THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

METR4202 - Sem 2 2018 - St Lucia - Internal

Authenticated View
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1. General Course Information

1.1 Course Details

Course Code: METR4202 **Course Title:** Robotics & Automation
Coordinating Unit: School of Information Technology and Electrical Engineering
Semester: Semester 2, 2018 **Mode:** Internal
Level: Undergraduate
Location: St Lucia
Number of Units: 2 **Contact Hours Per Week:** 2L1T3P
Pre-Requisites: ELEC3004 or METR3200 or METR4201
Incompatible: METR4200 or METR7201 or METR7202 or ELEC3700 or ELEC7700
Course Description: Modern control & robotic techniques for use in practical applications. Coverage of advanced control methodologies & intelligent robotic systems.
Assumed Background:
Fluid knowledge of control system modelling and design (METR4201/METR3200) is essential. Knowledge of linear algebra and differential equations, programming (in MATLAB and C), and point dynamics is assumed.

1.2 Course Introduction

This course teaches the fundamentals of autonomous systems -- principally robotics. Its emphasis is a principled, algorithmic approach to robotics from fixed manipulators to mobile robots. This includes robot system design and control in its various facets including multi-link robot arms and mobile robot systems. Robot arms are a good example of a multi-variate dynamical system.

The first part of this course will cover select mathematical techniques of Homogenous transformations, serial (open-chain) kinematics, multi-body dynamics, state-space control, and vision as they pertain to solving complex geometrical problems seen in calculating the correct positions and speeds to drive the robot motors in order to move the arm in the desired manner. The class consists of a three laboratory sections and includes building a robot arm yourself from LEGO (or Dynamixel) components. The latter parts of this course discuss the design of controllers using state-space and adaptive control techniques so as to enable automation and autonomous operation. The controller design methods are applicable to a range of challenging design problems in industrial and research settings, including robot systems.

(Note: METR4202 is in the process of being renamed "Robotics and Automation" so as to reflect its new focus)

Course Changes in Response to Previous Student Feedback

Based on student feedback:

* We will post the lectures to the class website
* Project specifications will be announced sooner
* Dynamixel systems are available

1.3 Course Staff

Course Coordinator: Dr Surya Singh
Phone: 58328/66325 **Email:** spns@uq.edu.au
Campus: St Lucia **Building:** General Purpose South (Map) **Room:** 531

Lecturer: Dr Surya Singh
Phone: 58328/66325 **Email:** spns@uq.edu.au **Homepage:** http://robotics.itee.uq.edu.au/~spns/
Campus: St Lucia **Building:** General Purpose South (Map) **Room:** 531

1.4 Timetable

Timetables are available on *mySI-net*.

Additional Timetable Information
Guest lecture in week 12

2. Aims, Objectives & Graduate Attributes

2.1 Course Aims

The objective of this this course is to understand robotic systems in a principled and algorithmic manner, chiefly by using the advanced tools of kinematics and state-space control. Robot analysis, sensing and planning/control are presented using a homogeneous geometric basis.

Aims of this course include:

1. Fundementally understanding homogeneous transformations and be able to apply them to robotic systems,
2. Explaining conventions used in robot kinematics and dynamics,
3. Interpreting the dynamics of mobile robotic systems and how they are modelled,
4. Designing state-space controllers and considering its applications to the control of structured systems (e.g. manipulator arms),
5. Evaluating sensor/actuator placement and technologies relevant to robotic systems,
6. Generating sensing and control algorithms on a practical robotic system
7. Applying a systematic approach to the design process for robotic systems,
8. Discussing the practical application of robotic systems in to intelligent mechatronics applications (e.g., manufacturing, automobile systems and assembly systems),
9. Developing the capacity to think creatively and independently about new design problems; and,
10. Undertaking independent research and analysis and to think creatively about engineering problems.

