About the University of Ballarat…

The University of Ballarat is a distinctive, dual-sector University in Western Victoria (Australia). In all its activities it strives to be accessible, collaborative, enterprising and rigorous.

Vision: To be a regional University of international standing, highly regarded by the communities we serve.

Mission: To promote the growth and well-being of individuals, organisations and communities in our part of Australia, and beyond, through education, training, research and partnerships.

Who should you know…

Dr Michael Tuck

Mick is our Associate Professor of Mining Engineering, and the program coordinator for the Graduate Diploma of Computing.

Speak with him for academic advice on subject selection, credit transfer requests, leave from studies, special considerations etc.

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Ms Julie Howes

Julie is both the Selection Officer and Student Liaison Officer, for the School of Science, IT and Engineering (SITE).

Speak with her for administrative advice on the application process, enrolment issues etc.

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Course Outlines
1 The Program

Strategic focus of Higher Education Engineering at the University of Ballarat:

Vision: To be a regional centre of engineering expertise valued and highly regarded by the communities we serve.

Mission: To provide knowledgeable and skilled graduates and postgraduates in a range of engineering disciplines appropriate to supporting rural and regional infrastructure. To provide a relatively substantial R&D effort directed towards solving local problems (typically with national and international relevance).

1.1 Program Title

Graduate Diploma of Mining

1.2 Mission Statement: Mining Engineering at the University of Ballarat

The vision of the Mining Engineering Program reflects its close relations to the mining industry and its desire to develop mining related technologies. The program is highly practical and progressive, providing comprehensive state-of-the-art education and training to its undergraduate and postgraduate students. The Mining Engineering Program develops innovative leaders for the Australian and global minerals industry that are highly professional, dedicated, compassionate and with a highly developed awareness of the principles of occupational health and safety and sustainable development.

1.3 Program Descriptor

A flexibly delivered mining engineering program designed to convert other minerals industry professionals into a mining engineer, or to educate minerals industry workers with no previous tertiary education to become mining engineers.

1.4 Entry and Pathways

The minimum requirement for entry to the Program is a degree or diploma in an appropriate discipline from an Australian tertiary institution. Equivalent overseas qualifications may be accepted. A limited number of students with lesser qualifications but substantial industrial experience may also be admitted. The courses that make up this program are also available as short courses. Candidates for admission to the program are eligible to seek advanced standing into the program, in accordance with existing University regulations.

1.5 Credit Points

120 credit points

1.6 Duration

1 year full-time or part-time equivalent.
1.7 Program Overview

This is a vocationally orientated program that provides students with the knowledge and skills that are necessary to obtain employment as an engineer and to be admitted as a Member with the Institution of Engineers, Australia or the Australasian Institute of Mining and Metallurgy. The program also serves as a preparation for further graduate studies in technology, business administration and other areas.

The applied design theme has a distinctive industry focus targeting the mineral industry, as well as service-oriented private professional consultancy.

1.8 Program Objectives

A student who successfully completes the program should be able to demonstrate:

- basic knowledge and skill in analysis;
- a knowledge of mining engineering for the student to gain employment as a mining engineer;
- an ability to analyse and propose solutions to technical problems in accordance with established practices and procedures;
- a high degree of written and oral communication skills;
- computer literacy;
- a capacity to adapt to changing circumstances and master new techniques;
- an aptitude to undertake further learning and study;
- a basic understanding of the operation of the industrial and social environments in which they will function;
- eligibility for admission as a Member of the Institution of Engineers Australia or the Australasian Institute of Mining and Metallurgy; and
- a knowledge of the principal journals and other major information sources relevant to mining engineering, and an ability to comprehend and utilise data from these sources.

1.9 Accreditation Status

The program is not accredited by Engineers Australia or the Australasian Institute of Mining and Metallurgy as it is a postgraduate program.

1.10 Program Delivery

One-year full-time or part-time equivalent on campus, in a block mode form, or off campus in the form of distance education, in the form of study book and accompanying CD Rom. On-line delivery is currently under development.

Program materials are delivered to students in the following formats:

- Face to face delivery in classrooms, tutorials, laboratory's on a one week block mode basis
- Distance education (study book and accompanying CD Rom)
1.11 Student Support

The University has a wide range of student learning support facilities in place as described at www.ballarat.edu.au/current-students/support-services

Foundation Access Studies Program

The University of Ballarat Foundation Access Studies Program allows prospective students to experience university study. FAST aims to give students enough skills and confidence to undertake degree level studies at the University of Ballarat in the following semester.

FAST is specifically designed to enable people returning to study to develop the skills, attitudes and knowledge to confirm their decision about university study. The FAST program will not remove all the difficulties you may face in attempting university study, but it will provide a stimulating and challenging opportunity to test yourself, and possibly find a new direction in life.

The FAST Program is designed to provide alternative entry to tertiary study for people who have a disadvantage as a consequence of:

- Being from a low socio-economic background
- Being from rural or isolated backgrounds
- Being of Aboriginal or Torres Strait Islander descent
- Being women in non-traditional areas
- Being away from non-English speaking backgrounds
- Having a disability

Further details can be found at http://www.ballarat.edu.au/fast

English and Academic Preparation Program (EAP)

These programs prepare students for entry into Higher Education degree programs by enhancing English language and academic enculturation.

While the programs are aimed at preparing students for entry into undergraduate level in approved articulation agreements, there will be some students for whom this program would be useful prior to entry to approved post graduate studies. While the programs are aimed at preparing students for entry into undergraduate level in approved articulation agreements, there will be some students for whom this program would be useful prior to entry to approved post graduate studies.

The short programs are non-award programs and are part of our contractual agreements with articulation partners. Students undertaking this program will be articulating with advanced standing into approved degree program (i.e. programs in management, business, computing, humanities and social sciences etc). The agreements provide for a program of study including English language enhancement, use of English for academic purposes, critical literacy skills, social and cultural orientation, as well as considerable academic preparation so that they can successfully enter their chosen program of study at the year level specified in their articulation agreement or planned enrolment into post graduate study.

