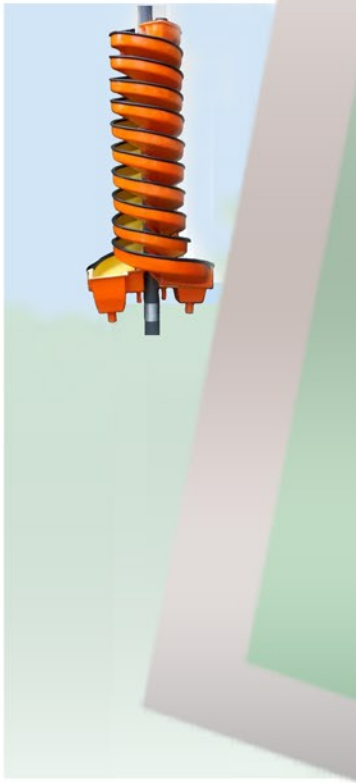
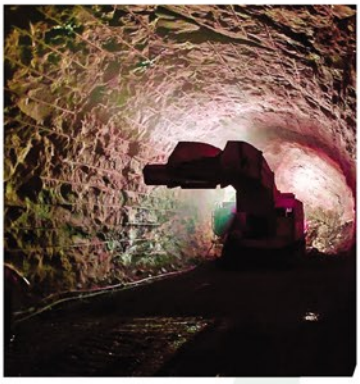
DEPARTMENT OF EARTH RESOURCES ENGINEERING

UNIVERSITY OF MORATUWA





2020

STUDENT HAND BOOK (BATCH 19)

Welcome to the Department of Earth Resources Engineering (ERE)

We invite you to obtain the maximum use of the facilities available for you to achieve your academic goals.

We are sure that you will make the **Department of Earth Resources Engineering,** your **Home Away From Home**!

The handbook includes information on the undergraduate and postgraduate programs conducted by the Department of Earth Resources Engineering, University of Moratuwa. It also provides information on different areas of expertise, as well as resources and facilities available to the students. The handbook helps you to select course modules and projects to fulfill the requirements for your graduation.

We wish you a very much pleasant stay in our department throughout your undergraduate career!

- Head of Department and the staff of ERE

Contents

Message from Head of Department

It is my pleasure to welcome you all to our department, together with my staff.

The Department of Earth Resources Engineering was first established under the link-program between the University of Leeds [U.K] and Katubedda Campus in 1974, when the School of Applied Science at Katubedda was instituted. Since its establishment, the department's name was "Mining & Mineral Engineering" up until year 2000 in which a major curriculum revision was done to match the industrial expectations and to provide wider opportunities for our undergraduates to gain relevant knowledge and experience.

The major curriculum revision done in year 2000 enhanced the student intake up to fifty students per year, introducing three focus areas namely; Remote Sensing & Geographic Systems [RS & GIS], Ocean Resources Engineering, Gem & Jewellery, while the core of the curriculum remaining as Mining & Mineral Engineering. Petroleum Engineering was also added as a focus area into the curriculum later, and hence by now students has a choice of four focus areas in their degree program.

In year 2004, the department secured competitive "IRQUE" grant funded by the World Bank to Improve Relevancy and Quality of Undergraduate Education. Winning of this grant made the Department of Earth Resources Engineering much more resourceful. RS & GIS Laboratory, Ocean Resources Engineering Labs, Gem & Jewellery Lab, and Engineering Design Lab were established under this grant. The department could also purchase a twenty six seat bus which is dedicated to the departmental activities under this grant. In addition, the department also has a Geology Lab, Mine Ventilation Lab, Rock Mechanics Lab, Mineral Processing Lab, Analytical Lab, Atomic Absorption & ICP-MS Lab and also Workshop facilities. All these laboratories are comprised of modern

equipment necessary for practical classes, and also for research work in the relevant fields of specialization.

The Department of Earth Resources Engineering was granted full international accreditation in accordance with the Washington Accord, by the Institution of Engineers Sri Lanka [IESL] after a comprehensive review of the academic program in year 2016, which is a significant benchmark in the history of our department.

The department also has a strong network of industrial contacts, which has already strengthened the future of our undergraduates. The department annually organizes industrial training placements for third year undergraduates, together with the Industrial Training Division of the University of Moratuwa, which provides ample opportunities for our undergraduates to gain the relevant industrial training experience, before their graduation. This six months period of training will mostly help to secure their future employment opportunities as well.

The department also offers opportunities and facilities for graduating students from the department to read for their postgraduate qualifications by research, up to PhD level.

I wish you all the very best on your academic program, and also a very much pleasant stay in our department.

Dr. G.V.I. Samaradivakara

Head – Department of Earth Resources Engineering
University of Moratuwa, Sri Lanka

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Department of Earth Resources Engineering

The history of the Department of Earth Resources Engineering dates back to 1974, when Houldsworth-Katubedda link termed as "Leeds Link" was instituted for the establishment of graduate level education schemes in Sri Lanka. The department was established as a division of the School of Applied Science under the above link with the assistance of Overseas Development Ministry in London. From 1974 to 2000, the department was under the name of "Mining and Minerals Engineering" and offered the degree of Bachelor of the Science of Engineering in Mining and Minerals Engineering. Responding to the challenges created by the expansion of the industrial sector, economic growth and the government policies in the country, the department was restructured in year 2000 and, renamed as "Department of Earth Resources Engineering", enabling accommodating a wider range of disciplines. In keeping with this, the annual student intake was also increased up to fifty.

Currently, the department offers a four-year full-time B.Sc. Engineering Honours Degree Program in Earth Resources Engineering. M.Sc./PG Diploma in Mining and Mineral Exploration, M.Sc., M.Phil. and Ph.D. degree programs by research are also available in collaboration with relevant industries. The Department also offers a diploma course in Gemmology and two part-time courses in Gemmology and Geology at certificate level.

Vision

To achieve excellence in sustainable development of mineral industry in the country for the benefit of the national economy, through creation and dissemination of knowledge.

B.Sc. Engineering Honours Degree Program has been granted Full Accreditation (Washington Accord) by the Institute of Engineers Sri Lanka and it will be initially applicable for the intake years from 2011 to 2020.