2.2 Learning Objectives

After successfully completing this course you should be able to:

1. ROBOTICS
1.1 Model (analyze) robotic systems
1.2 Design (synthesize) and control robotic systems
1.3 Be able to explain and describe basic image sensing and processing as it applies to automation and robotic systems
1.4 Discuss and demonstrate motion planning as part of a robot motion pipeline

2. AUTOMATION AND CONTROL
2.1 Design linear control systems using state-space methods such that it allows for regulation and/or tracking (particularly in the presence of delay).

2.3. Graduate Attributes

Successfully completing this course will contribute to the recognition of your attainment of the following **UQ (Undergrad Pass)** graduate attributes:

GRADUATE ATTRIBUTE	LEARNING OBJECTIVES
A. IN-DEPTH KNOWLEDGE OF THE FIELD OF STUDY	
A1. A **comprehensive** and **well-founded knowledge** in the field of study.	**1.1, 1.2, 1.3, 1.4, 2.1**
A4. An **understanding** of **how other disciplines relate** to the field of study.	**1.3, 1.4**
A5. An **international perspective** on the field of study.	**1.3, 1.4**
B. EFFECTIVE COMMUNICATION	
B1. The ability to **collect**, **analyse** and **organise information** and **ideas** and to **convey** those **ideas clearly** and **fluently**, in both **written** and **spoken forms**.	**1.1, 1.2, 1.4, 2.1**
B2. The ability to **interact effectively with others** in order to work towards a common outcome.	**1.2, 2.1**
B3. The ability to **select** and **use** the **appropriate level**, **style** and **means of communication**.	**1.1, 1.2, 1.4, 2.1**
B4. The ability to **engage effectively** and **appropriately with information and communication technologies**.	**1.1, 1.2, 2.1**
C. INDEPENDENCE AND CREATIVITY	
C1. The ability to **work** and **learn independently**.	**1.1, 1.2, 1.3, 1.4, 2.1**
C3. The ability to **generate ideas** and **adapt innovatively** to changing environments.	**1.2, 1.4**
C4. The ability to **identify problems**, **create solutions**, **innovate** and **improve** current **practices**.	**1.1, 1.2, 1.4, 2.1**
D. CRITICAL JUDGEMENT	
D1. The ability to **define** and **analyse problems**.	**1.1, 1.2, 1.3, 1.4, 2.1**
D2. The ability to **apply critical reasoning** to issues through **independent thought** and **informed judgement**.	**1.1, 1.2, 1.4, 2.1**
D3. The ability to **evaluate opinions**, **make decisions** and to **reflect critically** on the justifications for decisions.	**1.1, 1.2, 1.4, 2.1**
E. ETHICAL AND SOCIAL UNDERSTANDING	
E1. An **understanding** of **social** and **civic responsibility**.	**1.1, 1.2, 1.3**
E2. An **appreciation** of the **philosophical** and **social contexts** of a discipline.	**1.1, 1.2**
E4. A **knowledge** and **respect** of **ethics** and **ethical standards** in relation to a major area of study.	**1.1, 1.2, 1.3**
E5. A **knowledge** of other **cultures** and **times** and an **appreciation** of **cultural diversity**.	**1.1, 1.2, 1.3**

3. Learning Resources

3.1 Required Resources

Robotics, Vision and Control: Fundamental Algorithms in MATLAB (Prescribed)
P. Corke, Springer, 2011

Available via SpringerLink [http://search.library.uq.edu.au/61UQ:61UQ_All:61UQ_ALMA2178626970003131]

3.2 Recommended Resources

Robot Analysis: The Mechanics of Serial and Parallel Manipulators by
L.-W. Tsai. John Wiley & Sons, 1999

[UQ Library Catalog Link]

Computer Vision: Algorithms and Applications by
Richard Szeliski
[Online Via SpringerLink: http://link.springer.com/book/10.1007%2F978-1-84882-935-0]

Control system design : an introduction to state-space methods by Bernard Friedland.
(**HIGHLY** Recommended)

Available online via Knovel [http://search.library.uq.edu.au/61UQ:61UQ_All:61UQ_ALMA21112049390003131]

Control Systems Engineering 5e (Prescribed)
N.S. Nise, Wiley, 2008
UQ Library: TJ213 .N497 2008

Robot Analysis and Control,
H. Asada and J.-J. E. Slotine, Wiley-Interscience, 1986

3.3 University Learning Resources

Access to required and recommended resources, plus past central exam papers, is available at the UQ Library website (http://www.library.uq.edu.au/lr/METR4202).

