measurement of changes in the intracellular Ca^{2+} concentration 7 Gene and protein expression analysis 8 Genome wide association study			
Text/Materials/References etc.	There is no text for this course. Suitable materials will be destributed.			
Evaluation Method	The largest part of the evaluation will be based on active participation in class activities.			
Comments				
Class Registration	Students should contact the following before registration. Prof. WAKAMORI mpcb@dent.tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Oral Pathology	Instructor (○: Main Instructor)	○Shimizu Y Saito H
Credits	3	Subject No.	DDE-DEN 602
Day/time of classes	First semester Fri 4	Place	Division of Oral Pathology
Object and Summary of Class	Preparation and histological observation of tissue specimens are learned.		
Goal of Study	Preparation of tissue specimens, containing fixation, embedding, sectioning, and staining, are exercised. Findings of these specimens are discussed.		
Contents and Progress Schedule of the Class	1 Tissue prepararion 2 Tissue observation		
Preparation and review			
Text/Materials/References etc.	None specified.		
Evaluation Method	Attendance and discussion.		
Comments			
Class Registration	Students should contact the following before registration. Shimizu Y shmizu@dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Dental Informatics and Radiology		Instructor (○: Main Instructor)	○ Masahiro IIKOBO Noriaki SHOJI Ikuho Kojima
Credits	1		Subject No.	
Day/time of classes	Mondays～Fridays, 1st and 2nd periods	Place	Mainly at Oral and Maxillofacial Radiology clinical room, Tohoku University Hospital	
Object and Summary of Class	To experience on actual image reading in our hosital in order to learn a knowledge about the diagnostic imaging for the oral and maxillofacial disease based on the scientific evidence and logical thinking.			
Goal of Study	To acquire the process of the diagnostic imaging for oral and maxillofacial diseases based on the knowledge of image formation theory, anatomy and physiology.			
Contents and Progress Schedule of the Class	1 Learning about a X-ray CT imaging. 2 Learning about a nuclear medicine imaging.			
Preparation and review				
Text/Materials/References etc.	Oral Diagnosis and Radiology (8th Edition) (published by our department)			
Evaluation Method	Attendance, attitude and reports.			
Comments	We welcome foreign students.			
Class Registration	Students should contact the following before registration. Prof. Masahiro IIKUBO masahiro.iikubo.c6@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Oral and Maxillofacial Surgery□ □	Instructor (○: Main Instructor)	○Tetsu TAKAHASHI Atsumu Kouketsu Kensuke YAMAUCHI
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	Friday, 4th and 5th hour□ First semester	Place	Div. of Oral and Maxillofacial Surgery, 10F East Ward, 3F Outpatient Section
Object and Summary of Class	To master basic research technique for the development of basic research and clinical research of oral and maxillofacial surgery		
Goal of Study	To study the research methods related to oral and maxillofacial surgery such as dental implants, oral cancer, and trauma		
Contents and Progress Schedule of the Class	1 To learn biomaterial for implant, soft tissue and hard tissue interface□observation, analysis method□ 2 Methods for researches on control of tumors on oral and maxillofacial region 3 To learn experimental method of bone disease treatment 4 5		
Text/Materials/References etc.	Nothing particular		
Evaluation Method	Report should be presented suitably		
Comments			
Class Registration	Students should contact the following before registration. Prof. Tetsu Takahashi tetsu@dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Dento-oral Anesthesiology		Instructor (○: Main Instructor)	○Kentaro Mizuta Hiroshi Hoshijima Yukinori Tanaka Makoto Yasuda
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The second semester Friday, the 4th period	Place	Dento-oral Anesthesiology Rsearch Lab & Research Lab #13 (Both rooms are located in 2nd floor of Building for Clinical Dental Science)	
Object and Summary of Class	[Object] The aim of this course is to learn the development of study design, research methods, and statistics for the research in dento-oral anesthesiology. [Outline] To learn the development of resarch plan, several research methods in vivo and in vitro, and statistics.			
Goal of Study	Students can develop study design, understand various research methods *in vivo and in vitro*, and evaluate data with statistical analysis.			
Contents and Progress Schedule of the Class	1 Preparation of research plan 2 *in vivo* experiment 1 (Measuring pain behavior) 3 *in vivo* experiment 2 (Measuring orofacial blood flow in anesthetized rat) 4 *in vivo* experiment 3 (organ bath) 5 *in vitro* experiment 1 (Western blot, immunohistochemistryl) 6 *in vitro* experiment 2 (Calcium imaging) 7 Statistical analysis			
Preparation and review				
Text/Materials/References etc.	None			
Evaluation Method	Evaluated by attendance and reports			
Comments	Day/time of this class is flexible			
Class Registration	Students are required to contact the following designated person before registration. Prof. Kentaro Mizuta kentaro.mizuta.e6@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Comprehensive Dentistry	Instructor (○: Main Instructor)	○ Masahiko KIKUCHI Akio IZUMIDA
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Office of Comprehensive Dentistry
Object and Summary of Class	[Aims] To learn the theoretical and practical methods for dental education especially related to the postgraduate clinical training program.		
Goal of Study	To be able to explain the methods for dental education.		
Contents and Progress Schedule of the Class	[Contents] 1. History of dental education 2. Theory of dental education 3. Objectives of dental education 4. Methods for dental education 5. Evaluation for dental education		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Materials		
Evaluation Method	By report		
Comments			
Class Registration	Students should contact the following before registration. Prof.KIKUCHI mashiko.kikuchi.c7@tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences : Division of Oral and Craniofacial Anatomy	Instructor (○: Main Instructor)	○Hiroyuki ICHIKAWA Tadasu SATO・Takehiro YAJIMA・Tessei NAGAYAMA・Daisuke Tachiya・Satoshi KAWAKAMI・Maki SATO
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	Object: To learn and understand the method for measurement of anatomical and histological data about sensory neurons in the tooth pulp and periodontal tissues Summary: To learn methods for morphological analysis about tissues and cells in the tooth pulp and periodontium		
Goal of Study	To understand morphological characteristics of tissues and cells in the tooth pulp and periodontium		
Contents and Progress Schedule of the Class	1 Measure and software 2 Measurement of cell size of tooth pulp sensory neurons 3 Measurement of the length of nerve fibers in the tooth 4 Measurement of staining intensity in sensory neurons 5 Estimation and investigation of errors in measurement statistical analysis		
Preparation and review	The session time is limited and therefore self-directed learning is important. Students are required to review for each class.		
Text/Materials/References etc.	none		
Evaluation Method	By presence and reports		
Comments	none		
Class Registration	Students should contact the following before registration. Prof. ICHIKAWA hiroichi@anat.dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Craniofacial Development and Tissue Biology	Instructor (○: Main Instructor)	○ Yasuyuki SASANO Megumi NAKAMURA Mu-Chen YANG
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Craniofacial Development and Tissue Biology
Object and Summary of Class	This subject aims to learn about technics and methods used for tissue biology and calcified tissue research.		
Goal of Study	To learn about technics and methods for morphological analysis in tissue biology and calcified tissue research.		
Contents and Progress Schedule of the Class	1 Animal experiments 2 Transmission electron microscopy 3 Scanning electron microscopy 4 Immunohistochemistry		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Attendance and report		
Comments	Day/time of this class is flexible		
Class Registration	Students should contact the following before registration. Prof. Yasuyuki SASANO sasano@anat.dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Dental Biomaterials	Instructor (○: Main Instructor)	○Yukyo TAKADA Masatoshi TAKAHASHI
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student	Place	Div. of Dental Biomaterials (Building A, 4F)
Object and Summary of Class	The aim is to practice the research technique for observation methods and elemental analyses working for own research theme, using a scanning electron microscope (SEM) with energy dispersive X-ray spectrometry (EDS).		
Goal of Study	The goal of stdy enables to explain the principle and mechanism of a scanning electron microscope (SEM) with energy dispersive X-ray spectrometry (EDS), and also anables to apply it to one's research.		
Contents and Progress Schedule of the Class	1 Principle of an electron probe X-ray microanalyzer 2 Preparation of specimens 3 Elemental analysis methods 4 Qualitative analysis 5 Quantitatively analysis 6 Mapping analysis		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	A lecturer prepars it.		
Evaluation Method	By presence and reports		
Comments	After consultation with learners, time and day of starting the course will be adjusted.		
Class Registration	Students should contact the following before registration. Assoc. Prof.TAKADA yukyo.takada.a1@tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Craniofacial Function Engineering		Instructor (○: Main Instructor)	○ Osamu SUZUKI Yukari SHIWAKU Ryo HAMAI
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Craniofacial Function Engineering	
Object and Summary of Class	The aim of this class is to learn the design of synthetic biomaterials and the method to apply stem cells for regenerative medicine.			
Goal of Study	The goal of study is to understand the methodology of bone tissue engineering and the materials used such as synthetic biomaterials and stem cells.			
Contents and Progress Schedule of the Class	1 Methodology of bone tissue engineering 2 Analyses of scaffold materials, such as natural polymers and inorganic hydroxyapatite (HA) and octacalcium phosphate (OCP), by x-ray diffraction (XRD) and Fourier transform infrared (FTIR) spectroscopy 3 Cell culture			
Preparation and review	Please search for the references about calcium phosphates and bone regeneration.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. SUZUKI suzuki-o@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Advanced Prosthetic Dentistry	Instructor (○: Main Instructor)	○Keiichi SASAKI Toru OGAWA Nobuhiro YODA
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	TBA (1st -4th semester)	Place	TBA
Object and Summary of Class	This course aims to learn the research methods with technical procedures needed for performing research experiment.		
Goal of Study	Students should be able to understand the research methods with technical procedures needed for performing your own research experiment.		
Contents and Progress Schedule of the Class	1 in vivo measurement 1) using a strain gauge and pressure-transducer 2) using a 3D load-measuring sensor installed in a dental crown and implant. 3) using a pressure sensor sheet to measure the me-chanical stress beneath a denture-base (Instructor: Keiichi Sasaki) 2 Measurement of the bone metabolic activity using a bone Scintigraphy and NaF-PET (Instructor: Toru Ogawa) 3 Measurement of the function with mastication and swal-lowing 1) EMG (Electromyogram) of masticatory muscles 2) Measurement of tongue movement (Instructor: Toru Ogawa) 4 Prospective clinical study (Instructor: Nobuhiro Yoda)		
Preparation and review			
Text/Materials/References etc.	Instruct in the beginning of the class.		
Evaluation Method	Attendance and reports.		
Comments	Day/time and place of this class are flexible. Consult with instructors.		
Class Registration	Students should contact the following before registration. Prof. Keiichi SASAKI junko.hagawa.a3@tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Molecular and Regenerative Prosthodontics		Instructor (○: Main Instructor)	○ Hiroshi EGUSA Masahiro YAMADA Kunimichi NIIBE
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Wet laboratory : Division of Molecular and Regenerative Prosthodontics	
Object and Summary of Class	To learn the basic experimental skills for molecular and regenerative prosthodontics.			
Goal of Study				
Contents and Progress Schedule of the Class	1 Lecture on laboratory equipments 2 Lecture on cell culture 3 Lecture on RT-PCR 4 On-site training for cell culture experiments 5 On-site training for RT-PCR experiments			
Preparation and review	Students are required to prepare lectures to achieve the goals of the lectures.			
Text/Materials/References etc.	At the Bench: A Laboratory Navigator, Kathy Barker			
Evaluation Method	Attendance records.			
Comments				
Class Registration	Total capacity for participants is limited. Students should contact the following before registration. Prof. Hiroshi EGUSA egu@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences Aging and Geriatric Dentistry		Instructor (○: Main Instructor)	○Satoshi Yamaguchi Yoshinori Hattori et al.
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Aging & Geriatric Dentistry	
Object and Summary of Class	This training class is aimed to learn the research methods for capturing, analyzing, and evaluating stomatognathic functions.			
Goal of Study	1. Explain varieties of stomagognathic functions 2. Explain measurement/evaluation methods of various stomatognathic functions 3. Acquire basic skills to perform some of the basic examinations of stomatognatihic functions			
Contents and Progress Schedule of the Class	1 Registration, analysis and evaluation of jaw motion 2 Registration, analysis and evaluation of electromyographic activities of the jaw muscles 3 Registration, analysis and evaluation of masticatory function 4 Registration, analysis and evaluation of dental occlusion			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Dr. Satoshi Yamaguchi satoshi.yamaguchi.a3@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: International Collaborative and Innovative Dentistry	Instructor (○: Main Instructor)	○Guang HONG
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Globalization Initiative
Object and Summary of Class	The object of this course is to learn how to prepare and evaluate functional biomaterials and evaluate digital tools used in health care and education through experiments through international industry-academia/interdisciplinary collaboration.		
Goal of Study	Can prepare and evaluate of fuctional biomaterials Can evaluate of digital tools used in health care and education Practicing the international industry-acamedica/interdisciplinary collaboration Training at least one week at an overseas academic or educational/research institute		
Contents and Progress Schedule of the Class	1 Manufacturing method of biopolymer materials 2 Manufacturing method of bioceramic materials 3 Mechanical and biological evaluation methods for functional biomaterials 4 Evaluation methods for digital tools used in health care and education 5 Animal experiment method 6 Internships at coporate laboratories 7 Training at overseas academic or educational/research institutions		
Self-learning	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Non		
Evaluation Method	By presence and reports		
Comments			
Class Registration	Students should contact the following before registration. Prof. Guang Hong hong.guang.d6@tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Co-Creative Dentistry		Instructor (○: Main Instructor)	○Hiroyasu Kanetaka and others
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Interdisciplinary Integration	
Object and Summary of Class	The object of this class is to learn the principles and techniques of the evaluation methods necessary for the development of medical biomaterials and medical devices, and to be able to utilize them in one's own research, with a view to developing human resources who can take interdisciplinary overview of oral science through integrated intellectual education,			
Goal of Study	To be able to learn the principles and techniques of evaluation methods related to efficacy and safety as an evaluation for medical biomaterials,			
Contents and Progress Schedule of the Class	1 Biocompatibility test (using various cells) 2 Cytotoxicity test 3 Antibacterial test 4 Antiviral test 5 Mechanical property evaluation test			
Preparation and review	Preparatory learning is required according to the goals, the content, and the progress of the lesson.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and reports			
Comments				
Class Registration	Students should contact the following before registration. Prof. Hiroyasu Kanetaka hiroyasu.kanetaka.e6@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Oral Cancer Therapeutics	Instructor (○: Main Instructor)	○Hisanori HORIUCHI Ryutaro Shirakawa
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Department of Molecular and Cellular Biology, Institute of Development, Aging and Cancer
Object and Summary of Class	Training course of experimental technique of protein chemistry with electrophoresis and antibody.		
Goal of Study	To learn the experimental technique of basical biochemical experiments.		
Contents and Progress Schedule of the Class	1 2 3 4 5		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Prof.HORIUCHI hisanori.horiuchi.e8@tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Department of dental nuclear medicine and radiology		Instructor (○: Main Instructor)	○Yasuyuki Taki Tatsushi Mutoh Yasuko Tatewaki
Credits	1		Subject No.	DDE-DEN 602
Day/time of classes	The time of classes will be decided in consulting with student.	Place	IDAC SA building	
Object and Summary of Class	To understand the recent important researches for the relationship between dental issues and dementia.			
Goal of Study	To understand the seminars for the relationship between dental issues and dementia.			
Contents and Progress Schedule of the Class	1 To attend the seminars 2 To understand the seminars			
Preparation and review				
Text/Materials/References etc.				
Evaluation Method				
Comments				
Class Registration	Students should contact the following before registration. Prof. TAKI yasuyuki.taki.c7@tohoku.ac.jp			

Course Subject	Basic Technical Courses in Dental Sciences: Bio-Dental Engineering	Instructor (○: Main Instructor)	○ Shinji KAMAKURA
Credits	1	Subject No.	DDE-DEN 602
Day/time of classes	The second semester Monday 13:00~16:10	Place	Laboratory of Bone Regenerative Engineering and others
Object and Summary of Class	To learn fundamental technical skills concerning about Bio-Dental Engineering and related field in the course of implantation of biomaterials to the tissues in experimental animals, such as rats and so on.		
Goal of Study	Become proficient the handling technique for the experimental animals including rat. Accomplish the implantation of a biomaterial into an experimental animal. Perform the fundamental analysis related to bone regeneration.		
Contents and Progress Schedule of the Class	1 Implantation procedures of biomaterials in experimental animals 2 Radiographical examination of histopathological specimens 3 Preparation of histopathological specimens of hard tissues 4 Staining technique of histopathological specimens of hard tissues 5 Histomorphometrgical analysis of regenerated bone		
Preparation and review			
Text/Materials/References etc.	No textbook is used but handouts are distributed.		
Evaluation Method	The evaluation is performed based on the attendance at the class and scores on the submitted reports.		
Comments	Opening hours and place of the class will be altered in accordance with consulting with participants. An applicant should attend the education and training by Institute for Animal Experimentation Tohoku University School of Medicine in advance. Because of restriction on number of accepted applicants, an applicant should consult with main instructor beforehand.		
Class Registration	Students should contact the following before registration. Prof. Shinji KAMAKURA kamakura@tohoku.ac.jp		

