Course Outline

MATS6114/6113

Research Project

Materials Science and Engineering

Science

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	A/Prof Runyu Yang	r.yang@unsw.edu.au	Room 349, Hilmer Building E10, by appointment	Phone: 9385 6787

Supervisors

Dr. Claudio Cazorla	c.cazorla@unsw.edu.au	MSE 302
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A/Prof. Runyu Yang	r.yang@unsw.edu.au	MSE 349
Prof. Jianqiang Zhang	j.q.zhang@unsw.edu.au	MSE 348

2. Course information

Units of credit: 24 over 3 terms. MATS6114 (6 UoC) runs twice (Stages 1 and 2) over 2 consecutive terms, and MATS6113 (12 UOC Stage 3) runs in the 3rd term after the completion of MATS6114.

Entry Point: Term 1 or Term 3

Pre-requisite: Students are required to finish at least 2 term study before taking the subject

Teaching times and locations: This course is conducted through a self-directed study, there are no formal lectures (apart from course introduction session) for this course.

2.1 Course summary

This course is designed for students undertaking Master of Material Technology (MMT) coursework program. It is based on the performance of an original research project, and students need to demonstrate competency in the design and execution of a research investigation.

A self-directed experimental research or design-based project to apply, contextualise, and integrate fundamental scientific/engineering concepts learnt throughout the Materials Science and Engineering undergraduate program. Students will develop advanced disciplinary knowledge and will apply this to problem solving in the chosen topic area. Students will develop and practice high-level skills in critical thinking, project management, safety consideration and risk management, data collection and analysis, problem solving, and technical communication.

Note: study arrangements and attendance for this course is made on a case-by-case basis and all enrolments must be processed by the Materials Science & Engineering School Office only. Please contact enquiries@materials.unsw.edu.au.

2.2 Course aims

To provide research training and advanced disciplinary knowledge. Students will understand how to understand a research questions, identify project aims, perform experimental investigations and analyse and interpret data. The aim of the course is to provide students with structured opportunity to undertake a self-directed and substantial experimental research or design-based project to:

1) Apply, contextualise, and integrate fundamental scientific/engineering concepts learnt throughout the program;

2) Develop advanced disciplinary knowledge and to apply this to problem solving in the discipline;

3) Develop and practice high-level skills in critical thinking, project management, safety consideration and risk management, data collection and analysis, problem solving, and professional/technical communication; and,

4) Gain experience in the use of standard and specialised practical techniques relevant to their chosen area.

2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Develop and manage a project effectively, including the ability to plan and execute a significant project applying relevant methods and knowledge
2. Carry out research effectively, including the ability to work independently, design and carry out experiments, collect and analyse data, and solve problems.
3. Work effectively within the regulatory frameworks relevant to Materials Science, including workplace health and safety and ethics
4. Communicate scientific information in a written form
5. Understand and apply advanced concepts and knowledge to solve problems

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Program Learning Outcome (PLO)	Related Tasks & Assessment
CLO 1	Develop…	1, 2 & 3	All
CLO 2	Carry out…	1, 3 & 4	All
CLO 3	Work effectively…	2	All
CLO 4	Communicate…	1 & 5	All
CLO 5	Understand…	1, 2 & 3	All

3. Strategies and approaches to learning

3.1 Learning and teaching activities

(based on UNSW Learning Guidelines)

- Students are actively engaged in the learning process.

It is expected that, in addition to attending classes, students read, write, discuss, and are engaged in analysing various research topics within the field of materials science and engineering.

- Effective learning is supported by a climate of inquiry where students feel appropriately challenged.

Problems involving electron theory are challenging; students will be given assignments that will motivate deep analysis of various physical phenomena in materials science and engineering.

- Learning is more effective when students' prior experience and knowledge are recognised and built on.

This course is built on prior courses in materials science, nanotechnology, physics and chemistry.

- Students become more engaged in the learning process if they can see the relevance of their studies to professional and disciplinary contexts

The course content is designed to incorporate both theoretical and practical concepts, where the latter is intended to be applicable to real-world situations and contexts.