The University offers a range of resources and services to support student learning. Details are available on the myUQ website (https://my.uq.edu.au/).

3.4 School of Information Technology and Electrical Engineering Learning Resources

Most ITEE courses have Blackboard sites which can be found at https://learn.uq.edu.au.

4. Teaching & Learning Activities

4.1 Learning Activities

Date	Activity	Learning Objectives	Reading
23 Jul 18	**Lecture 1 (Lecture):** Introduction	1.1, 1.2, 1.3, 1.4, 2.1	Corke (Chapter 1);
30 Jul 18	**Lecture 2 (Lecture):** Representing Position & Orientation & State	1.1, 1.2, 1.4, 2.1	Corke (Chapter 2);
6 Aug 18 - 31 Aug 18 17:00	**Kinematics Lab (Laboratory):**	1.1, 1.2	
6 Aug 18	**Lecture 3 (Lecture):** Robot Kinematics and Dynamics	1.1, 1.2, 1.4, 2.1	Corke (Chapters 7, 8);
13 Aug 18	**Lecture 4 (Lecture):** Robot Dynamics & Control	1.1, 1.2, 2.1	Corke (Chapter 9);
20 Aug 18	**Lecture 5 (Lecture):** Obstacle Avoidance & Path Planning	1.1, 1.2, 1.3, 1.4	Corke (Chapter 5);
27 Aug 18 - 21 Sep 18 17:00	**Sensing Lab (Laboratory):**	1.3, 1.4	
27 Aug 18	**Lecture 6 (Lecture):** Sensors, Measurement and Perception	2.1	Corke (Chapters 12, 13);
3 Sep 18	**Lecture 7 (Lecture):** Localization and Navigation	1.1, 2.1	Corke (Chapter 14);
10 Sep 18	**Lecture 8 (Lecture):** State-space modelling & controller design	2.1	Friedland (Chapter 1)
17 Sep 18 - 27 Oct 18 17:00	**Systems Lab (Laboratory):**	1.1, 1.2, 1.3, 1.4, 2.1	
17 Sep 18	**Lecture 9 (Lecture):** Sensor-based control	2.1	Corke (Chapters 15, 16); Friedland (Chapter 5)
1 Oct 18	**Lecture 10 (Lecture):** Uncertainty/POMDPs	1.1, 2.1	
8 Oct 18	**Lecture 11 (Lecture):** Robot Machine Learning	1.1, 2.1	
15 Oct 18	**Lecture 12 (Lecture):** Guest Lecture	1.1, 2.1	
22 Oct 18	**Lecture 13 (Lecture):** Course Review	1.1, 1.2, 1.3, 1.4, 2.1	

5. Assessment

5.1 Assessment Summary

This is a summary of the assessment in the course. For detailed information on each assessment, see **5.5 Assessment Detail** below.

Assessment Task	Due Date	Weighting	Learning Objectives
Problem Set/s Kinematics	24 Aug 18 23:59	15%	1.1, 1.2, 1.3
In Class Quiz Theory Quiz	27 Aug 18	15%	1.1, 1.2, 1.3, 1.4, 2.1
Problem Set/s Sensing & State-Space Control	21 Sep 18 23:59	20%	1.3, 1.4, 2.1
Laboratory Systems Lab	22 Oct 18 - 26 Oct 18	50%	1.1, 1.2, 1.3, 1.4, 2.1

5.2 Course Grading

Grade X: No assessable work received.