Elective courses

Course Subject	Oral Biology	Instructor (○: Main Instructor)	Nobuhiro TAKAHASHI Yasuyuki SASANO Junichi NAKAI ○ Hiroyuki ICHIKAWA
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	Object: This subject aims to learn about basic dental sciences including biochemistry, histology, physiology and anatomy of cranio-oro-facial region, with scientific and logical thinking. Summary: To learn about biochemical, morphological and physiological structure/function of body constituents including cranio-oro-facial tissues		
Goal of Study	・To understand biochemical components and their function of the human body and the oral cavity, such as metabolism and cause of oral diseases. ・To understand histology and embryology of teeth and other cranio-oro-facial structures. To understand about neural mechanisms underlying oro-facial functions, such as feeding and articulation. ・To understand human cranial and cervical structures.		
Contents and Progress Schedule of the Class	1 Biochemical components and their function of the human body 2 Histology and embryology of cranio-oro-facial structures 3 Neural mechanisms underlying oro-facial functions 4 Gross anatomy of human cranial and cervical structures		
Preparation and review	The session time is limited and therefore self-directed learning is important. Students are required to review for each class.		
Text/Materials/References etc.	none		
Evaluation Method	By presence and reports		
Comments	none		
Class Registration	Students should contact the following before registration. Prof. ICHIKAWA hiroichi@anat.dent.tohoku.ac.jp		

Course Subject	Oral Pathophysiology		Instructor (○: Main Instructor)	○Wakamori M Sugawara S, Horiuchi H, Shimizu Y
Credits	2		Subject No.	DDE-DEN 603
Day/time of classes	First semester Tue 3	Place	Not determined	
Object and Summary of Class	Preparation and histological observation of tissue specimens are learned.We provide multidisciplinary perspectives on a wide variety of oral diseases, including a pharmacological aspect, a microbiological aspect, an immunological aspect, a morphological aspect, and cell signaling.			
Goal of Study	・Learn host defense mechanism that is characteristic of oral mucosa, and understand the immunologic characteristics in the expression of pathogenesis of the oral mucosal diseases. In addition, discuss the creation of prevention and treatment of the diseases. (Prof. Sugawara) ・Molecular mechanism about regulation by low molecular weight GTP binding protein associated with osteolysis inhibitor bisphosphonates is introduced. (Prof. Horiuchi) ・Pathological characteristics of various kinds of oral and maxillofacial disorders are introduced. (Prof.Shimizu) ・Lecture and discussion on molecular mechanisms of oral sensations which monitor environmental conditions. (Prof. Wakamori)			
Contents and Progress Schedule of the Class	1 Immunology 2 Molecular biology 3 Pathology 4 Physiology and pharmacology			
Preparation and review				
Text/Materials/References etc.	None specified.			
Evaluation Method	Attendance and discussion.			
Comments				
Class Registration	Students should contact the following before registration. Prof. Wakamori M wakamori@dent.tohoku.ac.jp			

Course Subject	Biomaterials for Regenerative Medicine		Instructor (○: Main Instructor)	○Osamu Suzuki Guang Hong Yukyo Takada Ryoichi Inagaki
Credits	2		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.	
Object and Summary of Class	The aim of this lecture: 1. To understand the basic properties of advanced materials used in regenerative dental medicine. 2. To learn the requirement of advanced materials used in regenerative dental medicine.			
Goal of Study	The goal of study is to understand and explain the fundamental properties and requirements for advanced materials used for regenerative dental medicine.			
Contents and Progress Schedule of the Class	1 Restoration and maintenance of the oral and maxillofacial morphology and function. 2 Clinical application of regenerative dental biomaterials. 3 Tissue regeneration and reconstruction. 4 Titanium as a dental biomaterial. 5 Composite resins used in CAD / CAM crowns. 6 Zirconia and lithium disilicate as dental biomaterials. 7 Basic and clinical research methods of advanced materials.			
Preparation and review	Preparation is required leading to the goals with progress of the learning.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. Osamu Suzuki suzuki-o@tohoku.ac.jp			

Course Subject	Introduction to Digital Engineering in Dentistry	Instructor (○: Main Instructor)	○Hiroshi Egusa Guang Hong Ryoichi Inagaki
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with students.	Place	The place of classes will be decided in consulting with students.
Object and Summary of Class	To understand the concepts and basic knowledge required for the introduction of digital technology into dentistry and dental engineering, and to learn about the matters that should be considered when introducing digital technology and equipment and applying them clinically.		
Goal of Study	Understand the outline of digital engineering in dentistry. Understand the requirements for digital equipment of medical/dental and the considerarion for use them.		
Contents and Progress Schedule of the Class	1 Learn the basics of digital technology 2 Learn about the characteristics of digital equipments and consider the requirements for digital engineering in dentistry. 3 Improve the understanding of digital dentgal engineering by reading articles for group presentation and discussion.		
Self-learning	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Non		
Evaluation Method	By attendance and reports on a topic of the classes.		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Prof. Hiroshi Egusa egu@tohoku.ac.jp		

Course Subject	Food Science		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Nobihiro TAKAHASHI
Credits	1		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Preventive Dentistry	
Object and Summary of Class	[Aims] From the viewpoints of prevention from dental caries and periodontal diseases, moreover, from the viewpoints of nurturing healthy growth and sound maintenance of oral function, this course provides the essential knowledge for the research and the development of foods.			
Goal of Study	Tviewpoints of the metabolism of nutrition in human bodies. To discuss the development of low-risk foods against dental caries from the viewpoints of metabolic mechanism in oral bacterial ecosystem (dental plaque). To understand the relationship between the texture of food and the metabolic mechanism in oral bacterial ecosystem (dental plaque) in the saliva. To learn the relationship between the properties of foods and functions of mastication and swallowing, and to discuss the influence of foots to the function of craniofacial systems.			
Contents and Progress Schedule of the Class	[Contents] Nutrition of foods Metabolic mechanisms in oral bacterial ecosystem (dental plaque) Saliva and properties of foods			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	Attendance and reports.			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	International Dental Health	Instructor (○: Main Instructor)	○Ken OSAKA Takeyoshi KOSEKI
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners
Object and Summary of Class	The aims of this lecture are: □ To learn dental health of Japan as well as other countries. □ To learn the framework of global cooperation in health and medical field.		
Goal of Study			
Contents and Progress Schedule of the Class	Content of class: ・To comprehend the current situation dentistry and dental health and explore their future direction in the world. ・To learn about the appropriate cooperation to developing countries. April-May 2012 Prof. Osaka ・To learn about the present state and future role of the Japanese social insurance system, focusing on the preventive dentistry. June-July 2012 Prof. Koseki		
Preparation and review			
Text/Materials/References etc.	Instruct at the beginning of the class.		
Evaluation Method	By presence and report		
Comments			
Class Registration	Students should contact the following before registration. Prof. Ken Osaka ken.osaka.e5@tohoku.ac.jp		

Course Subject	Social Dentistry		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Ken OSAKA
Credits	1		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Preventive Dentistry	
Object and Summary of Class	[Aims] To understand various issues of oral health and dental medicine through learning medical economics, medical welfare, and healthcare policies in dentistry.			
Goal of Study	To figure out the future images of dental medicine and oral health based on the current condition. To understand the alignments with society, dental medicine and oral health; e.g. disclosure of dental information. To understand the social insurance program of Japan, especially relationship between nursing-care insurance program and dental medicine and oral health			
Contents and Progress Schedule of the Class	[Contents] The current status and challenges of dental medicine and oral health The current status and challenges of the alignments with society, dental medicine and oral health The current status and challenges of social insurance program of Japan			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	Attendance and reports.			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	Comprehensive Dentistry		Instructor (○: Main Instructor)	○ Masahiko KIKUCHI Akio IZUMIDA
Credits	2		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Office of Comprehensive Dentistry	
Object and Summary of Class	[Aims] To understand the outline of comprehensive dentistry and primary care.			
Goal of Study	To be able to explain the outline of comprehensive dentistry and primary care.			
Contents and Progress Schedule of the Class	[Contents] To learn post graduate clinical education, team health care and general dental treatment in the comprehensive clinic.			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Materials			
Evaluation Method	By report			
Comments				
Class Registration	Students should contact the following before registration. Prof.KIKUCHI mashiko.kikuchi.c7@tohoku.ac.jp			

Course Subject	Oral Health Care for Children and Adolescents		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Kaoru IGARASHI Satoshi FUMUMOTO Itaru MIZOGUCHI
Credits	1		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Preventive Dentistry	
Object and Summary of Class	[Aims] To understand the importance of health development of oral function by learning epidemiology, prevention, and treatment of oral disorders of children and adolescents.			
Goal of Study	To understand the basics and applications for oral hygiene and oral health managements that are required for the healthy growth of mouth. To understand the nurturing and management of dental arches and occlusion of children and adolescents To prevent and cure the malocclusion and development disorders of craniofacial lesions To understand the dental and medical management and care to the problems related to the patients with cheilognathopalatoschisis			
Contents and Progress Schedule of the Class	[Contents] Basic and clinical issues related to oral hygiene and oral managements Oral management of dental arch and occlusion of children and adolescents Epidemiology, prevention, and treatment of development disorders of craniofacial lesions and malocclusion Dental and medical management and care to the problems related to the patients with cheilognathopalatoschisis			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	Attendance and reports.			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	Oral Restoration	Instructor (○: Main Instructor)	○Masahiro SAITO Keiichi SASAKI Masahiko KIKUCHI Satoru Yamada
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	TBA(1st -4th semester)	Place	TBA
Object and Summary of Class	This subject aims to learn about restoration, reconstruction, rehabilitation and maintenance of the oral and craniomaxillofacial form and function damaged by various diseases and injury at the life stages after adulthood.		
Goal of Study	Students should be able to understand restoration, reconstruction, rehabilitation and maintenance of the oral and craniomaxillofacial form and function damaged by various diseases and injury at the life stages after adulthood.		
Contents and Progress Schedule of the Class	1 To learn about pathological condition and pathogenesis of periodontal disease, and prevention and management of periodontal disease. (Prof. YAMADA) 2 To learn about prevention and management of oral diseases based on comprehension of the relationship among the oral diseases and systemic diseases. (Prof. KIKUCHI) 3 To learn about pathological condition and management of disorders accompanying with the loss of orofacial tissues including teeth, alveolar bone and soft tissues caused by dental caries, periodontal disease, inflammation and tumor in orafacila region. (Prof. SASAKI) 4 To learn about pathological condition and management of tooth decay caused by dental caries. (Prof. SAITO)		
Preparation and review			
Text/Materials/References etc.	Instruct in the beginning of the class.		
Evaluation Method	Attendance and reports.		
Comments	Day/time and place of this class are flexible. Consult with instructors.		
Class Registration	Students should contact the following before registration. Prof. SAITO mssaito@dent.tohoku.ac.jp		

Course Subject	Stomatognathic Function		Instructor (○: Main Instructor)	○Satoshi Yamaguchi Yoshinori Hattori et al.
Credits	2		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Aging & Geriatric Dentistry	
Object and Summary of Class	The stomatognathic system, which is comprised in digestive, respiratory, and sensory organs, participates in numerous functions. The aims of this class are to understand the functions of this system, and to learn the essential methods to study these functions.			
Goal of Study	1. Explain varieties of stomatogtathic functions 2. Explain the relations between various stonatognathic funtions and general health / QOL			
Contents and Progress Schedule of the Class	1 Numerous functions of the stomatognathic system 2 Various methods to study stomatognathic functions			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Dr. Satoshi Yamaguchi satoshi.yamaguchi.a3@tohoku.ac.jp			

Course Subject	Special Needs Dentistry	Instructor (○: Main Instructor)	○Takahashi Astushi
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Undecided
Object and Summary of Class	In order to contribute to the health promotion of people with special needs, students understand special needs in the dentistry, and learn about the support methods for oral health care and the multidisciplinary team approach.		
Goal of Study	Student can explain the present conditions and problems of people with special needs in Japan and the system of the dentistry. Student can explain the special needs on the oral health and dental treatment. Student can explain the behavior management of people with special needs in the dentistry. Student can explain the dysphagia and its rehabilitation in the developmental stage. Student can explain the multidisciplinary team approach for the health care of people with special needs.		
Contents and Progress Schedule of the Class	1 The present conditions and the problems of people with special needs in Japan and the system of dentistry 2 Diseases with special needs in dentistry 3 The behavior management in special needs dentistry 4 Dysphagia and its rehabilitation in the developmental stage 5 Multidisciplinary team approach for the health care		
Text/Materials/References etc.	Special Needs Dentistry 2nd ed.(Ishiyaku Syuppan) (Japanese)		
Evaluation Method	Students are evaluated by attendance and reports		
Comments			
Class Registration	Students should contact the following before registration. Takahashi Atsushi atsushi.takahashi.b5@tohoku.ac.jp		

Course Subject	Geriatric Dentistry		Instructor (○: Main Instructor)	○Yoshinori HATTORI
Credits	2		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Aging & Geriatric Dentistry	
Object and Summary of Class	In spite of remarkable development of oral health care, the mean life-span of the tooth is still far shorter than that of the individuals in Japan. This may partly due to the contribution of age-specific risk factors of dental caries and periodontitis, both are the main causes of tooth loss in the elderly people. The aim of this class is to understand the age-specific risk factors of oral health.			
Goal of Study	1. Explain the problems faced by geriatric oral health care 2. Explain the contribution of geriatric oral health care on general health / QOL			
Contents and Progress Schedule of the Class	1 The current state of oral and dental health of Japanese elderly population 2 The risk factors of oral and dental health in the stage of old age			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. HATTORI yoshinori.hattori.b4@tohoku.ac.jp			

Course Subject	Dental Infection Control		Instructor (○: Main Instructor)	○Yoko KOBAYASHI
Credits	2		Subject No.	DDE-DEN 603
Day/time of classes	Consult with Yoko KOBAYASHI	Place	Division of Dental Infection Control	
Object and Summary of Class	This class aim to learn the hospital infection disease and its mechanisms, basic knowledge for prevention of hospital infection and specificity of dental infection control measures.			
Goal of Study	1. To understand the hospital infection disease and its mechanisms, basic knowledge for prevention of hospital infection and specificity of dental infection control measures. 2. To obtain the necessary knowledge to offer safe dental treatment.			
Contents and Progress Schedule of the Class	1 Infection control dental seminar 1) Basic knowledge for infectious disease 2) Basis of infection control measures 3) Infection control measures for dentistry 2 Practice for standard precaution in dental hospital 3 Attendance at the designated lectures Designated lectures by faculty of Tohoku University Graduate School of Dentistry. 4 Attendance at the designated seminar, lectures or faculty development etc. * Attendance at the "1" and "2" are required, and addition, students who take this course must select "3" or "4".			
Preparation and review				
Text/Materials/References etc.	None specified.			
Evaluation Method	By presence and reports.			
Comments	Students should contact with Dr. Endo before registration.			
Class Registration	Students should contact the following before registration. Yoko KOBAYASHI yoko.kobayashi.a8@tohoku.ac.jp			

Course Subject	Oral and Maxillofacial Reconstruction	Instructor (○: Main Instructor)	○ Yasuyuki SASANO Keiichi SASAKI Tetsu TAKAHASHI Kentaro MIZUTA
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners
Object and Summary of Class	This subject aims to learn about reconstruction of the oral and craniomaxillofacial complex from the aspect of cell and tissue biology, tissue engineering and clinical dental science.		
Goal of Study	To give an outline of reconstruction of the oral and craniomaxillofacial complex from the aspect of cell and tissue biology, tissue engineering and clinical dental science		
Contents and Progress Schedule of the Class	1 Development and repair of the oral and craniomaxillofacial complex from the aspect of cell and tissue biology (Prof. SASANO) 2 Reconstruction of the oral and craniomaxillofacial complex from the aspect of clinical physiology and prosthodontics (Prof. SASAKI) 3 Reconstruction of the oral and craniomaxillofacial complex from the aspect of oral and maxillofacial surgery (Prof. TAKAHASHI) 4 Reconstruction of the oral and craniomaxillofacial complex from the aspect of anesthesiology (Prof. MIZUTA)		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Prof.Yasuyuki SASANO sasano@anat.dent.tohoku.ac.jp		

<table>
<tr><td>Course Subject</td><td colspan="2">Digital Engineering in Dentistry</td><td>Instructor (○: Main Instructor)</td><td>○Hiroshi Egusa
Guang Hong
Ryoichi Inagaki</td></tr>
<tr><td>Credits</td><td colspan="2">2</td><td>Subject No.</td><td>DDE-DEN 603</td></tr>
<tr><td>Day/time of classes</td><td>The time of classes will be decided in consulting with students.</td><td>Place</td><td colspan="2">D-2F lecture room (tentative)</td></tr>
<tr><td>Object and Summary of Class</td><td colspan="4">To learn the features of the clinical application of digital engineering in dentistry.
To learn the key points of clinical procedures and materials used in digital dental engineering.</td></tr>
<tr><td>Goal of Study</td><td colspan="4">Understand the features of digital engineering in dentistry, clinical procedures and materials used in digital dental equipment, and to be able to use them clinically.</td></tr>
<tr><td>Contents and Progress Schedule of the Class</td><td colspan="4">1 Experience the procedure of mouthguard fabrication using IOS (Intra Oral Scanner) and 3D printer.
2 Experience the fabrication of CAD/CAM crowns from CAD data obtained using IOS.</td></tr>
<tr><td>Self-learning</td><td colspan="4">Students are required to prepare lectures/lessons to achieve the goals of the lectures.</td></tr>
<tr><td>Text/Materials/References etc.</td><td colspan="4">Non</td></tr>
<tr><td>Evaluation Method</td><td colspan="4">By attendance and reports on a topic of the classes.</td></tr>
<tr><td>Comments</td><td colspan="4">Day/time of this class is flexible.</td></tr>
<tr><td>Class Registration</td><td colspan="4">Students should contact the following before registration.
Prof. Hiroshi Egusa
egu@tohoku.ac.jp</td></tr>
</table>