It is expected that students undertaking this articulation will grow to become a significant component of the University's on-campus international student cohort.
Objectives

The English and Academic Preparation (EAP) is designed to enable students to:

- actively participate in tertiary study at the University of Ballarat.
- understand the linguistic and cultural factors which underlie academic discourse in English;
- identify cross-cultural similarities and differences in academic discourse
- use relevant theory and skills in the context of academic writing and research;
- gain skills and confidence in participating in multicultural classes

The program allows two entry points, depending on the students assessed need for language and academic preparation.
2 Program Content

2.1 Area of Specialisation

Mining Engineering

2.2 Program Structure

Students must complete eight courses from the prescribed list. The following courses are offered:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Pre-2009 Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENMIN5017</td>
<td>EG 410</td>
<td>Ore Reserve Estimation</td>
</tr>
<tr>
<td>ENMIN5018</td>
<td>EG 411</td>
<td>Surface Mining Operations &amp; Equipment</td>
</tr>
<tr>
<td>ENMIN5019</td>
<td>EG 412</td>
<td>Computer Applications In Mining</td>
</tr>
<tr>
<td>ENMIN5020</td>
<td>EG 413</td>
<td>Mine Safety &amp; Environmental Engineering</td>
</tr>
<tr>
<td>ENMIN5021</td>
<td>EG 414</td>
<td>Mine Surveying</td>
</tr>
<tr>
<td>ENMIN5023</td>
<td>EG 416</td>
<td>Mine Ventilation</td>
</tr>
<tr>
<td>ENMIN5100</td>
<td>EG 401</td>
<td>Mine Power Supply &amp; Drainage</td>
</tr>
<tr>
<td>ENMIN5110</td>
<td>EG 402</td>
<td>Production Drilling &amp; Blasting</td>
</tr>
<tr>
<td>ENMIN5120</td>
<td>EG 403</td>
<td>Tunnelling &amp; Mine Development</td>
</tr>
<tr>
<td>ENMIN5130</td>
<td>EG 404</td>
<td>Underground Production Systems</td>
</tr>
<tr>
<td>ENMIN5140</td>
<td>EG 405</td>
<td>Materials Handling &amp; Hoisting</td>
</tr>
<tr>
<td>ENMIN5150</td>
<td>EG 408</td>
<td>Company Economics &amp; Finance</td>
</tr>
<tr>
<td>ENMIN5160</td>
<td>EG 409</td>
<td>Rock Mechanics Applications</td>
</tr>
<tr>
<td>ENMIN7010</td>
<td>EK821</td>
<td>Mine Planning &amp; Scheduling</td>
</tr>
<tr>
<td>ENMIN7020</td>
<td>EK822</td>
<td>Advanced Mine Ventilation</td>
</tr>
<tr>
<td>ENMIN7030</td>
<td>EK823</td>
<td>Advanced Rock Mechanics</td>
</tr>
<tr>
<td>ENMIN7040</td>
<td>EK824</td>
<td>Advanced Rock Breakage</td>
</tr>
<tr>
<td>ENMIN7050</td>
<td>EK825</td>
<td>Mine Environment Engineering</td>
</tr>
<tr>
<td>SCGEO5101 *</td>
<td>SG 411</td>
<td>Introduction To Earth Science</td>
</tr>
<tr>
<td>SCMET5010 *</td>
<td>SM 401</td>
<td>Mineral Processing</td>
</tr>
</tbody>
</table>

Full course outlines, detailing the objectives, content and assessment are provided in Appendix 1.

All courses are available for study by current University of Ballarat students as electives and by non-University of Ballarat students as single non-award study courses.

*Not offered in 2013
2.3 Advanced Standing/Exemptions

Credit transfer, recognition of prior learning and complementary credit will be given according to the current University Credit Regulations. For this program the maximum number of exemptions permitted will normally be four 15-credit point courses.

2.3.1 Credit Transfer

Studies used as the basis for claims for advanced standing must normally be graduate studies and must not have been used to meet the requirements of another award. They will normally have been completed within a period of five years prior to the date of application for advanced standing.

2.3.2 Recognition of Prior Experience

As well as recognising credit for previous studies the University also has a policy of recognition of prior experience (RPL). Students wishing to discuss possible RPL with the Discipline Coordinator should do so at enrolment.
3 Progress Rules

3.1 Intervention Counselling:

Students that fail a course will be contacted via email and advised to contact their coordinator to seek advice on how to address the issues that contributed to the result.

3.2 Unsatisfactory:

Students who fail in 50% or more of the courses in which they are enrolled in any semester will be regarded as having unsatisfactory progress. Any student who has not passed a course after two attempts will be regarded as having unsatisfactory progress.

3.3 Exclusion / Suspension:

Following unsatisfactory progress, by failing in 50% or more of the courses in which a student is enrolled, in two consecutive semesters, students will be asked to show cause why they should not be excluded from the program. Unless a satisfactory response is received by the School Programs Committee the student may be excluded from the program for a period of up to two years.

Any student who has not passed a course after three attempts may be excluded from the program for a period of up to two years.

3.4 Final Course Supplementary Assessment:

Students who receive an MF grade in a course administered by the School of Science, Information Technology and Engineering in their final Semester may apply to the Coordinator of Programs within 7 days of the publication of results for supplementary assessment if that course is the only outstanding course required to complete the degree. The highest grade attainable will be a Pass grade.

3.5 Term Commendation:

Students that achieve a grade of High Distinction (HD) in at least half of the courses they study in a teaching period, receive nothing less than a Distinction (D) in the remaining courses in that teaching period, and who are enrolled in at least 2 courses of their program in that teaching period, will receive a letter of commendation from their School.

4 Disputes

Any disputes will be resolved according to the regulations of the University of Ballarat. Students should familiarise themselves with the formal dispute resolution procedures for the University. This procedure can be found in the International Handbook for University of Ballarat Students.
Appendix 1

Course Outlines
Course Outline
ENMIN5017 ORE RESERVE ESTIMATION

Title: ORE RESERVE ESTIMATION
Code: ENMIN5017
Formerly: EG410
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG410)
Progress Units: 15
ASCED Code: 030303

Objectives:
This course covers the identification of target minerals, its exploration, sampling methods, methods of estimating tonnage and grades and reporting of resources and reserves. This course also covers the financial evaluation of mining projects.