Grade 1, Fail: Fails to demonstrate most or all of the basic requirements of the course:
Total marks from and including 0 up to but not including 20.

Grade 2, Fail: Demonstrates clear deficiencies in understanding and applying fundamental concepts; communicates information or ideas in ways that are frequently incomplete or confusing and give little attention to the conventions of the discipline:
Total marks from and including 20 up to but not including 45.

Grade 3, Fail: Demonstrates superficial or partial or faulty understanding of the fundamental concepts of the field of study and limited ability to apply these concepts; presents undeveloped or inappropriate or unsupported arguments; communicates information or ideas with lack of clarity and inconsistent adherence to the conventions of the discipline:
Total marks from and including 45 up to but not including 50.

Grade 4, Pass: Demonstrates adequate understanding and application of the fundamental concepts of the field of study; develops routine arguments or decisions and provides acceptable justification; communicates information and ideas adequately in terms of the conventions of the discipline:
Total marks from and including 50 up to but not including 65.

Grade 5, Credit: Demonstrates substantial understanding of fundamental concepts of the field of study and ability to apply these concepts in a variety of contexts; develops or adapts convincing arguments and provides coherent justification; communicates information and ideas clearly and fluently in terms of the conventions of the discipline:
Total marks from and including 65 up to but not including 75.

Grade 6, Distinction: As for 5, with frequent evidence of originality in defining and analysing issues or problems and in creating solutions; uses a level, style and means of communication appropriate to the discipline and the audience:
Total marks from and including 75 up to but not including 85.

Grade 7, High Distinction: As for 6, with consistent evidence of substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critically evaluates problems, their solutions and implications:
Total marks from and including 85 up to and including 100.

Other Requirements & Comments :
Please note that for all grade levels, standard algebraic rounding will be exercised. For example, a 49.49% will be recorded as a 49 (a 3 or fail), where as a 49.51 is a 50 (a 4 or pass). In extenuating circumstances, the course coordinator may adjust marks to reflect the achievement of the student.

You must achieve greater than 40% on the exam in order to pass the course. If you do not pass the exam then you final mark will be capped at 49% and your final grade will be capped at a 3.

5.3 Late Submission

The submission of progressive assessment material on the due date as set out in this Electronic Course Profile is the sole responsibility of the student. Students should not leave assignment preparation until the last minute and must plan their workloads to meet advertised or notified deadlines. It is your responsibility to manage your time effectively.

Unless advised in the Course Profile, assessment items received after the due date will receive a zero mark unless you have been approved to submit the assessment item after the due date.

However, if there are medical or exceptional circumstances (Link) that will affect your ability to complete an assessment by the due date, then you can apply for an extension via the following methods:

Mid-Semester Examinations (includes Oral Presentation, Written Examination or Laboratory Practical held during the teaching weeks of semester):
You can find further information on deferred mid-semester examinations online (Link)and instructions on how to submit your application via mySI-net are available online (Link). All applications for deferred mid-semester examinations must be submitted online via mySI-net > myRequests. Hard copy application forms or requests received via email will not be considered.

Other Assignments:
Extensions to all other assessment items must be requested via my.UQ (Link). You can find instructions on how to submit your request online (Link).
While a scanned copy or clear photographic image of the supporting documentation is acceptable, you must retain the original documentation for a minimum period of six (6) months to provide as verification should you be requested to do so. Failure to produce the original documentation for verification may result in the approval of your extension being rescinded.

An extension application granted on medical grounds will not be approved for any more than the number of calendar days the medical certificate indicates you were unfit for study. Students who are ill for more than 14 days should consider applying for withdrawal without academic penalty (Link).

Requests must be made at least 48 hours prior to the submission deadline, unless the medical or other circumstances are such that you could not reasonably be expected to have applied by then. Requests for extensions which are received on or after the due date may not be considered.

Extensions may not be possible for some pieces of assessment (such as assignments for which solutions are posted immediately after the submission deadline or in the case of group work). Where an extension cannot be granted for such reasons, the Course Coordinator may propose equivalent assessment.

