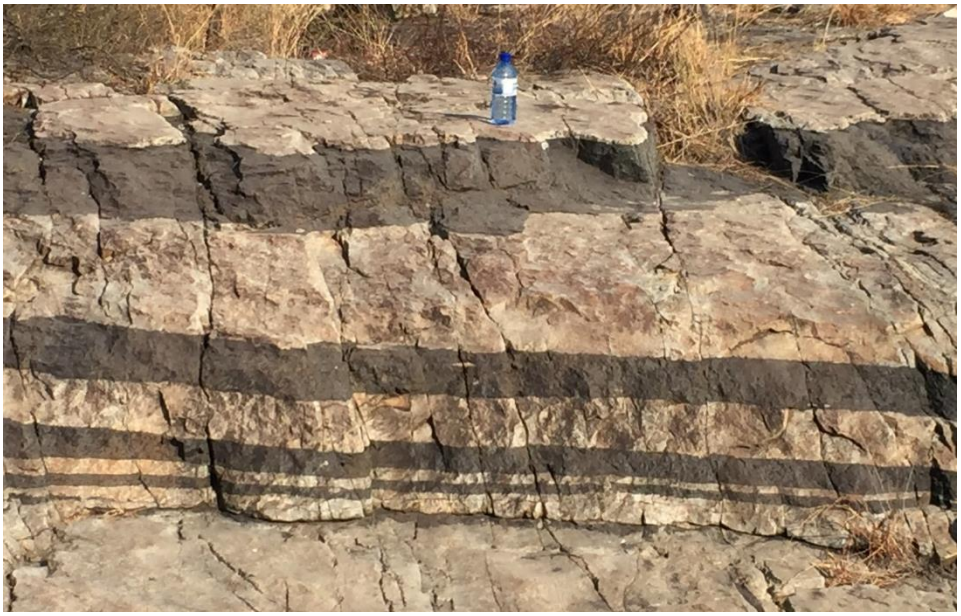
THE UNIVERSITY OF
NEW SOUTH WALES

SCHOOL OF BIOLOGICAL, EARTH
AND ENVIRONMENTAL SCIENCES

GEOS3141
Mineral and Energy Resources
(6 UOC)

MINE2810
(Ore Deposits and Coal Component)
Minerals and Processing
(6 UOC)



MANUAL

2020

THE UNIVERSITY OF
NEW SOUTH WALES

SCHOOL OF BIOLOGICAL, EARTH
AND ENVIRONMENTAL SCIENCES

GEOS3141
Mineral and Energy Resources

MINE2810
Minerals and Processing
(Ore deposits and coal component)

Term 3, 2020

Important Dates

WEEK	DAY	DATE	DETAILS
GEOS3141 and MINE2810:			
Week 1	Tue	15 Sept	Classes commence
Week 2	Fri	25 Sept	First ore deposit summary pages due
Week 5	Fri	16 Oct	Laboratory report & remaining summaries **(MINE2810 only)**
Week 7			MINE2810 mid-session test. Date and location TBC
GEOS3141 only:			
Week 3	Fri	18 Sept	Minerals economics exercise due
Week 9	Fri	15 Nov	Laboratory report and remaining summary pages due
Week 9	Tue	12 Nov	Lab skills test (in normal lab time)
Week 10	Thu	22 Nov	Seminar presentations (online)
Week 10	Fri	23 Nov	Seminar presentations (online)
Week 10	Fri	23 Nov	Ore deposit essay due

Completed assignments **with cover sheet** must be submitted in the lab class or via Moodle (as required) **on or before the due date**.

Penalty for late submission is a reduction in the maximum mark obtainable of 10% per day (a weekend will count as 20%).

LECTURES (all delivered online and pre-recorded)

Tuesday	**2-3 pm**	**online**
Thursday	**5-6 pm**	**online**
Friday	**12-1 pm**	**online**

LABS (Laboratory 2, Ground Floor north-east end of Building D26, Upper Campus)

Tuesday	**3-5 pm**	**D26 Lab 2**
Wednesday	**3-5 pm**	**D26 Lab 2**

Week 6 19-25 October will have no classes as it is the fieldtrip week for all BEES courses.