After successfully completing this course, students should be able to:

Knowledge:
- Understand and be able to identify the target mineral for exploration
- Understand and be able to describe the principles and applications of geophysical and geochemical exploration techniques
- Know the appropriate ways to sample various types of mineral deposits
- Understand the methods of estimating the tonnage and grade of any mineral deposit
- Understand and be able to evaluate a mining project

Skills:
- Be able to identify the target minerals for exploration
- Be able to carry out an estimation of the grade and tonnage of a mineral deposit using classical and geostatistical methods
- Be able to use appropriate statistical and geostatistical tools
- Be able to carry out a simple reconciliation of period production at an operating mine
- Be able to carry out a financial evaluation of a mining project

Values:
- Appreciate the legal and ethical requirements for reporting statements of mineral resources and reserves
- Appreciate the importance of sampling techniques in an mining project
- Experience of the necessity of team work in carrying out an ore reserve/resource information
Course Outline
ENMIN5017 ORE RESERVE ESTIMATION

Content:

Topics may include:

• Identification of target minerals for exploration
• Exploration techniques
• Sampling of mineral deposits
• Methods of estimating and quantifying tonnage and grade
• Grade control and reconciliation of mine production
• Reporting of mineral resources and reserves
• Financial evaluation of mining projects

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be given base data for a mineral deposits. Through a series of exercises students will complete the tasks required to take the project ore reserve estimation from exploration stage to final mining stages</td>
<td>Written submission of solutions/reports to each phase</td>
<td>100%</td>
</tr>
</tbody>
</table>

Adopted Reference Style:

APA

Library Website:

http://www.ballarat.edu.au/generalguide
Course Outline
ENMIN5018 SURFACE MINING OPERATIONS & EQUIPMENT

Title: SURFACE MINING OPERATIONS & EQUIPMENT
Code: ENMIN5018
Formerly: EG411
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG411)
Progress Units: 15
ASCED Code: 030303

Objectives:
To give the participant an overview of the different systems of surface mining that are in use and to describe the construction and application of different mining equipment used in surface operations, also the selection of the correct equipment and methods of assessing productivity.

After successfully completing this course, students should be able to:

Knowledge:
- Have an overview on development, in general, of surface mines
- Have an overview of the mining systems used in surface operations
- Have an overview of the operation and application of the equipment used in surface mining
- Have an overview on the reclamation and land management

Skills:
- Have the ability to select appropriate systems for the various types of mineral deposits in varying conditions
- Have the ability to select the number required and the size of appropriate equipment
- Have the ability to select the number required and the size of appropriate equipment
- Have the ability to carry out land care management plans

Values:
- Appreciate how the geological, petrological and mineralogical nature of a deposit determines the method and manner of extraction
- Appreciate how a surface mine is developed
- Appreciate how the production rate dictates the number and size of materials handling equipment required for the operation.
- Appreciate the reclamation and land rehabilitation
Course Outline
ENMIN5018 SURFACE MINING OPERATIONS & EQUIPMENT

Content:

Mining Systems and Mining Equipment. Topics may include:

- Bench mining
- Strip mining
- Alluvial mining
- Miscellaneous mining systems
- Cyclic methods - face, shovels, hydraulic excavators, wheeled loaders, trucks, drag lines, scrapers etc
- Continuous methods - bucket wheel excavators, continuous surface miners

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning</th>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and study to answer a number of assignment questions to expand knowledge of surface mining systems</td>
<td>Submission of written answers to specified problems</td>
<td>60%</td>
</tr>
<tr>
<td>Students are given a choice of a number of different mining deposits for which they are required to develop and design a mining system for one deposit of their choice</td>
<td>Submission of written Design Project</td>
<td>40%</td>
</tr>
</tbody>
</table>

Adopted Reference Style:

APA

Library Website:

http://www.ballarat.edu.au/generalguide
Title: COMPUTER APPLICATIONS IN MINING

Code: ENMIN5019

Formerly: EG412

School / Division: School of Science, Information Technology and Engineering

Level: Advanced

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: (EG412)

Progress Units: 15

ASCED Code: 030303

Objectives:
Introduce students to the more complex system design tasks, which span disciplines and involve many areas of engineering science.

After successfully completing this course, students should be able to:

Knowledge:
- Acquire and expand on the principles of the design process
- Acquire further skills in the principles of design and engineering analysis
- Relate and integrate environmental, social, organizational, economic and safety aspects in engineering design
- Acquire a flair for original thinking in the engineering design environment
- Identify, where appropriate, issues of sustainable development in engineering practice
- Identify various methods of determining the reliability and safety of an engineering system

Skills:
- Apply a model of the design process to plan and make logical progress with a design project
- Define design objectives and prepare design specification to meet client's requirements
- Use judgement in the selection of appropriate methodologies and techniques to apply to the solution of design problems
- Model and simulate engineering systems and interpret and validate solutions
- Apply knowledge of reliability and safety in engineering designs
- Manage and cost design projects
- Apply safety and environmental principles to engineering design systems

Values:
- Appreciate that while engineering design is a creative process, rigorous analysis is essential in order to achieve a high quality optimal solution
- Recognise the importance of aesthetics in design
- Appreciate the importance of safety, environmental and community considerations in design
- Appreciate that learning is a lifelong process
Course Outline
ENMIN5019 COMPUTER APPLICATIONS IN MINING

Content:
Topics may include:

• Overview of current computer usage in the mining industry
• Introduction to computing systems and equipment
• Evaluation and selection of hardware and software
• Computer applications in mine design, optimisation, planning, scheduling, simulation and project management
• Workshops using selected packages in current usage

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undertaking a number of activities to obtain proficiency in using mine design software.</td>
<td>Submission of selected problems in written or digital form for assessment.</td>
<td>100%</td>
</tr>
</tbody>
</table>

Adopted Reference Style:

APA

Library Website:

http://www.ballarat.edu.au/generalguide
Title: MINE SAFETY & ENVIRONMENTAL ENGINEERING

Code: ENMIN5020

Formerly: EG413

School / Division: School of Science, Information Technology and Engineering

Level: Advanced

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: (EG413)

Progress Units: 15

ASCED Code: 030303

Objectives:
The course is designed to give a basis for understanding the various elements that make up the mine environment, and how to control and regulate it to achieve a safe, healthy and comfortable workplace conducive to performance and efficiency.