Once finalised, you will receive notification of the outcome via mySI-net or my.UQ (the method of application).

5.4 Other Assessment Information

Having Troubles?

If you are having difficulties with any aspect of the course material you should seek help. Speak to your tutors and/or the course co-ordinator.

If external circumstances are affecting your ability to work on the course, you should seek help as soon as possible. The University and UQ Union have organisations and staff who are able to help, for example, UQ Student Services are able to help with study and exam skills, tertiary learning skills, writing skills, financial assistance, personal issues, and disability services (among other things).

Complaints and criticisms should be directed in the first instance to the course coordinator. If you are not satisfied with the outcome, you may bring the matter to the attention of the Mechatronics Plan Director.

5.5 Assessment Detail

Kinematics
Type: Problem Set/s
Learning Objectives Assessed: 1.1, 1.2, 1.3
Due Date:
24 Aug 18 23:59
Weight: 15%
Task Description:
Answer questions about a robot arm in simulation.

(This will be submitted individually.)

Criteria & Marking:
This will be marked based on the criteria itemised on the Kinematics Problem Set available for download from the course web page.

Submission: Online as per the instructions in the Problem Set guide (e.g., via the Platypus System)

Theory Quiz
Type: In Class Quiz
Learning Objectives Assessed: 1.1, 1.2, 1.3, 1.4, 2.1
Due Date:
27 Aug 18
Weight: 15%
Reading: 10 minutes
Duration: 45 minutes
Format: Short answer, Short essay, Problem solving
Task Description:
A quiz on kinematics and sensing that is to be completed individually in class.

==> Scheduled before the "census date" of August 31 in case a student wants to drop <==

Criteria & Marking:
The quiz will consist of a variety of questions which may include multiple choice, short answer, worked problems

The quiz allows one single-sided A4-page of formula/notes. (It can be on any weight

The quiz is **closed-book**, **closed-computers** and **closed-electronic aids** (e.g., phones, tables, etc.).

The quiz optionally may allow (as per the instructor's decision on the day of the quiz) a single A4-page of formula/notes.

One UQ-approved handheld calculator may be used (but it is **not** required).

This is an **identity-verified assessment** item with a specified minimum standard which must be met to pass the course.

Sensing & State-Space Control
Type: Problem Set/s
Learning Objectives Assessed: 1.3, 1.4, 2.1
Due Date:
21 Sep 18 23:59
Weight: 20%
Task Description:
Implement navigation, sensing and control algorithms on a simulation of a practical robotic system. This may be thought of as the "kinematics of sensing"

Criteria & Marking:
This will be marked based on the criteria itemised on the Sensing & Control Problem Set Sheet available for download from the course web page.

Submission: Online as per the instructions in the Problem Set guide (e.g., via the Platypus System)

Systems Lab
Type: Laboratory
Learning Objectives Assessed: 1.1, 1.2, 1.3, 1.4, 2.1
Due Date:
22 Oct 18 - 26 Oct 18
Weight: 50%
Task Description:
A synthesis of kinematics, sensing, and state-space control.

This will be done in small groups.

Criteria & Marking:
The demonstration will be marked based on the criteria itemised on the Systems Lab Sheet available for download from the course web page.

The course coordinator will arrange demonstation times during Monday to Thursday of Week 13. Where practicable, it is recommended that students be available during the entire lab/prac session on October 26, 2017.

This is an identity-verified assessment item. You must be present at the demonstration.

The course coordinator reserves the right to vary group marks for each group member in the event of varied contributions to the team effort.

Submission: At the time of demonstration. Additional reports to be submitted via the Platypus system.

6. Policies & Guidelines

This section contains the details of and links to the most relevant policies and course guidelines. For further details on University Policies please visit my.UQ and the Policy and Procedures Library.

