[Title]				[Instructor]		
Advanced Mechatronics				Kazuyoshi Ishida		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ501	2	Mechatronics		1st Semester	Wed.／IV	Japanese

[Outline and purpose]

This course involves the principle of digital measurement and control system to understand application from the basics about control, mechanism, and signal processing. An aim in this course is to obtain an adequate knowledge of building a system using the various science and technology in mechatronics.

[Objectives]

1. To understand the system of mechatronics
2. To understand the mechanisms with articulated links
3. To understand the control elements for robot

[Requirements]

This course will be needed to understand the following fundamental knowledge: classical control, linear differential equation, Laplace transform, transfer function, stability condition of control system, hardware, programming language, and mechanism of operating machine.

[Evaluation]

1. Quizzes in class/Reports / 70%
2. Presentations/expressions, etc. / 30%

[Textbooks]

1. 古田勝久 編著, メカトロニクス概論 改訂 3 版, オーム社, ISBN:9784274228841(in Japanese)
2. 橋本 巨, 基礎から学ぶトライボロジー, 森北出版, ISBN: 9784627665910 (in Japanese)

[References]

1. 土谷武士／深谷健一, メカトロニクス入門（第 2 版）, 森北出版, ISBN:9784627944220 (in Japanese)

[Schedule]

1. Introduction of mechatronics (machine, electricity, information)
2. Practical examples of mechatronics
3. Link mechanism and articulated robot
4. Kinematics of mechanism
5. Technology for machine element [1] (friction, wear, lubrication)
6. Technology for machine element [2] (surface modification, application to Tribology)
7. Outline of the first part & report assignment
8. Dynamics of mechanical systems
9. Outline of kinematics
10. Principle of electric motor (servomotor, stepping motor)
11. Digital circuit and interface
12. Components of positioning system
13. Application to numerical controlled machine tool
14. Application to robot
15. Outline of the last half & report assignment

[Title]				[Instructor]		
Advanced Robotics				Hidetsugu Terada		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ502	2	Mechatronics		1st Semester	Thu.／I	Japanese

[Outline and purpose]

At this lecture, the background and outlines of robotics and the current trends of the robot technology will be taught. Especially, a structure of an industrial robot, an analytical solution of a robot motion, a control algorithm and a fundamental service robot application will be studied.

[Objectives]

(1) Various kinds of robot structures can be understood.
(2) Fundamental robotics control technologies can be understood.
(3) The trend of robot technologies can be understood.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Reports :40%
Presentation: 60%

[Textbooks]

We will distribute reference papers if necessary.

[References]

1.   Mark E. Rosheim, Robot Evolution -The Development of Authrobotics-, John Wiley & Sons, Inc., ISBN:0471026220
2.   則次俊郎ほか, 学生のための機械工学シリーズ6　ロボット工学, 朝倉書店, ISBN:4254237367 (In Japanese)

[Schedule]

1.   Introductions of the robotics
2.   Mechanical and electric structures of robot
3.   Serial robot
4.   Parallel robot
5.   Kinematics of Parallel robot
6.   Mechanical elements of robotics
7.   Design of Mechanical elements
8.   Robotics control 1 (Collision avoidance)
9.   Robotics control 2 (Cooperative control)
10.   Robotics control 3 (Motion planning methods)
11.   Moving robotics (Gait and wheels)
12.   Energies of robotics
13.   Micro robotics
14.   Robotics and factory automations
15.   Research of foreign trends

[Title]				[Instructor]		
Ergonomics				Toshiya Kitamura / Hiromi Watanabe		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ503	2	Mechatronics		1st Semester	Thu.／IV	Japanese

[Outline and purpose]

　In ergonomics, students learn about the methods, techniques and characteristics of human beings necessary to design systems and artifacts suitable for human beings. The human characteristics are physical characteristics, cognitive and psychological characteristics, and the technologies are sensors, control, vibration, man/machine interface, etc. In addition, students learn how to design artifacts based on human-centered design. Students also improve their communication skills through group discussions and exercises.

[Objectives]

1. Understand human physical characteristics, psychological characteristics, cognitive characteristics etc.
2. Understand technologies such as sensors, control, vibration, man-machine interface and others.
3. Grasp potential requirements of human beings.
4. Discuss and propose prototypes of artifacts based on human-centered design.