After successfully completing this course, students should be able to:

Knowledge:
- Determine the size of the occupational health and safety problem
- Find the specialist definitions of key terms in occupational health and safety
- Appreciate the history of occupational health and safety
- Determine how the legal system deals with occupational health and safety problems
- Examine risk management models
- Understand consultative mechanisms
- Compare and contrast occupational health and safety auditing tools
- Understand the effects of specific hazards on the human body

Skills:
- Build models for the management of occupational health and safety problems
- Tackle health and safety problems at their source
- Use the hierarchy of hazard controls to control hazards
- Apply management system concepts to occupational health and safety case studies
- Develop occupational health and safety policies
- Determine assessment methods for specific hazards
- Prepare a plan for hazard control

Values:
- Appreciate that social problems have an historical and legal context
- Prefer the “safe-place” over the “safe-person” approach to control hazards
- Value workplace consultation
Course Outline
ENMIN5020 MINE SAFETY & ENVIRONMENTAL ENGINEERING

Content:
Topics may include:

- Legislation:
  - general framework;
  - health & safety legislation;
  - mines regulations.

- Occupational Health & Safety:
  - history and philosophy;
  - types of accidents and injuries;
  - hazard management;
  - manual handling;
  - human factors;
  - entry into confined spaces;
  - control strategies.

- Mine Environmental Engineering:
  - atmospheric contaminants and their control (dusts, gases, radiation, heat and humidity, noise);
  - mine illumination.

- Emergency Situations:
  - outbursts and explosions;
  - mine fires;
  - mine rescue.

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Questions</td>
<td>Written report</td>
<td>40 – 50%</td>
</tr>
<tr>
<td>Risk Assessment</td>
<td>Written report</td>
<td>25-30%</td>
</tr>
<tr>
<td>Safe design Project</td>
<td>Written report</td>
<td>25-30%</td>
</tr>
</tbody>
</table>

Adopted Reference Style:

APA

Library Website:

http://www.ballarat.edu.au/generalguide
Course Outline
ENMIN5021 MINE SURVEYING

Title: MINE SURVEYING
Code: ENMIN5021
Formerly: EG414
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG414)
Progress Units: 15
ASCED Code: 030303

Objectives:
This course covers the theory and practice of mine surveying.

After successfully completing this course, students should be able to:

Knowledge:
• To explain the fundamentals of engineering surveying
• To display familiarity with a range of surveying instruments, survey techniques, computational methods used in engineering surveying
• To describe and explain the role of engineering surveying in the development and execution of engineering projects

Skills:
• To be able use a range of modern surveying instruments
• To apply appropriate techniques to collect survey data
• To use appropriate computation techniques to process survey data
• To produce maps, plans and digital data required for the design and construction of engineering projects

Values:
• To recognise the role of engineering surveying in engineering projects
• To recognise the role of engineering surveying in engineering projects
• Appreciate learning as a lifelong process

Content:
Topics may include:
• Basic surveying instrumentation for the measurement of:
  • lengths;
  • angles;
  • differences in elevation
• The survey techniques used in
  • provision of survey control;
  • engineering detail surveys;
  • mine surveying;
  • layout of engineering projects
Course Outline
ENMIN5021 MINE SURVEYING

- The computation and processing methods used in engineering surveying
  - coordinate systems;
  - computer processing;
  - plotting and presentation of data
- The management of the processes of engineering surveying
  - equipment selection;
  - management of surveying personnel;
  - management of survey data and records

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solving a number of calculation problems relating to surveying.</td>
<td>Submission of tutorial problems for assessment.</td>
<td>70%</td>
</tr>
<tr>
<td>Active participation in survey work and use of surveying equipment to undertake a number of exercises.</td>
<td>Submission of report on exercises undertaken.</td>
<td>30%</td>
</tr>
</tbody>
</table>

Adopted Reference Style:
APA

Library Website:
http://www.ballarat.edu.au/generalguide
Course Outline
ENMIN5023 MINE VENTILATION

Title: MINE VENTILATION
Code: ENMIN5023
Formerly: EG416

School / Division: School of Science, Information Technology and Engineering
Level: Advanced

Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG416)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- The objective of the course is to give the student an in-depth treatment of the basic engineering science required for the study of underground environmental engineering and of underground environmental problems, which are experienced in mines. The course will address the range of pollutants, which can occur and investigate the various remedial strategies, which may be employed by the ventilation engineer to provide a safe and economic solution to the problem. Design calculations form an integral part of the course.

Skills:
- Group Problem Solving Classes
- The use of library resources
- The use of library resources

Values:
- Be aware of how the needs for occupational health and can be achieved by ventilation and pollutant control
- Appreciate the distinction between the safe place and the safe person philosophy
- To recognise the need to minimise risk exposure

Content:
Mine Ventilation, Heat and Humidity, Mine Gases, Mine Dusts, Radiation in Mines, Mine Fires and Explosions

Topics may include:
- Incompressible airflow, Turbulent and laminar flow, Mine pollutants
- Mine airway resistance
- Mine fans
- The components of mine ventilation systems, Mine ventilation network analysis
- The principles of mine ventilation planning, Computer aided mine ventilation planning
- Thermodynamic analysis of mine ventilation systems
- Auxiliary ventilation methods
- Controlled recirculation
Course Outline
ENMIN5023 MINE VENTILATION

• Sources of heat and humidity in mines, Strata heat, Other sources of heat
• Psychrometric relationships and processes, Theory of wet bulb thermometer, Summary of psychrometric charts
• Physiological responses, Thermo-regulation of the human body, Physiological heat transfer, Indices of heat stress, Heat illness
• Cold environments
• Acclimatisation
• Cooling strategies, Components and design of mine cooling systems, Air heating
• Calculations
• Classification of mine gases, Gas mixtures, Gas detection and monitoring
• Methane: the properties of methane, The retention and release of methane in coal, Migration of methane, Emission pattern into workings, Methane drainage
• Pathogenicity of mineral dusts, Respirable dusts
• Sources of airborne dust, Generation and dispersion
• Dust prevention in mining operations, dust control on mechanised faces, drivages and transport systems. Extraction and filtration techniques
• Airborne dusts, Standards, sampling and analysis, Personal protective equipment
• Ionising radiation, Types of radiation, Biological effects
• Exposure and maximum permissible dose, Principles of protection
• Natural radioactivity in mines: radium, radon and radon daughters, Radon control and working levels, Methods of monitoring for radiation
• Calculations
• Causes of ignitions, Frictional ignitions, Open fires
• Explosions, Spontaneous combustion
• Stoppings, sealings and pressure balances
• Emergency procedure and disaster management

Learning Tasks & Assessment:

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Adopted Reference Style:

APA

Library Website:

http://www.ballarat.edu.au/generalguide
Course Outline
ENMIN5100 MINE POWER SUPPLY AND DRAINAGE