Course Subject	Environmental Dentistry	Instructor (○: Main Instructor)	○ Ken Osaka Keiichi Sasaki Tsutomu Sekine Atsushi Takahashi
Credits	2	Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	undecided
Object and Summary of Class	The Fukushima Daiichi Nuclear Power Plant accident in March 2011 was environmentally detrimental in surrounding areas. Teeth tend to incorporate and retain various radionuclides such as strontium-90 and caesium-137 from the environment. In this program, students learn how is the relationship between the environmental pollution and the amount of radionuclides incorporated into the teeth.		
Goal of Study	Students learn that the status of radiation exposure in humans and animals can be estimated by measuring radionuclides in the tooth.		
Contents and Progress Schedule of the Class	1 Learn about environmental pollution caused by the Fukushima Daiichi Nuclear Power Plant accident. 2 Learn about basics of radiation measurement in teeth. 3 Understand how to estimate external and internal exposure to radiation using teeth.		
Preparation and review			
Text/Materials/References etc.	Students are given appropriate instructions in the lecture.		
Evaluation Method	Students are evaluated by attendance and reports.		
Comments			
Class Registration	Students should contact the following before registration. Prof. Ken Osaka ken.osaka.e5@tohoku.ac.jp		

Course Subject	Oral Care Program for Cancer Patients		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Naoko TANDA Risa ISHIKO Mina DODO
Credits	1		Subject No.	DDE-DEN 603
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Preventive Dentistry	
Object and Summary of Class	It is directly connected to the QOL of patients in hospital and under best supportive care to maintain higher level of oral functions. It is reported that oral care for the patients during cancer treatment of head and neck lesions, results the less incidences of side effects, e.g. fever after operation. It is also reported that oral mucosal managements against dry mouth during chemotherapy and radiotherapy is important to support their struggle undergoing medical treatment. The aims of this course to develop the human resources that practice oral care of inpatients suffering cancer and that lead the movement to spread oral care in hospitals.			
Goal of Study	To explain biological characteristics of cancer To explain special symptoms and side effects of cancer treatment in oral cavity To explain the method of oral care and oral management of patients with cancer To perform oral care of cancer patients			
Contents and Progress Schedule of the Class	[Contents] Basic biology and clinical pathology of cancers Oral symptoms and side effects of cancer treatment in oral cavity Supportive management of patients with cancer Methods of oral supportive care Hands-on practice of oral care of patients in hospital			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	Attendance and reports.			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

8. Educational Goals and Class Plan by Subject (Doctoral Course)

Compulsory courses

Course Subject	Psychosocial Science of Oral Health and Wellbeing		Instructor (○: Main Instructor)	○Guang HONG Ryoko NAKANO
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	Second Semestar Fourth Semestar	Place	Learning by ISTU	
Object and Summary of Class	Objectives: To understand the influence of cultural, religious, social, and economic backgrounds on ethics, health, and views of life and death, and to learn the basic knowledge necessary for the establishment and promotion of Asian-model dentistry. Summary: The program provides an humanism fusion and interdisciplinary education in the fields of arts and sciences, cultural anthropology, life and death, religion, economics of health and welfare, medical and social ethics, and social dentistry.			
Goal of Study	Can discuss in detail the necessity and ideal of Asian-model dentistry. ・Can outline the medical and social ethics that a medical professional should possess. ・Understand basics of physical anthropology and explain its definition. ・Understand international differences and problems of welfare, policies, and health systems in dentistry. ・Understand the influence of cultural, religious, and social backgrounds on welfare and policy in dentistry. ・Understand the influence of economics backgrounds on welfare and policy in dentistry and aging society.			
Class Contents and Progress Schedule	1 Medical Ethics and Social Ethics 2 Introduction to Physical Anthropology 3 Social Dentistry 4 International Oral Health 5 Cultural Anthropology 6 Death & Life Studies/Religious Studies 7 Health and Welfare Economics 8 Economics of Aging			
Preparation and review	Students are required to prepare lectures and lessons to achieve the lecture goals.			
Text/ Materials/ References, etc.	None			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students in CA+inD courses do not need to register because it is a required course. Students who in other courses should contact the following before registration. Prof. Guang HONG hong.guang.d6@tohoku.ac.jp			

Course Subject	Entrepreneur Science of Oral Health and Wellbeeing	Instructor (○: Main Instructor)	○Guang HONG Ryoko NAKANO
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	Forth Semester Sixth Semester	Place	Learning by ISTU
Object and Summary of Class	Objects: To understand the necessity of interdisciplinary collaboration and international industry-government-academia collaboration in a global society and super-aging society, and to learn the basic knowledge of oral health science. Summary: Students will learn the basics of translational research, advanced materials research, regenerative medicine, and digital transformation in dentistry through interdisciplinary education and industry-government-academia collaboration education.		
Goal of Study	Can explain and discuss the necessity and ideal of interdisciplinary collaboration and international industry-government-academia collaboration. ・Can understand the necessity and problems of international industry-government-academia and interdisciplinary collaboration. ・Can explain the ideal of dentistry in the global society and super-aging society. ・Understand the basic knowledge necessary for the application of digital technology to dentistry and dental education. ・Understand the basic characteristics and problems of advanced biomaterials used in dentistry. ・Understand the outline and basic knowledge of translational research.		
Contents and Progress Schedule of the Class	1 International Industry-Acamedica/Interdisciplinary Collaboration 2 Innovative Dentistry 3 Introduction to Digital Engineering in Dentistry 4 Digital Engineering in Dentistry 5 Biomaterials for Regenerative Medicine 6 Translational Research		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Non		
Evaluation Method	By presence and report		
Comments			
Class Registration	Students in CA+inD courses don't need to register as it is a required course. Students who in other courses should contact the following before registration. Prof. Guang HONG hong.guang.d6@tohoku.ac.jp		

Course Subject	Cross-sectional Science of Oral Health and Wellbeing		Instructor (○: Main Instructor)	○Guang HONG Ryoko NAKANO
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	Sixth Semester Eighth Semester	Place	Learning by ISTU	
Object and Summary of Class	Objects: To understand the necessity of medical-dental collaboration in a global society and super-aging society, and to learn basic knowledge of oral health and well-being. Summary: Students will learn about the basics of approaches from dentistry to wellbeing and medical-dental collaboration, including food science and nutrition, disaster dental science, environment dental science, and perioperative dentistry as well as studying oral health science.			
Goal of Study	Can discuss in detail the necessity and ideal of medical-dental collaboration in dentistry. ・Understand oral health science universality and uniqueness. ・Understand basic knowledge of food science, nutrition, and food research and development for preservation of oral functions. ・Can explain the role of dentistry in times of disaster and the relation between environmental factors and oral health. ・Understand medical-dental collaboration using perioperative dentistry as an example.			
Contents and Progress Schedule of the Class	1 Oral Health Science 2 Food Science and Nutritional Science 3 Disaster Dental Science 4 Enviroment Dental Science 5 Perioperative Dentistry and Collaboration between medical and dental sciences			
Preparation and review	Students are required to prepare lectures and lessons to achieve the lecture goals.			
Text/ Materials/ References, etc.	None			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students in CA+inD courses need not register because it is a required course. Students in other courses should contact the following before registration. Prof. Guang HONG hong.guang.d6@tohoku.ac.jp			

Course Subject	Global Exposure in Oral Health and Wellbeing	Instructor (○: Main Instructor)	○Guang HONG Ryoko NAKANO
Credits	1	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Globalization Initiative
Object and Summary of Class	Objects: To understand the necessity of international joint education in a global and super-aging society, and to learn skills for building a global network through practice. Summary: Through study abroad and internships, students will experience the global environment of their field of major, learn about the action plans necessary to build a global career, and gain the skills necessary to build a global network through international symposiums and joint symposiums with partner schools.		
Goal of Study	Can discuss in detail the necessity and ideal of international joint education and global networks in a global society and super-aging society. ・Can explain the requirements and action plans for a global career. ・Understand the necessity and development of international joint education. ・Training at overseas academic or educational/research institutions. ・Make at least two presentations at international conferences and joint symposiums with overseas partner schools.		
Contents and Progress Schedule of the Class	1 Global Career Seminar 2 International Education and Development 3 Training at overseas academic or educational/research institutions 4 Research presentations at international conferences and symposiums 5 Presentation at a joint symposium with overseas partner schools		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Non		
Evaluation Method	By presence and report		
Comments			
Class Registration	Students in CA+inD courses don't need to register as it is a required course. Students who in other courses should contact the following before registration. Prof. Guang HONH hong.guang.d6@tohoku.ac.jp		

Course Subject	Courses for Thesis Preparation (Research Foundations Course)		Instructor (○: Main Instructor)	○Chief Supervisor
Credits	1, 4, 4		Subject No.	DDE-DEN 711,712,713
Day/ time of classes	Times of classes will be decided in consulting with student.	Place	"Research Foundations Course" and APRIN research ethics education through e-learning. Othhers are conducted in various fields	
Object and Summary of Class	Students learn the basics of conducting research as a graduate student by taking "Basic Graduate School Research" and acquire specialized knowledge through participation in and presentations given at research theme selection meetings, journal club, clinical conferences, research seminars, research progress report, medical treatment, and specialized conferences. Students promote research under the guidance of their chief supervisor to prepare a doctoral dissertation, and to prepare for the doctoral dissertation presentation (preliminary review, final review and final examination).			
Goal of Study	To acquire the basic knowledge required to conduct research as a graduate student, to acquire specialized knowledge related to the preparation of a doctoral dissertation, to conduct original research, and to complete a doctoral dissertation.			
Class Contents and Progress Schedule	In the first semester of the first year, students are required to take the following e-learning courses as part of the "Basic Graduate School Research" course, as well as the APRIN Research Ethics Course. Introduction: GIO/SBO of Basic Graduate School Research 1. Manners of Research: What is Research? 2. How to be a graduate student: What it means to be a graduate student 3. Career path starting from graduate school 4. Beginning of Research 5. About harassment 6. Alcohol and Tobacco The above information is tentative and will be explained in detail at the orientation. In the first year, in addition to attending "Research Foundations Course", students attend and present at "Theme Selection Meetings". In the second and third years, students participate in journal club, clinical conferences, research seminars, research progress report, medical examinations, etc., which are held individually for each field, and also attend and present at specialized conferences related to each field. In the fourth year, students publish the results of their research as a doctoral dissertation.			
Preparation and Review	Students are required to prepare lectures and lessons to achieve the goals of the lectures.			
Text/ Materials/ References, etc.	In "Research Foundations Course" we will distribute "How to be a Researcher," "About Laboratory Notebooks," and "For the Healthy Development of Science" (Green Book). Other information will be provided by your chief supervisor. The Lab (https://www.jst.go.jp/kousei_p/measuretutorial/mt_lab.html)			
Evaluation Method	"Research Foundations Course" will be evaluated by a report. The other lectures and lessons will be evaluated by the chief supervisor in consideration of the research attitude, research progress, and master's thesis.			
Comments				
Class Registration	Registration is not required for this course.			

Lectures in Dental Sciences

Course Subject	Lectures in Dental Sciences: Oral Molecular Bioregulation		Instructor (○: Main Instructor)	○ Shunji SUGAWARA Toshinobu KUROISHI
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	First semester/Mon. 1st and 2nd periods	Place	B4 Seminar Room (Building B)	
Object and Summary of Class	Aims Understand the mechanisms of immune and inflammatory responses and oral defense.			
Goal of Study	Students understand the mechanisms of oral defense (oral immune response) and can explain them.			
Contents and Progress Schedule of the Class	Contents 1. Learn about oral defense mechanism and the expression and pathogenesis of oral diseases (Sugawara) 2. Learn about the mechanism of immune response and tolerance induction in oral mucosa (Kuroishi)			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the course.			
Text/Materials/References etc.				
Evaluation Method	By presence and report.			
Comments				
Class Registration	Students should contact the following before registration. Prof. SUGAWARA shunji.sugawara.d5@tohoku.ac.jp			

Course Subject	Lecture in Dental Sciences: Periodontology and Endodontology		Instructor (○: Main Instructor)	○ Satoru Yamada Eiji Nemoto and others
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners	
Object and Summary of Class	Understanding 1) infectious diseases in endo-perio lesion and 2) host-parasite interaction associated between oral and systemic lesions.			
Goal of Study	Understanding possible development of new therapy based on biological response and enhancing capabilities to gather information leading to new clinical dentistry.			
Contents and Progress Schedule of the Class	1 Periodontitis and immune response 2 Periodontal regeneration from the aspect of cellular biology 3 Periodontitis and systemic diseases			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and reports			
Comments				
Class Registration	Students should contact the following before registration. Prof. Satoru Yamada satoruy@tohoku.ac.jp			

Course Subject	Lectures in Dental Science:Operative Dentistry		Instructor (○: Main Instructor)	○Masahiro SAITO
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Staff Room of Division of Operative Dentistry	
Object and Summary of Class	1. Understanding of the dental treatment for patient of systemic disease 2. Understanding of the periodontal ligament regeneration therapy			
Goal of Study	1. Systemic disease and operative dentistry 2. Regeration therapy of periodontal ligament			
Contents and Progress Schedule of the Class	1 Basic knowledge of connective tissue disorder accompanied by dental disease. 2 Evaluation of periodontal tissue using disease animal model. 3 Basic knowledge of regeneration therapy 4 Basic knowledge of clinical trial of the periodontal ligament regeneration therapy.			
Preparation and review				
Text/Materials/References etc.	No Text is prepared.			
Evaluation Method	Attendance and Report			
Comments				
Class Registration	Students should contact the following before registration. Prof. SAITO mssaito@dent.tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: International Oral Health		Instructor (○: Main Instructor)	○Ken Osaka Jun Aida
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	First Term Thursday /1-2nd period	Place	The seminar room of the department	
Object and Summary of Class	The aims of this lecture are: □ To learn dental health system of Japan as well as other countries. □ To learn the framework of global cooperation in health field.			
Goal of Study				
Contents and Progress Schedule of the Class	Content of class: ・To comprehend the needs of international collaboration. ・To learn about the appropriate technology in cooperation with developing countries. ・To learn about the present state and future role of the Japanese social insurance system.			
Preparation and review				
Text/Materials/References etc.	Instruct at the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. Ken Osaka ken.osaka.e5@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: Dental and Digital Forensics	Instructor (○: Main Instructor)	○ Toshihiko SUZUKI Moe KOSAKA Yuka HATANO
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	A. Course for dentists / dental care professionals This course is designed for dental professionals.In this course, students learn basic knowledge of method of personal identification using dental information. B: Course for non-dental professionals This course is designed for non-dental professionals. In this course, students learn basic knowledge of method to differentiate human from non-human bones and teeth.		
Goal of Study	Lerners should be able to: Course A: ・Describe the need for dentistry in forensic medicine ・Explain the roles of the dentists in the mass disaster Course B: ・Explain the difference between human and animal skeleton ・Explain the difference between human and animal teeth		
Contents and Progress Schedule of the Class	Course A 1 What is dental identification? 2 Collecting the post-mortem information 3 Collecting the ante-mortem information 4 Matching and comparison of post- and ante- mortem information 5 Dental identification in mass fatality incident Course B 1 Human or non-human? 2 Basic comparative anatomy of mammalian skeleton 3 Basic comparative anatomy of mammalian dentition		
Preparation and review	In order to achive the learning goals of the course, students need self-study according to the contents and progress of the course.		
Text/Materials/References etc.	Textbooks are not specified. Other recommended readings will be provided in the class.		
Evaluation Method	Grading will be based on participation and final report.		
Comments	Alternative study materials might be provided according to the background of students.		
Class	Students should contact the following before registration.		

