2025Robotics Takafumi MATSUMARU 2025/09/16

Robotics (RBT):

This course will be conducted in the form of **active learning** and **flipped classroom** using Waseda Moodle and Zoom meeting.

Waseda Moodle
(1) Pre-learning by reading the material, watching videos, submitting the **assignment** report, and so on.
(2) After-learning by submitting the **supplement** report on learning outcomes concerning the lecture topic.

Zoom meeting (Class hours)
Students must attend the real-time online/offline class from 08h50 to 10h30.
(1) Talk together the related topics between students,
(2) Talk about findings and questions in pre-learning between students,
(3) Present the conclusion of group works (discussions) to other students,
(4) Talk with teachers and coaches,
and so on.

Staff
Lecturer: Takafumi MATSUMARU (Professor, Waseda University)
Coach: Pengcheng HAN (Ph. D student, Waseda University) 44252008
Coach: Vibekananda DUTTA (Warsaw University of Technology) 0000A68999
Coach: Mi LIU (Hunan University) 0000 AF2399

Feature
+ **Active learning** 能動的学修
+ **Flipped classroom** 反転授業

Requirement
+ **PC** (screen / display, headphone / earphone, camera, microphone, etc.)
+ **Communication environment** (high-speed, large-capacity, stable, etc.)

Procedure of each one lecture of BIE (bioengineering)
<<1/3>> **Pre-learning** 事前学習
<<2/3>> **Classwork** 授業
<<3/3>> **Post-learning** 事後学習

Schedule: Wednesday 08h50-10h30.
[00] 2025/10/00. 00. Course guidance.
[01] 2025/10/08. 01. What is robot?
[02] 2025/10/15. 02. Robot history.
[03] 2025/10/22. 03. Robot configuration.
[04] 2025/10/29. 04. Robot mechanism.
[05] 2025/11/05. 09. Basic principles of manipulator: vector approach for kinetics (1).
[06] 2025/11/12. 10. Basic principles of manipulator: vector approach for kinetics (2).
[07] 2025/11/19. 11. Basic principles of manipulator: vector approach for kinetics (3).
[08] 2025/11/26. 12. Basic principles of manipulator: vector approach for kinetics (4).
[09] 2025/12/03. 05. Actuator.
[10] 2025/12/10. 06. Sensor (part I).
[11] 2025/12/17. 07. Sensor (part II).
[---] 2025/12/24. Winter break.
[---] 2025/12/31. Winter break.
[12] 2026/01/07. 08. Reduction drive and design of driving section.

[13] 2026/01/14.　13. Manipulator control (1).
[14] 2026/01/21.　14. Manipulator control (2).
[Sup] 2026/01/28.　15. Summary and total discussion (if necessary).