Title: MINE POWER SUPPLY & DRAINAGE
Code: ENMIN5100
Formerly: EG401
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG401)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Review the principles and practice of mine power supply and distribution
- Give an understanding of the utilisation of electric power
- Current trends and applications of electro-hydraulic systems
- Production, distribution and application of compressed air
- To give an understanding of the nature and occurrence of water encountered in mining situations
- Review methods of dealing with mine water

Skills:
- Have the ability to plan and design power and drainage for a mine

Values:
- Appreciate how appropriate power and drainage contribute to the optimisation of production in the most economical and environmentally responsible manner
# Course Outline

**ENMIN5100 MINE POWER SUPPLY AND DRAINAGE**

## Content:

**Mine Dewatering and Power Supply.**

Topics may include:

- The occurrence of ground water, surface water and mine water
- Quantitative and qualitative measurement of water
- Mine dewatering systems - surface and underground
- Mine water treatment and disposal
- Prevention of inflow and mine flooding
- Electrical
- Compressed air
- Hydraulic
- Hydropower
- Hydropower
- Diesel

## Learning Tasks & Assessment:

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## Adopted Reference Style:

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## Library Website:

Title: PRODUCTION DRILLING & BLASTING

Code: ENMIN5110

Formerly: EG402

School / Division: School of Science, Information Technology and Engineering

Level: Advanced

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: (EG402)

Progress Units: 15

ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Have an overview on development, in general, of mines
- Have an overview of the Drilling and Blasting systems used in mining operations
- Have an overview of the operation and application of the equipment used in mining
- Have an overview on the properties and use of explosives and initiation systems

Skills:
- Have the ability to select appropriate systems for the various types of mineral deposits
  in varying conditions
- Have the ability to select the number required and the size of appropriate equipment
- Have the ability to design a blasting operation to meet a pre-defined production rate

Values:
- Appreciate how the geological, petrological and mineralogical nature of a deposit
determines the method and manner of extraction
- Appreciate how a mine is developed
- Appreciate how the production rate dictates the number and size of equipment
  required for the operation
- Appreciate the environmental effects of blasting
Course Outline  
ENMIN5110 PRODUCTION, DRILLING AND BLASTING

Content:
This course reinforces present knowledge in production drilling and blasting, and examines up-to-date production drilling and blasting methods. Content includes production drilling methods and equipment, bits and drilling accessories, explosive types, explosive properties and characteristics, principles of blasting, initiation systems, small-scale methods of drilling and blasting, large-scale methods and mass blasting, crater blasting systems, controlled blasting techniques, vibrations and air blast, secondary breaking, case studies and costs.

Topics may include:
- Production drilling machines
- Bits and drilling accessories
- Explosive types
- Explosive properties and characteristics
- New explosive products
- Initiation systems
- Small scale drilling and blasting
- Large scale methods and mass blasting
- Crater blasting systems
- Controlled blasting techniques
- Vibrations and air blast
- Secondary breaking
- Case studies and costs

Learning Tasks & Assessment:

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Adopted Reference Style:
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Library Website:
http://www.ballarat.edu.au/generalguide
Course Outline

ENMIN5120 TUNNELLING AND MINE DEVELOPMENT

Title: TUNNELLING & MINE DEVELOPMENT
Code: ENMIN5120
Formerly: EG403
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG403)
Progress Units: 15
ASCED Code: 030303

Objectives:
This course develops an understanding of conventional and mechanised tunnelling methods and their application to mine development. Mine planning, shafts versus declines, conventional tunnelling, jumbo methods, road headers, full face tunnel boring, raising methods, sinking and winzing, ground support, underground layouts, case studies and costs are the main topics covered.

After successfully completing this course, students should be able to:

Knowledge:
• Review the principles and practice of mine development
• Give an understanding of shaft sinking, tunnelling, raising and winzing
• Current trends and applications of mechanical rock cutting systems
• Mine development through difficult ground

Skills:
• Have the ability to plan and design development requirements for a mine

Values:
• Have the ability to plan and design development requirements for a mine
Course Outline
ENMIN5120 TUNNELLING AND MINE DEVELOPMENT

Content:
Topics may include:
- Mine planning
- Shafts versus declines
- Conventional tunnelling
- Jumbo methods
- Road headers
- Full face tunnel boring
- Raising methods
- Sinking and winzing
- Ground support
- Underground layouts
- Case studies and costs

Learning Tasks & Assessment:

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Adopted Reference Style:
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Library Website:
http://www.ballarat.edu.au/generalguide
Title: UNDERGROUND PRODUCTION SYSTEMS

Code: ENMIN5130

Formerly: EG404

School / Division: School of Science, Information Technology and Engineering

Level: Advanced

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: (EG404)

Progress Units: 15

ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:

- Appreciate the significance of the mining industry in the economy
- Understand the difficulties in starting a new mine in Australia
- Know the parameters used in determining which production system should be used
- Describe the effects of dilution on profitability and the relationship between dilution and recovery
- Describe and illustrate all of the common mining methods
- Describe the various loading/transport systems in underground stoping and development
- Understand the resources required for each method including:
  - capital and operating costs;
  - personnel and equipment;
  - development requirements
- Appreciate some of the social, political and environmental issues associated with mining

Skills:

- Appreciate some of the social, political and environmental issues associated with mining
- Solve problems related to profit and ore dilution
- Ability to lay out simple plans and sections of mine development
- Have the skills to determine if a given mineral deposit is likely to be profitable
- Recognize what effects a mining operation may have in regard to social, political and environmental issues

Values:

- Recognise the need for good engineering practice in underground mining operations
- Understand that although there will always be a need for minerals, they must be recovered within a framework of environmental protection
- Understand that although there will always be a need for minerals, they must be recovered within a framework of environmental protection
Course Outline
ENMIN5130 UNDERGROUND PRODUCTION SYSTEMS

Content:
Topics may include:

- Mining and the economy
- Setting up a new mine
- Social, political and environmental issues
- Selecting an underground production system
- Dilution and recovery
- Mining methods
- Mining methods resource requirements

Learning Tasks & Assessment:

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Course Outline
ENMIN5140 MATERIALS HANDLING AND HOISTING

Title: MATERIALS HANDLING & HOISTING
Code: ENMIN5140
Formerly: EG405
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG405)
Progress Units: 15
ASCED Code: 030305

Objectives:
An introduction to the handling of broken rock and mineral products in underground mines. Hoisting, wire ropes, underground rail, trackless mining, pipeline systems, loaders, scrapers, conveyors, continuous mining.