Class Registration	Assoc. Prof. Toshihiko SUZUKI suzk@anat.dent.tohoku.ac.jp

Course Subject	Lectures in Dental Sciences: Preventive Dentistry		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Naoko TANDA
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners	
Object and Summary of Class	Aims and objectives: To learn the dental practice and oral health guidance of preventive dentistry, to improve and promote public oral health to ensure the healthy life style among whole nations.			
Goal of Study	To understand various problems and effective managements of the activities of oral health promotion in local communities. To understand oral environmental factors and preventive oral diseases in the elderly.			
Contents and Progress Schedule of the Class	Content of class: Relationship between oral environments and prevention of oral diseases Current situation and problems of oral health promotion in local community. Current situation and problems of oral health promotion among elderly.			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: Pediatric Dentistry	Instructor (○: Main Instructor)	○Sastoshi Fukumoto Aya Yamada Kan Saito Yuriko Maruya
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	Jun, Oct (Thu 1st and 2nd period)	Place	suspense
Object and Summary of Class	Purpose of this course is to understand the pediatric dental disorder (phenotypes, frequency and treatment) and regeneration medicine in the field of dental research.		
Goal of Study	To learn about the pathogenesis of developmental disorder in childhood.		
Contents and Progress Schedule of the Class	1 First semester (Jun) Physical and psychological development of children necessary for the pediatric dental treatment. 2 First semester (Jun) Genetic disorder associated with craniofacial development. 3 Second semester (Oct) Over view of tooth regeneration study. 4 5		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Attendance record and reports		
Comments	Please confirm the schedule of course		
Class Registration	Students should contact the following before registration. Prof. Satoshi Fukumoto fukumoto@dent.tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Craniofacial Anomalies	Instructor (○: Main Instructor)	○Kaoru IGARASHI, and others
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The 2nd semester, Tuesday, The 1st and 2nd classes	Place	Seminar & Training Room of Division of Craniofacial Anomalies
Object and Summary of Class	1. To understand the latest researches performed in this laboratory and those on the relevant issues from other laboratories in the world. 2. To obtain useful information for your own research.		
Goal of Study	To be able to obtain useful information for your own research.		
Contents and Progress Schedule of the Class	1 Diagonsis and treatment of craniofacial anomalies 2 Multidisciplinary approach to cleft lip and palate treatment 3 Assigned lectures, seminars and others		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time and place of this class are flexible. Consult with instructors.		
Class Registration	Students should contact the following before registration. Prof. IGARASHI kaoru.igarashi.a3@tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Orthodontics and Dentofacial Orthopedics	Instructor (○: Main Instructor)	○Itaru Mizoguchi
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consult-ing with student.	Place	Labolatory room of orthodontics
Object and Summary of Class	The objects of this course is to understand influences of orthopedic appliances to growth of the maxillofacial bones and mechanisms of orthodonitc tooth movement.		
Goal of Study	The goals of this course is to deeply understand novel findings about influences of orthopedic appliances to growth of the maxillofacial bones and mechanisms of orthodonitc tooth movement.		
Contents and Progress Schedule of the Class	1 Biological reactions and mechanisms in orthodontic tooth movenent 2 Orthodontic diagnosis and cephalometric analysis 3 Orofacial function analysis of orthodontics 4 Orthodontic treatment of congenital anomalies 5 Attendance of specified lectures 6 Others (specified seminors and lectures)		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.□		
Text/Materials/References etc.	Text/Materials/References will be given timely to student.		
Evaluation Method	Attendance and reports		
Comments	No other comments		
Class Registration	Students should contact the following before registration. Prof. Itaru Mizoguchi mizo@tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Oral Physiology	Instructor (○: Main Instructor)	○Junichi Nakai Keiko Ando Mirei Chiba Takaaki Kudo
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Oral Physiology
Object and Summary of Class	Object: The object of this class is to understand the mechanisms underlying the oro-facial functions, such as somesthetic sensation of the oro-facial regions, gustatory functions, jaw reflexes, and mastication. Summary of class: This class will focus on the oro-facial sensory functions and the motor control.		
Goal of Study	General instructive objective: to understand the neural mechanisms of oro-facial sensory-motor functions. Specific behavioral objectives are to understand the mechanisms of: ① periodontal sensation ② pain of dental pulp and dentin ③ pain and analgesia of oro-facial portions ④ gustatory function ⑤ jaw reflexes and mastication		
Contents and Progress Schedule of the Class	1 periodontal sensation 2 pain of dental pulp and dentin 3 pain and analgesia of oro-facial portions 4 gustatory function 5 jaw reflexes and mastication		
Preparation and review	It is important to review what you learnt in the lesson. Make sure to do a lot of review.		
Text/Materials/References etc.	None		
Evaluation Method	By attendance and report		
Comments			
Class Registration	Students should contact the following teaching staff before registration. Professor Junichi Nakai (Email: junichi.nakai.a5@tohoku.ac.jp)		

Course Subject	Lectures in Dental Sciences: Dental Pharmacology	Instructor (○: Main Instructor)	○Minoru WAKAMORI Takashi NAKAMURA Kaori TAKAHASHI
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Mol. Biol. & Biochem. Room in Lab. of Pharmacol.
Object and Summary of Class	This course is designed to help students understand membrane physiology. Neurons convey fast neural information by virtue of electrical and chem-ical signals. The chemical signals released from pre-synaptic mem-branes are converted into electrical signals by ligand-gated ion channels. Electrical signals are carried by transmembrane ion cur-rents, and result in changes in transmembrane voltage. Therefore, we will lecture on the following contents.		
Goal of Study	The goals of the lectures are to understand diseases based on pathophysiology.		
Contents and Progress Schedule of the Class	1 Electrophysiological and molecular biological descriptions of ionic channels and transporters. Lecture on the Hodgkin-Huxley model and structural biology of ion channels 2 Channelopathy Lecture on the diseases caused by dysfunction of the channels 3 Channels and transporters as targets for drug therapy 4 New channels as receptors of oral sensations and signal amplifiers A. TRPV1 channel and pain		
Text/Materials/References etc.	There is no text for this course. Suitable materials will be destributed.		
Evaluation Method	The largest part of the evaluation will be based on active participation in class activities.		
Comments			
Class Registration	Students should contact the following before registration. Prof. WAKAMORI mpcb@dent.tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Oral Pathology		Instructor (○: Main Instructor)	○Shimizu Y Saito H Sano Y
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Division of Oral Pathology	
Object and Summary of Class	Specific and synthetic lectures about oral cancer and bone regenration are done.			
Goal of Study	1. Oral cancer: Precancerous lesions, epidemiology, etiology, morphology, diagnosis, and therapy. 2. Bone regeneration: Bone regeneration in Implantology, Periodotology and Oral surgery.			
Contents and Progress Schedule of the Class	1 Oral cancer 2 Bone regeneration in dentistry			
Preparation and review				
Text/Materials/References etc.	None specified.			
Evaluation Method	Attendance and discussion.			
Comments				
Class Registration	Students should contact the following before registration. Shimizu Y shimizu@dent.tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: Dental Informatics and Radiology		Instructor (○: Main Instructor)	○ Masahiro IIKOBO Noriaki SHOJI Ikuho KOJIMA
Credits	3		Subject No.	
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Mainly at Oral and Maxillofacial Radiology clinical room, Tohoku University Hospital	
Object and Summary of Class	To learn about the medical interview, clinical findings, imaging findings, and laboratory findings that form the basis for diagnosis, with the aim of acquiring the ability of the logical thinking based on various medical information to diagnose oral and maxillofacial diseases.			
Goal of Study	To make an accurate diagnosis comprehensively based on information obtained from medical interviews, clinical findigns, diagnostic imaging and laboratory findings.			
Contents and Progress Schedule of the Class	1 The mutual relationship between oral diseases and systemic diseases. 2 The latest imaging methods for oral diseases. 3 How to practice the clinical laboratory examinations.			
Preparation and review				
Text/Materials/References etc.	Oral Diagnosis and Radiology (8th Edition) (published by our department)			
Evaluation Method	Attendance and reports.			
Comments	Lecture will be held with residents. Day/time of classes is subject to change by consulting with the students.			
Class Registration	Students should contact the following before registration. Prof. Masahiro IIKUBO masahiro.iikubo.c6@tohoku.ac.jp			

<table>
<tr><td>Course Subject</td><td colspan="2">Lectures in Dental Sciences:

Oral and Maxillofacial Surgery</td><td>Instructor
(○: Main Instructor)</td><td>○Tetsu TAKAHASHI
Masatoshi CHIBA
Kensuke YAMAUCHI
Hitoshi MIYASHITA</td></tr>
<tr><td>Credits</td><td colspan="2">3</td><td>Subject No.</td><td>DDE-DEN 701</td></tr>
<tr><td rowspan="2">Day/time of classes</td><td>iday, 1st and 2nd hou</td><td rowspan="2">Place</td><td colspan="2" rowspan="2">Div. of Oral and Maxillofacial Surgery,
10F East Ward, 3F Outpatient Section</td></tr>
<tr><td>First Semester</td></tr>
<tr><td>Object and Summary of Class</td><td colspan="4">To learn the basic knowledge of morphology, pathophysiology and treatment for oral and maxillofacial regions, and further learn materials and methods for basic and clinical research for oral and maxillofacial surgery. Lastly, brush up the cutting edge of research</td></tr>
<tr><td>Goal of Study</td><td colspan="4">To learn basic knowledge of oral and maxillofacial surgery</td></tr>
<tr><td>Contents and Progress Schedule of the Class</td><td colspan="4">1 Current concept of Oral and Maxillofacial Surgery
2 Congenital anormalies and doformities in oral and maxillofacial area
3 Inflammation and trauma in oral and maxillofacial region
4 Tumors in oral and maxillofacial region
5 Temporomandibular diseases
6 Morphological and functional reconstruction in OMFS
7 Reconstruction using dental implants in oral and maxillofacial region</td></tr>
<tr><td>Text/Materials/References etc.</td><td colspan="4">A report should be presented suitably.</td></tr>
<tr><td>Evaluation Method</td><td colspan="4">It judges by the check of the degree of comprehension by the number of times of attendance, and a report, etc.</td></tr>
<tr><td>Comments</td><td colspan="4">Opening time and a course content may be changed after consulting with a participant.</td></tr>
<tr><td>Class Registration</td><td colspan="4">Students should contact the following before registration.
Prof. Tesu TAKAHASHI
tetsu@dent.tohoku.ac.jp</td></tr>
</table>

Course Subject	Lectures in Dental Sciences: Dento-oral Anesthesiology		Instructor (○: Main Instructor)	○Kentaro Mizuta Hiroshi Hoshijima Makoto Yasuda Daisuke Watanabe (part-time)
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The 2nd semester Friday, 1st & 2nd period	Place	Dento-oral Anesthesiology Office (2nd floor of Building for Clinical Dental Science)	
Object and Summary of Class	[Object] The purpose of this course is to understand basic anethesiology for conducting the research. [Summary] Students learn general and local anesthesia, IV sedation, medical emergencies in dental practice, and cardiopulmonary resuscitation.			
Goal of Study	Students can acquire the fundamental knowledge of anesthetic managements.			
Contents and Progress Schedule of the Class	1 Introduction of anesthesiology 2 General anesthesia 3 IV sedation 4 Local anesthesia 5 Medical emergencies in dental practice 6 Cardiopulmonary resuscitation			
Preparation and review				
Text/Materials/References etc.	None			
Evaluation Method	Evaluated by attendance and reports			
Comments	Day/time of this class is flexible			
Class Registration	Students are required to contact the following designated person before registration. Prof. Kentaro Mizuta kentaro.mizuta.e6@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences:Comprehensive Dentistry		Instructor (○: Main Instructor)	○ Masahiko KIKUCHI Akio IZUMIDA
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Office of Comprehensive Dentistry	
Object and Summary of Class	The aim of this lecture: To learn the relationship between oral status and systemic health for understanding holistic dental care.			
Goal of Study	To be able to explain the relationship between oral status and systemic health.			
Contents and Progress Schedule of the Class	Content of Class: 1. Oral hygiene and quality of life 2. Eating function and nutrition 3. Mastication and physical function 4. Mastication and mental health 5. Oral hygiene and systemic diseases			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Materials			
Evaluation Method	By report			
Comments				
Class Registration	Students should contact the following before registration. Prof.KIKUCHI mashiko.kikuchi.c7@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences Oral and Craniofacial Anatomy	Instructor (○: Main Instructor)	○Hiroyuki ICHIKAWA Tadasu SATO Takehiro YAJIMA
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	Object : To understand the advanced science research about neuronal degeneration and regeneration. Summary: To learn about degeneartive and regenerative neurons and neurotrophic factrs.		
Goal of Study	To understand about morpphological change of degeneartive and regenerative neurons. To understand about function of neurotrophic factors		
Contents and Progress Schedule of the Class	1 Degeneration and regeneration of neurons 2 Importance of neurotrophic factors 3 Application of neurotrophic factors		
Preparation and review	The session time is limited and therefore self-directed learning is important. Students are required to review for each class.		
Text/Materials/References etc.	none		
Evaluation Method	By presence and reports		
Comments	none		
Class Registration	Students should contact the following before registration. Prof. ICHIKAWA hiroichi@anat.dent.tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Craniofacial Development and Tissue Biology	Instructor (○: Main Instructor)	○ Yasuyuki SASANO Megumi NAKAMURA
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners
Object and Summary of Class	To introduce research in tissue biology of calcification and calcified tissues, i.e., bones and teeth		
Goal of Study	To be able to give an outline of tissue biology of calcification and calcified tissues, i.e., bones and teeth		
Contents and Progress Schedule of the Class	1 Introduction of research conducted by the lecturer. 2 Review of recent information in literature.		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible		
Class Registration	Students should contact the following before registration. Prof. Yasuyuki SASANO sasano@anat.dent.tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Dental Biomaterials		Instructor (○: Main Instructor)	○Yukyo TAKADA Masatoshi TAKAHASHI
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Div. of Dental Biomaterials (Building A, 4F)	
Object and Summary of Class	The aim is to understand basic knowledge of metallic materials used for dentistry and to equip its applied skill.			
Goal of Study	The goal of study enables to explain metals for biomaterials. Espacially, it enables to apply titanium and dental magnetic attachments to one's research.			
Contents and Progress Schedule of the Class	1 Overview of titanium and titanium alloys 2 Titanium and titanium alloys as biomaterials 3 Biocompatibility of titanium alloys 4 Corrosion resistance of titanium alloys 5 Dental casting of titanium alloys 6 Titanium alloys for a dental CAD/CAM 7 Application of magnets and magnetic materials 8 Dental magnetic attachments			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	A lecturer prepars it.			
Evaluation Method	By presence and reports			
Comments	After consultation with learners, time and day of starting the course will be adjusted.			
Class Registration	Students should contact the following before registration. Assoc. Prof.TAKADA yukyo.takada.a1@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: Craniofacial Function Engineering		Instructor (○: Main Instructor)	○ Osamu SUZUKI Yukari SHIWAKU Ryo HAMAI
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Craniofacial Function Engineering	
Object and Summary of Class	The aim of this lecture: 1. To understand the biological reaction of bone substitute materials such as octacalcium phosphate (OCP). 2. To understand the role of stem cells in relation to bone regeneration. 3. To understand the methodology of tissue engineering.			
Goal of Study	The goal of study is to understand the methodology of bone tissue engineering and the materials used such as synthetic biomaterials and stem cells.			
Contents and Progress Schedule of the Class	1 Methodology of tissue engineering 2 Design of biomaterials 3 Cells and biomaterials 4 Drug delivery system with biomaterials			
Preparation and review	Please search for the references about calcium phosphates and bone regeneration.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. SUZUKI			

suzuki-o@tohoku.ac.jp

Course Subject	Lectures in Dental Sciences: Advanced Prosthetic Dentistry		Instructor (○: Main Instructor)	○Keiichi SASAKI Toru OGAWA Nobuhiro YODA
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	the 1st term, Tuesday, 1st -2nd periods	Place	The office of Advanced Prosthetic Dentistry	
Object and Summary of Class	This class aim to learn basic research, clinical study and state-of-the-art study in the prosthetic dental field.			
Goal of Study	Students should be able to understand basic research, clinical study and state-of-the-art study in the prosthetic dental field.			
Contents and Progress Schedule of the Class	1 Current trends and issues of the prosthetic dentistry (Instructor: Keiichi Sasaki) 2 Biomaterial - biological interface (Instructor: Keiichi Sasaki) 3 Biomechanical - biological interface (Instructor: Keiichi Sasaki) 4 Relationship between the function of mastication and swallowing (Instructor: Toru Ogawa) 5 Evidence in the prosthodontics (Instructor: Nobuhiro Yoda)			
Preparation and review				
Text/Materials/References etc.	Ask the corresponding instructor.			
Evaluation Method	Attendance of the class and a report of assignment.			
Comments	In consultation with students, time of classes can be changed.			
Class Registration	Students should contact the following before registration. Prof. Keiichi SASAKI junko.hagawa.a3@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: Molecular and Regenerative Prosthodontics		Instructor (○: Main Instructor)	○ Hiroshi EGUSA Masahiro Yamada Kunimichi Niibe
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	Wednesday Evening	Place	Seminar room: Division of Molecular and Regenerative Prosthodontics	
Object and Summary of Class	To learn basic knowledge for molecular and regenerative prosthodontics and to understand biology-based prosthodontic treatment approach.			
Goal of Study				
Contents and Progress Schedule of the Class	1 Increasing diversity in prosthodontic research 2 Impact of biotechnology on current and future prosthodontics 3 Prosthodontics as science 4 Emerging regenerative approachs for prosthodontic treatments 5 Stem cells in dentistry			
Preparation and review	Students are required to prepare lectures to achieve the goals of the lectures.			
Text/Materials/References etc.	Egusa H. et al.: Stem cells in dentistry -Part I & II. J Prosthodont Res. 2012. Egusa H: Increasing diversity in prosthodontic research. J Prosthodont Res, 2014.			
Evaluation Method	Attendance records and attitude in group discussion.			
Comments	The class is performed in a lab meeting of the biology research group in the Devision of Molecular and Regenerative Prosthodontics.			
Class Registration	Total capacity for participants is limited. Students should contact the following before registration. Prof. Hiroshi EGUSA			