Score
1) **Assignment report**　課題報告書
2) **Supplement report**　追加報告書
3) Others

Textbook:
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Reference:
[j1] 日本ロボット学会 (編): "ロボット工学ハンドブック（第３版）", コロナ社, (2023). https://www.coronasha.co.jp/np/isbn/9784339046793/
[j2] 日本ロボット学会 (編): "ロボットテクノロジー", オーム社, (2011). https://www.ohmsha.co.jp/book/9784274210723/
[j3] 日本機械学会 (編): "ロボティクス", 丸善, (2011). https://www.maruzen-publishing.co.jp/book/b10116626.html
[j4] 日本機械学会 (編): "機械工学便覧 応用システム編〈γ7〉メカトロニクス・ロボティクス", 丸善, (2008). https://www.maruzen-publishing.co.jp/book/b10115496.html
[j5] コロナ社, ロボティクスシリーズ（既刊 18 冊）, (2005-). https://www.coronasha.co.jp/np/result.html?ser=82&limit=30
[e1] B. Siciliano: "Robotics Goes MOOC - Knowledge", Springer, (2025.06). https://link.springer.com/book/10.1007/978-3-319-74095-9
[e2] B. Siciliano: "Robotics Goes MOOC - Interaction", Springer, (2025.04). https://link.springer.com/book/10.1007/978-3-319-77270-7
[e3] B. Siciliano: "Robotics Goes MOOC - Design", Springer, (2025.02). https://link.springer.com/book/10.1007/978-3-319-75823-7
[e4] D. Herath, D. St-Onge (eds.): "Foundations of Robotics", Springer, (2022.09). https://link.springer.com/book/10.1007/978-981-19-1983-1
[e5] M. H. Ang, O. Khatib, B. Siciliano (eds.): "Encyclopedia of Robotics", Springer, (2018.07). https://link.springer.com/referencework/10.1007/978-3-642-41610-1
[e6] B. Siciliano, O. Khatib (eds.): "Springer Handbook of Robotics", Springer, (2016.06). https://link.springer.com/book/10.1007/978-3-319-32552-1
[e7] P. Corke: "Robotics, Vision and Control", Springer, (2023.08). https://link.springer.com/book/10.1007/978-3-031-06469-2
[e8] J. Jiang, D. Wu, Y. Zhang, X. Dai (ed.): "Medical Robot Technology", Springer, (2024.11). https://link.springer.com/book/10.1007/978-981-97-1484-1
[e9] Y. Guo, G. Dagnino, G.-Z. Yang: "Medical Robotics", Springer, (2024.02). https://link.springer.com/book/10.1007/978-981-99-7317-0
[e10] A. Imran, K. Gopalakrishnan: "AI for Robotics", Springer, (2025.05). https://link.springer.com/book/10.1007/979-8-8688-0989-7
[e11] T. Nanayakkara (ed.): "Handbook on Soft Robotics", Springer, (2024.12). https://link.springer.com/book/10.1007/978-3-031-68620-7
[e12] S.Y. Nof (ed.): "Springer Handbook of Automation", Springer, (2023.06). http://link.springer.com/book/978-3-030-96729-1
[e13] J. Baillieul, T. Samad(ed.): "Encyclopedia of Systems and Control", Springer, (2021.06). https://link.springer.com/referencework/10.1007/978-3-030-44184-5
[e14] A. Y. C. Nee (ed.): "Handbook of Manufacturing Engineering and Technology", Springer, (2014.10). https://link.springer.com/referencework/10.1007/978-1-4471-4670-4
[e15] B. Furht, A. Agarwal (eds.): "Handbook of Medical and Healthcare Technologies", Springer, (2013.11). https://link.springer.com/book/10.1007/978-1-4614-8495-0
[e16] R. Kramme, K-P. Hoffmann, R.S. Pozos (eds.): "Springer Handbook of Medical technology", Springer, (2011.09). http://link.springer.com/book/10.1007/978-3-540-74658-4

[o1] Lecture Notes | Introduction to Robotics - MIT OpenCourseWare, MIT.
https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/lecture-notes/
[o2] Introduction to Robotics by Stanford on Apple Podcasts, Stanford.
https://itunes.apple.com/us/itunes-u/introduction-to-robotics/id384233063?mt=10
[o3] Foundations of Robot Motion - Modern Robotics, Northwestern.
https://modernrobotics.northwestern.edu/nu-gm-book-resource/foundations-of-robot-motion/

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EXAMPLE in [01] 2025/10/08. 01. What is robot?

<<1/3>> **Pre-learning** 事前学習
Using Waseda Moodle.
From 2025/10/01 (Wed) 10h30, to 2025/10/08 (Wed) 08h50. --- about 1 week

(01) Materials 資料
Students should access the PDF and read it carefully with taking notes while watching videos.
R01-01, R01-11, R01-21, R01-31, R01-41
Videos explaining the contents of the PDF.
Students must watch them one by one.
(01) Assignment report 課題報告書
Prepare your assignment report while studying, exploring, considering, and so on.
Write your answer, referring not only to the lecture material, but also to various other information sources (books, academic papers, interpretive articles, etc.).
Download the DOC or TXT, use it to write into your answer, and upload it before the lecture time.
Title, submitted date, ID number and Family-Given name.
The layered section structure with leading words, following the instructions.
Up to 20 files and total 50M byte.
2025RbtExampleAssignment.doc/txt
Reference PDF files

1.
Q1)
A1)
2.
Q2)
A2)
3.
Q3)
A3)
4.
Q4)
A4)
5.
Q5)
A5)

Format:
Electric file in A4 format.
* First line: Title (RBT (01) assignment), Submitted dates (in y/m/d).
* Second line: ID number, Full name.
* Third line and followings: Your own answers.
# The body text must be in professional style.
* Sections/Items well-organized with appropriate Titles / Headings / Leading words.
* Divided into significant paragraphs, consisting of simple sentences.