After successfully completing this course, students should be able to:

Knowledge:
- Have an overview on development, in general, of mines
- Have an overview of the mining systems used in mining operations
- Have an overview of the operation and application of the equipment used in mining

Skills:
- Have the ability to select appropriate systems for the various types of mineral deposits in varying conditions
- Have the ability to select the number required and the size of appropriate equipment
- Have the ability to design a mine transport system to meet a pre-defined production rate

Values:
- Appreciate how the geological, petrological and mineralogical nature of a deposit determines the method and manner of extraction
- Appreciate how a mine transport system is developed
- Appreciate how the production rate dictates the number and size of materials handling equipment required for the operation
Course Outline
ENMIN5140 MATERIALS HANDLING AND HOISTING

Content:
Hoisting, Underground Rail, Trackless Mining, Conveyors, Pipeline Systems, Pneumatic Systems. Topics may include:

- **Hoisting:**
  - Hoist types
  - Selection
  - Design features
  - Ropes
  - Head frame and shaft systems

- **Underground Rail:**
  - Advantages of rail
  - Rail system - planning
  - Rail system - layout

- **Trackless Mining:**
  - Criteria for choice
  - Trends in trackless mining plant
  - Selection and application

- **Conveyors:**
  - Design
  - Types
  - Components of Conveyor System
  - Belt Construction
  - Utilisation Underground
  - Developments

- **Pipeline Systems:**
  - Principles of Hydraulic Transportation
  - Practical application
  - Equipment
  - Developments

- **Pneumatic Systems: Electric Motors & Control**
- **Continuous Mining Systems Underground**
- **Bins & Feeders**
- **Development Loaders**
- **Drum Scrapers**

Learning Tasks & Assessment:

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Library Website:

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Course Outline
ENMIN5150 COMPANY ECONOMICS AND FINANCE

Title: COMPANY ECONOMICS & FINANCE
Code: ENMIN5150
Formerly: EG408
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EG408)
Progress Units: 15
ASCED Code: 091901

Objectives:
This course provides an understanding of the corporate economic environment at a mine. Marketing mineral products, abundance, price, credit assessment and financing of mines, feasibility studies, economic optimisation, financial analysis; pit optimisation; cut-off grades; production scheduling; maintenance replacement decisions, taxation, freight, balance sheets and reports, equity and debt financing, true cost of capital, leverage, ratio analysis, project analysis, production economies, cost control systems and reporting.

The course will provide an understanding of the corporate economic environment particularly with regard to - Evaluation of project proposals; Preparing capital applications; Replacing labour with capital equipment; Preparing production plans. The course will also provide the basis for - Completion of production schedules; Optimisation of the cost effectiveness of plant and consumable materials; Setting and achieving performance goals.

Content:
Topics may include:

- Marketing Mineral Products:
  - Abundance of minerals;
  - Price of minerals;
  - Producer organisations and cartels.

- Role of Government:
  - Titles;
  - Royalties;
  - Taxation;
  - Freight.

- Balance Sheet and Annual Reports:
  - Equity and debt financing;
  - The time cost of capital;
  - Leverage;
  - Ratio analysis.
Course Outline
ENMIN5150 COMPANY ECONOMICS AND FINANCE

- Project Analysis:
  - Discounted cash flow method;
  - Monte Carlo simulation.
- Production Economics:
  - Production from orebody extensions at marginal cost;
  - Equipment maintenance and replacement decisions;
  - Optimisation of blasting patterns;
  - The cost of secondary breaking;
  - Cost control systems and reporting.

Learning Tasks & Assessment:

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Adopted Reference Style:

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Library Website:

http://www.ballarat.edu.au/generalguide
Title: ROCK MECHANICS APPLICATIONS

Code: ENMIN5160

Formerly: EG409

School / Division: School of Science, Information Technology and Engineering

Level: Advanced

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: (EG409)

Progress Units: 15

ASCED Code: 030303

Objectives:
Intact rock and rockmass characterisation in relation to surface excavations and underground mining will be investigated through fieldwork examination and laboratory test definition. This is then followed up by design analyses and synthesis by using the processes of physical, numerical and analytical modelling.

After successfully completing this course, students should be able to:

Knowledge:
- To describe and explain the principles involved in theory of elasticity
- To describe the rock as a structural material and to analyse the applicability of classical elasticity principles to rock structures
- To be able to classify rockmass depending on its structural quality, in-situ stress field and groundwater regime
- To be able to study and analyse stress re-distributions due to the excavation processes
- To be able to recommend support systems appropriate to a particular excavation based on different analysis

Skills:
- To be able to design and analyse typical rock structures used in mining
- To be able to select and monitor appropriate support systems; and to refine the design processes
- To be able to utilise the data gathered by monitoring the excavations in refining the design processes
- To be able to predict trouble zone in an excavation in terms of the stress concentrations
- To be able to apply advanced computer aided design techniques to design and analysis of typical rock structures used in mining
- To work effectively, both independently and in teams
- To reflect with insight on personal and group practice

Values:
- To recognise the diversity of factors influencing the design and analysis of typical rock structures used in mining, such as process characteristics, environmental and human factors, legal and economical issues
- To be aware of all responsibilities encompassed by the life cycle of mine excavations
- To be committed to quality, ethical standards, occupational health and safety
- To appreciate learning as a lifelong process
Course Outline
ENMIN5160 ROCK MECHANICS APPLICATIONS

Content:
Topics may include:

- Overview of Theory of Elasticity
- Rock as a structure
- Strength & Deformation of rock
- In-situ stresses
- Methods of Excavation Analysis
- Stresses around excavations
- Stability Evaluation of rock structures
- Evaluation of support requirements

Learning Tasks & Assessment:

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Adopted Reference Style:
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Library Website:
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Course Outline
ENMIN7010 MINE PLANNING AND SCHEDULING

Title: MINE PLANNING & SCHEDULING
Code: ENMIN7010
Formerly: EK821
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EK821)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Appreciate the significance production planning and scheduling in the mining industry;
- Know the parameters used in determining which planning and scheduling system should be used;
- Describe and illustrate all of the common mining planning methods;
- Undertake a variety of planning exercises using modern simulation techniques;
- Appreciate the requirements for continuous system monitoring;
- Appreciate some of the social, political and environmental issues associated with mining.