Students of the department are exposed to the areas of mineral exploration, mining engineering and mineral processing. Mineral exploration involves the study of geology of ore deposits and exploration using geophysical and geochemical methods, geological mapping, groundwater studies and offshore exploration for minerals.

Mining involves, mine designing, rock drilling and blasting, shaft sinking, tunneling, hoisting, and quarrying in open-pit mining.

Mineral processing involves processing of minerals for metal extraction and refining of minerals for industries.

In year 2004, the department managed to secure a grant funded by the World Bank for the purpose of Improving the Relevance and Quality of Undergraduate Education (IRQUE) as an emerging field of study. Consequently, the department revised and expanded its undergraduate curriculum to offer three minors under the study stream of Earth Resources Engineering. These three minors are Remote Sensing and Geographic Information System (RS & GIS), Ocean Resources Engineering, and Gem & Jewellery.

In 2014, the Department was awarded a grant funded by the Government of Sri Lanka through year 2013 budget proposal for the purpose of introducing Petroleum Engineering into the undergraduate education system. As a result, the main degree program was restructured with Mining and Minerals Engineering stream having four focus areas in RS & GIS, Ocean Resources Engineering, Gem & Jewellery and Petroleum Engineering.

Introduction of modern software in a variety of disciplines such as rock blasting, mine planning and design was done with establishment of a new Computer Engineering Design Laboratory. This helps students in the department to gain more exposure to modern design software and develop skills in modeling. Students those who select the focus area of RS & GIS will be exposed to theory and application in this field, which is a

tool for planning, managing and policy development on natural resources as well as disaster mitigation.

Ocean Resources Engineering focus area exposes the students to exploitation of ocean resources. The Gem & Jewellery focus area covers jewellery design, jewellery production technology and jewellery production management.

The newly introduced Petroleum Engineering focus area covers the areas in petroleum exploration, drilling and production.

The senior academic staff of the Department of Earth Resources Engineering have had specialized training local and overseas in the fields of Extraction Metallurgy, Mineral Processing, Analytical Chemistry, Mining Engineering, Rock Mechanics, Electrochemistry, Geology, Geophysics, Geochemistry, Engineering Geology, Gemmology, Marine Geology, Remote Sensing and GIS, Environmental Engineering and Petroleum Engineering. They are also supported by qualified academic support staff and enthusiastic non-academic staff.

The department consists of a Geology Laboratory, Gemology Laboratory, Mineral Engineering Laboratory, Mine Ventilation Laboratory, Analytical and Environmental Engineering Laboratory, Remote Sensing and GIS Laboratory, Rock Mechanics Laboratory, Computer Laboratory, Ocean Resources Engineering Laboratory, Computer Design Laboratory, Jewellery Design Laboratory and the Workshop. The laboratories are equipped with modern instruments and equipment necessary to conduct undergraduate practical classes as well as research projects.

Mission

To produce competent graduates in the fields of Mineral Exploration, Mining and Mineral Processing to achieve sustainable development in the mineral industry.

To conduct high quality research and provide professional experience to become leaders in the field of Earth Resources Engineering.

The services offered by the department for the industry includes; mine planning and design for quarries and underground mines; designing of rock blasting operations; environmental impact assessments; site investigations; geological and engineering geological mapping; slope stability assessment; geophysical investigation for groundwater, minerals and foundations; resource management using RS and GIS; groundwater studies; natural disaster management; designing of mineral processing plants; heat treatment and processing of precious gem stones; gem identification and valuation; and industrial waste water treatment.

Taking another step forward, the department launched a postgraduate program in 2013, leading to Master of Science / Postgraduate Diploma in Mining & Mineral Exploration in response to the high demand from industry. Further, departmental relationships with local industries and overseas academic institutions are continuously being strengthened for the benefit of undergraduates of the department.

Why Study Earth Resources Engineering?

Earth's resources can be considered as an endowment or a gift to mankind. These resources are basic necessities for survival of mankind, limited, and therefore must be used with care. Earth's resources, a nation is endowed with, often determine its wealth and living conditions together with attitude of its people and, are essential elements in the achievement of economic prosperity and higher living standards. The sustainable development and economic extraction of these resources comprising valuable minerals and petroleum is a challenging endower requiring high professional standards.

With the gradual depletion of near surface mineral resources of the world, exploration and extraction of deeper lying resources is a daunting task requiring the intellectual input of high-caliber professionals in the fields of mineral prospecting, well trained with the adoption of modern RS & GIS techniques, environmental sciences and engineering, mining engineering and industrial management.

Therefore, the objectives of education and research in the department are to produce Earth Resource Engineers on par with international standards, committed to contribute to

the sustainable and environmentally adaptable development of global minerals and energy sources.

With this objective in mind, the department has committed itself for education and research in the sustainable development of mineral resources essential for industries through a multi-disciplinary approach. The degree program provides a holistic education and training in understanding, management and development of the mineral resources. In this context, the degree program provides a sound foundation in mathematics, sciences, and engineering. The undergraduates are exposed to onshore and offshore mineral exploration, mining and mineral processing.

The department prides itself in being the only department in Sri Lankan university system presenting an undergraduate engineering discipline in Mining which produces a large number of mining engineers making a great contribution to the industry locally and internationally.

Department Organization

ACADEMIC STAFF MEMBERS

HEAD OF THE DEPARTMENT

Dr. GVI Samaradivakara

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EMERITUS PROFESSOR

Professor WLW Fernando

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SENIOR PROFESSOR

Professor PGR Dharmaratne

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PROFESSORS

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SENIOR LECTURERS – GRADE I

Dr. DMDOK Dissanayake

B.Sc.Eng.(Hons)(Moratuwa), LLB (Bucks), Dip. in Mgt, PG.Dip(RS & GIS), MSc(Env. Sc.), MBA (CMB), Ph.D.(SNU), C.Eng, MIE(SL), MGISSL, MSLAAS

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Dr. LPS Rohitha

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SENIOR LECTURERS – GRADE II

Dr. CL Jayawardena

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Dr. SP Chaminda

B.Sc.Eng.(Hons)(Moratuwa), M.Eng.(AIT, Thailand), Ph.D.(Tohoku, Japan), AMIE(SL)