6.1 Assessment Related Policies and Guidelines

University Policies & Guidelines

An overview of the University's assessment-related procedures can be found on my.UQ. (https://my.uq.edu.au/services/exams-and-assessment)

Academic Integrity
It is the University's task to encourage ethical scholarship and to inform students and staff about the institutional standards of academic behaviour expected of them in learning, teaching and research. Students have a responsibility to maintain the highest standards of academic integrity in their work. Students must not cheat in examinations or other forms of assessment and must ensure they do not plagiarise.

Plagiarism
The University has adopted the following definition of plagiarism:

> Plagiarism is the act of misrepresenting as one's own original work the ideas, interpretations, words or creative works of another. These include published and unpublished documents, designs, music, sounds, images, photographs, computer codes and ideas gained through working in a group. These ideas, interpretations, words or works may be found in print and/or electronic media.

Students are encouraged to read the UQ Student Integrity and Misconduct policy (http://ppl.app.uq.edu.au/content/3.60.04-student-integrity-and-misconduct) which makes a comprehensive statement about the University's approach to plagiarism, including the approved use of plagiarism detection software, the consequences of plagiarism and the principles associated with preventing plagiarism.

Applications for Extensions
An application for an ***Extension of Assessment Due Date*** for medical grounds and/or other exceptional circumstances shall be submitted by lodging the appropriate (online) form with supporting documentation by the date specified in Section 5.3 of the Electronic Course Profile. Students will be notified of the outcome of their request via the *myRequests* section of my.UQ (and an email sent to their student account).

Additional details associated with extension requests, including acceptable and unacceptable reasons, may be found at my.UQ.

Feedback on Assessment
There are certain steps you can take if you feel your result does not reflect your performance. Please refer to the my.UQ web site. (https://my.uq.edu.au/information-and-services/manage-my-program/academic-progress-and-final-results/querying-result)

As a student you have a responsibility to incorporate feedback into your learning; make use of the assessment criteria that you are given; be aware of the rules, policies and other documents related to assessment; and provide teachers with feedback on their assessment practices.

School of Information Technology and Electrical Engineering Assessment Guidelines

Feedback in this Course

Feedback on any aspects of the course can be emailed to the course coordinator.

Misconduct

Further to the statement on academic integrity and plagiarism above, students are required to read and understand the ITEE policy on Student Misconduct (http://www.itee.uq.edu.au/itee-student-misconduct-including-plagiarism).

Examination Conduct

Examinations will be conducted in accordance with section 3.10.11 Examinations of the UQ Policy and Procedures Library (https://my.uq.edu.au/information-and-services/manage-my-program/uq-policies-and-rules/student-policies-and-rules).

Non-attendance at Examinations

If you miss a mid-semester or final examination due to exceptional circumstances, you may be entitled to a deferred examination. For information on deferred examinations, refer to myAdvisor https://my.uq.edu.au/information-and-services/manage-my-program/exams-and-assessment/deferring-exam .

Examination Feedback

Students wishing to view examination answer scripts and/or question papers should consult with the School office (Room 425, General Purpose South Building [78], St Lucia) regarding arrangements. The ITEE policy on exam script viewing is available at http://www.itee.uq.edu.au/script-viewing.

Supplementary Assessment
If you fail this course you may be eligible for supplementary assessment - see https://my.uq.edu.au/information-and-services/manage-my-program/exams-and-assessment/supplementary-assessment for details. You should note that even though you may be eligible for supplementary assessment under these rules, in some circumstances there may be no practical assessment that can be offered to allow you to meet the minimum passing requirements. These circumstances may include failure based on:

- group or team based assessment;
- attendance or class participation requirements;
- laboratory-based assessment, where laboratories can't practically be made available after classes have finished;
- project or thesis-based assessment, where a significant period of time would be required to undertake supplementary assessment;
- progressive assessment, where subsequent assessment items build on earlier assessment items; or
- multiple assessment items, where it is impractical to offer multiple supplementary assessment items.

If the course coordinator determines that there is no practical supplementary assessment that can be offered to allow you to improve your grade, then you will not be offered supplementary assessment and your grade will remain unchanged.