Skills:
- Able to apply knowledge to select the best mining system for an ore deposit;
- Ability to lay out simple plans and sections of mine development;
- Recognise what effects a mining operation may have in regard to social, political and environmental issues;
- Have the ability to select appropriate excavation processes for various types of mineral deposits in varying conditions;
- Have the ability to select the appropriate safety systems

Values:
- Recognise the need for good engineering practice in underground mining operations;
- Understand that although there will always be a need for minerals, they must be recovered within a framework of environmental protection and safety;
- Improve lifelong learning skills by critical analysis of complex mining problems.
Course Outline
ENMIN7010 MINE PLANNING AND SCHEDULING

Content:
Topics may include:

- Review and evaluation of existing and new developments in underground and surface mining to achieve productivity, whilst ensuring environmental protection, worker safety and reducing costs;
- Design and layout of bulk underground mining techniques;
- Narrow vein mining;
- Stope optimisation;
- Equipment selection, production planning and mining costs;
- Optimisation in open pits;
- 3D ultimate pit limit algorithms and their application;
- Computer aided haul road generation and dump design;
- Heuristic long and short term scheduling techniques;
- Mathematical optimisation for sequencing and scheduling;
- Drill blast, shovel-truck production systems;
- Equipment monitoring;
- Future concepts.

Learning Tasks & Assessment:

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Adopted Reference Style:
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Library Website:
http://www.ballarat.edu.au/generalguide
Course Outline
ENMIN7020 ADVANCED MINE VENTILATION

Title: ADVANCED MINE VENTILATION
Code: ENMIN7020
Formerly: EK822
School / Division: School of Science, Information Technology and Engineering
Level: Introductory
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EK822)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Basic engineering science involved in environmental engineering in underground structures
- Understanding of ventilation and ventilation pollutant control
- Understanding of alternative systems to ventilation to achieve control over ventilation contaminants
- Economic evaluation of alternative ventilation methods in mining
- Ability to undertake detailed engineering calculations related to subsurface environmental engineering

Skills:
- Group Problem Solving Classes
- The use of library resources.
- Computing skills
- Oral and written presentations.

Values:
- Be aware of how the needs for occupational health and can be achieved by ventilation and pollutant control;
- Appreciate the distinction between the safe place and the safe person philosophy;
- To recognise the need to minimise risk exposure.
- Recognise the need for good engineering practice in underground mining operations;
- Understand that although there will always be a need for minerals, they must be recovered within a framework of environmental protection and safety;
- Improve lifelong learning skills by critical analysis of complex mining problems.
Course Outline
ENMIN7020 ADVANCED MINE VENTILATION

Content:
Topics may include:
- Review of elementary mine ventilation
- Review and extension of mine ventilation network analysis
- Optimisation of mine ventilation systems
- Design and planning of Chilled water reticulation systems
- Design and Planning of Mine refrigeration systems
- Ice as a mine coolant
- Methane drainage systems
- Radon and Radon daughter control in mines
- The effects of mine fires on ventilation and the prediction of these events
- Stench analysis

Learning Tasks & Assessment:

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Library Website:
http://www.ballarat.edu.au/generalguide
Title: ADVANCED ROCK MECHANICS
Code: ENMIN7030
Formerly: EK823
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EK823)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- To describe the rock as a structural material and to analyse the applicability of classical elasticity principles to rock structures;
- To be able to classify rockmass depending on its structural quality, in-situ stress field and groundwater regime;
- To be able to study and analyse stress re-distributions due to the excavation processes;
- To be able to recommend support systems appropriate to a particular excavation based on different analysis.

Skills:
- To be able to design and analyse typical rock structures used in mining;
- To be able to select and monitor appropriate support systems; and to refine the design processes;
- To be able to utilise the data gathered by monitoring the excavations in refining the design processes;
- To be able to predict trouble zone in an excavation in terms of the stress concentrations;
- To be able to apply advanced computer aided design techniques to design and analysis of typical rock structures used in mining;
- To work effectively, both independently and in teams;
- To reflect with insight on personal and group practice.

Values:
- To recognise the diversity of factors influencing the design and analysis of typical rock structures used in mining, such as process characteristics, environmental and human factors, legal and economical issues;
- To be aware of all responsibilities encompassed by the life cycle of mine excavations;
- To be committed to quality, ethical standards, occupational health and safety;
- To appreciate learning as a lifelong process.
Course Outline
ENMIN7030 ADVANCED ROCK MECHANICS

Content:

Topics may include:

- Overview of Theory of Elasticity
- Rock as a structure
- Strength & Deformation of rock
- In-situ stresses
- Methods of Excavation Analysis
- Stresses around excavations
- Stability Evaluation of rock structures
- Evaluation of support requirements
- Mine Fill and the design of filling systems
- Rock and cable bolt systems
- Hydraulic yielding roof support systems
- Strengthening of rock
- Design of caving mining systems
- Case studies

Learning Tasks & Assessment:

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Adopted Reference Style:

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Library Website:

http://www.ballarat.edu.au/generalguide
Course Outline
ENMIN7040 ADVANCED ROCK BREAKAGE

Title: ADVANCED ROCK BREAKAGE
Code: ENMIN7040
Formerly: EK824
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EK824)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Understand the various methods of surface and underground excavation in mining;
- Understand the general principles of blasting including the effect of rock properties on blasting;
- Understand the environmental considerations associated with blasting;
- Have an appreciation of underground excavation methods including shaft sinking, tunnelling, raising, etc;
- Understand new techniques and principles of blasting in surface and underground mining operations;
- Understand the principles and techniques of non-explosive rock fragmentation;
- Describe the practices and principles associated with quality rock breakage;
- Understand the need for well designed fragmentation in mining operations.

Skills:
- Apply knowledge gained to determine which type of excavating machine is suitable for a specific task;
- Solve problems on the amount of explosives required to fragment a given volume of rock;
- Perform calculations on rock fragmentation techniques;
- Specify appropriate control measures to minimise environmental and safety problems in rock fragmentation;
- Select the most appropriate methods and practices to achieve quality rock breakage.