3.2 Expectations of students

- Students should complete all assessment and milestone tasks and submit them on time.
- Students are expected to participate in online discussions through the Moodle page
- Each student is expected to maintain a regular dialogue with their supervisor (for example by weekly meetings) about their project

4. Course schedule and structure

This course consists of no formal class contact hours. When enrolled in MATS6114 you are expected to allocate 150 hours over each Term to complete all milestones and assessment tasks. When enrolled in MATS6113 you are expected to allocate 300 hours of your time over the Term. The table below lists the areas students should be focusing on throughout the year.

	MATS6114 – Stage 1	
Week	**Topics/Tasks**	**Activity**
1-10	Course Information session (Week 1) Laboratory Safety Course (Week 2) Project Management Plan (Due Week 4) Complete Literature Survey (Due Week 10) Complete Project-Specific Laboratory Inductions & Training and WHS Documentation/Risk Assessments Begin Experimental Research	Week 1: Introduction Week 2: Safety Training Week 4: PMP submission Week 10: Literature Survey Complete all required safety training
	Term Break	
	MATS6114 – Stage 2	
Week	**Topics/Tasks**	**Activity**
1-10	Experimental Research & Analysis Begin ongoing Thesis Write-Up	Week 10: Experimental set up and preliminary results report
	Term Break	
	MATS6113	
Week	**Topics/Tasks**	**Activity**
1-10	Experimental Research & Analysis Progress Report (Week 4) Ongoing Thesis Write-Up Thesis Submission (Week 10)	Week 4: Progress Report Week 10: Thesis Submission

5. Assessment

5.1 Assessment tasks

Assessment task	Description	Weight	Due date
Project Management Plan	Students are required to submit a PMP covering the key elements of the project (see requirements below)	10%	Stage 1 Week 4
Literature Review	Students will submit a literature review of their project topic. Students would need to be able to demonstrate competency in understanding the research project and be able to clearly identify the research questions that they seek to investigate.	0%*	Stage 1 Week 10
Experimental Procedures and Preliminary Results Report	As part of the thesis writing process students need to submit a report detailing the work completed so far. The report should contain a section of the experimental procedures and the preliminary results.	0%*	Stage 2 Week 10
Progress Report	Students are required to submit a report on the progress they have made so far and detailing any issues that have arisen through the project that may affect the final submission of their thesis.	0%*	Stage 3 Week 4
Thesis Submission	The thesis is the major piece of work submitted at the end of the 24 UOC research project. A thesis at this level typically is 60 pages. It is marked by three nominated academic assessors using a standardised rubric for all theses.	90%	Stage 3 Week 10

***Note: Students are required to submit these assessment tasks throughout the thesis to obtain feedback from their Supervisors and meet the milestones for progression in the course. The sections will be given a final grade upon marking of the completed thesis at the end of the course.**

Further information

UNSW grading system: https://student.unsw.edu.au/grades

UNSW assessment policy: https://student.unsw.edu.au/assessment

5.2 Assessment criteria and standards

Along with the assessment tasks listed in the table above there are a number of activities that students are required to complete in order to be able to progress through the research project. All assessment and tasks are explained below.

1. **Laboratory Safety Training Course**

Due: Stage 1 Week 1 – time to be advised

Location: TBA, MSE

Details: Students are required first to attend the Laboratory Safety Training Course. Students who do not attend this course will be forbidden to start experimental work until appropriate safety training is completed – this may result in significant delay in commencing experimental work.

2. **Project Management Plan**

Due: 5:00 pm Friday, Stage 1 Week 4

Submission: Upload to the Moodle course site.

Coversheet: Coversheet (downloadable from the Moodle course site) must accompany the submitted plan, which must be signed by the academic supervisor to the effect that the plan is reasonable in terms of academic scope as well as the available time and resources.

Late Penalty: Work submitted after the deadline will attract a penalty of 2 marks of the total mark per day (or part thereof) late.

Marking: Marked by the course coordinator.