	egu@tohoku.ac.jp

Course Subject	Lectures in Dental Sciences Aging and Geriatric Dentistry		Instructor (○: Main Instructor)	○Yoshinori HATTORI
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Aging & Geriatric Dentistry	
Object and Summary of Class	1. To understand the risk factors for the deterioration of the oral health status of the elderly population 2. To argue the strategy for promoting geriatric oral health			
Goal of Study	1. Explain the problems faced by geriatric oral health care 2. Explain the contribution of geriatric oral health care on general health / QOL			
Contents and Progress Schedule of the Class	1 Oral health status of the Japanese elderly population 2 Risk factors for the deterioration of geriatric oral health status 3 The strategy for promoting oral health in the elderly population			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. HATTORI yoshinori.hattori.b4@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: International Collabrative and Innovative Dentsitry	Instructor (○: Main Instructor)	○Guang Hong
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Globalization Initiative
Object and Summary of Class	The object of this course is to understand the outline and basic knowledge about development research on functional biomaterial and digital transformation in healthcare and educational settings based on international joint education and international industry-academia / interdisciplinary collaboration with a view to cultivating multimodal global human resources in dentistry, and to learn the application skills, to improve the research and development capabilities of functional biomaterials.		
Goal of Study	Can explain the definition and function of functional biomaterials. Can explain the definition and function of digital tools used in health care and education Understand the outline of international joint education and international industry-academia/interdisciplinary collaboration and how to proceed. Learn and use the techniques used in functional biomaterials research.		
Contents and Progress Schedule of the Class	1 Curent status and issues of biopolymer and bioceramic materials 2 Curent status and issues of digital tools used in health care and education 3 Basic of International Joint Education 4 Basic of International Industry-Academia/Interdiciplinary collaboration 5 Rheology of functional biomaterials 6 Surface modification of functional biomaterials 7 Evaluation of physical properties and bioactivity of functional biomaterials 8 Evaluation methods for digital tools used in health care and education		
Self-learning	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Non		
Evaluation Method	By presence and reports		
Comments			
Class Registration	Students should contact the following before registration. Prof. Guang Hong hong.guang.d6@tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Co-Creative Dentistry	Instructor (○: Main Instructor)	○Hiroyasu Kanetaka and others
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Interdisciplinary Integration
Object and Summary of Class	The object of this class is to acquire multimodal ability to create innovation liaison in dentistry by understanding the significance and basic knowledge of translational research and regulatory science based on interdisciplinary research, industry-government-academia collaboration research.		
Goal of Study	To be able to understand the significance and basic knowledge of translational research and regulatory science based on interdisciplinary research, industry-government-academia collaboration research.		
Contents and Progress Schedule of the Class	1 Overview of interdisciplinary research and industry-government-academia collaboration research 2 Significance and basic knowledge of SDGs (Sustainable Development Goals) 3 Significance and basic knowledge of translational research 4 Significance and basic knowledge of regulatory science		
Preparation and review	Preparatory learning is required according to the goals, the content, and the progress of the lesson.		
Text/Materials/References etc.	None		
Evaluation Method	By presence and reports		
Comments			
Class Registration	Students should contact the following before registration. Prof. Hiroyasu Kanetaka hiroyasu.kanetaka.e6@tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Oral Cancer Therapeutics	Instructor (○: Main Instructor)	○Hisanori HORIUCHI Ryutaro Shirakawa
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Department of Molecular and Cellular Biology, Institute of Development, Aging and Cancer
Object and Summary of Class	Lecture on the molecular mechanisms of intracellular signal transduction.		
Goal of Study	To understand the molecular mechanism of cellular processes such as cell proliferation and movement in oral inflammation and cancer.		
Contents and Progress Schedule of the Class	1 2 3 4 5		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Prof.HORIUCHI hisanori.horiuchi.e8@tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences: Department of dental nuclear medicine and radiology		Instructor (○: Main Instructor)	○Yasuyuki Taki Tatsushi Mutoh Yasuko Tatewaki
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	IDAC SA building	
Object and Summary of Class	To understand the recent important researches for the relationship between dental issues and dementia, and also understand the methodology of brain MRI image analysis.			
Goal of Study	To understand the seminars for the relationship between dental issues and dementia.			
Contents and Progress Schedule of the Class	1 To attend the seminars 2 To understand the seminars 3 Brain MR image analysis			
Preparation and review				
Text/Materials/References etc.				
Evaluation Method				
Comments				
Class Registration	Students should contact the following before registration. Prof. TAKI yasuyuki.taki.c7@tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences: Bio-Dental Engi-neering	Instructor (○: Main Instructor)	○ Shinji KAMAKURA
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Bone Regenerative Engineering and others
Object and Summary of Class	To learn various bone regenrative materials using in the field of dentistry and oral surgery and relationship between organism and these materials To explain the latest regenerative medicine on dental field and related new materials		
Goal of Study	Comprehend the significance and essential] condition for bone regeneration. Comprehend the bone regenerative materials used in the clinic of oral and maxillofacial surgery Comprehend the new bone regenerative materials in oral and maxillofacial surgery		
Contents and Progress Schedule of the Class	1 Significance of bone regeneration 2 Three elements for bone regeneration 3 Hydroxyapatite 4 ß-tricalcium phosphate 5 Octacalcium phosphate collagen composites		
Preparation and review			
Text/Materials/References etc.	No textbook is used but handouts are distributed.		
Evaluation Method	The evaluation is performed based on attendance at lectures and scores on examination.		
Comments	Opening hours and place of the class will be altered in accordance with consulting with participants.		
Class Registration	Students should contact the following before registration. Prof. Shinji KAMAKURA kamakura@tohoku.ac.jp		

Seminars in Dental Sciences

Course Subject	Seminars in Dental Sceiences: Oral Ecology and Biochemistry		Instructor (○: Main Instructor)	○Nobuhiro Takahashi Jumpei Washio Gen Mayanagi Yuki Abiko
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	Monday / 16:30-18:00	Place	Division of Oral Ecology and Biochemstry 8th floor in Building A	
Object and Summary of Class	The aim of this exercise lesson class is to learn current topics on oral ecosystem, oral biofilm and oral diseases (such as dental caries, periodontal diseases and halitosis) as well as oral cancer, in order to encourage the research activities performed by students in the Division of Oral Ecology and Biochemistry. Students who take this class may attend the weekly research seminar in the Division of Oral Ecology and Biochemistry, and then they may perform the presentations of the progress reports on their own research activities.			
Goal of Study	1. Through the learning the latest knowledge on oral biochemistry, to obtain the ability to understand well and feed back to own study. 2. To obtain the ability for presentation using the visual aid			
Contents and Progress Schedule of the Class	1 Attendence to the weekly research seminar in the Division of Oral Ecology and Biochemistry (over 15 times / year) 2 Presentations of the progress reports on their own research activities at the seminar (twice / year)			
Preparation and review	After attending the seminar, please review the contents of the day and deepen your understanding. Also, please get enough advices from your instructor to prepare for your presentation.			
Text/Materials/References etc.	N/A			
Evaluation Method	Evaluation will be done based on yout attendance and presentation at seminer.			
Comments	Attention：This course intends for graduate students engaging in the study in our laboratory as a general rule.			
Class Registration	Students should contact the following before registration. Prof. Nobuhiro Takahashi OEB@dent.tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Oral Molecular Bioregulation		Instructor (○: Main Instructor)	○Shunji SUGAWARA Toshinobu KUROISHI Hiroyuki TADA
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	First semester/Mon. 1st and 2nd periods	Place	B4 Seminar Room (Building B)	
Object and Summary of Class	Aims Understand the mechanisms of immune and inflammatory responses and oral defense.			
Goal of Study	Students can read and understand scientific papers and apply the contents to own research.			
Contents and Progress Schedule of the Class	Contents 1. Learn about oral defense mechanism and the expression and pathogenesis of oral diseases (Sugawara) 2. Learn about the mechanism of immune response and tolerance induction in oral mucosa (Kuroishi)			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the course.			
Text/Materials/References etc.	Papers will be ditributed beforhand.			
Evaluation Method	By presence and report.			
Comments				
Class Registration	Students should contact the following before registration. Prof. SUGAWARA shunji.sugawara.d5@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Periodontology and Endodontology		Instructor (○: Main Instructor)	○ Satoru Yamada Eiji Nemoto and others
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Conference room in Division of Periodontology &Endodontology	
Object and Summary of Class	Developing an ability to comprehend international scientific paper regarding basic science of endodontology, periodontology and the related fields including bacteriology, immunology, and regenerative medicine. Enhancing of capacity gathering useful information and providing comprehensive yet concise commentaries on the topics.			
Goal of Study	This exercise is prepared for graduate students and post-doctoral researchers. Article about the background of the study of each participant or the experimental method are discussed. The student attending a lecture can acquire the ability to read and understand an English article and summarize the content in more by participating in this. In addition, the ability as a researcher, is improved by up-date the latest information and participating in discussion.			
Contents and Progress Schedule of the Class	1 2 3 4 5			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	The person in charge makes a document every time and distributes it.			
Evaluation Method	presentation contents and attendance.			
Comments				
Class Registration	Students should contact the following before registration. Prof. Satoru Yamada satoruy@tohoku.ac.jp			

Course Subject	Seminars in Dental Science:Operative Dentistry	Instructor (○: Main Instructor)	○Masahiro SAITO
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Division of Operative Dentistry
Object and Summary of Class	Basic understanding of pathology and treatment regarding cardiovascular disease associated with apical periodontitis and periodontitis		
Goal of Study	1. Basic understanding of cardiovascular disease 2. Dental treatment of cardiovascular disease		
Contents and Progress Schedule of the Class	1 Understanding of aorta including anatomy and biochemistry 2 Understanding of the molecular pathogenesis of arterial disease 3 Basic understanding of clinical treatment for arterial disease 4 Effect of cardiovascular disease on apical periodontitis and periodontitis 5 Basic understanding of conservative dentistry for cardiovascular disease 6 Clinical treatment of conservative dentistry for cardiovascular disease		
Preparation and review			
Text/Materials/References etc.	No Text is prepared.		
Evaluation Method	Attendance and Report		
Comments			
Class Registration	Students should contact the following before registration. Prof. SAITO mssaito@dent.tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: International Oral Health		Instructor (○: Main Instructor)	○Ken Osaka Jun Aida
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	First Term Thursday /3rd period	Place	The seminar room of the department	
Object and Summary of Class	The aims of this lecture are: □ To learn dental health system of Japan as well as other countries. □ To learn the framework of global cooperation in health field.			
Goal of Study				
Contents and Progress Schedule of the Class	Content of class: ・To comprehend the indicators in global oral health situation. ・To analyze the data on health of Japan and other OECD countries. ・To learn about the health inequality of oral health in Japan and the world.			
Preparation and review				
Text/Materials/References etc.	Instruct at the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. Ken Osaka ken.osaka.e5@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Dental and Digital Forensics	Instructor (○: Main Instructor)	○ Toshihiko SUZUKI Moe KOSAKA Yuka HATANO
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	A. Course for dentists / dental care professionals This course is designed for dental professionals. Students learn fundamental methods of dental identification through the experience of filling the Japanese victim identification forms on some actual cases of forensic autopsies. B: Course for non-dental professionals This course aims to make a fundamental understanding of forensic identification of human and non-human bones through intensive reading of the scientific literatures		
Goal of Study	Lerners should be able to: Course A: ・Competent to make post-mortem dental record appropriately ・Manage appropriate matching and comparison between post and ante-mortem dental records Course B: ・Read and discuss critically specific journal articles in forensic medicine/dentistry		
Contents and Progress Schedule of the Class	Course A: 1 Postmortem dental examination 2 Taking oral/dental photographs 3 Reconstruction of the ante-mortem dental status from the records 4 Matching and comparison between post- and ante-mortem records Course B: 1 Reading scientific papers (or textbooks) on forensic medicine/densitstry		
Preparation and review	In order to achive the learning goals of the course, students need self-study according to the contents and progress of the course.		
Text/Materials/References etc.	Textbooks are not specified. Other recommended readings will be provided in the class.		
Evaluation Method	Grading will be based on participation and final report.		
Comments	Alternative study materials might be provided according to the background of students.		
Class Registration	Students should contact the following before registration. Assoc. Prof. Toshihiko SUZUKI		

registration	suzk@anat.dent.tohoku.ac.jp

Course Subject	Seminars in Dental Sciences: Preventive Dentistry		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Naoko TANDA
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners	
Object and Summary of Class	The aims and objectives: To learn the skills for providing the motivation toward the oral health in the social activity of preventive dentistry. In this class, we focus on the effect of oral malodor measuring as the motivational tool of oral health.			
Goal of Study	To explain the method of oral malodor measurement To understand oral health promotion with prevention of malodor in community To understand the grassroots activities with oral health volunteers in community To understand the methodology of oral health checkup			
Contents and Progress Schedule of the Class	Content of class: 1. Basics of oral malodor measurements 2. Application of oral malodor measurements 3. Activity of oral health promotion and education with oral malodor measurement as a motivational tool.			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Pediatric Dentistry	Instructor (○: Main Instructor)	○Sastoshi Fukumoto Aya Yamada Kan Saito Yuriko Maruya
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	Jun, Oct (Thu 3rd period)	Place	suspense
Object and Summary of Class	To predict tooth eruption and occlusional development, and evaluate the feeding and swelling of children, student who take the course study the basic knowledge and evaluation technique in pediatric dentistry.		
Goal of Study	To learn about diagnosis and treatment of tooth anormaly and feeding disorders.		
Contents and Progress Schedule of the Class	1 First semester (Jun) Diagnosis of tooth anormaly. 2 First semester (Jun) Evaluation of primary and mixed dentition, and prediction of permanent dentition. 3 Second semester (Oct) Evaluation of feeding and swelling in developmental stages. 4 Second semester (Oct) Dysphagia rehabilitation. 5		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Attendance record and reports.		
Comments	Please confirm the schedule of course.		
Class Registration	Students should contact the following before registration. Prof. Satoshi Fukumoto fukumoto@dent.tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Craniofacial Anomalies		Instructor (○: Main Instructor)	○Kaoru IGARASHI, and others
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The 1st semester, Wednesday, The 5th class	Place	Seminar & Training Room of Division of Craniofacial Anomalies	
Object and Summary of Class	1. To understand the consensus and controversy on the diagnosis and treatment of malocclusion through reading around selected articles and books. 2. To get ability to objectively evaluate papers.			
Goal of Study	To be able to explain the diagnosis and treatment of malocclusion.			
Contents and Progress Schedule of the Class	1 Literature reviews in the field of malocclusion and related issues			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Assigned articles and textbooks on malocclusion (The reading list will be provided.)			
Evaluation Method	By presence and report (summary of the papers)			
Comments	Day/time and place of this class are flexible. Consult with instructors.			
Class Registration	Students should contact the following before registration. Prof. IGARASHI kaoru.igarashi.a3@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Orthodontics and Dentofacial Orthopedics	Instructor (○: Main Instructor)	○Itaru Mizoguchi
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consult-ing with student.	Place	Labolatory room of orthodontics
Object and Summary of Class	The objects of this course is to obtain ability of critical and evidence-based thinking through paper reading about orthodontics.		
Goal of Study	This course deals with reading about orthodontic diagnosis and treatment. The goals of this course are to obtain the abilities to present precisely the contenst of papers, to think critically about study methods, results and discussion, and to evaluate the papers based on evidences.		
Contents and Progress Schedule of the Class	1 Reading of papers related to orthoditic diagnosis and treatment		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Text/Materials/References will be given timely to student.		
Evaluation Method	Attendance and reports		
Comments	No other comments		
Class Registration	Students should contact the following before registration. Prof. Itaru Mizoguchi mizo@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Oral Physiology	Instructor (○: Main Instructor)	○Junichi Nakai Keiko Ando Mirei Chiba Tadaaki Kudo
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Oral Physiology
Object and Summary of Class	Object: The object of this class is to expand the knowledge about the mechanisms underlying the oro-facial functions by reading papers in this fields. Summary of class: Students are required to search and choose papers that they should read, and to present and discuss the contents of the papers at the seminar.		
Goal of Study	General instructive objective: to expand the knowledge about the neural mechanisms of oro-facial sensory-motor functions. Specific behavioral objectives are to develop skills about : ① how to search an appropriate article ② how to read through and interpret ③ how to present and discuss		
Contents and Progress Schedule of the Class	1 searching and reading paper 2 presenting and discussing the contents at the seminar		
Preparation and review	Be prepared for your presentation and make sure to do a lot of review.		
Text/Materials/References etc.	None		
Evaluation Method	By presentation at the seminar		
Comments			
Class Registration	Students should contact the following teaching staff before registration. Professor Junichi Nakai (Email: junichi.nakai.a5@tohoku.ac.jp)		