1. CLASS SCHEDULE (MINE2810 students should also refer to Mineral processing component schedule)

Wk	Lecture 1 (1hr)	Lecture 2 (1hr)	Lecture 3 (1hr)	Lab 1 (2hr)	Lab 2 (2hr)	Assessment
1	Intro to course (AA)	Weathering, oxidation and alteration (IG)	Ore Petrology (IG)	Revision of minerals (IG)	Mineral Economics / Ore suites 1 (DC)	
2	Volcanogenic Massive Sulfide deposits 1 (IG)	Volcanogenic Massive Sulfide deposits 2 (IG)	Sedimentary Mn & Fe / Supergene deposits (DC)	Ore petrology (IG)	Alteration Assemblages / Ore suites 2 (IG)	First summary sheet (initial feedback on deposit reports)
3	JORC code and compliance (JB)	Porphyry Cu-Au-Mo 1 (IG)	Porphyry Cu-Au-Mo 2 (IG)	Ore suites 3 (IG)	Ore suites 4 (IG)	
4	Hydrothermal Au I (AA)	Hydrothermal Au 2 (AA)	Use of portable technologies (DC)	Ore suites 5 (IG)	Ore suites 6 (IG)	
5	Magmatic deposits 1 (IG)	Magmatic deposits 2 (IG)	MVT and CMPV deposits (IG)	Ore suites 7 (IG)	Ore suites 8 (IG)	Summary sheets and report
				Coal I (JB)	Coal II (JB)	No GEOS3141 Classes in week 6
7	Critical element deposits 1 (IG)	Critical element deposits 2 (IG)	Uranium deposits (NR)	Logging and interpreting drill chips and cores (IG)	Ore suites 9 (IG)	MINE2810 mid session exam
8	Diamond deposits (IG)	Gem deposits (IG)	Case study: Bowdens epithermal Ag deposit (IG)	Lab skills revision (IG)	Lab skills revision (IG)	
9	Case study: Hera and Federation deposits (IG)	Exploration project management (industry)	*Industry speaker*	Lab skills test	Lithogeochemical lecture + lab (DC)	Lab skills test / Summaries and Report
10	*Industry speaker*	*Student seminars*	*Student seminars*	Geotech lecture + lab	Field techniques (IG)	Essay and seminars

	GEOS3141 and MINE2810
	GEOS3141 only
	MINE2810 only

LIST OF LECTURES AND LABS

WEEK 1

Tue 15 September

LEC 1, 2-3: Introduction to course (AA)

LAB 1, 3-5: Revision of minerals (IG)

Wed 16 September

LAB 2, 3-5: Mineral Economics / Ore suites 1 (DC)

Thu 17 September

LEC 2, 5-6: Weathering, oxidation and alteration (IG)

Fri 18 September

LEC 3, 12-1: Introduction to Ore Petrology (IG)

WEEK 2

Tue 22 September

LEC 4, 2-3: Volcanogenic massive sulfide and SEDEX deposits I (IG)

LAB 3, 3-5: Ore Petrology (IG)

Wed 23 September

LAB 4, 3-5: Alteration assemblages / Ore suites 2 (IG)

Thu 24 September

LEC 5, 5-6: Volcanogenic massive sulfide and SEDEX deposits II (IG)

Fri 25 September

LEC 6, 12-1: Sedimentary Fe and Mn deposits (DC)

WEEK 3

Tue 29 September

LEC 7, 2-3: JORC code and compliance (JB)

LAB 5, 3-5: Ore suites 3 (IG)

Wed 30 September

LAB 6, 3-5: Ore suites 4 (IG)

Thu 1 October

LEC 8, 5-6: Porphyry Cu-Au-Mo deposits I (IG)

Fri 18 September

LEC 9, 12-1: Porphyry Cu-Au-Mo deposits II (IG)

WEEK 4

Tue 6 October

LEC 10, 2-3: Hydrothermal Au I (AA)

LAB 7, 3-5: Ore suites 5 (IG)

Wed 7 October

LAB 8, 3-5: Ore suites 6 (IG)

Thu 8 October

LEC 11, 5-6: Hydrothermal Au II (AA)

Fri 9 October

LEC 12, 12-1: Use of portable technologies (DC)

WEEK 5

Coal component for MINE2810 students / normal classes for GEOS3141 students

Tue 13 October

GEOS3141

LEC 13, 2-3: Magmatic deposits I (IG)

LAB 9, 3-5: Ore suites 7 (IG)

MINE2810

LAB/LEC, 3-5: Coal component I (JB)

Wed 14 October

GEOS3141

LAB 10, 3-5: Ore suites 8 (IG)

MINE2810

LAB/LEC, 3-5: Coal component II (JB)

Thu 15 October
GEOS3141 students only
LEC 14, 5-6: Magmatic deposits II (IG)

Fri 16 October
GEOS3141 students only
LEC 15, 12-1: MVT and CMPV deposits (IG)

WEEK 6
19 to 25 October

Fieldtrip week break for GEOS3141 students

WEEK 7

Tue 27 October

LEC 16, 2-3: Critical element deposits I (IG)

LAB 11, 3-5: Analysing and interpreting drillcores and drill chips (IG)

Wed 28 October

LAB 12, 3-5: Ore suites 9

Thu 29 October

LEC 17, 5-6: Critical element deposits II (IG)

Fri 30 October

LEC 18, 12-1: Uranium deposits (NR)

WEEK 8

Tue 3 November

LEC 19, 2-3: Diamond deposits (IG)

LAB 13, 3-5: Lab skills revision (IG)