Details: The aim of this assignment is to develop a project management plan for the Project. The plan should include the following:

1. General Outline including:
    a. Description of the project to be undertaken
    b. General scope of the project
    c. Critical personnel
2. Goals of the Project
3. Project Planning
4. Budgeting and Cost Estimation
5. Scheduling
6. Resource Allocation (including inventory & status of all equipment)
7. Monitoring and Project Control
8. Project Auditing
9. Project Termination

Length: Maximum 6 A4 pages

Coursework: Project Management is taught in MATS6004 Management (core course). For students who have not done this course, relevant lecture notes are posted on the Moodle course site to assist in the formulation of the project management plan.

3. **Introduction and Literature Survey**

Due: 5:00 pm, Friday, Stage 1 Week 10

Submission: Upload to the Moodle course site

Late Penalty: Work submitted after the deadline will attract a penalty of 2 marks of the total mark per day (or part thereof) late.

Details: Students must submit one copy of the completed Introduction and Literature Review thesis chapters. In particular, the Literature Review is to be properly written and referenced. Students are strongly advised to submit any drafts of these chapters to their supervisor beforehand in order to give the supervisor time to provide feedback and to return the work. The report will not be marked but kept as a record showing the students' progress.

Refer below for details concerning requests for extensions to the deadline.

4. **Risk Assessment of Experimental Work**

Due: No set date but must be completed and approved PRIOR TO ANY experimental work is commenced.

Submission: Hand-in hard copy to academic supervisors.

Details: A detailed risk assessment of all experimental work is required BEFORE ANY EXPERIMENTAL WORK IS DONE. Students are strongly urged to consult with their supervisor when completing the Risk Assessment. A new Risk Assessment is required for any later experimental work not covered in the original Risk Assessment. The Risk Assessment form is available in electronic form from the school website.

FAILURE TO COMPLETE A RISK ASSESSMENT PRIOR TO UNDERTAKING EXPERIMENTAL WORK WILL RESULT IN SUSPENSION FROM THE UNIVERSITY'S LABORATORIES AND AFFECT SUCCESSFUL COMPLETION OF THE COURSE.

In addition to your supervisor, the School's Safety Officer (Mr Anthony Zhang), and the Laboratory Safety Training Course, information on relevant UNSW Occupational Health and Safety policies and expectations can be obtained from: https://safety.unsw.edu.au/

5. **Experimental Procedures and Preliminary Results Report**

Due: 5:00 pm Friday, Stage 2 Week 10

Submission: Upload to MATS6114 Moodle course site

Late Penalty: Work submitted after the deadline will attract a penalty of 2 marks of the total mark per day (or part thereof) late.

Details: Students must submit one copy of the draft Experimental Procedures thesis chapter. Students are strongly advised to submit any drafts of these chapters to their supervisor beforehand in order to give the supervisor time to provide feedback and to return the work. The report will not be marked but kept as a record showing the students' progress. It is recommended that students discuss the contents of the Progress Report form with their supervisors. If there are any unresolved issues the students are asked to contact the course coordinator as soon as possible.

6.	**Progress Report**
Due:	5:00 pm Friday, Stage 3 Week 4
Submission:	Upload to Moodle course site
Late Penalty:	Completion of the thesis progress report form is mandatory to be considered for project extension and explanation of any delays.
Details:	The report will not be marked but kept as a record showing the students' progress. It is recommended that students discuss the contents of the Progress Report form with their supervisors. If there are any unresolved issues the students are asked to contact the course coordinator as soon as possible.

7.	**Final Thesis**
Due:	5:00 pm Friday, Stage 3 Week 10
Submission:	Upload to Moodle course site.
Late Penalty:	Work submitted after the deadline will attract a penalty of 5 marks of the total mark per day (or part thereof) late.
Details:	Students must upload a completed thesis to the course Moodle site. Refer Theses Guideline for the content and length of these chapters. Students are strongly advised to submit any drafts of the thesis well before this deadline in order to give the supervisor time to read, correct, and return the work. The thesis is marked by three independent academic staff who are not the thesis supervisor. The marks are then averaged to give the final mark. Refer below for details concerning requests for extensions to the deadline.