Course Subject	Seminars in Dental Sciences: Dental Pharmacology	Instructor (○: Main Instructor)	○Minoru WAKAMORI Takashi NAKAMURA Kaori TAKAHASHI
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Mol. Biol. & Biochem. Room in Lab. of Pharmacol.
Object and Summary of Class	This class is designed to help students accumulate knowledge about signal transmission and intracellular signal transduction through the class presentation. Before the class presentation, students need to read some articles which are related to their own thesis works.		
Goal of Study	The goals of the seminars are to learn the abilities to collect a lot of information from published papers and to present the information properly using PowerPoint.		
Contents and Progress Schedule of the Class	1 Students should read papers published recently in high-grade journals in pharmacology, physiology and related fields. 2 Students should explain the findings to attendants. 3 Students should attend the discussion on the papers presented by other attendants.		
Text/Materials/References etc.	There is no text for this course. Suitable materials will be destributed.		
Evaluation Method	The largest part of the evaluation will be based on active participation in class activities.		
Comments			
Class Registration	Students should contact the following before registration. Prof. WAKAMORI mpcb@dent.tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Oral Pathology	Instructor (○: Main Instructor)	○Shimizu Y Saito H
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Division of Oral Pathology
Object and Summary of Class	Autopsy cases are observed, and association of the oral lesion is learned.		
Goal of Study	Macroscopic and microscopic observation of autopsy cases is exercised , and various organs and tissues, containing the oral cavity, are examined.		
Contents and Progress Schedule of the Class	1 Autopsy case study 2 Discussion		
Preparation and review			
Text/Materials/References etc.	None specified.		
Evaluation Method	Attendance and discussion.		
Comments			
Class Registration	Students should contact the following before registration. Shimizu Y shimizu@dent.tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Dental Informatics and Radiology		Instructor (○: Main Instructor)	○ Masahiro IIKOBO Noriaki SHOJI Ikuho KOJIMA
Credits	2		Subject No.	
Day/time of classes	Mondays～Fridays, 1st and 2nd periods	Place	Mainly at Oral and Maxillofacial Radiology clinical room, Tohoku University Hospital	
Object and Summary of Class	To experience on actual image reading in our hosital in order to learn a knowledge about the diagnostic imaging for the oral and maxillofacial disease based on the scientific evidence and logical thinking.			
Goal of Study	To acquire the process of the diagnostic imaging for oral and maxillofacial diseases based on the knowledge of image formation theory, anatomy and physiology.			
Contents and Progress Schedule of the Class	1 Practice of the diagnostic CT imaging . 2 Practice of the diagnostic MR imaging. 3 Practice of the diagnostic ultra sound imaging. 4 Practice of the diagnostic nuclear medicine imaging.			
Preparation and review				
Text/Materials/References etc.	Oral Diagnosis and Radiology (8th Edition) (published in our department)			
Evaluation Method	Attendance, attitude and reports.			
Comments	We welcome foreign students.			
Class Registration	Students should contact the following before registration. Prof. Masahiro IIKUBO masahiro.iikubo.c6@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Oral and Maxillofacial Surgery		Instructor (○: Main Instructor)	○Tetsu Takahashi Kensuke Yamauchi Masatoshi Chiba Hitoshi Miyashita
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	Friday, 3rd hour First Semester	Place	Div. of Oral and Maxillofacial Surgery, 10F East Ward, 3F Outpatient Section	
Object and Summary of Class	To extract the subject for oral and maxillofacial surgery, to learn the basic knowledge and materials and methods for planning and performing of front line researches for solution and enforcement of it.			
Goal of Study	To fully understand clinical anatomy of oral and maxillofacial regions. Then, to learn how to evaluate functions of oral and maxillofacial area. Final goal of this study is to investigate and create the reconstruction methods of oral and maxillofacial regions using biomaterials and regenerative medicine.			
Contents and Progress Schedule of the Class	1 To learn clinical Anatomy of oral and maxillofacial region 2 To learn functions and their evaluation in oral and maxillofacial region 3 To learn artificial materials for reconstruction of oral and maxillofacial region 4 To learn method of reconstruction, clinical aspects, and researches on hard tissue 5 To learn method of reconstruction, clinical aspects, and researches on soft 6 To learn basic researches on regenerative medicine 7 To learn clinical application of regenerative medicine to oral and maxillofacial surgery			
Text/Materials/References etc.	Nothing Particular			
Evaluation Method	A report should be presented suitably.			
Comments				
Class Registration	Students should contact the following before registration. Prof. Tetsu Takahashi tetsu@dent.tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Dento-oral Anesthesiology	Instructor (○: Main Instructor)	○Kentaro Mizuta Hiroshi Hoshijima Makoto Yasuda Fumiko Mizuta (part-time)
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The 2nd semester Friday, the 3rd period	Place	Dento-oral Anesthesiology Office (2nd floor of Building for Clinical Dental Science) & Operating room in University hospital (3rd floor of Operation and Medical Check Building)
Object and Summary of Class	[Objective] The purpose of this course is to practice clinical anesthesia. [Summary] Students learn anesthetic management and vital sign monitring of the patients.		
Goal of Study	Students can learn clinical anesthesia procedures.		
Contents and Progress Schedule of the Class	1 Preoperative evaluation of patients 2 Patient monitoring 3 Sedation for dental practice 4 Induction of general anesthesia 5 Maintenance of general anesthesia 6 Emergence of general anesthesia 6 Postoperative anesthetic management		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Evaluated by attendance and reports		
Comments	Day/time of this class is flexible		
Class Registration	Students are required to contact the following designated person before registration. Prof. Kentaro Mizuta kentaro.mizuta.e6@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences:Comprehensive Dentistry	Instructor (○: Main Instructor)	○ Masahiko KIKUCHI Akio IZUMIDA
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Office of Comprehensive Dentistry
Object and Summary of Class	The aim of this lecture: To understand the educational method and role of comprehensive dentistry and primary care.		
Goal of Study	To be able to explain comprehensive dentistry and primary care.		
Contents and Progress Schedule of the Class	Content of Class: To learn the outline of postgraduate clinical education and comprehensive dental care in the comprehensive clinic.		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Materials		
Evaluation Method	By report		
Comments			
Class Registration	Students should contact the following before registration. Prof.KIKUCHI mashiko.kikuchi.c7@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences Oral and Craniofacial Anatomy		Instructor (○: Main Instructor)	○Hiroyuki ICHIKAWA Tadasu SATO Takehiro YAJIMA
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	Consult with student	Place	Consult with student	
Object and Summary of Class	Objective: To understand the recent data about nociceptive transmission of oral and craniofacial structures Summary: Reading and presentation of the recent papers about nociceptive transmission of oral and craniofacial structures			
Goal of Study	To understand the mechanism about nociceptive transmission of oral and craniofacial structures. To have the ability of problem solving about about research			
Contents and Progress Schedule of the Class	1 Reading papers about nociceptive transmission 2 Presentation of the papers 3 Discussion about the subject of the papers			
Preparation and review	The session time is limited and therefore self-directed learning is important. Students are required to review for each class.			
Text/Materials/References etc.	none			
Evaluation Method	By presence and reports			
Comments	none			
Class Registration	Students should contact the following before registration. Prof. ICHIKAWA hiroichi@anat.dent.tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Craniofacial Development and Tissue Biology	Instructor (○: Main Instructor)	○ Yasuyuki SASANO Megumi NAKAMURA Mu-Chen YANG
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners
Object and Summary of Class	To share knowledge of cutting-edge tissue biology about development and repair of bones and teeth through studying the latest research articles published in international journals		
Goal of Study	To be able to give an outline of cutting-edge tissue biology about development and repair of bones and teeth through studying the latest research articles published in international journals		
Contents and Progress Schedule of the Class	1 Study of research articles 2 Study of the structure of research articles 3 Study of the method of presentation and discussion in research		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Prof.Yasuyuki SASANO sasano@anat.dent.tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Dental Biomaterials		Instructor (○: Main Instructor)	○Yukyo TAKADA Masatoshi TAKAHASHI
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Div. of Dental Biomaterials (Building A, 4F)	
Object and Summary of Class	The aim is to acquire the fundamental observation methods and elemental analyses that are necessary to study biomaterials, using a transmission electron microscope (TEM), a scanning electron microscope (SEM), and an electron probe X-ray microanalyzer (EPMA), respectively.			
Goal of Study	The goal of study enables to explain the methods of observation and analysis for biomaterials using a transmission electron microscope (TEM), a scanning electron microscope (SEM), and an electron probe X-ray microanalyzer (EPMA), respectively in an appropriate manner.			
Contents and Progress Schedule of the Class	1 Principle of a scanning electron microscope 2 Preparation of specimens 3 Observation methods 4 Principle of an electron probe X-ray microanalyzer 5 Preparation of specimens 6 Elemental analysis methods 7 Qualitative analysis 8 Quantitative analysis			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	A lecturer prepars it.			
Evaluation Method	By presence and reports			
Comments	After consultation with learners, time and day of starting the course will be adjusted.			
Class Registration	Students should contact the following before registration. Assoc. Prof.TAKADA yukyo.takada.a1@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Craniofacial Function Engineering		Instructor (○: Main Instructor)	○ Osamu SUZUKI Yukari SHIWAKU Ryo HAMAI
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Craniofacial Function Engineering	
Object and Summary of Class	The aim of this lecture is to learn the methodology of tissue engineering through studying the latest research articles published in the international journals.			
Goal of Study	The goal of study is to understand the recent research topics about bone tissue engineering and to learn the method of science presentation.			
Contents and Progress Schedule of the Class	1 Study of the research articles 2 Study of the structure of the articles 3 Study of the method of presentation and discussion in the researches			
Preparation and review	Please search for the references about calcium phosphates and bone regeneration.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. SUZUKI suzuki-o@m.tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Advanced Prosthetic Dentistry		Instructor (○: Main Instructor)	○Keiichi SASAKI Toru OGAWA Nobuhiro YODA
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The 1st term Tuesday, 3rd period	Place	The office of Advanced Prosthetic Dentistry	
Object and Summary of Class	Learn the research methods with technical procedure for performing own research experiment.			
Goal of Study	Students should be able to understand the research methods with technical procedure for performing own research experiment.			
Contents and Progress Schedule of the Class	1	Biomechanical study in prosthodontics (Instructor: Keiichi Sasaki,Nobuhiro Yoda) ① Biomechanics of jaw bone, temporomandibular joint and dentition ② Biomechanics of prostheses ③ In vivo measurement ④ Analysis by finite elemental model		
	2	Biomaterial-biological reaction in Prosthodontics (Instructor: Keiichi Sasaki) ① Regulation of biological reaction by biomaterial - Self-organization - Control of biological reaction - Mechanical adaptability ② Surface reforming/modification of biomaterial ③ Development into new biomaterial		
	3	Study about function of mastication and swallowing (Instructor: Toru Ogawa)		
	4	Prospective clinical study (Instructor: Nobuhiro Yoda)		
Text/Materials/References etc.	Ask the corresponding instructor.			
Evaluation Method	Attendance of the class and a report of assignment.			
Comments	In consultation with students, time of classes can be changed.			
Class Registration	Students should contact the following before registration. Prof. Keiichi SASAKI junko.hagawa.a3@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences: Molecular and Regenerative Prosthodontics	Instructor (○: Main Instructor)	○ Hiroshi EGUSA Masahiro YAMADA Kunimichi NIIBE
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	Wednesday Evening	Place	Seminar room: Division of Molecular and Regenerative Prosthodontics
Object and Summary of Class	To acquire knowledge for molecular and regenerative prosthodontics and to understand a concept of biology-driven prosthodontics.		
Goal of Study			
Contents and Progress Schedule of the Class	1 Participating in the weekly Journal Club. 2 Presentation and discussion in the Journal Club.		
Preparation and review	Students are required to prepare lectures to achieve the goals of the lectures.		
Text/Materials/References etc.	Articles will be assigned for the Journal Club.		
Evaluation Method	Attendance records and attitude in group discussion.		
Comments	The class is performed in a lab meeting of the biology research group in the Devision of Molecular and Regenerative Prosthodontics.		
Class Registration	Total capacity for participants is limited. Students should contact the following before registration. Prof. Hiroshi EGUSA egu@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences Aging and Geriatric Dentistry	Instructor (○: Main Instructor)	○Takamasa Komiyama Yoshinori Hattori et al.
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Aging & Geriatric Dentistry Hanamaki, Iwate
Object and Summary of Class	To learn the theory and practice of clinical epidemiology through the participation in a longitudinal cohort study (the Ohasama Study).		
Goal of Study	1. Explain the objectives and methods of epidemiological cohort study		
Contents and Progress Schedule of the Class	1 Lecture on the mutual interrelation between the oral and general health conditions 2 Lecture on the history, aim, and outcome of the Ohasama Study Participation in the Ohasama Study		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Dr. Takamasa Komiyama takamasa.komiyama.c6@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: International Collabrative and Innovative Dentsitry	Instructor (○: Main Instructor)	○Guang Hong
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Globalization Initiative
Object and Summary of Class	The object of this course is to develop the ability to read, present, discuss, and summarize the resarch article through literature review on development research of functional biomaterials and digital transformation in healthcare and educational settings, understand the latest trends in functional biomaterials research and research on digital transformation in healthcare and educational settings, and improve the ability to apply to their own research.		
Goal of Study	Can read, present, summarize, and discuss the research article on development research of functional biomaterials and digital transformation in healthcare and educational settings. Can explain the latest trends in research on functional biomaterialsand digital transformation in healthcare and educational settings. Can present regarding own research in English.		
Contents and Progress Schedule of the Class	1 Search the research article on development research of functional biomaterials and functional biomaterials and digital transformation in healthcare and educational settings 2 Read, summarize the research article and make the presentation 3 Group discussion on the latest trends in functional biomaterials research and research on digital transformation in healthcare and educational settings 4 World café for research planing, how to proceed and discussion 5 Presentation of research progress and achievements of own research		
Self-learning	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Non		
Evaluation Method	By presence and reports		
Comments			
Class Registration	Students should contact the following before registration. Prof. Guang Hong hong.guang.d6@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Co-Creative Dentistry	Instructor (○: Main Instructor)	○Hiroyasu Kanetaka and others
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Interdisciplinary Integration
Object and Summary of Class	The object of this class is to understand the latest trends in translational research and regulatory science, and to acquire the ability to apply them to one's own research, by developing the ability to read, summarize, and discuss Englis papers regarding interdisciplinary research and translational research based on industry-government-academia collaboration research and regulatory science.		
Goal of Study	To be able to read, summarize, and discuss English papers regarding translational research and regulatory science, and to apply them to one's own research.		
Contents and Progress Schedule of the Class	1 Search for English papers on translational research 2 Search for English papers on regulatory science 3 Group discussion on the latest research trends 4 Presentation on research planning, progress, and discusssion 5		
Preparation and review	Preparatory learning is required according to the goals, the content, and the progress of the lesson.		
Text/Materials/References etc.	None		
Evaluation Method	By presence and reports		
Comments			
Class Registration	Students should contact the following before registration. Prof. Hiroyasu Kanetaka hiroyasu.kanetaka.e6@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Oral Cancer Therapeutics		Instructor (○: Main Instructor)	○ Hisanori HORIUCHI Hiroki SEKINE Ryutaro SHIRAKAWA
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Seminar room of Institute of Development, Aging and Cancer	
Object and Summary of Class	To understand the front lines of various fields of basic bioscience by listening to the lectures by seminar speakers.			
Goal of Study				
Contents and Progress Schedule of the Class	1 Seminars of basic bioscience at Institute of Development, Aging and Cancer.			
Preparation and review				
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof.HORIUCHI hisanori.horiuchi.e8@tohoku.ac.jp			

Course Subject	Seminars in Dental Sciences : Department of dental nuclear medicine and radiology	Instructor (○: Main Instructor)	○Yasuyuki Taki Tatsushi Mutoh Yasuko Tatewaki
Credits	2	Subject No.	DDE-DEN 702
Day/time of classes	The time of classes will be decided in consulting with student.	Place	IDAC SA building
Object and Summary of Class	To understand the relationship between dental issue and cognitive function, and brain structure.		
Goal of Study	To understand the seminars for the relationship between dental issues and dementia.		
Contents and Progress Schedule of the Class	1 To attend the seminars 2 To understand the seminars 3 Brain MR image analysis		
Preparation and review			
Text/Materials/References etc.			
Evaluation Method			
Comments			
Class Registration	Students should contact the following before registration. Prof. TSKI yasuyuki.taki.c7@tohoku.ac.jp		

Course Subject	Seminars in Dental Sciences: Bio-Dental Engi-neering		Instructor (○: Main Instructor)	○ Shinji KAMAKURA
Credits	2		Subject No.	DDE-DEN 702
Day/time of classes	The first semester Tuesday 8:50~12:00	Place	Laboratory of Bone Regenerative Engineering and others	
Object and Summary of Class	After perusing the highly cited and the latest manuscripts in English concerning about Bio-Dental Engineering, draw up the abstracts and plainly explain the content. Present and make a report of content and progress of your own research.			
Goal of Study	To aim to acquire the undermentioned competence of presentation and discussion through these exertion. Search and obtain useful information from manuscripts Explain and discuss the contents of your own research			
Contents and Progress Schedule of the Class	1 Comprehension of the content of the published manuscript 2 Prepare the abstract of the published manuscript 3 Explanation of the content of the published manuscript 4 Presentation of your own research			
Preparation and review				
Text/Materials/References etc.	No textbook is used but handouts are distributed.			
Evaluation Method	The evaluation is performed based on the submitted reports (abstracts of manuscripts) and oral presentation.			
Comments	Opening hours and place of the class will be altered in accordance with consulting with participants.			
Class Registration	Students should contact the following before registration. Prof. Shinji KAMAKURA kamakura@tohoku.ac.jp			