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Dr. (Mrs.) ABN Dassanayake

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Final Year Research Project Coordinator |

Student Counsellor

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LECTURERS

Eng. AVP Vijitha

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ACADEMIC SUPPORT STAFF

PROGRAMMER CUM SYSTEMS ANALYST

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ANALYTICAL CHEMIST

Ms. WASM Wickramaarachchi

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NON-ACADEMIC STAFF

TECHNICAL OFFICERS

Ms. PR Dissanayake

Geology and Gemmology Laboratories

Ms. AR Amarasinghe

Ocean Resources Engineering Laboratories

Mr. WWS Perera

Mineral Processing and Rock Mechanics Laboratories

Mr. DMB Wikcramasinghe

Mine Ventilation, Analytical and RS & GIS Laboratories

Mr. GP Priyasad

Computer Laboratories

Mr. LM Dushantha

Engineering Design Laboratory

SENIOR STAFF MANAGEMENT ASSISTANT

Ms. PL Jayadewa

LABORATORY ATTENDANTS/ OTHER ASSISTING STAFF

Mr. SD Sumith

Geology and Gemmology Laboratories

Mr. SSU Silva

Ocean Resources Engineering Laboratory

Mr. WGA Bandara

Office

Mr. NMAB Nawarathne

Design and Computer Laboratories

Mr. PS Gulawita

Analytical and RS & GIS Laboratories

Mr. HMR Bandara

Mineral Processing and Rock Mechanics Laboratories

Mrs. HGC Shyamalie

Mine Ventilation Laboratory

Program Educational Objectives (PEOs)

The Department of Earth Resources Engineering expects to produce graduates, who are:

1. Technically competent in Mining and Mineral Process Engineering/Earth Resources Engineering to become professional engineers leading to successful career advancement.
2. Ethical and responsible to contribute to sustainable development.
3. Effective global citizens ensuring compliance to international standards and capable of fostering competitiveness in the sector adopting best practices.

Program Criteria

What Earth Resources Engineers Do?

Earth Resources Engineers are involved in the widest range of specialties and processes in extracting and processing minerals from the Earth economically and environmentally responsible manner. This process includes exploration of minerals, evaluation of the economics of mineral deposits, development of surface and underground mine, excavation processes of roadways and tunnels, designing ventilation systems, designing blast and excavation sequences, selecting equipment, optimizing productivity and profit, managing personnel, designing plant, ensuring safety and health, monitoring environmental characteristics, mine closure and rehabilitation, processing mineral and metallurgical extraction of material into the end product.

Focus Areas

Ocean Resources Engineering

Ocean Resources Engineering focuses on ocean/ocean floor where sampling, drilling, bathymetric/marine-geophysical surveying, hydrodynamic/sediment-dynamic modelling using marine instrumentation and related software are carried out to sustainably utilize marine mineral resources, resolve coastal engineering problems and mitigate coastal hazards.

Petroleum Engineering

Petroleum Engineering focuses on operations in the upstream petroleum sector where geological, geophysical, drilling, petrophysical, modelling and designing methods are practiced for petroleum exploration, formation evaluation, reservoir engineering and production engineering, etc.

Remote Sensing and Geographic Information System

Remote Sensing and GIS focuses on the collection, storage, management, processing, modelling, analysis and interpretation of spatially referenced data to utilize in natural resources management, environmental, hydrogeological analysis and hazard identification.

Gem and Jewellery

Gem and Jewellery focuses on gemmology, Jewellery products design and development, related production technology, fashioning of gemstone and Management of Jewellery production units.

Program Outcomes (POs)

I. Apply knowledge of mathematics, basic sciences and engineering fundamentals to the analysis of complex engineering problems related to Mining and Mineral Processing Engineering/ Earth Resources Engineering.

II. Identify, formulate, research literature, conduct investigations, and solve complex engineering problems to provide valid conclusions for related areas.

III. Design systems, components, or process that meet specified needs.

IV. Conduct investigation of complex problems using research-based knowledge and research methods.

V. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools to engineering activities.

VI. Assess societal, health, safety, legal, cultural and environmental issues related to professional engineering solutions.

VII. Demonstrate broad knowledge of sustainable development concepts and practices required for dealing with contemporary issues related to professional engineering practices.

VIII. Demonstrate broad knowledge of ethical responsibilities and professional standards.

IX. Demonstrate ability to function effectively as an individual and multidisciplinary and multi-cultural team, with the capacity to be a leader or manger as well as an effective team member.

X. Communicate effective on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and designs, documentation, make effective preparations, and give and issue clear instructions.

XI. Demonstrate broad knowledge of management and business practices, including financial management, risk and change management.

XII. Engage in independent and lifelong learning in the broad context of technological change.

Academic Program

Degree Program

Degree program consists of eight semesters and spreads over a period of four academic years, including industrial training. The industrial training is intended to provide students with an exposure to apply the theoretical knowledge in practice.

The total number of 150 credits* are required to obtain the B.Sc. Engineering Honours Degree in Earth Resources Engineering, and the minimum credit requirement for each semester is given below.

	Credits for GPA***	Non GPA Credits	Total Credits
Semester**1	15	1	16
Semester 2	16	2	18
Semester 3	19.5	2	21.5
Semester 4	21.5	0	21.5
Semester 5	17.5	0	17.5
Industrial Training	0	6	06
Semester 6	7	3	10
Semester 7	19.5	1	20.5
Semester 8	19	1	20
Total	**135**	**16**	**151**

** A Credit is equivalent to one hour of lecture per week per semester or three hours of practical work/tutorials per week per semester.*
*** A Semester generally consists of twenty-two weeks including sixteen weeks of academic work, three weeks for examinations and three weeks of vacation.*
**** GPA stands for Grade Point Average*

Focus Areas

Currently, the Earth Resources Engineering Degree programme offers Mining and Mineral Engineering stream, with four focus areas. The department is planning to develop the Petroleum Engineering focus area into a separate stream in the future.

Students have the option to follow the subjects which make them eligible to take one of the four focus areas. The four focus areas are: (1) Ocean Resources Engineering, (2) Gem & Jewellery, (3) Remote Sensing and Geographic Information System (RS & GIS) and (4) Petroleum Engineering. It is not compulsory to follow a focus area.