Wed 4 November

LAB 14, 3-5: Lab skills revision (IG)

Thu 5 November

LEC 20, 5-6: Gem deposits (IG)

Fri 6 November

LEC 21, 12-1: Case study: Bowdens epithermal Ag deposit (IG)

WEEK 9

Tue 12 November

LEC 22, 2-3: Case study: Hera and Federation deposits (IG)

LAB 15, 3-5: Lab skills test (IG)

Wed 13 November

LAB/LEC 16, 3-5: Lithogeochemistry (DC)

Thu 14 November

LEC 23, 5-6: Exploration project management (industry)

Fri 15 November

LEC 24, 12-1: Industry speaker

WEEK 10

Tue 17 November

LEC 25, 2-3: Industry speaker

LAB/LEC 17, 3-5: Geotechnical (industry)

Wed 21 November

LAB 18, 3-5: Field techniques (IG)

Thu 22 November

LEC 26, 5-6: Student seminars I

Fri 23 November

LEC 27, 12-1: Student seminars II

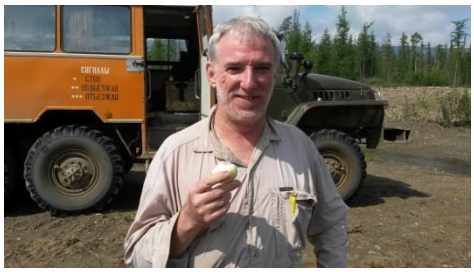
2. COURSE LOGISTICS

This course component forms part of GEOS3141 (6 uoc) and MINE2810. GEOS3141 extends for all 10 weeks and includes the mineral (ore and coal) and the petroleum geology component. The geology component of MINE2810 extends over the first 5 weeks (followed by a mid-session exam).

It is a core course of the BE (Mining Engineering) and in the geology major of the BSc, as well as being an option in other science programs for students who have completed the necessary prerequisite level 1 GEOS courses.

Course staff (minerals section):

Coordinator	IG – Ian Graham	i.graham@unsw.edu.au	Samuels 131



Lecturers	DC – David Cohen	d.cohen@unsw.edu.au	by arrangement
	JB – Jon Barber	j.barber@unsw.edu.au	OMB (Mining Eng)
	NFR – Neil Rutherford		
	AA – Anita Andrew		
Technical Staff	Mira van der Ley		

Consultation: During laboratory sessions or by appointment with staff.

Other Details:

Year of Delivery	**2020**
Course Code	**GEOS3141 / MINE2810**
Course Name	**Mineral and Energy Resources / Minerals and Processing**
Academic Unit	**School of Biological, Earth and Environmental Sciences, Faculty of Science**
Level of Course	**III**
Units of Credit	**6 for GEOS3141 3 unit component of MINE2810**
Session(s) Offered	**T3**
Assumed Knowledge, Prereqs	**Level 1 geology**
Hours per Week	**7 (GEOS3141); 7 MINE2810 (weeks 1 to 4 inclusive)**
Number of Weeks	**9 / 6 weeks**
Commencement Date	**Tuesday, September 15**

Equipment: **Appropriate footwear** is required for laboratory sessions (i.e. no thongs). Students with inappropriate footwear will be ejected from the labs.

3. COURSE OVERVIEW

The Australian economy remains closely linked to the success at discovery, mining and export of a range of mineral commodities. Australia is a major exporter of Au, Al, Fe, Ni, C and U. A significant proportion of graduates in the geosciences or mining will wind up working for all or part of their professional careers in the minerals sector. At the small scale, ore deposits can be viewed in terms of their host rocks, structure, mineral distributions, geochemistry and geophysical characteristics. At the larger scale, the nature and location of mineral deposits can be explained in terms of crustal and upper mantle processes, most of which are embedded in the great unifying theory of geology, plate tectonics.

Australia is a major producer and exporter of thermal (power production) and coking (steel production) coals. Periods of relative stability in the crust provided opportunities for the growth of vegetation and the deposition of plant materials in an anaerobic swamp that prevented oxidation. Subsequent burial with associated temperature and pressure gradients reduced moisture and resulted after uplift and erosion in the coal deposits mined today.

General content:
Ore forming processes, mobilization, transport and deposition of metals. Description and genesis of key ore deposit types, volcanic and sedimentary hosted massive sulfides, porphyry Cu-Au, mesothermal Au, magmatic Ni, iron ores, gem stones and uranium. Exploration methods. Review of (economic) mineral and rock identification. Deposit suites from some important Australian and overseas mineral deposits. The coal component will focus on the formation of coal, its chemical changes in formation and how these changes affect the marketability and utilization. Basic methods of exploration and mining will be reviewed. The final lectures for mining engineering students only will cover processing and utilization.