6.2 Other Policies and Guidelines

University Policies and Guidelines

Placement Courses
Students on a placement course – also known as a work placement, internship, industry study, industry experience, clinical practice, clinical placement, practical work, practicum, fieldwork, teaching practice – should refer to the University policy, Placement Courses (https://ppl.app.uq.edu.au/content/3.10.04-placement-courses) for detailed information.

Working with Children
Students whose studies include a professional/work placement, internship, clinical practice, teaching practice or other similar activity which involves them in regular contact with children should refer to the University policy, Working with Children Check - "blue card" (http://ppl.app.uq.edu.au/content/1.60.07-working-children) to find out how to apply for a 'blue card'.

Students with a Disability
Any student with a disability who may require alternative academic arrangements, including assessment, in the course/program is encouraged to seek advice at the commencement of the semester from a Disability Advisor at Student Services. Refer to the University policy, Students with a Disability (Disability Action Plan) (https://ppl.app.uq.edu.au/content/3.50.08-alternative-academic-arrangements-students-disability) and to the policy on Special Arrangements for Examinations for Students with a Disability (https://ppl.app.uq.edu.au/content/3.50.09-arrangements-reasonable-adjustments-examinations-students-disability#Procedures).

While it is the responsibility of the relevant faculty to liaise with professional and registration bodies regarding the acceptability of any adjustment to an academic program, the University Health Service can arrange appropriate advice and assistance on personal and public health issues.

Occupational Health and Safety
Undergraduate and Postgraduate Students should be familiar with the University policies on occupational health and safety in the laboratory (https://ppl.app.uq.edu.au/content/2.30.14-occupational-health-and-safety-laboratory).

Fitness to Practise
Students enrolled in programs and courses that include a practical placement component (also known as work integrated learning, clinical immersion, clinical placement, clinical practice, externship, fieldwork, industry experience, industry study, internship, practicum, teaching practice, work placement) should refer to the University policy Fitness to Practise (https://ppl.app.uq.edu.au/content/3.30.14-fitness-practise) for detailed information on issues of competence and on management of concerns relating to patient and public safety.

Other School of Information Technology and Electrical Engineering Guidelines

Workplace (Occupational) Health & Safety (WH&S; OH&S) in ITEE

The School of ITEE takes its obligations to WH&S very seriously. WH&S is everybody's responsibility, both the School's and the students'. The School has worked to ensure that WH&S processes are effective and that assessments are kept up to date. Students must take the time to familiarise themselves with these procedures and assessments.
Before entering any ITEE lab, students must read the student edition of 'OH&S in the Laboratory' and complete the Safety Declaration Form to be found there. In addition, students must complete the 'Student OH&S Induction' on Blackboard (under "My Courses").
Other relevant information on WH&S in the School is to be found at the School's WH&S website including links from that page to the Risk Assessment Register and Electrical Safety.
Students, please ensure, by reading the information just referenced and completing the OH&S Induction and Safety Declaration Form as appropriate, that you are an active participant in a safe learning environment.

Medical Conditions that may affect safety

Persons suffering from any condition likely to compromise their own safety or the safety of others whilst in an Engineering Lab (such as colour blindness, epilepsy etc) must inform the school before access to labs is sought.

Ethical Clearance

If your course involves assignment or project work involving human subjects or human-related materials, you must investigate the need for ethical clearance and obtain it when required. Information on ethical clearance can be found at http://www.uq.edu.au/research/integrity-compliance/human-ethics

Grievances

If you have a grievance about this course you should, in the first instance, contact the course coordinator. If a satisfactory reply is not received, please contact the ITEE Director of Coursework Studies, A/Prof Stephen Viller.

Other Course Guidelines

Supplementary assessment may not be available for the practical/laboratory assessment items because of the resources and infrastructure involved.

Learning Summary

Below is a table showing the relationship between the learning objectives for this course and the broader graduate attributes developed, the learning activities used to develop each objective and the assessment task used to assess each objective.