The compulsory subject modules to be completed by students who wish to follow a particular focus area.

Focus Area	Module Code	Module Name	Credits
Ocean Resources Engineering	ER1023	Introduction to Oceanography	2.0
	ER2703	Coastal Hydrodynamics	2.5
	ER3942	Oceanography Field Studies	1.0
	ER4433	Marine Surveying	2.0
	ER4290	Petroleum Drilling & Formation Evaluation	2.5
	ER4253	Offshore Mining and Project Design	3.0
Gem & Jewellery	ER2013	Principles of Gemmology	2.5
	ER3713	Jewellery Products Development	3.0
	ER4512	Jewellery Production Technology	3.0
	ER4522	Fashioning of Gem Stones	2.0
	ER4271	Advanced Gemmology	2.5
	ER4532	Jewellery Production Management	3.0
Remote Sensing and Geographic Information System (RS & GIS)	ER2033	Principles of RS & GIS	2.5
	ER3703	Digital Image Processing & Photogrammetry	3.0
	ER4313	GIS & Spatial Statistics	2.5
	ER4243	Natural Disaster Management	2.0
	ER4322	Space Technology & Navigation Systems	2.0
Petroleum Engineering	ER2053	Introduction to Petroleum Engineering	1.5
	ER2703	Coastal Hydrodynamics	2.5
	ER3700	Petroleum Exploration and Basin Analysis	2.5
	ER3942	Oceanography Field Studies	1.0
	ER4290	Petroleum Drilling & Formation Evaluation	2.5
	CH4350	Petroleum Refining & petrochemical Industry	2.0
	ER4350	Petroleum Reservoir Engineering & Project Design	2.5
	ER4460	Petroleum Production	2.0

Curriculum

Curriculum of B.Sc. Engineering Honours Degree Programme

Field of Specialization: Earth Resources Engineering

Stream: Mining and Mineral Engineering

Module Code	Module Name	Category	Lec. hrs/ week	Lab / Assign hrs/weeks	Credits		Norm		Total
					GPA	NGPA	GPA	NGPA	
Semester 1									
CE1022	Fluid Mechanics	**C**	2.0	3/4	2.0				
CS1032	Programming Fundamentals	**C**	2.0	3/1	3.0				
EE1012	Electrical Engineering	**C**	2.0	3/4	2.0				
EL1012	Language Skill Enhancement I	**C**	-	3/1	1.0				
MA1013	Mathematics	**C**	3.0	1/1	3.0				
ME1032	Mechanics	**C**	2.0	3/4	2.0				
MT1022	Properties of Materials	**C**	2.0	3/4	2.0				
MN1012	Engineering in Context	**C**	1.0	-	-	1.0	15.0	1.0	16.0
				Total for Semester 1	15.0	1.0	**15.0**	**1.0**	**16.0**
Semester 2									
DE2XXX	Humanities Elective I *	**C**	2.0	-	2.0				
EL1022	Language Skill Enhancement II	**C**	-	3/1	1.0				
ER1013	Geology	**C**	2.0	3/1	3.0				
ER1023	Introduction to Oceanography	**C**	2.0	-	2.0				
MA1023	Methods of Mathematics	**C**	3.0	1/1	3.0				
ME1812	Basic Thermal Sciences	**C**	2.0	-	2.0				
ME1090	Engineering Drawing & Computer Aided Modeling	**C**	2.0	3/1	3.0				
ER1901	Introduction to Engineering Design & Workshop Technology	**C**	1.0	3/1	-	2.0	16.0	2.0	18.0
ER1703	Analytical Methods	O	1.5	3/2	2.0				
MN1030	Entrepreneurship Skill Development (continuing in Semester 3)	O	0.5	3/2	-	1.0			
				Total for Semester 2	18.0	3.0	**16.0**	**2.0**	**18.0**
Semester 3									
CE1812	Mechanics of Materials	**C**	2.0	-	2.0				
CE2062	Surveying I	**C**	2.0	3/1	3.0				
CS2812	Visual Programming	**C**	1.0	3/1	2.0				
ER2013	Principles of Gemmology	**C**	2.0	3/2	2.5				
ER2023	Principles of Environmental Engineering	**C**	1.5	-	1.5				
ER2033	Principles of RS and GIS	**C**	2.0	3/2	2.5				

Module Code	Module Name	Category	Lec. hrs/ week	Lab / Assign hrs/weeks	Credits		Norm		Total
					GPA	NGPA	GPA	NGPA	
ER2041	Industrial Rock Blasting	**C**	2.0	-	2.0				
MA2013	Differential Equations	**C**	2.0	-	2.0				
MA2023	Calculus	**C**	2.0	-	2.0				
EL2952	Language Skills Enhancement III	**C**	2.0	-	-	2.0	19.5	2.0	21.5
ER2703	Coastal Hydrodynamics	O	2.0	3/2	2.5				
MN1030	Entrepreneurship Skill Development (continued from Semester 2)	O	0.5	3/2	-	1.0			
				Total for Semester 3	22.0	3.0	**19.5**	**2.0**	**21.5**
Semester 4									
CE2142	Surveying II	**C**	2.0	3/1	3.0				
DE2XXX	Humanities Elective II *	**C**	2.0	-	2.0				
ER2053	Introduction to Petroleum Engineering	**C**	1.5	-	1.5				
ER2063	Geochemistry for Mineral Exploration	**C**	2.0	-	2.0				
ER2073	Optical Mineralogy and Petrology	**C**	2.0	3/2	2.5				
ER2083	Mineral Engineering I	**C**	2.0	3/2	2.5				
ER2093	Geophysics for Mineral Exploration	**C**	2.0	-	2.0				
ER2101	Mine Development	**C**	2.0	-	2.0				
MA2033	Linear Algebra	**C**	2.0	-	2.0				
MA3013	Applied Statistics	**C**	2.0	-	2.0		21.5	0.0	21.5
MN2010	Entrepreneurial Leadership	O	1.5	3/2	2.0				
				Total for Semester 4	23.5	0.0	**21.5**	**0.0**	**21.5**
Semester 5									
CE2812	Soil Mechanics	**C**	2.0	3/2	2.5				
ER3013	Extraction Metallurgy	**C**	2.0	-	2.0				
ER3033	Mining Methods	**C**	2.0	-	2.0				
ER3043	Mine Machinery & Design of Mineral Transport Systems	**C**	3.0	-	3.0				
MA3023	Numerical Methods	**C**	2.0	-	2.0				
MN3042	Business Economics and Financial Accounting	**C**	3.0	-	3.0				
MN3052	Industrial Management and Marketing	**C**	2.5	3/2	3.0		17.5	0.0	17.5
ER3703	Digital Image Processing and Photogrammetry	O	2.0	3/1	3.0				
ER3713	Jewellery Products Development	O	2.0	3/1	3.0				
ER3700	Petroleum Exploration and Basin Analysis	O	2.0	3/2	2.5				
MN3010	Multidisciplinary Design, Innovation & Venture Creation	O	1.5	3/2	2.0				
				Total for Semester 5	28.0	0.0	**17.5**	**0.0**	**17.5**