Course objectives:
The course provides students an introduction to the fundamental concepts and processes relating to the genesis, geological characteristics and exploration for some archetypical ore deposits.
Laboratory work will provide practical skills in identifying the key features of samples from some important ore deposits and to place these samples within the geological framework of the genesis of those deposits.
The course also emphasises the development of report writing skills and group work

Domains:

Fundamental principles	→	Deposit examples	→	Laboratory exercises	→	Reporting
Acquisition of knowledge	→	*Application to theory*	→	*Application to practice*	→	*Communication to others*

Assumed knowledge:

Geology	Basic mineralogy and petrology; the plate tectonic model.
Chemistry	Basic knowledge of the periodic table and chemical reactions.

Readings:

A couple of key references will be provided for each of the major topics in the course. These are required reading and their content is examinable in the exam.

Continual course improvement:

Periodically, student evaluative feedback on this course is gathered, using among other means myExperience. Student feedback assists us in continual improvements to courses in the School of BEES. myExperience and Blue pulse will operate this session.

4. TEACHING AND LEARNING METHODS

The framework will be provided by the lectures and selected readings, together with practical exercises. Students will be directed towards appropriate references in the library and on the web and will be expected to undertake their own program of reading and reflection.

Intellectual skill development is embedded throughout the course, but is specifically addressed in a number of the topics and tasks. The ability to integrate and apply concepts and principles from one area of the subject to another are intrinsic to high-level performance in the programme.

Expectations of students

Attendance at laboratories is strongly suggested.
See school website for other BEES policies http://www.bees.unsw.edu.au/current-students

Guidelines on Teaching:

1. A climate of enquiry should be developed where students feel challenged
2. Activities should be interesting and challenging
3. Material must be perceived as relevant to future study or professional practice
4. There must be dialogue/interaction between lecturers and students
5. There should be multiple teaching methods
6. Goals, outcomes and requirements of the course must be clearly articulated
7. Students are to be encouraged to take responsibility for own learning
8. Broad graduate attributes must be developed
9. Co-operative work with peers assists learning
10. There must be informative and timely feedback to students on progress.

Knowledge, Understanding and Skills (Course learning outcomes):

(a) Knowledge and understanding of:
   1. The nature of economic geology as a discipline
   2. Relevant fundamentals of ore- and coal-forming processes
   3. Ore deposits in the context of their plate tectonics setting
   4. Genetic models for key deposit types and related examples

(b) Intellectual skills
   1. Think logically and critically in a scientific manner
   2. Undertake study and investigations in areas of science outside those immediately familiar
   3. Analyse and interpret mineralogical and lithological data
   4. Distill observations, literature review and other knowledge into concise technical reports
   5. Appreciate the current state of knowledge of ore deposits

(c) Practical skills
   1. Accurately observe, record and interpret earth materials and data
   2. Contribute to group work

(d) Transferable skills
   1. Communicate scientific ideas
   2. Work as part of a team

5. Resources

Moodle: Lecture notes and other references.

Books:

Evans, A.M., 1997, An introduction to economic geology and its environmental impact, P 553/62

Australasian Institute of Mining and Metallurgy, 1998, Geology of Australian and Papua New Guinean mineral deposits, PQ 553.0994/5

Australian Mineral Foundation, 1998, Porphyry and hydrothermal Cu & Au deposits: a global perspective, PQ 553.4/18

Centre for Ore Deposit Research, 2002, Giant ore deposits: characteristics, genesis and exploration, PQ 553.1/52

Solomon, M., 1994, The geology and origin of Australia's mineral deposits, P 553.10994/3.

Ridley, J., 2013, Ore deposit geology. Cambridge University Press. 553/64.

Thomas, L. 1992. Handbook of Practical Coal Geology. P553.24.19C

Ward, C. 1984. Coal Geology and Coal Technology (in chapter format on Moodle)

Suarez-Ruiz, I & Crelling, J 2008. Applied Coal Petrology.

Geological Society. Geology Australian Coal Basins

Speight, J. 2005. Handbook of Coal Analysis. P662.622/48

Journals:

Economic Geology

Mineralium Deposita

Ore Geology Reviews

International Journal of Coal Geology

6. Assessment, Ore deposits section of the course

	MINE2810 (Geology cpt)	**GEOS3141**
Ore suites (50%) & final report (50%)	30 %	40 %
Mineral economics exercise	-	10 %
Lab skills test	-	25 %
Seminar presentation	-	10 %
Seminar paper (ore deposit essay)	-	15 %
Theory exam (mid session)	50 %	-
Coal exercises	20 %	

Knowledge and understanding will be tested through the reports, assignments and exam. The theory exam will be based on the lecture material plus key articles indicated in this manual and provided on Moodle.

The **theory exam for the geology component of MINE2810** will be 1 hour and include ore deposits and coal geology. It is scheduled for Week 7.

There is no exam for GEOS3141.

The criteria for assessing the ore suite reports is described below but will be further discussed in the laboratories. Full details of each assessment and marking criteria will be provided in class or on Moodle. Where group work is permitted, students should ensure that they make a significant contribution to the group.