* Line-space, side margin, etc. to make it easy to read for others.
* References listed in order at the end (of each section) with [num.] in body text.

Time limit: Received until the beginning of the next class.

<Aim> 1. Find out for yourself. 2. Think by yourself. 3. Express with yourself.
There is no correct answer. There may not be only one answer.

(01) Assignment PDF

The questions of the assignment report are described in the PDF, which you can access after watching all videos.

(01) Discussion 議論交流

If you have something to discuss while pre-learning, classwork, and post-learning, please let us know to share and talk with.

It is available until the deadline for submitting (**01**) **Supplement report** 追加報告書.

<Reason>
You may not be the single one who has the same question. Please share to discuss.

<<2/3>> **Classwork** 授業

Using Waseda Moodle and Zoom meeting (so PC and communication environment are required).

During class hour, 2025/10/08 (Wed) from 08h50 to 10h30.

(01) Zoom meeting ズーム会議

Open Zoom meeting,

Displaying participants name as "**ID number, Family name, Given name**".

(1) Greeting and short talk.
(2) Grouping, breakout room with less than five students.
(3) Group work (GW) at breakout room (about 20 min).
(4) Coming back to main room, report by each reporter, and discussions.
(5) Closing.

(01) Attendance 出欠入力

Place your check of attendance during the lecture time.

(01) Group work グループワーク

Move to a breakout room.

Read the PDF file posted, and start talks and discussions among students.

<Aim>
Presenter: Devise to convey what you want to inform in a short time.
Learn new things and others' viewpoint from questions and answers.
Audiences: Incorporate the other's good points into yourself and correct your missing.
Learn anything on writing, presentation, discussion, and so on.

Download the DOC or TXT as a worksheet in **(01) Supplement report**.

Title, given/submitted date, ID number, and Family-Given name.

Supplement sheet should be constructed well-organized in tree structure consists of sections (and subsections, sub-subsections, and so on), titles, leading words (headings), and (detailed) explanations, with figures and tables if necessary.

<First half of (01) Supplement report>

1. Group work:

1.1. Group member list (indicating chairperson and reporter):

1.2. Topic details to be discussed (in your group) + Important points (both of reporting from other groups and entire discussion):

2. Answers to five questions (updating and adding your assignment report)**:**

--- Your study outcome + Your group work conclusions + Findings from other groups and discussions. * If you update or add something of your assignment report, please let us know by indicating in different colors.

2.1. Q1-A1:

2.2. Q2-A2:
2.3. Q3-A3:
2.4. Q4-A4:
2.5. Q5-A5:

[**Caution**] Screenshots can be cut and pasted only for figures. However, you will need to reconstruct the information obtained from the presentations of other students in your own words and create an original text to explain your understanding. (You need to report your own learning outcomes in the lecture, not a simple and superficial copy, so screenshots of the text are not graded).

<Aim> Inform the activities and results of the Group work during the class hours.

<<3/3>> **Post-learning** 事後学習

Using Waseda Moodle

From 2025/10/08 (Wed) 08h50, to 2025/10/09 (Thu) 08h50. --- 24 hours.

(01) Supplement report 追加報告書

Up to 20 files and total 50M byte.

2025RbtExampleSupplement.doc/txt

Reference PDFs

Revise and update the DOC or TXT as a worksheet in **(01) Supplement report**.

Section structure with leading words following the instructions.

<Second half of (01) Supplement report>

3. Summary of learning outcomes:

--- study contents and understandings = fact part.

4. Comments and opinions:

--- about this section / chapter = opinion part.

<Aim> Present what you have learned through your total study activities.

[EOF]