Module Code	Module Name	Category	Lec. hrs/ week	Lab / Assign hrs/weeks	Credits		Norm		Total
					GPA	NGPA	GPA	NGPA	
Industrial Training									
ER3992	Industrial Training	**C**	-	-	-	6.0			
				Total for Industrial Training	0	6.0	**0.0**	**6.0**	**6.0**
Semester 6									
ER3022	Mine Surveying	**C**	1.5	3/2	2.0				
ER3063	Economic Geology	**C**	2.0	-	2.0				
ER3053	Structural & Field Geology	**C**	1.0	3/1	2.0				
ER3202	Design Project**(continued in Semester 7)	**C**	-	-	1.0				
ER3912	Geology Field Camp	**C**	-	-	-	1.0			
ER3922	Mine Surveying Field Camp	**C**	-	-	-	1.0			
ER3933	Mineral Exploration Field Camp	**C**	-	-	-	1.0	7.0	3.0	10.0
ER3903	Industrial Visits	O	-	-	-	1.0			
ER3942	Oceanography Field Studies	O	-	-	-	1.0			
				Total for Semester 6	7.0	5.0	**7.0**	**3**	**10.0**
Semester 7									
ER3202	Design Project (continued from Semester 6)	**C**	-	-	2.0				
ER4013	Rock Mechanics	**C**	2.0	3/2	2.5				
ER4023	Mine Ventilation	**C**	2.0	3/2	2.5				
ER4042	Mineral Engineering II	**C**	3.0	-	3.0				
ER3950	Scientific Writing and Presentation Skills	**C**	-	-	-	1.0			
ER4083	Mine Planning and Design	**C**	2.0	3/2	2.5				
ER4202	Research Project (continuing in Semester 8)	**C**	-	-	1.0				
MN4022	Engineering Economics	**C**	2.0	-	2.0		15.5	1.0	16.5
ER4290	Petroleum Drilling and Formation Evaluation	E	2.0	3/2	2.5				
ER4350	Petroleum Reservoir Engineering & Project Design	E	2.0	3/2	2.5				
ER4223	Hydrogeology and Groundwater Modeling	E	2.5	3/2	3.0				
ER4313	GIS and Spatial Statistics	E	2.0	3/2	2.5				
ER4433	Marine Surveying	E	2.0	-	2.0				
ER4512	Jewellery Production Technology	E	2.0	3/1	3.0				
ER4522	Fashioning of Gemstones	E	1.0	3/1	2.0		4.0	0.0	4.0
MN3020	Entrepreneurship Business Basics	O	2.0	3/1	3.0				
MN4800	Supply Chain Management	O	2.0	-	2.0				
MN4042	Technology Management	O	1.5	3/2	2.0				
				Total for Semester 7	40.0	1.0	**19.5**	**1.0**	**20.5**

Module Code	Module Name	Category	Lec. hrs/ week	Lab / Assign hrs/weeks	Credits		Norm		Total
					GPA	NGPA	GPA		
Semester 8									
ER4033	Engineering Geology	**C**	2.0	3/2	2.5				
ER4073	Mineral Economics	**C**	2.0	-	2.0				
ER4093	Plant Performance	**C**	2.0	-	2.0				
ER4130	Mine Waste Management and Rehabilitation	**C**	2.0	3/2	2.5				
ER4103	Mine Safety and Legislation	**C**	2.0	-	2.0				
MN4900	Professional Ethics	**C**	-	-		1.0			
ER4202	Research Project** (continued from Semester 7)	**C**	-	-	4.0		15.0	1.0	16.0
CH4350	Petroleum Refining and Petrochemical Industry	E	1.5	3/2	2.0				
ER4243	Natural Disaster Management	E	2.0	-	2.0				
ER4253	Offshore Mining & Project Design	E	2.0	3/1	3.0				
ER4460	Petroleum Production	E	2.0	-	2.0				
ER4271	Advanced Gemmology	E	2.0	3/2	2.5				
ER4322	Space Technology and Navigation Systems	E	1.5	3/2	2.0				
ER4532	Jewellery Production Management	E	2.0	3/1	3.0		4.0	0.0	4.0
ER4713	Construction Engineering Practice	O	2.0	-	2.0				
ER4720	Tunnel Engineering and Design	O	2.0	-	2.0				
MA4013	Linear Models and Multivariate Statistics	O	3.0	-	3.0				
MA4023	Operational Research	O	3.0	-	3.0				
MN4010	Business Plan Development	O	1.5	3/2	2.0				
MN4072	Small Business Management and Entrepreneurship	O	1.5	3/2	2.0				
MN4150	Project Management	O	2.0	-	2.0				
				Total for Semester 8	47.5	1.0	**19.0**	**1.0**	**20.0**
Total for the Programme					201.0	20.0	**135.0**	**16.0**	**151.0**

Semester 1

Module Code	**CE1022**	**Title**	**FLUID MECHANICS**			
Credits	**2.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre – requisites**	**-**
GPA/NGPA	**GPA**		**Lab/ Assignments**	**3/4**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Define the properties of fluids and describe the significance of such properties in applications in engineering practice,

Determine hydrostatic forces on submerged surfaces/ bodies and assess the conditions for equilibrium and stability such surfaces/ bodies in applications in engineering practice, and

Apply the concepts of conservation of mass, energy and momentum of fluids and determine the velocities, pressures, flow rates, forces, etc., in applications in engineering practice.