Feedback on all assessments will be provided 2 weeks after submission, through marks and comments on Moodle

Marking Criteria:

Component	***Pass / Credit***	***Distinction +***
Laboratories	Demonstrate basic observational skills applied to samples. Adequate presentation of results. Basic data interpretation and the drawing of conclusions from results. Use of clear technical English in reports.	Demonstrate a high level of observational skills applied to samples. Superior skills in presentation of results. Detailed interpretation of results drawing out most of the key features of the data as they relate to the problems posed. Use of literature to assist in interpretation of observations, including a number of journal articles. Use of clear technical English in reports.
Essay *GEOS3141 only*	Review of a sufficient number of references of direct relevance to the topic selected, but with minimal reference to high level sources (e.g. journal articles). Drawing some key observations, principals, theories and issues from the literature. Basic integration of material drawn from the literature and subsequent presentation in the essay. Summarizing key conclusions within the literature reviewed. Use of clear technical English and effective structure.	Review of more than the minimum required amount of literature, including use of scientific papers, books and other high level sources of direct relevance to the topic selected. Comprehensive coverage of observations, principals, theories and issues drawn from the literature. Advanced level of integration and synthesis of material from the literature and presentation in the essay. Critical evaluation and synthesis of the material presented in the literature. Use of clear technical English and effective structure with demonstration of higher level communication skills.
Seminar *GEOS3141 only*	Some demonstration of capacity to generate own slides, with necessary clarity and relevance to topic. Capacity to engage audience with the oral presentation. Good technical content. Correct timing. Ability to answer questions.	Creation of high visual impact slide material. Capacity to enthuse audience with the oral presentation. A high level of technical content. Good balance between components of presentation, introduction, data, and conclusions. Correct timing. Ability to answer questions.

7. ACADEMIC HONESTY AND PLAGIARISM

UNSW policies on avoiding plagiarism must be followed. Students who commit plagiarism, as defined below, risk academic penalties ranging from loss of marks to exclusion from the university.

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

https://student.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

8. H & S OBLIGATIONS

The School of BEES recognises its obligations to provide a safe working environment for all persons involved in School-related activities. To achieve this goal with regards to teaching and learning, the School conforms with the UNSW Health and Safety Policy Statement and related procedures. These documents stipulate that everyone attending a UNSW workplace must ensure their actions do not adversely affect the health and safety of others. This outcome is achieved through the establishment of a documented chain of responsibility and accountability for all persons in the workplace, extending from the Head of School through to the students undertaking courses offered.

As part of this chain of responsibility and accountability, the Course Authority is responsible for ensuring all activities associated with this course are safe. The Course Authority has undertaken detailed risk assessments of all course activities and identified all associated potential hazards. These hazards have been minimised and appropriate steps taken to ensure your health and safety. For each activity, clear written instructions are given and appropriate hazard warnings or risk minimisation procedures included for your protection.

It is the student's responsibility to prepare for all practical work. Students should be familiar with the written procedures scheduled for the practical class and identify all personal protection requirements needed to complete the exercise in a safe manner. Students must comply with all safety instructions given by the Course Authority and/or Laboratory / Field Demonstrator, and observe the Safety Information located outside or within teaching rooms. If you are unsure of any safe operating procedures or written instruction regarding safety, you should seek further information from the Course Authority and/or Laboratory / Field Demonstrator before attempting the task. Failure to comply with safety instructions may be considered as a form of academic misconduct. If the outcome of a student's failure to comply with safety instructions results in personal injury, or endangers the health and safety of others, then the matter may be dealt with by WorkCover as a breach of the Work Health and Safety Act 2011, and the Work Health and Safety Regulation 2011.

CONDITIONS OF ENTRY TO COURSES

To abide with Section 17 (1) (Persons in control of workplaces etc, used by non-employees to ensure health and safety) and Section 19 (Employees at work to take care of others and to co-operate with employer) of the N.S.W. Occupational Health & Safety Act (1983):

1. (a) All persons entering laboratories are required to wear sturdy shoes at all times. **Thongs, sandals and open toed shoes are not acceptable**.
   (b) Sturdy footwear is required on all field excursions and boots are strongly recommended.
2. (a) Safety glasses, masks, gloves, helmets and/or ear muffs must be worn when provided by supervising staff. Students must wear laboratory coats and safety glasses in chemical laboratories.
   (b) Students in second and higher years must be in possession of approved safety goggles and must wear them when within 3 m of anyone hammering rocks.
3. Students with ongoing medical conditions, needing regular medication (e.g. diabetes, asthma, allergies, etc.), are required to inform the field excursion supervisor so that they are aware of your condition, but this information will be strictly confidential to staff members.
4. All students taking field excursions are expected to have had a *Tetanus* injection within the last 10 years. These injections are readily available at the Student Health Centre.
5. (a) The University of New South Wales is a **smoke-free work environment.** Smoking is prohibited on the entire UNSW campus. BEES, the sciences of the outdoors, strongly supports this concept of a healthy, clean-air work environment.
   (b) Alcohol consumption and smoking are not permitted in University vehicles nor in vehicles hired by the University for field excursions.