Technical Courses in Dental Sciences

Course Subject	Technical Courses in DentalSceiences: OralEcology and Biochemistry		Instructor (○: Main Instructor)	○Nobuhiro Takahashi Jumpei Washio Gen Mayanagi Yuki Abiko
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Division of Oral Ecology and Biochemstry 8th floor in Building A	
Object and Summary of Class	The aim of this training course is to obtain and master the experimental technique for the studies on oral ecosystem, oral biofilm and oral diseases (e.g., dental caries, periodontal diseases and halitosis), as well as oral cancer, which is performed in the Division of Oral Ecology and Biochemistry.			
Goal of Study	To obtain the basic experimental techniques (biochemical and molecular biologic techniques) and the advenced experimental techmiques that are necessary for your study.			
Contents and Progress Schedule of the Class	1 Basic biochemical methods (e.g., Spectrphotometric analysis) 2 Molecular biological methods(e.g., Polymerase Chain Reaction) 3 How to use anaerobic chamber 4 Advanced experimental technique on oral plaque biofilm 5 Metabolic activity measuring method (e.g., pH stat system) 6 Metabolome analysis method (e.g., HPLC) Along the research thema of the individual, a necessary item will be chosen.			
Preparation and review	Before taking this course, please get the instruction about what to prepare. In addition, it is desirable to review well after taking the course.			
Text/Materials/References etc.	N/A			
Evaluation Method	Evaluation will be done based on yout attendance and submitted reports			
Comments	Attention：This course intends for graduate students engaging in the study in our laboratory as a general rule.			
Class Registration	Students should contact the following before registration. Prof. Nobuhiro Takahashi OEB@dent.tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Oral Molecular Bioregulation		Instructor (○: Main Instructor)	○ Shunji SUGAWARA Toshinobu KUROISHI
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	Second semester/Mon. 4th and 5th periods	Place	Collaborative Experimental Lab. VI (Building C)	
Object and Summary of Class	Aims Master the basics of Western blotting, and utilized the skills in the research.			
Goal of Study	Understand the principle of Western blotting, master the method of Western blotting, and apply the method for your reserch.			
Contents and Progress Schedule of the Class	Contents 1. Master the basic principles of Western blotting (Sugawara) 2. Learn the skills of Western blotting (Kuroishi) 3. Discuss the application of research (Sugawara and Kuroishi)			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the course.			
Text/Materials/References etc.	Handout will be ditributed beforhand.			
Evaluation Method	By presence and report.			
Comments	N/A			
Class Registration	Students should contact the following before registration. Prof. SUGAWARA shunji.sugawara.d5@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Periodontology and Endodontology		Instructor (○: Main Instructor)	○ Satoru Yamada Eiji Nemoto and others
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Practice room in Division of Periodontology &Endodontology	
Object and Summary of Class	Learning of experimental skill required for the research in periodontology, endodontology and the related fields.			
Goal of Study	Learning of experimental skill required for the research in periodontolo-gy, endodontology and the related fields			
Contents and Progress Schedule of the Class	1 Cell culture 2 ELISA 3 RT-PCR and Real-time PCR 4 Western blotting 5 Flow cytometry 6 Basic technique in animal experiments (mouse and rat)			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Provide materials if needed			
Evaluation Method	By presence and reports			
Comments				
Class Registration	Students should contact the following before registration. Prof. Satoru Yamada satoruy@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Operative Dentistry		Instructor (○: Main Instructor)	○ Masahiro Saito
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Division of Operative Dentistry	
Object and Summary of Class				
Goal of Study				
Contents and Progress Schedule of the Class	1 2 3 4 5			
Preparation and review				
Text/Materials/References etc.	No Text is prepared.			
Evaluation Method	Attendance and Report			
Comments				
Class Registration	Students should contact the following before registration. Prof. SAITO mssaito@dent.tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: International Oral Health	Instructor (○: Main Instructor)	○Ken Osaka Jun Aida
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The seminar room of the department
Object and Summary of Class	The aims of this lecture are: □ To make a plan of international collaboration on oral health targeting some developing countries. □ To learn the framework of global cooperation in health field.		
Goal of Study			
Contents and Progress Schedule of the Class	Content of class: ・To comprehend the indicators in global oral health situation and the project cycle management. ・To analyze the data on health of Japan and other OECD countries. ・To make a proposal of international collaboration with a developing country in South –East Asia.		
Preparation and review			
Text/Materials/References etc.	Instruct at the beginning of the class.		
Evaluation Method	By presence and report		
Comments			
Class Registration	Students should contact the following before registration. Prof. Ken Osaka ken.osaka.e5@tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Dental and Digital Forensics	Instructor (○: Main Instructor)	○ Toshihiko SUZUKI Moe KOSAKA Yuka HATANO
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.
Object and Summary of Class	The aim of this course is to acquire the techniques to identify the bones of the human skeleton and human teeth, and bone fragments as well.		
Goal of Study	Lerners should be able to: ・Identify the human unbroken bones ・Identify the human teeth ・Identify broken bones/teeth of the human skeleton		
Contents and Progress Schedule of the Class	1 Identification of human bones 2 Identification of human permanent teeth 3 Identification of human deciduous teeth 4 Identification of fragments of broken bones/teeth		
Preparation and review	In order to achive the learning goals of the course, students need self-study according to the contents and progress of the course.		
Text/Materials/References etc.	Textbooks are not specified. Other recommended readings will be provided in the class.		
Evaluation Method	Grading will be based on participation and practical skills test.		
Comments	Alternative training materials might be provided according to the background of students.		
Class Registration	Students should contact the following before registration. Assoc. Prof. Toshihiko SUZUKI suzk@anat.dent.tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Preventive Dentistry		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Naoko TANDA
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners	
Object and Summary of Class	Aims and objectives : To understand the basic methodology of preventive dentistry, we demonstrate the several experiment techniques and clinical procedures of public health and preventive dentistry.			
Goal of Study	To understand environmental assessments To understand health assessments To evaluate oral health assessments To evaluate risk assessments of oral diseases To understand preventive measure by application of fluoride			
Contents and Progress Schedule of the Class	Content of class: (January 2014) Monitoring method of climate and environment Monitoring method of air pollution Monitoring method of drinking water Body measurement and nutrition evaluation (July 2013) Diagnostic method of early caries lesions Methods of oral hygiene Oral examination Application of fluoride for the prevention of dental caries Risk assessment of the dental caries Periodontal examination Scaling and root planing Professional mechanical tooth cleaning			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Pediatric dentistry	Instructor (○: Main Instructor)	○Sastoshi Fukumoto Aya Yamada Kan Saito Yuriko Maruya
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	Jun, Oct (Thu 4 and 5th period)	Place	suspense
Object and Summary of Class	Purpose of this course is learning the induction methods of ameloblasts and odontoblasts from precursor cells to develop the tooth regeneration.		
Goal of Study	To culture dental tissues and understand the molecular mechanism of tooth and salivary gland development.		
Contents and Progress Schedule of the Class	1 Culture and evaluation of dental epithelial cells inducted by growth factors. 2 Induction of neuronal, odontoblstic and adipogenic cells fron dental pulp stem cells. 3 Culture of dental pulp cells from primary tooth. 4 Gene expression screening of tooth specific genes to evaluate the tooth cell phenotype. 5		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Attendance record and reports		
Comments	Please confirm the schedule of course.		
Class Registration	Students should contact the following before registration. Prof. Satoshi Fukumoto fukumoto@dent.tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Craniofacial Anomalies	Instructor (○: Main Instructor)	○Kaoru IGARASHI, and others
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The 2nd semester, Thursday, The 4th and 5th classes	Place	Seminar & Training Room of Division of Craniofacial Anomalies
Object and Summary of Class	To learn various examinations and analyses that are necessary for diagnosis, treatment planning, and treatment evaluation of craniofacial anomalies and jaw deformity.		
Goal of Study	To be able to do diagnosis, treatment planning, and treatment evaluation of craniofacial anomalies and jaw deformity.		
Contents and Progress Schedule of the Class	1 Various radiographic examinations 2 Roentgenographic cephalometric analyses 3 Examinations of various oral functions 4 Other examinations and analyses		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Assigned textbooks on orthodontics and orthognathic surgery		
Evaluation Method	By presence and report		
Comments	Day/time and place of this class are flexible. Consult with instructors.		
Class Registration	Students should contact the following before registration. Prof. IGARASHI kaoru.igarashi.a3@tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Orthodontics and Dentofacial Orthopedics	Instructor (○: Main Instructor)	○Hideki Kitaura
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consult-ing with student.	Place	Labolatory room of orthodontics
Object and Summary of Class	The objective of this course is to study orthodontic diagnosis and basic experimental studies about biological reactions during orthodontic treatment.		
Goal of Study	The goal of this course is to understand orthodontic diagnosis, including examination, inspection and analysis, and to obtain experimental techniques for basic studies about biological reactions during orthodontic treatment.		
Contents and Progress Schedule of the Class	1 Cell culture (PDL cells and osteogenic cells) 2 Animal experiment (mouse, rat, dog, etc.) 3 In situ hybridization 4 Immunohistocemistry and confocal leser microscopy 5 Acquisition of materials for orthodontic diagnosis 6 Cephalometric and dental cast analyses 7 3D analysis of jaw movement 8 Medical statistical analysis		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.			
Evaluation Method	Attendance and reports		
Comments	No other comments		
Class Registration	Students should contact the following before registration. Associate Prof. Hideki Kitaura hkitaura@m.tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Oral Physiology		Instructor (○: Main Instructor)	○Junichi Nakai Keiko Ando Mirei Chiba Takaaki Kudo
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Oral Physiology	
Object and Summary of Class	Object: The object of this class is to learn the physiological techniques that are needed for the investigation of the funtion of human body including the oral function. Summary of class: To understand the basics of physiological techniques and to master how to apply them to the research.			
Goal of Study	General instructive objective: to understand experimental methods of oral physiology. Specific behavioral objectives are to understand : ① Methodology of anesthesia of animals ② Methodology of tissure and cell cultures ③ Methodology of reserch for human subjects ④ Methodology of gene recombination experiments ⑤ Methodology of tissue sections ⑥ Methodology of data aquisition and analysis			
Contents and Progress Schedule of the Class	1 Methodology of anesthesia of animals 2 Methodology of tissure and cell cultures 3 Methodology of reserch for human subjects 4 Methodology of gene recombination experiments 5 Methodology of tissue sections 6 Methodology of data aquisition and analysis			
Preparation and review	It is important to review what you learnt in the lesson. Make sure to do a lot of review.			
Text/Materials/References etc.	Materials will be provided as appropriate.			
Evaluation Method	By attendance and reports			
Comments				
Class Registration	Students should contact the following teaching staff before registration. Professor Junichi Nakai (Email: junichi.nakai.a5@tohoku.ac.jp)			

Course Subject	Technical Courses in Dental Sciences: Dental Pharmacology	Instructor (○: Main Instructor)	○Minoru WAKAMORI Takashi NAKAMURA Kaori TAKAHASHI Motohide HORI Norihiro KATAYAMA Kentaro ARAKI
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Mol. Biol. & Biochem. Room in Lab. of Pharmacol.
Object and Summary of Class	This course is designed to help students master molecular biological, electrophysiological and pharmacological techniques which enable them to perform their thesis works by themselves.		
Goal of Study	The goal of this course is to master the following techniques to do experiments by themselves.		
Contents and Progress Schedule of the Class	1 Mammalian cell culture 2 PCR analysis 3 Cloning method and sequence analysis 4 Gene transfection 5 Patch-clamp techniques 6 Measurement of changes in the intracellular Ca^{2+} concentration 7 Gene and protein expression analysis 8 Genome wide association study		
Text/Materials/References etc.	There is no text for this course. Suitable materials will be destributed.		
Evaluation Method	The largest part of the evaluation will be based on active participation in class activities.		
Comments			
Class Registration	Students should contact the following before registration. Prof. WAKAMORI mpcb@dent.tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Oral Pathology	Instructor (○: Main Instructor)	○Shimizu Y Saito H
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Division of Oral Pathology
Object and Summary of Class	Preparation and histological observation of tissue specimens are learned. If indicated, specific staining, immunohistochemistry, and molecular investigation are added.		
Goal of Study	Preparation of tissue specimens, containing fixation, embedding, sectioning, and staining, are exercised. Significance of the histopathological features and other examination is discussed.		
Contents and Progress Schedule of the Class	1 Morphology 2 Specific and immunohictochemical staining		
Preparation and review			
Text/Materials/References etc.	None specified.		
Evaluation Method	Attendance and discussion.		
Comments			
Class Registration	Students should contact the following before registration. Shimizu Y shmizu@dent.tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Dental Informatics and Radiology		Instructor (○: Main Instructor)	○ Masahiro IIKOBO Noriaki SHOJI Ikuho KOJIMA
Credits	2		Subject No.	
Day/time of classes	Mondays～Fridays, 1st and 2nd periods	Place	Mainly at Oral and Maxillofacial Radiology clinical room, Tohoku University Hospital	
Object and Summary of Class	To understand the characteristics and indications of imaging modalities necessary for the accurate diagnosis of oral and maxillofacial diseases.			
Goal of Study	1) To understand the various diagnostic imaging modalities and be able to select the appropriate diagnostic imaging. 2) To diagnose diseases comprehensively based on medical interviews, clinical findings, and imaging findings.			
Contents and Progress Schedule of the Class	1 Professional diagnosis using intraoral radiographic images. 2 Professional diagnosis using panoramic radiograph images. 3 Professional diagnosis using CT. 4 Professional diagnosis using MRI. 5 Professional diagnosis using US.			
Preparation and review				
Text/Materials/References etc.	Oral Diagnosis and Radiology (8th Edition) (published by our department)			
Evaluation Method	Attendance, attitude and reports.			
Comments	We welcome foreign students.			
Class Registration	Students should contact the following before registration. Prof. Masahiro IIKUBO masahiro.iikubo.c6@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Oral and Maxillofacial Surgery		Instructor (○: Main Instructor)	○Tetsu TAKAHASHI Hirokazu NAGAI Hitoshi MIYASHITA Kensuke YAMAUCHI
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	Friday, 4th and 5th hour, First Semester	Place	Div. of Oral and Maxillofacial Surgery 10F East Ward, 3F Outpatient Section	
Object and Summary of Class	To master practical technique for the experiments for development of oral and maxillofacial surgery after planning of the research projects			
Goal of Study	To learn practical technique for oral and maxillofacial surgery			
Contents and Progress Schedule of the Class	1 Statistical analysis for clinical study of oral and maxillofacial surgery 2 Methods for researches on control of tumors on oral and maxillofacial region 3 To learn tissue section, a various kind of staining method tissue section, a various kind of staining method 4 Research method for clinical application of regenerative medicine in oral and maxillofacial region 5 Clinical observation and methods of analysis of interface between bone and dental implant□ 6 Methods of histomorphometric analysis on oral and maxillofacial regeion 7 New methods of morphometric analysis using diagnostic imaging such as computed tomography			
Text/Materials/References etc.	A report should be presented suitably.			
Evaluation Method	It judges by the check of the degree of comprehension by the number of times of attendance, and a report, etc.			
Comments	Opening time and a course content may be changed after consulting with a participant.			
Class Registration	Students should contact the following before registration. Prof. Tetsu TAKAHASHI tetsu@dent.tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Dento-oral Anesthesiology	Instructor (○: Main Instructor)	○Kentaro Mizuta Hiroshi Hoshijima Makoto Yasuda Yukinori Tanaka
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The 2nd semester Friday, 4th & 5th period	Place	Dento-oral Anesthesiology Rsearch Lab & Research Lab #13 (Both rooms are located in 2nd floor of Building for Clinical Dental Science)
Object and Summary of Class	[Aim of this class]The purpose of this course is to learn the development of study design, research methods, and statistics for the research on dento-oral anesthesiology. [Outline] Students can learn the development of resarch plan, several research methods in vivo and in vitro, and statistics.		
Goal of Study	Students can develop study design, understand various research methods *in vivo and in vitro*, and evaluate data with statistical analysis.		
Contents and Progress Schedule of the Class	1 Preparation of research plan 2 *in vivo* experiment 1 (Measuring pain behavior) 3 *in vivo* experiment 2 (Measuring orofacial blood flow in anesthetized rat) 4 *in vivo* experiment 3 (organ bath) 5 *in vitro* experiment 1 (Western blot, immunohistochemistryl) 6 *in vitro* experiment 2 (Calcium imaging) 7 Statistical analysis		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Evaluated by attendance and reports		
Comments	Day/time of this class is flexible		
Class Registration	Students are required to contact the following designated person before registration. Prof. Kentaro Mizuta kentaro.mizuta.e6@tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Comprehensive Dentistry	Instructor (○: Main Instructor)	○ Masahiko KIKUCHI Akio IZUMIDA
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Office of Comprehensive Dentistry
Object and Summary of Class	The aim of this lecture: To learn the theoretical and practical methods for dental education especially related to the postgraduate clinical training program.		
Goal of Study	To be able to explain the methods for dental education.		
Contents and Progress Schedule of the Class	Content of Class: 1. History of dental education 2. Theory of dental education 3. Objectives of dental education 4. Methods for dental education 5. Evaluation for dental education		
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.		
Text/Materials/References etc.	Materials		
Evaluation Method	By report		
Comments			
Class Registration	Students should contact the following before registration. Prof.KIKUCHI mashiko.kikuchi.c7@tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences Oral and Craniofacial Anatomy		Instructor (○: Main Instructor)	○Hiroyuki ICHIKAWA　Tadasu SATO・Takehiro YAJIMA・Tessei NAGAYAMA・Daisuke Tachiya・Satoshi KAWAKAMI
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	The place of classes will be decided in consulting with student.	
Object and Summary of Class	Object: To make and stain tissue sections for microscopic observation Summary: To learn perfusion fixation, and cutting and satining sections			
Goal of Study	To have the ability about tissue preparation and histochemical analysis			
Contents and Progress Schedule of the Class	1　Perfusion with fixative 2　Cutting sections 3　Immunohistochemistry 4　Taking microphotographs			
Preparation and review	The session time is limited and therefore self-directed learning is important. Students are required to review for each class.			
Text/Materials/References etc.	none			
Evaluation Method	By presence and reports			
Comments	none			
Class Registration	Students should contact the following before registration. Prof. ICHIKAWA hiroichi@anat.dent.tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Craniofacial Development and Tissue Biology	Instructor (○: Main Instructor)	○ Yasuyuki SASANO Megumi NAKAMURA Mu-Chen YANG
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Craniofacial Development and Regeneration
Object and Summary of Class	This subject aims to learn about technics and methods used for tissue biology and calcified tissue research.		
Goal of Study	To learn about technics and methods for morphological analysis in tissue biology and calcified tissue research.		
Contents and Progress Schedule of the Class	1 Animal experiments 2 Transmission electron microscopy 3 Scanning electron microscopy 4 Immunohistochemistry		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	Attendance and report		
Comments	Day/time of this class is flexible		
Class Registration	Students should contact the following before registration. Prof. Yasuyuki SASANO sasano@anat.dent.tohoku.ac.jp		