Outline Syllabus

Introduction: Applications of Fluid Mechanics in Engineering Practice, historical development of Fluid Mechanics.

Characteristic/ Properties of Fluids: Characteristics of fluids, Continuum concept, properties of fluids: Density, Specific Weight, Relative Density, Viscosity, Compressibility, Surface Tension, Vapour Pressure

Fluid Statics: Hydrostatic Pressure: governing equation, variation of pressure, piezometric pressure, absolute and gauge pressures, pressure head, measurement of pressure, pressure rating of pipes; Hydrostatic thrust: hydrostatic thrust on plane and curved surfaces, pressure diagram; Buoyancy: Up thrust on submerged bodies, Archimedes principle, Equilibrium and stability of fully submerged and floating bodies, effect of liquid cargo; Relative equilibrium: relative equilibrium of fluids under linear acceleration, forced vortex motion.

Fluids in Motion: Introduction to fluid flow: characteristics of fluid flow, flow classifications, flow visualization; Conservation of mass: continuity equation for incompressible flow, applications; Conservation of energy: Bernoulli's equation, steady flow energy equation, applications; Conservation of momentum: steady flow force-momentum equation, applications

Introduction to Hydraulic machinery: classification of hydraulic machinery, pumps and turbines, operating conditions of pumps.

Assessment scheme

Continuous assessments 20%

Final exam 80%

Semester 1

Module Code	CS1032	Title	PROGRAMMING FUNDAMENTALS			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Device algorithms to solve simple computational problems

Develop programs from algorithms using a high level programming language (e.g., Python)

Develop programs for simple control applications using embedded hardware platforms

Outline Syllabus

Admin matters, Introduction to Computing

Python: Introduction, Operators, Expressions, Selection Control Structures, Loop Control Structures, Lists, Functions

Data Representation

Problem Solving

Computer System & Hardware

Assessment scheme

Continuous assessments 20%

Final exam 80%

Module Code	EE1012	Title	ELECTRICAL ENGINEERING			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/4		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Use correct SI units

Project an overall picture of Electrical Engineering

Perform DC, AC and transient calculations

Analyse complex alternating current circuits and give solutions

Apply different types of meters for electrical measurements

Draw up complete wiring circuit of a household and appreciate the importance of different protection

Course Outline

SI Units, Overview of Electrical Engineering; Basic DC circuit analysis: Circuit elements, circuit laws, circuit solutions; Transient solution of simple RLC circuits

AC Theory: Phasor representation, complex representation, impedance, admittance, complex power and energy, power factor, AC circuit calculations; Electrical Measurement: Moving coil, moving iron and rectifier type meters, bridge methods, power and energy meters, working principles; Electrical Installations: Fuses, MCBs, ELCBs, wires, complete household wiring circuit

Assessment scheme

Continuous assessments 20%

Final exam 80%

Semester 1

<table>
<tr><td>Module Code</td><td>EL1012</td><td>Title</td><td colspan="4">LANGUAGE SKILLS ENHANCEMNT I</td></tr>
<tr><td>Credits</td><td>1.0</td><td rowspan="2">Hours/ Week</td><td>Lectures</td><td>-</td><td rowspan="2">Pre-requisites</td><td rowspan="2">-</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Tutorials</td><td>3/1</td></tr>
<tr><td colspan="7">Learning Outcomes
Upon successful completion of this module, the student will be able to:
Demonstrate an understanding of information, opinions and arguments presented in written or oral forms and to engage critically with the ideas thus presented,
Adapt material prepared in one form for presentation in another — e.g. (from a reading text to a presentation/assignment),
Communicate technical (i.e. Engineering/IT/Architecture) information effectively in the academic setting in different modes: written, oral, audio-visual and graphic following internationally accepted conventions,
Communicate effectively with non-specialist audiences in tasks related to his/her area of specialisation.</td></tr>
<tr><td colspan="7">Course Outline
Communication - Preparation for academic study
• Get Acquainted
• Academic Writing
• Fact and Theory
Systems - Description and definition
• Description and Definition
• Static Descriptions
• Building Academic Vocabulary
Organisation - Classification
• Classification
• Flow Charts
• Sign-post Language
Change - Process writing
• Cause and Effect
• Different Types of Processes
• Linear Processes
Education - Comparison and contrast
• Language of Opinion
• Similarities and Differences
• Predicting</td></tr>
<tr><td colspan="7">Assessment scheme
Continuous assessments 20%
Final exam 80%</td></tr>
</table>

Semester 1

Module Code	MA1013	Title	MATHEMATICS			
Credits	3.0	Hours/ Week	Lectures	3.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	1/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Use discrete mathematical structures such as Logic and Set Theory in applications.
Use algebraic structures such as Real Numbers, Vectors and Matrices in applications.
Apply the basic concepts of limits, differentiation and integration in engineering applications.

Course Outline

Logic and Set Theory

Propositions, truth tables, symbolic statements, conditional connectives, quantifiers;
Techniques of proof: Direct, contradiction, induction, pigeon-hole principle;
Sets, cardinality, Cartesian product, ordered pairs;
Relations, functions, Boolean algebra: Disjunctive and conjunctive normal forms, logic gates, Karnaugh maps, minimization and applications.

Real Analysis

Real number system, supremum and infimum, completeness axiom
Basic functions: Polynomial, exponential, trigonometric, hyperbolic and their inverses.
Limit of a function, continuity, differentiability, derivatives,
Rolle's theorem, mean value theorem, L' Hospital's rule;
Sequences and series of real numbers.
Tests for convergence of sequences and series.