[Requirements]

1. Fundamental knowledge on engineering and liberal arts
2. Critical mind and curiosity

[Evaluation]

Assignments: 70%
Presentations: 30%

[Textbooks]

Handouts will be distributed if necessary.

[References]

References will be introduced during the course.

[Schedule]

1. Orientation, History and significance of Ergonomics
2. Ethics in Ergonomics
3. Ergonomics in design of artifacts /Notice of the case study theme
4. Universal Design
5. Human Centered Design (1)
6. Case study and presentation (1)
7. Human Centered Design (2)
8. Physiological characteristics of human
9. Psychological and cognitive characteristics of human
10. Case study and presentation (2)
11. Human error and accidents
12. Technology to quantify senses
13. Measuring technology of condition
14. Man-machine interface
15. Case study and presentation (3)

[Title]				[Instructor]		
Advanced Electromagnetic Wave Engineering				Lianhua Jin		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ507	2	Mechatronics		2nd Semester	Mon./II	Japanese

[Outline and purpose]

The Electromagnetic Wave is the most important science and technology for the modern communication. The basic knowledges are required for any advance researchers in the Mechatronics.

[Objectives]

Understanding the theory of the wave equation in Electromagnetic Wave and its technical application

[Requirements]

Basic knowledge about the Electromagnetism

[Evaluation]

Fundamental knowledge and understanding about the Electromagnetic Wave

[Textbooks]

[References]

[Schedule]

 (1) Maxwell equations and Electromagnetic wave
 (2) Electromagnetic wave equation and its solution.
 (3) Electromagnetic wave equation and its solution.
 (4) Electromagnetic wave properties
 (5) Energy of Electromagnetic wave
 (6) Electromagnetic wave and light
 (7) Light properties
 (8) Application of the Electromagnetic Waves
 (9) Interference of the Electromagnetic Waves
 (10) Interference applications
 (11) Diffraction of the Electromagnetic waves
 (12) Diffraction applications
 (13) Polarization of the Electromagnetic waves
 (14) Polarization applications
 (15) Summary

[Title]	[Instructor]
Computer Networks of Embedded Systems	Masayuki Morisawa / Tsutomu Tanzawa / Hiromitsu Nishizaki

[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTJ508	2	Mechatronics	1st Semester	Thu. / II	Japanese

[Outline and purpose]

   The control computer and the communication between the individual devices are essential for the embedded system used in mechatronics products. In recent years, wireless and internet connections have become widespread in addition to traditional communication methods that connect devices with cables.
   In this course, students enrolled in this course will learn about computer networks based on communication technology, from different methods used in embedded systems to the Internet. Specifically, we aim to understand the methods of communication between typical personal computers and embedded microcontrollers and with peripheral devices, as well as the TCP/IP protocol used in the Internet system. Students will also be given practical training in networking using switching devices.

[Objectives]

1   Enable to explain the communication interface between the computer and peripheral modules in embedded system
2.   Enable to explain the basics of the digital signals and communications
3.   Enable to build a small computer communication system.
4.   Enable to explain the working of each layer of OSI Reference Model and its necessity.
5.   Enable to explain TCP/IP protocol and to read information in packet headers.
6.   Enable to explain basic matters on internet such as route control and application protocol such as DNS.

[Requirements]

Basic knowledge of computer architecture and programming is required as the premise.

[Evaluation]

The comprehension level is evaluated through several reports and mini tests.

[Textbooks]

[References]

[Schedule]
 1. Introduction to communication methods
 2. Communication methods for embedded computers
 3. Data Communication by wireless
 4. Typical microcomputer communication RS232C (1)
 5. Typical microcomputer communication RS232C (2)
 6. Typical Microcomputer Communication USB(1)
 7. Typical Microcomputer Communication USB(2)
 8. Internet protocol, OSI reference model, packet communication, composition of computer networks
 9. The first layer communication, the second layer communication
10. The third layer communication 1 (overview, IP address, subnet)
11. The third layer communication 2 (Details of the third layer communication, ARP, router, routing)
12. Routing protocols
13. The 4th layer communication (TCP, UDP)
14. Hands-on Practice of Network Construction (how to operate a routing/switching device)
15. Hands-on Practice of Network Construction (configuration for building a network)