ENTRY TO SCHOOL BUILDINGS, AND ATTENDANCE ON FIELD EXCURSIONS, WILL BE DENIED TO STUDENTS WHO DO NOT ABIDE BY THESE CONDITIONS.

Prof Alistair Poore, Head of School

9. Ore Deposit Suites and Laboratory Reports

The laboratories will focus on a suit of world-class mineral deposits. Literature on each deposit is available on Moodle and in the UNSW laboratory. Apart from the formal lab session times, you may make use of the laboratory when not being used for other classes.

Do not remove any of the rocks or sections from the laboratory.

GEOS3141

General examination of the ore suites

1. Examine the specimen sets from **all** the deposits listed below and complete a **summary sheet for ten of the deposits**, representing **at least five** deposit types.
2. For each deposit suite you are required to study the hand specimens provided, including the thin and polished sections where available.
3. At least one paper on the deposits examined should be read.
4. Feel free to work in small groups **in the lab** but the **summary sheets must be written individually**.

Detailed examination and report on one of the ore suites

5. Select **one** of the deposits and, in addition to the summary page, write a brief technical report describing the form of the deposit and its host rocks and outlining current understanding of the deposit genesis.
6. The length of this report should be 1,500–1,700 words and include a detailed analysis of the samples and deposit descriptions. The headings used in the summary sheet provide a good basis for the headings you should use in your report but do not need to be adhered to strictly.
7. Many features of the deposit and your account of deposit genesis will need to be summarised from the literature. When using information obtained from the provided literature be careful not to plagiarise. Rephrase text into your own words. Do not copy text verbatim. Reference correctly
8. Feel free to work in small groups **in the lab** but the **reports must be written individually**. If you have worked with other student then quote your partner(s)' name(s) in the report heading.
9. The reports are due as per the schedule on page 2 of the Manual.

MINE2810

General examination of the ore suites

1. Examine **five** specimen sets, each from different deposit *types* and complete a **summary sheet for those five deposits**.
2. For each deposit suite you are required to study the hand specimens provided. Examination of the thin and polished sections is optional.
3. At least one paper on the deposits examined should be read.
4. Feel free to work in small groups **in the lab** but the **summary sheets must be written individually**.

Detailed examination and report on one of the ore suites

5. Select **one** of the deposits and, in addition to the summary page, write a brief technical report describing the form of the deposit and its host rocks and outlining current understanding of the deposit genesis.
6. The length of this report should be 800–1,000 words (3 to 4 pages excluding summary sheet and illustrations) The headings used in the summary sheet provide a good basis for the headings you should use in your report but do not need to be adhered to strictly.
7. Many features of the deposit and your account of deposit genesis will need to be summarised from the literature. When using information obtained from the provided literature be careful not to plagiarise. Rephrase text into your own words. Do not copy text verbatim. Reference correctly.
8. Feel free to work in small groups **in the lab** but the **reports must be written individually**. If you have worked with other student then quote your partner(s)' name(s) in the report heading.
9. The reports are due as per the schedule on page 2 of the Manual.

All summary sheets and reports should be submitted as hard copies to the B-S-B Office (G27).

Ore Suite Specimen Sets (selected from)

DEPOSIT TYPE VHMS Sedex	Porphyry / epithermal	Mesothermal Au	Magmatic Ni	Iron Ore	Regolith
Mt. Isa	Bingham	Giddginbung	Sudbury	Middleback Ra.	Lady Annie
Woodlawn	Goonumbla	Lancefield St Ives	Kambalda		Thakaringa
Rosebury	Ok Tedi	Kalgoorlie	Mt. Windarra		
Scuddles	Grasberg	Paddington			
Mt. Lyell	Woodlark				
Lady Loretta					

10. ORE SUITE SPECIMEN SETS (PAPERS)

VHMS / sedex

Mt. Isa	Forrestal, P.J., 1990, Mount Isa and Hilton Silver-Lead-Zinc Deposits.
Woodlawn	McKay, W.J. and Hazeldene, R.K., 1987, Woodlawn Zn-Pb-Cu sulfide deposit, NSW, Australia: An interpretation of ore formation from field observations and metal zoning.
Rosebury	Lees, T., Khin Zaw, Large, R.R. and Huston, D.L., 1990, Rosebery and Hercules Copper-Lead-Zinc Deposits.
Scuddles	Mill, J.H.A., Clifford, B.A., Dudley, R.J. and Roxton, P.A., 1990, Scuddles Zinc-Copper Deposit at Golden Grove.
Mt.Lyell	Corbett, K.D., 2001, New mapping and interpretations of the Mt Lyell Mining District, Tasmania.
Lady Loretta	Hancock, M.C., Purvis, A.H., 1990. Lady Loretta Silver-Lead-Zinc deposit: in Hughes F E (Ed.), Geology of the Mineral Deposits of Australia & Papua New Guinea The AusIMM, Melbourne Mono 14, v1, 943-948
Lady Annie	
General	Kuroda, H., 1993, Geological characteristics and formation environments of the Furutobe and Matsuki Kuroko Deposits, Akita Prefecture, NE Japan.