Vectors, and Matrices

Vector algebra, vector product, scalar product, scalar triple product, vector triple product, Equations of lines and planes;
Matrix operations, transpose, adjoint and inverse of a matrix, echelon forms, rank, determinants.
Systems of linear equations

Assessment scheme

Continuous assessments	20%
Final exam	80%

Semester 1

<table>
<tr><td>Module Code</td><td>ME1032</td><td>Title</td><td colspan="4">MECHANICS</td></tr>
<tr><td>Credits</td><td>2.0</td><td rowspan="2">Hours/ Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">-</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Tutorials</td><td>3/4</td></tr>
<tr><td colspan="7">Learning Outcomes
Upon successful completion of this module, the student will be able to:
Calculate sectional properties of plane areas,
Calculate internal forces in beams,
Identify statically determinate / indeterminate trusses, their stability and determine forces in truss members,
After completing this part (Dynamics) of the module, the students should be able to
Determine the geometry of planar motion of particles and rigid bodies,
Analyse geometry of motion of kinematic elements in 2D link mechanisms,
Analyse the forces in particles and rigid bodies in motion,
Estimate energy associated in particle and rigid body motion,
Analyse natural vibrations of damped, single degree of freedom systems,
Model systems and solve basic problems in dynamics.</td></tr>
<tr><td colspan="7">Course Outline
Statics
¶ Properties of Plane Areas
¶ Internal Forces (BMD & SFD)
¶ Principle of Superposition
¶ Determination of Forces in Assemblies of Rigid Bodies
Dynamics
Fundamentals of dynamics
¶ Kinematics of particles (rectilinear and curvilinear motion, relative motion, general motion in 2D) and rigid bodies (relative motion between two points in a rigid body, velocities in 2D link mechanisms, instantaneous centre of rotation method, introduction to acceleration)
¶ Kinetics of particles and rigid bodies (force, torque, work, energy and power, linear momentum, angular momentum)
Mechanical vibrations
¶ Free vibrations (undamped and damped) of single degree of freedom systems.</td></tr>
<tr><td colspan="7">Assessment scheme
Continuous assessments 20%
Final exam 80%</td></tr>
</table>

Semester 1

Module Code	MT1022	Title	PROPERTIES OF MATERIALS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/4		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Recognize the structure of metals, polymers and ceramics
Identify the relationships between the structure of materials and their properties
Assess the properties of engineering materials

Course Outline

- ¶ Introduction to engineering materials
- ¶ Structure of atoms, atomic theories, atomic bonding in materials
- ¶ Crystal structures and defects
- ¶ Mechanical properties of materials
- ¶ Chemical properties of materials
- ¶ Electrical properties of materials
- ¶ Introduction to nanomaterials
- ¶ Radioactivity and nuclear properties

Assessment scheme

Continuous assessments 20%
Final exam 80%

Module Code	MN1012	Title	ENGINEERING IN CONTEXT			
Credits	1.0	Hours/ Week	Lectures	1.0	Pre - requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Recognize the scientific and social contexts in engineering profession.
Identify the basic ingredients of professionalism in engineering.
Explain the importance of economic, risk and safety issues for the engineering decisions.
Describe the basic professional skills, ethics and concepts required for an engineer in industrial society.

Course Outline

What is engineering and its relevance to society. Historical development of engineering and Sri Lankan engineering heritage (old and recent)
Economic, risk and safety issues in engineering. Roles and responsibilities of a professional engineer in society and industry.
Interaction of engineering with natural and built environment; Engineering solutions for environmental problems.
Sustainable engineering design, learning from failures
Skills of engineer in industrial environment (management, teamwork, communication)

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 2

Module Code	EL1022	Title	LANGUAGE SKILLS ENHANCEMNT II			
Credits	1.0	Hours/ Week	Lectures	-	Pre - requisites	EL1012
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Demonstrate understanding and express ideas, opinions, arguments in written and oral forms and to engage critically with ideas.
Synthesise and summarise information from different sources.
Use different academic discourse structures to develop arguments.
Communicate technical (i.e. Engineering/IT/Architecture) information effectively in the academic setting in different modes: written, oral, audio-visual and graphic, following internationally accepted conventions.

Course Outline

Aptitude — Connecting ideas: Structure of a Text, Linking Ideas, Conclusions
Analysis — Fact and opinion: Fact and Opinion, Citations and Referencing, Interviews and Discussions
Persuasion — developing an argument: Persuasion, Argument, Evaluation
Autonomy — Summarising: Summarising, Note taking, Spoken punctuation
Technology — Evaluation: Problem Solution Texts, Evaluation — Problem /Solutions, Analysis and Evaluation

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER1013	Title	GEOLOGY			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain the basic concepts in geology

Course Outline

General geology – Origin of the Earth, interior structure of the Earth, rock cycle
Physical geology – Endogenic and exogenic processes of the earth
Deformational features of rocks – Foliation, fold, fault, joints and unconformities
Crystallography – External characteristics, symmetry, and crystallographic systems
Mineralogy – Classification and identification of minerals using physical properties

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 2

Module Code	ER1023	Title	INTRODUCTION TO OCEANOGRAPHY			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student should be able to:

Apply the plate tectonics theory to the origin, evolution, and features of ocean basins.

Classify and analyze the stratigraphy of ocean floor rocks and sediment.

Demonstrate and explain the unique properties of water and their application to the oceans.

Evaluate the effects of temperature, pressure, and salinity on the density and the layering of the oceans.

Analyze and assess the origin and effects of waves.

Integrate and evaluate the general circulation of the atmosphere and oceans.

Analyze and evaluate the interactions and effects of the biological, physical, and chemical components of the oceans.

Course Outline

Origin of ocean basins.

The physiography of the ocean floor.

Marine sedimentation.

The Properties of Seawater --Composition of sea water, Salinity, principle of constant proportion, andsalinometers.

Structure of the Oceans--Sea surface temperature (SST), thermocline, halocline, density, pycnocline, gases in seawater, chemical techniques, Light penetration and the speed of sound in sea water.

The Ocean's Resources --Mineral Resources, Living Resources, and Mariculture.

The human presence in the ocean--pollution, hydrocarbons in the sea, municipal and industrial effluents, Introduction to ocean dredging and mining, Over fishing, Climate change and The ocean's future.

Marine Productivity--Global patterns of productivity, Biological productivity of upwelling water and El Niño.

Waves in the Ocean --Properties of ocean waves, progressive waves, Wave motions, Wave steepness, Tsunami and Storm surges. Wave property related equations.