Values:
- Recognise the environmental implications in excavation of rock, soil, etc;
- Accept the fact that excavation is essential to maintenance of modern living standards, but that it must be balanced with environmental protection;
- Appreciate the long-term importance of quality rock fragmentation.
Course Outline
ENMIN7040 ADVANCED ROCK BREAKAGE

Content:
Topics may include:
- Excavation Techniques and Equipment
- The need for various excavations in surface and underground construction and mining
- Assessment of ground conditions for selection of equipment and safety
- Selection of most suitable shape and size of excavation and excavation technique
- Minimisation of accidents and various forms of disturbance and pollution during excavation
- PCF technology
- Mechanical rock breakage
- Novel techniques of rock breakage
- Case studies

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial problems to extend understanding and knowledge from formal lectures and presentations</td>
<td>Tutorial problems to extend understanding and knowledge from formal lectures and presentations</td>
<td>50%</td>
</tr>
<tr>
<td>Design Projects</td>
<td>Design Projects</td>
<td>50%</td>
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</tbody>
</table>

Adopted Reference Style:

APA

Library Website:

http://www.ballarat.edu.au/generalguide
Title: MINE ENVIRONMENT ENGINEERING
Code: ENMIN7050
Formerly: EK825
School / Division: School of Science, Information Technology and Engineering
Level: Advanced
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (EK825)
Progress Units: 15
ASCED Code: 030303

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Understand the various mechanisms of environmental impact that mining operations have;
- Understand the general principles and responsibilities enshrined in law of the mining industry to the environment;
- Understand how environmental considerations can be designed into mining operations;
- Be able to describe what is meant by sustainable development;
- Be able to evaluate the economic, social, political and environmental aspects that are essential elements in achieving sustainable development

Skills:
- Be able to integrate environmental principles with engineering practice.

Values:
- Recognise the environmental implications in excavation of rock, soil, etc;
- Accept the fact that excavation is essential to maintenance of modern living standards, but that it must be balanced with environmental protection;
- Value the sustainability ethic in engineering;
- Appreciate that engineer' professional responsibilities to the profession, the workplace, the community and the environment.
Course Outline
ENMIN7050 MINE ENVIRONMENT ENGINEERING

Content:
Topics may include:
- Ecologically sustainable development
- The law, the environment and the workplace
- Engineering ethics.
- The concept of “waste”
- Airborne pollution
- Water and fluid pollution
- Environmental impact and impact analysis
- Contaminated land management
- Environmental impact assessment
- Disposal of mine tailings
- Vibration and fly rock
- Noise
- Methods of minimising environmental impact
- Case studies

Learning Tasks & Assessment:

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<td>Tutorial problems to extend understanding and knowledge from formal lectures and presentations</td>
<td>50%</td>
</tr>
<tr>
<td>Critical analysis of case studies</td>
<td>Critical analysis of case studies</td>
<td>30%</td>
</tr>
<tr>
<td>Design project</td>
<td>Design project</td>
<td>30%</td>
</tr>
</tbody>
</table>

Adopted Reference Style:
APA

Library Website:
http://www.ballarat.edu.au/generallguide
Course Outline
SCGEO5101 INTRODUCTION TO EARTH SCIENCE

Title: INTRODUCTION TO EARTH SCIENCE
Code: SCGEO5101
Formerly: SG411
School / Division: School of Science, Information Technology and Engineering
Level: Introductory
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (SG411)
Progress Units: 15
ASCED Code: 010703

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
- Understand the basic principles of physical geology
- Examine the variety of rocks, minerals and environments that make up our planet

Skills:
- Appreciate geologic variety in time and space

Values:
- Comprehend the interrelatedness of geologic cycles on the planet
- Appreciate the significance of Earth’s dynamic system to humans
Course Outline
SCGEO5101 INTRODUCTION TO EARTH SCIENCE

Content:
Topics may include:
• Structure of the Earth
• Geological time
• The rock cycle and rock-forming minerals
• Igneous, metamorphic and sedimentary rocks
• Fossils and their significance
• Map interpretation and construction
• Plate tectonics and earthquakes
• Environmental geology
• Surfaces processes and weathering

Learning Tasks & Assessment:

<table>
<thead>
<tr>
<th>Learning Task</th>
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<tbody>
<tr>
<td>Practical assignments</td>
<td>Complete structured practical exercises on the major content material</td>
<td>15-25%</td>
</tr>
<tr>
<td>Practical examination</td>
<td>Supervised assessment of the practical components of the course in an open book environment</td>
<td>15-25%</td>
</tr>
<tr>
<td>Field trip report</td>
<td>Complete structures exercises relating to geological observations in the field</td>
<td>10-20%</td>
</tr>
<tr>
<td>Examination</td>
<td>Supervised assessment in the context of a theory examination of all material covered</td>
<td>30-50%</td>
</tr>
</tbody>
</table>

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APA

Library Website:
http://www.ballarat.edu.au/generalguide
Course Outline
SCMET5010 MINERAL PROCESSING

Title: MINERAL PROCESSING
Code: SCMET5010
Formerly: SM401
School / Division: School of Science, Information Technology and Engineering
Level: Introductory
Pre-requisites: Nil
Co-requisites: Nil
Exclusions: (SM401)
Progress Units: 15
ASCED Code: 030305

Objectives:
After successfully completing this course, students should be able to:

Knowledge:
• Describe and explain the fundamentals of mineral processing in areas such as froth flotation, mineral deposit evaluation and industrial mineral processing;
• Describe and explain and determine factors, which are significant to the efficiency measures in mining processing.

Skills:
• Calculate performance criteria for Mineral Separations. Determine sample sizes for mineral products;
• Calculate and determine factors in mathematical models of mineral processing unit operations.

Values:
• Appreciate efficiency measures in mineral separations;
• Appreciate value of models of unit operations;
• Discuss, articulate and argue the merits of unit operations and operating philosophies in mineral plant operation.
Course Outline
SCMET5010 MINERAL PROCESSING

Content:
Topics may include:

• Impact of ore and process mineralogy
• Three product formula calculations and problems (metallurgical balances)
• The influence of smelter schedules and metal prices on plant operating strategies
• Comminution circuits (crushing and grinding) and power utilisation/optimisation
• Sampling in Mineral processing, Gy's formula
• Dense medium and gravity separation
• Coal preparation: washability and breakage
• Ore sorting, magnetic and electrostatic separation
• Flotation theory and practice
• Gold metallurgy

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<tbody>
<tr>
<td>Assignments</td>
<td>Written report</td>
<td>50-60%</td>
</tr>
<tr>
<td>Tutorial problems</td>
<td>Written report</td>
<td>30-40%</td>
</tr>
<tr>
<td>Site report</td>
<td>Written report</td>
<td>0-10%</td>
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