Learning Objectives

After successfully completing this course you should be able to:

1. ROBOTICS
1.1 Model (analyze) robotic systems
1.2 Design (synthesize) and control robotic systems
1.3 Be able to explain and describe basic image sensing and processing as it applies to automation and robotic systems
1.4 Discuss and demonstrate motion planning as part of a robot motion pipeline
2. AUTOMATION AND CONTROL
2.1 Design linear control systems using state-space methods such that it allows for regulation and/or tracking (particularly in the presence of delay).

Assessment & Learning Activities

	Learning Objectives				
	1.1	1.2	1.3	1.4	2.1
Learning Activities					
Lecture 1 (Lecture)	●	●	●	●	●
Lecture 2 (Lecture)	●	●		●	●
Kinematics Lab (Laboratory)	●	●			
Lecture 3 (Lecture)	●	●		●	●
Lecture 4 (Lecture)	●	●			●
Lecture 5 (Lecture)	●	●	●	●	
Sensing Lab (Laboratory)			●	●	
Lecture 6 (Lecture)					●
Lecture 7 (Lecture)	●				●
Lecture 8 (Lecture)					●
Systems Lab (Laboratory)	●	●	●	●	●
Lecture 9 (Lecture)					●
Lecture 10 (Lecture)	●				●
Lecture 11 (Lecture)	●				●
Lecture 12 (Lecture)	●				●
Lecture 13 (Lecture)	●	●	●	●	●
Assessment Tasks					
Kinematics	●	●	●		
Theory Quiz	●	●	●	●	●
Sensing & State-Space Control			●	●	●
Systems Lab	●	●	●	●	●

Graduate Attributes

Successfully completing this course will contribute to the recognition of your attainment of the following **UQ (Undergrad Pass)** graduate attributes:

	Learning Objectives				
	1.1	1.2	1.3	1.4	2.1
Graduate Attributes					
A IN-DEPTH KNOWLEDGE OF THE FIELD OF STUDY					
A1. A **comprehensive** and **well-founded knowledge** in the field of study.	●	●	●	●	●
A4. An **understanding** of **how other disciplines relate** to the field of study.			●	●	
A5. An **international perspective** on the field of study.			●	●	
B EFFECTIVE COMMUNICATION					
B1. The ability to **collect**, **analyse** and **organise information** and **ideas** and to **convey** those **ideas clearly** and **fluently**, in both **written** and **spoken forms**.	●	●		●	●
B2. The ability to **interact effectively with others** in order to work towards a common outcome.		●			●
B3. The ability to **select** and **use** the **appropriate level**, **style** and **means of communication**.	●	●		●	●
B4. The ability to **engage effectively** and **appropriately with information and communication technologies**.	●	●			●
C INDEPENDENCE AND CREATIVITY					
C1. The ability to **work** and **learn independently**.	●	●	●	●	●
C3. The ability to **generate ideas** and **adapt innovatively** to changing environments.		●		●	
C4. The ability to **identify problems**, **create solutions**, **innovate** and **improve** current **practices**.	●	●		●	●
D CRITICAL JUDGEMENT					
D1. The ability to **define** and **analyse problems**.	●	●	●	●	●
D2. The ability to **apply critical reasoning** to issues through **independent thought** and **informed judgement**.	●	●		●	●
D3. The ability to **evaluate opinions**, **make decisions** and to **reflect critically** on the justifications for decisions.	●	●		●	●
E ETHICAL AND SOCIAL UNDERSTANDING					
E1. An **understanding** of **social** and **civic responsibility**.	●	●	●		
E2. An **appreciation** of the **philosophical** and **social contexts** of a discipline.	●	●			

E4. A **knowledge** and **respect** of **ethics** and **ethical standards** in relation to a major area of study.	●	●	●		
E5. A **knowledge** of other **cultures** and **times** and an **appreciation** of **cultural diversity**.	●	●	●		