5.3 Submission of assessment tasks

See the above assessment task details for submission requirements for each task

UNSW operates under a Fit to Sit/ Submit rule for all assessments. If a student wishes to submit an application for special consideration for an exam or assessment, the application must be submitted prior to the start of the exam or before an assessment is submitted. If a student sits the exam/ submits an assignment, they are declaring themselves well enough to do so. Information on this process can be found here: https://student.unsw.edu.au/special-consideration. Medical certificates or other appropriate documents must be included. Students should also advise the lecturer of the situation. It must be noted that merely submitting a request for Special Consideration does not automatically imply the granting of additional assessment or the extension of due date.

5.4 Feedback on assessment

Students should consult their supervisor/s throughout the year to determine how they are progressing through the project.

Project management plan: The assignment is marked by the course coordinator using a standardised rubric. Written feedback is given by the course coordinator and verbal feedback is given by the student's supervisor.

Literature Review: Students are expected to meet with their supervisor/s to discuss their literature review throughout writing it.

Experimental Procedures and Preliminary Results Report: Students are expected to meet with their supervisor/s to discuss their literature review throughout writing it.

Thesis: Students will receive their final mark.

6. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Referencing style: Consult you supervisor for the preferred refencing style.

Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits**:** honesty, trust, fairness, respect, responsibility and courage.[1] At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site https://student.unsw.edu.au/plagiarism**,** and
- The *ELISE* training site http://subjectguides.library.unsw.edu.au/elise/presenting

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct.

7. Readings and resources

There are no recommended reading or resources for this course, your supervisor may recommend texts that relate to your project.

8. Administrative matters

School Office: Room 137, Building E10 School of Materials Science and Engineering
School Website: http://www.materials.unsw.edu.au/
Faculty Office: Robert Webster Building, Room 128
Faculty Website: http://www.science.unsw.edu.au/

9. Additional support for students

- The Current Students Gateway: https://student.unsw.edu.au/
- Academic Skills and Support: https://student.unsw.edu.au/academic-skills
- Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing
- Disability Support Services: https://student.unsw.edu.au/disability-services
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html
- Assessment Implementation Procedure: https://www.gs.unsw.edu.au/policy/documents/assessmentimplementationprocedure.pdf

[1] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

Appendix A Thesis Guideline and Marking Criteria

The thesis must be your own work. All references should be properly cited, any plagiarism is forbidden in all parts of the thesis (refer Academic Honesty and Plagiarism Rules). All the theses will be run through a plagiarism-checking program. Any such academic misconduct could result in serious consequences in the assessment of the thesis.

The final thesis should be ~60 pages in total length (excluding references). Guidelines detailing expected formatting of the thesis are given below.

- **Thesis Format**

Page size is A4 with the margins set to 2.5 cm for all the sides. The header should include Chapter Title (left align), and the footer: Must include page number (centre align). Fonts can be Times New Roman 12pt, Arial 11.5pt or Calibri 11.5pt, but only one type of fonts should be used throughout the thesis. Line spacing is 1.5 line and paragraph spacing: 6pt.

- **Cover page (1 page)**

The cover page should include thesis title, student name and number, supervisor name, the program name (Master of Material Technology) and date.

- **Originality Statement (1 page)**
- **Acknowledgement (1 page)**
- **Abstract (1 page)**

This should be one page in length. It should briefly but succinctly summarise the following points: problem investigated; procedures followed; principal results obtained; and major conclusions reached.

- **Table of Content (2 pages max)**

Chapter 1 Introduction (2 pages max)

This should provide a general background to the thesis topic, indicating the nature of the field, the state of knowledge of the subject, and why the topic is of interest. The Introduction should include a general statement of the project aims. This Chapter should also briefly describe the structure of the thesis.

Chapter 2 Literature Survey (5000 ~ 5500 words, 20 pages max).

Length Required up to 5500 words maximum including figure captions, not to exceed 20 pages in length. It should be comprehensive but should be strictly confined to issues highly relevant to the thesis topic. Enough information should be provided so that an adequate general background to the thesis topic is given. The Literature Survey should be up-to-date, accurate, and properly referenced (refer to ACADEMIC HONESTY AND PLAGIARISM RULES in this document). Most importantly, it should be analytical in nature and concise. The findings, interpretations and opinions of other writers should be compared; conflicts and/or agreements should be identified; gaps in knowledge or understanding should be pointed out. Do not pad the Literature Survey with material that is irrelevant or of peripheral interest to the thesis topic.