Course Subject	Basic Technical Courses in Dental Sciences: Dental Biomaterials		Instructor (○: Main Instructor)	○Yukyo TAKADA Masatoshi TAKAHASHI
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Div. of Dental Biomaterials (Building A, 4F)	
Object and Summary of Class	The aim is to practice the research technique for observation methods and elemental analyses working for own research theme, using a scanning electron microscope (SEM) with energy dispersive X-ray spectrometry (EDS).			
Goal of Study	The goal of stdy enables to explain the principle and mechanism of a scanning electron microscope (SEM) with energy dispersive X-ray spectrometry (EDS), and also anables to apply it to one's research.			
Contents and Progress Schedule of the Class	1 Principle of a scanning electron microscope (SEM) 2 Principle of an electron probe X-ray microanalyzer (EPMA) 3 Principle of energy-dispersive X-ray spectrometry (EDS). 4 Principle of wavelength-dispersive X-ray spectrometer (WDS) 5 Elemental analysis methods 6 Qualitative analysis 7 Quantitatively analysis 8 Mapping analysis			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	A lecturer prepars it.			
Evaluation Method	By presence and reports			
Comments	After consultation with learners, time and day of starting the course will be adjusted.			
Class Registration	Students should contact the following before registration. Assoc. Prof.TAKADA yukyo.takada.a1@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Craniofacial Function Engineering		Instructor (○: Main Instructor)	○ Osamu SUZUKI Yukari SHIWAKU Ryo HAMAI
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Craniofacial Function Engineering	
Object and Summary of Class	The aim of this class is to learn the design of synthetic biomaterials and the method to apply stem cells for regenerative medicine.			
Goal of Study	The goal of study is to understand the methodology of bone tissue engineering and the materials used such as synthetic biomaterials and stem cells.			
Contents and Progress Schedule of the Class	1 Methodology of bone tissue engineering 2 Analyses of scaffold materials, such as natural polymers and inorganic hydroxyapatite (HA) and octacalcium phosphate (OCP), by x-ray diffraction (XRD) and Fourier transform infrared (FTIR) spectroscopy 3 Cell culture			
Preparation and review	Please search for the references about calcium phosphates and bone regeneration.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof. SUZUKI suzuki-o@m.tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Advanced Prosthetic Dentistry		Instructor (○: Main Instructor)	○Keiichi SASAKI Toru OGAWA Nobuhiro YODA
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The 1st term Tuesday, 4- 5st period	Place	The office of Advanced Prosthetic Dentistry	
Object and Summary of Class	Learn the research-methods with technical procedure for performing own research experiment.			
Goal of Study	Students should be able to understand the research-methods with technical procedure for performing own research experiment.			
Contents and Progress Schedule of the Class	1 *in vivo* measurement ① using a strain gauge and pressure-transducer ② using a 3D load-measuring sensor installed in a dental crown and implant. ③ using a pressure sensor sheet to measure the mechanical stress beneath a denture-base (Instructor: Keiichi Sasaki) 2 Measurement of the bone metabolic activity using a bone scintigraphy (Instructor: Toru Ogawa) 3 Measurement of the function with mastication and swallowing ① EMG (Electromyogram) of masticatory muscles ② Measurement of tongue movement (Instructor: Toru Ogawa) 4 Prospective clinical study (Instructor: Nobuhiro Yoda)			
Preparation and review				
Text/Materials/References etc.	Ask the corresponding instructor.			
Evaluation Method	Attendance and report of an assignment.			
Comments	In consultation with students, time of classes can be changed.			
Class Registration	Students should contact the following before registration. Prof. Keiichi SASAKI junko.hagawa.a3@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Molecular and Regenerative Prosthodontics		Instructor (○: Main Instructor)	○ Hiroshi EGUSA Masahiro YAMADA Kunimichi NIIBE
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Wet laboratory : Division of Molecular and Regenerative Prosthodontics	
Object and Summary of Class	To learn the basic experimental skills for molecular and regenerative prosthodontics.			
Goal of Study				
Contents and Progress Schedule of the Class	1 Lecture on laboratory equipments 2 Lecture on cell culture 3 Lecture on RT-PCR 4 Cell culture practices/obsevation 5 RT-PCR practices/observation			
Preparation and review	Students are required to prepare lectures to achieve the goals of the lectures.			
Text/Materials/References etc.	At the Bench: A Laboratory Navigator, Kathy Barker			
Evaluation Method	Attendance records.			
Comments				
Class Registration	Total capacity for participants is limited. Students should contact the following before registration. Prof. Hiroshi EGUSA egu@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences Aging and Geriatric Dentistry		Instructor (○: Main Instructor)	○Takako Numazaki Yohei Igari Yoshinori Hattori et al.
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Laboratory of Aging & Geriatric Dentistry	
Object and Summary of Class	To learn the research methods for capturing, analyzing, and evaluating various oral functions			
Goal of Study	1. Acquire fundamental knowledges and skills to register, analyze and evaluate jaw motion 2. Acquire fundamental knowledges and skills to register, analyze and evaluate elactomuographic activities of the jaw muscles 3. Acquire fundamental knowledges and skills to register, analyze and evaluate masticatory function 4. Acquire fundamental knowledges and skills to register, analyze and evaluate dental occlusal conditions			
Contents and Progress Schedule of the Class	1 Registration, analysis and evaluation of the motion of the jaw 2 Registration, analysis and evaluation of the electromyography of the jaw muscles 3 Registration, analysis and evaluation of the chewing oral function 4 Registration, analysis and evaluation of the occlusion of the dentitions			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Dr. Takako Numazaki takako.numazaki.d1@tohoku.ac.jp			

<table>
<tr><td>Course Subject</td><td colspan="2">Technical Courses in Dental Sciences:

International Collabrative and Innovative Dentsitry</td><td>Instructor (○: Main Instructor)</td><td>○Guang Hong</td></tr>
<tr><td>Credits</td><td colspan="2">2</td><td>Subject No.</td><td>DDE-DEN 703</td></tr>
<tr><td>Day/time of classes</td><td>The time of classes will be decided in consulting with student.</td><td>Place</td><td colspan="2">Liaison Center for Innovative Dentistry
Division for Globalization Initiative</td></tr>
<tr><td>Object and Summary of Class</td><td colspan="4">Participate in international collaborative education programs, and aim to learn how to prepare and evaluate functional biomaterials and evaluate digital tools used in health care and education through experiments through international industry-academia/interdisciplinary collaboration.</td></tr>
<tr><td>Goal of Study</td><td colspan="4">Can prepare and evaluate of fuctional biomaterials
Can evaluate of digital tools used in health care and education
Practicing the international industry-acamedica/interdisciplinary collaboration
Training at least one week at an overseas academic or educational/research institute</td></tr>
<tr><td>Contents and Progress Schedule of the Class</td><td colspan="4">1 Manufacturing method of biopolymer materials
2 Manufacturing method of bioceramic materials
3 Mechanical and biological evaluation methods for functional biomaterials
4 Evaluation methods for digital tools used in health care and education
5 Animal experiment method
6 Internships at coporate laboratories
7 Training at overseas academic or educational/research institutions</td></tr>
<tr><td>Self-learning</td><td colspan="4">Students are required to prepare lectures/lessons to achieve the goals of the lectures.</td></tr>
<tr><td>Text/Materials/References etc.</td><td colspan="4">Non</td></tr>
<tr><td>Evaluation Method</td><td colspan="4">By presence and reports</td></tr>
<tr><td>Comments</td><td colspan="4">For international students, Japan is treated as overseas.</td></tr>
<tr><td>Class Registration</td><td colspan="4">Students should contact the following before registration.
Prof. Guang Hong
hong.guang.d6@tohoku.ac.jp</td></tr>
</table>

Course Subject	Technical Courses in Dental Sciences: Co-Creative Dentistry		Instructor (○: Main Instructor)	○Hiroyasu Kanetaka and others
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Liaison Center for Innovative Dentistry Division for Interdisciplinary Integration	
Object and Summary of Class	The object of this class is to learn the principles and techniques of the evaluation methods necessary for the development of medical biomaterials and medical devices, and to be able to utilize them in one's own research.			
Goal of Study	To be able to learn the principles and techniques of evaluation methods related to efficacy and safety as an evaluation for medical biomaterials,			
Contents and Progress Schedule of the Class	1 Biocompatibility test (using various cells) 2 Cytotoxicity test 3 Antibacterial test 4 Antiviral test 5 Mechanical property evaluation test			
Preparation and review	Preparatory learning is required according to the goals, the content, and the progress of the lesson.			
Text/Materials/References etc.	None			
Evaluation Method	By presence and reports			
Comments				
Class Registration	Students should contact the following before registration. Prof. Hiroyasu Kanetaka hiroyasu.kanetaka.e6@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Oral Cancer Therapeutics		Instructor (○: Main Instructor)	○Hisanori HORIUCHI Ryutaro Shirakawa
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Department of Molecular and Cellular Biology, Institute of Development, Aging and Cancer	
Object and Summary of Class	Training course of experimental technique of molecular biology including generation and purification of recombinant proteins and biochemical experiments and producing antibodies with them.			
Goal of Study	To learn the experimental technique of molecular biology for the analysis of intracellular signal transduction.			
Contents and Progress Schedule of the Class	1 2 3 4 5			
Preparation and review				
Text/Materials/References etc.	None			
Evaluation Method	By presence and report			
Comments	Day/time of this class is flexible.			
Class Registration	Students should contact the following before registration. Prof.HORIUCHI hisanori.horiuchi.e8@tohoku.ac.jp			

Course Subject	Technical Courses in Dental Sciences: Department of dental nuclear medicine and radiology	Instructor (○: Main Instructor)	○Yasuyuki Taki Tatsushi Mutoh Yasuko Tatewaki
Credits	2	Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	IDAC SA building
Object and Summary of Class	To understand understand the methodology of brain MRI image analysis and to understand methodology epidemiology.		
Goal of Study	To understand the seminars for the relationship between dental issues and dementia.		
Contents and Progress Schedule of the Class	1 To attend the seminars 2 To understand the seminars 3 Brain MR image analysis 4 5		
Preparation and review			
Text/Materials/References etc.	None		
Evaluation Method	By presence and report		
Comments	Day/time of this class is flexible.		
Class Registration	Students should contact the following before registration. Prof.TAKI yasuyuki.taki.c7@tohoku.ac.jp		

Course Subject	Technical Courses in Dental Sciences: Bio-Dental Engineering		Instructor (○: Main Instructor)	○ Shinji KAMAKURA
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The second semester Monday 13:00~16:10	Place	Laboratory of Bone Regenerative Engineering and others	
Object and Summary of Class	To learn fundamental technical skills concerning about Bio-Dental Engineering and related field in the course of implantation of biomaterials to the tissues in experimental animals, such as rats and so on.			
Goal of Study	Become proficient the handling technique for the experimental animals including rat. Accomplish the implantation of a biomaterial into an experimental animal. Perform the fundamental analysis related to bone regeneration.			
Contents and Progress Schedule of the Class	1 Implantation procedures of biomaterials in experimental animals 2 Radiographical examination of histopathological specimens 3 Preparation of histopathological specimens of hard tissues 4 Staining technique of histopathological specimens of hard tissues 5 Histomorphometrgical analysis of regenerated bone			
Preparation and review				
Text/Materials/References etc.	No textbook is used but handouts are distributed.			
Evaluation Method	The evaluation is performed based on the attendance at the class and scores on the submitted reports.			
Comments	Opening hours and place of the class will be altered in accordance with consulting with participants. An applicant should attend the education and training by Institute for Animal Experimentation Tohoku University School of Medicine in advance. Because of restriction on number of accepted applicants, an applicant should consult with main instructor beforehand.			
Class Registration	Students should contact the following before registration. Prof. Shinji KAMAKURA kamakura@tohoku.ac.jp			

Elective courses

Course Subject	Lectures in Dental Sciences : Advanced course Clinical Oncology I	Instructor (○: Main Instructor)	○Tetsu TAKAHASHI Shiro MORI Hitoshi MIYASHITA
Credits	3	Subject No.	DDE-DEN 701
Day/time of classes	ISTU Everyday, 24 hours	Place	ISTU Network
Object and Summary of Class	To learn general principles of clinical oncology for oral and maxillofaical regions.		
Goal of Study	To cover the basic epidemiology, statistics, biology, and pathology requied for oral and maxillofacial oncology specialist		
Contents and Progress Schedule of the Class	1 Learning by ISTU 2 To make reports of the summary of each unit using own format 3 4 5		
Preparation and review			
Text/Materials/References etc.			
Evaluation Method	Evaluate the reports (Pass greater than 60 points)		
Comments			
Class Registration	Students should contact the following before registration. Prof. Tetsu TAKAHASHI tetsu@dent.tohoku.ac.jp		

Course Subject	Lectures in Dental Sciences : Advanced course Clinical Oncology II		Instructor (○: Main Instructor)	○Tetsu TAKAHASHI Shiro MORI Hitoshi MIYASHITA
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	Everyday, 24 hours	Place	ISTU Network	
Object and Summary of Class	To learn general principles of oral and maxillofacial cancer treatment			
Goal of Study	To understand surgical treatment, chemotherapy, radiation therapy, palliative care, and ethics needed for oral and maxillofaical cancer specialist			
Contents and Progress Schedule of the Class	1 Learning by ISTU 2 To make reports of the summary of each unit using own format			
Preparation and review				
Text/Materials/References etc.				
Evaluation Method	Evaluated by reprots (Pass greater than 60 points)			
Comments				
Class Registration	Students should contact the following before registration. Prof. Tetsu Takahashi tetsu@dent.tohoku.ac.jp			

Course Subject	Lectures in Dental Sciences : Advanced course Clinical Oncology III		Instructor (○: Main Instructor)	○Tetsu TAKAHASHI Shiro MORI Hitoshi MIYASHITA
Credits	3		Subject No.	DDE-DEN 701
Day/time of classes	Everyday, 24 hours	Place	ISTU Network	
Object and Summary of Class	To learn details of clinical oncology of oral and maxillofacial region			
Goal of Study	To comprehensively understand diagnosis, prevention, treatment modalities (surgery, chemotherapy, radiation therapy, intensivecare) needed for oral and maxillofacial oncology specialist			
Contents and Progress Schedule of the Class	1 Learning by ISTU 2 To make reports of the summary of each unit using own format			
Preparation and review				
Text/Materials/References etc.				
Evaluation Method	Evaluated by reports (Pass greater than 60 points)			
Comments				
Class Registration	Students should contact the following before registration. Prof.Tetsu TAKAHASHI tetsu@dent.tohoku.ac.jp			

Course Subject	Artificial Intelligence in Medicine I		Instructor (○: Main Instructor)	○ Masahiro IIKOBO
Credits	2		Subject No.	
Day/time of classes	Mondays～Fridays, 1st and 2nd periods	Place	Online attendance on a dedicated page	
Object and Summary of Class	In this course, students will learn about the role of artificial intelligence in the medical fields and fundamental concept and skills of machine learning. To deepen own understanding of regression and classification, etc, which are the fundamental components of machine learning, by hands-on programming. To learn about programing language Python and how to use a numerical calculation library which has the important role of machine learning.			
Goal of Study	This course is designed to help students understand the basic knowledge of artificial intelligence in medical field and develop basic programming skills for machaine learning by Python language.			
Contents and Progress Schedule of the Class	1 Prerequisite mathematics for applications in machine learning and artificial intelligence 2 Python/Unix programming,			
Preparation and review				
Text/Materials/References etc.	Online teaching materials.			
Evaluation Method	Attendance, attitude and reports.			
Comments	Only Japanese teaching materials.			
Class Registration	Students should contact the following before registration. Prof. Masahiro IIKUBO masahiro.iikubo.c6@tohoku.ac.jp			

Course Subject	Artificial Intelligence in Medicine Ⅱ		Instructor (○: Main Instructor)	○ Masahiro IIKOBO
Credits	2		Subject No.	
Day/time of classes	Mondays～Fridays, 1st and 2nd periods	Place	Online attendance on a dedicated page	
Object and Summary of Class	In this course, students will learn about the role of artificial intelligence in the medical fields and fundamental concept and skills of machine learning. To deepen own understanding of clustering, deeplearning and reinforcement, etc, which are the fundamental components of machine learning, by hands-on programming. To learn about programing language Python and how to use a numerical calculation library which has the important role of machine learning.			
Goal of Study	To acquire the process of the diagnostic imaging for oral and maxillofacial diseases based on the knowledge of image formation theory, anatomy and physiology.			
Contents and Progress Schedule of the Class	1 Clustering and Deep learning 2 Design thinking for medical AI			
Preparation and review				
Text/Materials/References etc.	Online teaching materials.			
Evaluation Method	Attendance, attitude and reports.			
Comments	Only Japanese teaching materials.			
Class Registration	Students should contact the following before registration. Prof. Masahiro IIKUBO masahiro.iikubo.c6@tohoku.ac.jp			

Course Subject	Special Lecture for Oral Cancer and its Screening		Instructor (○: Main Instructor)	○Takeyoshi KOSEKI Yoshinaka SHIMIZU
Credits	2		Subject No.	DDE-DEN 703
Day/time of classes	The time of classes will be decided in consulting with student.	Place	Consult with learners	
Object and Summary of Class	The occurrence of the cancers related to oral cavity is exceeding 4% of the whole cancers. Oral cancer is easy to observe directly in one's mouth, then, differential diagnosis of oral cancer is important because some oral mucosal diseases express similar appearance of mucosal surfaces. The purpose of this course is to train the dentists who intendedly work against oral cancer in daily practice and in community. The dentists who join this lecture and learn the methods of early diagnosis and perioperative oral management, will contribute the promotion of early cancer treatment and the safety of the dental patients in community. Furthermore, the experience of learning in University hospital promotes the participant's cooperation with local dental office and hospitals, then, it will build the regional platform for the patients who suffer cancers.			
Goal of Study	Goal of Study To explain the characteristics of oral cancer To assess and to diagnose oral mucosa To understand the method of differential diagnosis of oral cancer To manage and to care oral health under perioperative oral management of cancer treatment			
Contents and Progress Schedule of the Class	Contents and Progress Schedule of the Class Basic biology of cancer Pathology of oral cancer Oral mucosal assessment Perioperative oral management of cancer treatment			
Preparation and review	Students are required to prepare lectures/lessons to achieve the goals of the lectures.			
Text/Materials/References etc.	Instruct in the beginning of the class.			
Evaluation Method	By presence and report			
Comments				
Class Registration	Students should contact the following before registration. Prof. KOSEKI yobou@dent.tohoku.ac.jp			

9. Graduate School of Dentistry Student Counseling Center

The Tohoku University School/Graduate School of Dentistry provides a Student Counseling Center for dealing with problems experienced by graduate and undergraduate students. The center provides counseling for a variety of issues, from concerns related to studies, career and lifestyle, to coercion by religious groups and sexual harassment. If necessary, the center will provide information on appropriate services and specialists. Students with concerns are encouraged to request counseling at an early stage.

The details of counseling are kept strictly confidential, but if a student's issue cannot be resolved by the Counseling Center alone, concerned instructors or staff may be consulted, with permission from that student.

Counseling Hours: As needed, subject to availability of instructors and counselors.
Contact: Educational Affairs Section
(TEL 717-8248; E-mail: den-kyom@grp.tohoku.ac.jp)

Counselors: [Undergraduate Students] Undergraduate Educational Records and Programs Committee Director, Educational Records and Programs Committee in charge of each grade
[Graduate school Students] Graduate Educational Records and Programs Committee Director