[Title]				[Instructor]		
Advanced Medical and Welfare Devices Engineering				Hidetsugu Terada / Koji Makino		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ509	2	Mechatronics		1st Semester	Mon.／II	

[Outline and purpose]

Medical and welfare equipment must be not only equipment from the viewpoint of engineering but also equipment that fully secures biological safety. Therefore, understanding of laws such as complicated approval / certification / business permission, risk management, electric safety / electromagnetic compatibility, complex understanding of the market are essential. In this lecture, we learn about various matters necessary in the process of newly developing medical and welfare equipment based on the needs of the medical field and the welfare site.

[Objectives]

(1) It can understand the ensuring safety of medical and welfare equipment.
(2) Clinical tests can be planned by themselves and application documents to be submitted to the Ethics committee can be prepared.
(3) It can understand medical device certification and welfare equipment authentication procedure.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Reports :50%
Test: 50%

[Textbooks]

We will distribute reference papers if necessary.

[References]

None

[Schedule]

Because the plan of the medical department has not been decided, the detailed schedule is undecided. Considering the medical service in our hospital, the lecture hour for several times will be from 18:00 to 21:00 on Tuesday.
The first lecture will be started at April 15th, II period. Please check announcement in CNS.

[Title]				[Instructor]		
Mechatronics Special Lecture I						
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ601	1	Mechatronics		Intensive	／	Japanese

[Outline and purpose]

The lecture indicates the state of the art of mechatronics.

[Objectives]

To acquire the interdisciplinary knowledge on mechatronics engineering based on the knowledge of mechanics, electronics and computer science.

[Requirements]

Basic knowledge of mechatronics for undergraduate level.

[Evaluation]

Presentation 100%

[Textbooks]

[References]

[Schedule]

	[Title]				[Instructor]		
	Mechatronics Special Lecture II						
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]	
GTJ602	1	Mechatronics		Intensive	／	Japanese	

[Outline and purpose]

The lecture indicates the state of the art of mechatronics.

[Objectives]

To acquire the interdisciplinary knowledge on mechatronics engineering based on the knowledge of mechanics, electronics and computer science.

[Requirements]

Basic knowledge of mechatronics for undergraduate level.

[Evaluation]

Presentation 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Seminar in Mechatronics Engineering IA				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ603	1	Mechatronics		1st Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the seminar.

[Objectives]

To direct one's study through the knowledge from this seminar.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Seminar in Mechatronics Engineering IB				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ604	1	Mechatronics		2nd Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the seminar.

[Objectives]

To direct one's study through the knowledge from this seminar.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Seminar in Mechatronics Engineering IIA				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ605	1	Mechatronics		1st Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field in addition to the Seminar I. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the seminar.

[Objectives]

To direct one's study through the knowledge from this seminar.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Seminar in Mechatronics Engineering IIB				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ606	1	Mechatronics		2nd Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field in addition to the Seminar I. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the seminar.

[Objectives]

To direct one's study through the knowledge from this seminar.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Research Work in Mechatronics Engineering IA				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ607	2	Mechatronics		1st Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the research.

[Objectives]

To direct one's study through the knowledge from this research.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Research Work in Mechatronics Engineering IB				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ608	2	Mechatronics		2nd Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the research.

[Objectives]

To direct one's study through the knowledge from this research.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Research Work in Mechatronics Engineering IIA				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ609	2	Mechatronics		1st Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field in addition to the Research I. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the research.

[Objectives]

To direct one's study through the knowledge from this research.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]

[Title]				[Instructor]		
Research Work in Mechatronics Engineering IIB				all academic supervisors		
[Code]	[Credits]	[Program]		[Semester]	[Hours]	[Language of instruction]
GTJ610	2	Mechatronics		2nd Semester		English／Japanese

[Outline and purpose]

It is necessary to review the related literatures, to consider the theme of research, including foreign journals of the related field in addition to the Research I. This program provides information on approaching those literatures. Other than that, the way of communication and collaboration on research group is also studied through the research.

[Objectives]

To direct one's study through the knowledge from this research.

[Requirements]

General knowledge of engineering relating research at undergraduate course.

[Evaluation]

Integrated evaluation : 100%

[Textbooks]

[References]

[Schedule]