Porphyry Cu-Au-Mo (+ epithermals)

Bingham	Lanier, G., John, E.C., Swensen, A.J., Reid, J., Bard, C.E., Caddey, S.W. and Wilson, J.C., 1978, General Geology of the Bingham Mine, Bingham Canyon, Utah.
Goonumbla	Heithersay, P.S., O'Neill, W.J., van der Helder, P., Moore, C.R. and Harbno, P.G., 1990, Goonumbla porphyry copper district - Endeavour 26 North, Endeavour 22 and 27 Cu-Zn deposits.
Ok Tedi	Rush, P.M. and Seegers, H.J., 1990, Ok Tedi Copper-Gold Deposits.
Grasberg	MacDonald, G.D. and Arnold, L.C., 1994, Geological and geochemical zoning of the Grasberg Igneous Complex, Irian Jaya, Indonesia. Journal of Geochemical Exploration 50:143-178.
Woodlark	tba
General	Dilles, J.H. and Einaudi, M.T., 1992, Wall-rock alteration and hydrothermal flow paths about the Ann-Mason porphyry copper deposit, Nevada - A 6 km vertical reconstruction.

Mesothermal Au

Gidginbung	Lindhorst, J.W. and Cook, W.G., 1990, Gidginbung Gold-Silver Deposit, Temora. Thompson, J.F.H, Lessman, J. and Thompson, J.B., 1986, The Temora Au-Ag Deposit: A newly recognised style of high sulfur mineralisation in the lower Palaeozoic of Australia.
Lancefield St Ives	Hronsky, J.M.A., Perriam, R.P.A. and Schmulian, ML, 1990, Lancefield Gold Deposit, Laverton.

Kalgoorlie	Clout, J.M.F., Cleghorn, J.H. and Eaton, P.C., 1990, Geology of the Kalgoorlie gold field
	Roberts, D.E. and Elias, M., 1990, Gold Deposits of the Kambalda-St Ives Region.
Paddington	Hancock, M.C., Robertson, I.G. and Booth, G.W., 1990, Paddington Gold Deposits.

Magmatic Ni

Sudbury	Ames, D.E., 2005, Consolidation and synthesis of mineral deposit knowledge.
Kambalda	Cowden, A. and Roberts, D.E., 1990, Komatiite-hosted nickel sulphide deposits, Kambalda
Mt. Windarra	Reddell, C.T. and Schmulian, M.L., 2002, Windarra Nickel Deposits, Laverton
General	Naldrett, A.J., 2002, Requirements for forming giant Ni-Cu sulphide deposits.

Iron Ore

Middleback Ra.	Yeates, G. 1990, Middleback Ranges Iron Ore Deposits.
General	Harmsworth, R.A., Kneeshaw, M., Morris, R.C., Robinson, C.J. and Shrivastava, P.K., 1990, BIF-derived iron ores of the Hamersley Province.

Regolith

Thackaringa	*(Excerpts from*) Cohen, E.J., 2014. Cobalt dispersion in the secondary environment at the Thackaringa cobaltiferous pyrite deposits, Broken Hill, NSW.
Lady Annie	*(Excerpts from)* Davies, O., 2016.

11. REFERENCE LIST:

Ames, D.E., 2005, Consolidation and synthesis of mineral deposit knowledge. Geological Survey of Canada. Web site; gsc.nrcan.gc.ca/mindep/ photolib/vms/whitewater/index_e.php.

Bettles, K. 2002, Overview of geology and exploration history at the Goldstrike porphyry, Carlin Trend, Nevada. In: Cooke DR & Pongratz J (eds), Giant Ore Deposits: Characteristics, Genesis and Exploration, CODES Spec Publ 4:175-188.

Bettles, K., 2002, Carlin-type gold deposits: A summary, 191-193.

Bolton, B.R., Berents, H.W. and Frakes, L.A., 1990, Groote Eyland manganese deposit. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 1575-1579.

Clout, J.M.F., Cleghorn, J.H. and Eaton, P.C., 1990, Geology of the Kalgoorlie gold field In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 411-431.

Cohen, E.J., 2014. Cobalt dispersion in the secondary environment at the Thackaringa cobaltiferous pyrite deposits, Broken Hill, NSW. Hons Thesis, UNSW.