The Literature Survey is written for professionals. It must not be too basic. Instead it should be written on the premise that the reader should be familiar with the broad technical area of the thesis discipline but that he or she may be unfamiliar with the specific thesis topic and relevant terminology.

A Literature Survey must lead to conclusions if it is to be of any use. These conclusions in turn permit the author to formulate and define the specific project aims.

Chapter 3 Methodology and Procedure (5 pages max)

This section should begin by presenting an experimental/numerical plan that will answer the questions raised in the Literature Survey and, hence, achieve the project aims. A working Plan is a very important part of the thesis, although it is usually rather brief.

A brief but concise description of the methods and procedure should then be presented. The procedure should be descriptive to the point that another trained scientist or engineer would be able to repeat the work. It must clearly state the analytical methods used (a theoretical background of the analytical methods is not necessary). It must also specify the variables, which are being explored and state over what range of values.

Chapter 4. Results and Analysis (2000-2500 words, 10 pages max)

This chapter should be brief but complete. Logical organisation is important to achieve brevity. Appropriate use of graphs and/or tables is important to achieve condensation. The use of correct units, scales, magnifications and the specification of errors are essential.

Chapter 5. Discussion (2500-3000 words, 15 pages max)

This chapter is of crucial importance and much of the intellectual content of the thesis will be found within it. The results will have to be interpreted, that is, reasons for the observed behaviour, patterns, correlations, etc. must be advanced and evaluated. Such interpretation will commonly require the use of the information or data presented in the literature survey. If possible, predictions should be made on the basis of any models advanced.

The Discussion must place the results within the context of information summarised in the literature review. Most importantly, the findings must be used in answering the questions posed by the project, that is, in achieving the project aims.

To meet the various requirements, a good discussion will lead in a logical way to the conclusions with which the thesis will end.

Chapter 6. Summary and Conclusions (2 pages max)

This Chapter should be no more than four pages in length. It should summarise both the results and their ramifications. This section represents a brief overview of the findings and their significance.

References

This section lists full citations of literature references used in the thesis. References should use 10 pt fonts. It is recommended that Endnote (free for UNSW students) is used to manage the reference.

Note: Students should submit any drafts of work for assessment to their supervisors at least one week before the deadline so the supervisors have time to read, correct, and return the work.

Marking Sheet MATS6114/MATS6113 (24 UOC)

Student: _____

Thesis Title: _____

Examiner: _____ **Signature:** _____

Adj. Mark

Abstract, Thesis Format and Presentation

1.	Quality of Abstract	/10	
2.	English expression and spelling	/10	
3.	Thesis formatting & general impression	/10	
	Mark:	/30	_____ **/15**

Introduction and Literature Review Chapters

1.	Level of presentation, extent and relevance	/10	
2.	Critical assessment of the literature	/10	
3.	Referencing	/10	
4.	Establishment of project aims	/10	
	Mark:	/40	_____ **/20**

Experimental Procedure Chapter

1.	Completeness and clarity of experimental outline	/15	_____ **/15**

Results/Work Effort

1.	Amount of experimental work done	/10	
2.	Completeness of study	/10	
3.	Quality, logic and organisation of experiments	/10	
4.	Use of graphs, figures and tables to summarise results	/10	
	Mark:	/40	_____ **/20**

Discussion and Conclusions

2.	Interpretation of results and sophistication of analysis	/10	
3.	Handling and identification of errors	/10	
4.	Comparison with other data	/10	
5.	Achievements with respect to project aims	/10	
	Mark:	/40	_____ **/20**

TOTAL MARK: _____ **/90**

The completed thesis (90%) is marked by three (3) independent examiners in the School. All feedback and discussion concerning the marked work is between the student and the supervisor.

The PMP (10%) is marked by the course coordinator.