Corbett, K.D., 2001, New mapping and interpretations of the Mt Lyell Mining District, Tasmania. Economic Geology, 96:1089-1122.

Cowden, A. and Roberts, D.E., 1990, Komatiite-hosted nickel sulphide deposits, Kambalda In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 567-581.

Dilles, J.H. and Einaudi, M.T., 1992, Wall-rock alteration and hydrothermal flow paths about the Ann-Mason porphyry copper deposit, Nevada - A 6 km vertical reconstruction. Economic Geology, 87:1963-2001.

Eldridge, C.S., Barton, P.B. and Ohmoto, H., 1983, Mineral textures and their bearing on the formation of the Kuroko orebodies. Economic Geology, Monograph 5, 241-281.

Forrestal, P.J., 1990, Mount Isa and Hilton Silver-Lead-Zinc Deposits. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 927-934.

Hancock, M.C., Robertson, I.G. and Booth, G.W., 1990, Paddington Gold Deposits. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 395-400.

Harmsworth, R.A., Kneeshaw, M., Morris, R.C., Robinson, C.J. and Shrivastava, P.K., 1990, BIF-derived iron ores of the Hamersley Province. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 617-642.

Heithersay, P.S., O'Neill, W.J., van der Helder, P., Moore, C.R. and Harbno, P.G., 1990, Goonumbla porphyry copper district - Endeavour 26 North, Endeavour 22 and 27 Cu-Zn deposits. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 1385-1398.

Hronsky, J.M.A., Perriam, R.P.A. and Schmulian, ML, 1990, Lancefield Gold Deposit, Laverton. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 511-517.

Ilchick, R.P and Barton, M.D., 1997, An amagmatic origin of Carlin-type gold deposits. Economic Geology, 92:269-288.

Kuroda, H., 1993, Geological characteristics and formation environments of the Furutobe and Matsuki Kuroko Deposits, Akita Prefecture, NE Japan. Economic Geology, Monograph 5, 144-169.

Davies, O., 2016. Lady Annie. Hons Thesis, UNSW.

Lanier, G., John, E.C., Swensen, A.J., Reid, J., Bard, C.E., Caddey, S.W. and Wilson, J.C., 1978, General Geology of the Bingham Mine, Bingham Canyon, Utah. Economic Geology, 73:1228-1241.
Lees, T., Khin Zaw, Large, R.R. and Huston, D.L., 1990, Rosebery and Hercules Copper-Lead-Zinc Deposits. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 1241-1247.
Lindhorst, J.W. and Cook, W.G., 1990, Gidginbung Gold-Silver Deposit, Temora. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 1365-1370.
MacDonald, G.D. and Arnold, L.C., 1994, Geological and geochemical zoning of the Grasberg Igneous Complex, Irian Jaya, Indonesia. Journal of Geochemical Exploration, 50:143-178.
McKay, W.J. and Hazeldene, R.K., 1987, Woodlawn Zn-Pb-Cu sulfide deposit, NSW, Australia: An interpretation of ore formation from field observations and metal zoning. Economic Geology, 82:141-164.
Mernagh, T.P., Wyborn, L.A.J. and Jagodzinski, E.A., 1998, Unconformity-related U-Au-PGE deposits AGSO Journal of Australian Geology and Geophysics, 17:197-205.
Mill, J.H.A., Clifford, B.A., Dudley, R.J. and Roxton, P.A., 1990, Scuddles Zinc-Copper Deposit at Golden Grove. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 583-590.
Naldrett, A.J., 2002, Requirements for forming giant Ni-Cu sulphide deposits. In: Cooke DR & Pongratz J (eds), Giant Ore Deposits: Characteristics, Genesis and Exploration, CODES Spec Publ 4, 195–220.
Reddell, C.T. and Schmulian, M.L., 2002, Windarra Nickel Deposits, Laverton In: Cooke DR & Pongratz J (eds), Giant Ore Deposits: Characteristics, Genesis and Exploration, CODES Spec Publ 4, 561-566.
Roberts, D.E. and Elias, M., 1990, Gold Deposits of the Kambalda-St Ives Region. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 479-491.
Rush, P.M. and Seegers, H.J., 1990, Ok Tedi Copper-Gold Deposits. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 1747-1754.
Stenger, D.P., Kelsey, S.E., Peltonen, D. and Tapper, C., 1998, Deposition of gold in Carlin-type deposits: The role of sulfidation and decarbonisation at Twin Creeks, Nevada Economic Geology, 90:301-315.
Thompson, J.F.H, Lessman, J. and Thompson, J.B., 1986, The Temora Au-Ag Deposit: A newly recognised style of high sulfur mineralisation in the lower Palaeozoic of Australia. Economic Geology, 81:732-738.
Yeates, G. 1990, Middleback Ranges Iron Ore Deposits. In: F.E. Hughes (Ed), Geology of the Mineral Deposits of Australia and Papua New Guinea, 1045-1048.