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 2

Module Code	MA1023	Title	METHODS OF MATHEMATICS			
Credits	3.0	Hours/ Week	Lectures	3.0	Pre - requisites	MA1013
GPA/NGPA	GPA		Lab/Tutorial	1/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Understand the basic concepts of Numerical Methods.
Able to solve Ordinary Differential Equations.
Acquire the concepts of Multivariate Function and Calculus.
Acquire the concepts of Distributions for Statistical Applications.

Course Outline

Numerical Methods

Approximations by Taylor Series, Numerical Solution of System of Linear Equations: Non Iterative Methods: Gauss Elimination, LU Factorization; Iterative Methods: Gauss-Seidel and Jacobi Methods; Solution of Non-linear Equations: Bisection, Simple Iterative, Newton-Rapson; Polynomial Approximation of Functions: Lagrange Polynomials, Newton's Divided Differences, Least Square Polynomial and Functions, Finite Differences, Interpolation and Extrapolation, Numerical Differentiation, Numerical Integration: Trapezoidal, Simpson's Rules, Numerical Solution of Ordinary Differential Equations: Euler's Method, Taylor Series Method.

Ordinary Differential Equations

Orthogonal Trajectories, Isoclines, First Order Ordinary Differential Equations; Variable Separable, Homogeneous, Linear and Exact; Reducible Forms, Second Order Ordinary Differential Equations, Reducible Forms.

Multivariate Calculus

Multivariable Functions, Partial Differentiation, Chain Rule, Change of Variables and Jacobians, Directional Derivatives, Maxima and Minima, Lagrange Multipliers, Taylor Series Expansion, Double Integral, Triple Integral, Geodesics, Vector Functions, Introduction to Vector Calculus.

Statistics

Discrete and Continuous Random Variables, Joint Distribution Functions, Introduction of Common Distributions and their application: Binomial, Poisson, Normal and Exponential. Measures of Central Tendency. Measures of Dispersion. Moments. Skewness. Kurtosis. Association between random variables: Pearson Correlation Coefficient, Rank Correlation Coefficient, Introduction of Bi-Varaite and Multivariate Distributions:

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 2

Module Code	ME1812	Title	BASIC THERMAL SCIENCES			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Describe the basic concepts of thermodynamics and identify associated engineering problems.

Use thermodynamic property tables.

Apply fundamental laws to solve simplified thermal system derived from real world applications.

Apply basic concepts of heat transfer to engineering problems.

Estimate basic requirements related to thermodynamic cycles and their application.

Course Outline

Introduction [2 hours]

Historical Development, thermodynamics concepts and terminology, units and conversions

Basic principles [4 hours]

Forms of energy and their transformations, heat and work as methods of energy transfer, the statistical nature of thermodynamics, types of systems.

Fundamental laws of thermodynamics [8 hours]

First law of thermodynamics, first law with reference to principal system types, internal energy as a consequence of the first law, second law of thermodynamics, entropy as a consequence of the second law

Thermodynamic processes [2 hrs]

Basic types of processes, processes as transition of thermodynamic states, property diagrams, reversible and irreversible processes, cyclic processes

Heat Transfer [3 hrs]

Mechanisms of heat transfer, heat transfer applications in engineering

Psychrometrics [3 hrs]

Thermodynamic properties in psychrometrics, Use of psychrometric Charts estimate properties

Power Cycles [4 hrs]

Heat engines and heat pumps. Idealised gas & vapour power cycles and performance indices, basic estimations

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 2

Module Code	ME1090	Title	ENGINEERING DRAWING & COMPUTER AIDED MODELING			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Draw the orthographic projections of a given mechanical part or assembly
Memorize graphical construction techniques in engineering graphics
Draw orthographic projections on a CAD package
Develop 3D models using a CAD package so as to be able to carry out engineering graphics on the CAD system
Describe the principles of parametric solid modeling with CAD packages
Use a CAD package to generate orthographic views of a 3D model

Course Outline

The concepts in Engineering Drawing will be taught using both manual draughting techniques and computer aided draughting

Engineering Drawing

Orthographic projection methods:First angle projection, third angle projection
Orthographic views: Orthographic views of objects from given pictorial views, third view from two orthographic views, sectional views, orthographic views of an assembled object
Orthographic views of an assembly of a set of given components
Loci: Construction of Cycloids, Involutes, Helices

Lines and Planes: Graphical estimations of true lengths, inclinations, traces, auxiliary projection methods and true shapes of sections

Interpenetration Curves: Construction of interpenetration curves of cylinder, cone, sphere, pyramid, etc.

Developments: Construction of developments of prism, cylinder, cone, pyramid and developments by the method of triangulation

Isometric view: Drawing isometric views with an isometric scale

Computer-Aided Modeling

Draw orthographic projections using a CAD packages
Introduction to 3-dimentional modeling on a CAD packages
Carry out engineering graphics on the CAD system
Introduction to parametric 3-dimentional modeling using Pro-Engineer/SolidWorks
Generate orthographic projections from the solid model

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 2

Module Code	ER1901	Title	INTRODUCTION TO ENGINEERING DESIGN AND WORKSHOP TECHNOLOGY			
Credits	2.0	Hours/ Week	Lectures	1.0	Pre-requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain basic engineering design concepts, Simulate the dynamics of a small design group, Apply the knowledge gained to a design project resulting in a working prototype

Course Outline

Introduction to Engineering Design

Design Principles

Introduction to Engineering Design, life cycles of engineering products and processes, design processes and design tools, concurrent engineering, creativity and reasoning, analysis and synthesis, simulation, evaluation and decision making

Case Studies

Several simple but comprehensive design case studies selected from different disciplines of engineering addressing the topics ;

Design for manufacturing ,Mechanical and material aspects in design, Electrical, Electronic and IT aspects in design

Design Assignments

Group based design projects will include;

gathering of data and information from various sources as a preliminary to the design preparing a work plan and delegating duties, working with others and to produce results by given deadlines and within given costs, learning the basic procedures required for conceptual, preliminary and detailed designs, learning the importance of the cost component in the manufacturing process, preparing a report and making a presentation of the design, demonstrating the working of the prototype

Workshop Practice

Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise &tennon joints. 4. Simple exercise on woodworking lathe.

Fitting Bench Working Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises base on black smithy operations such as upsetting, drawing down, punching, bending, fullering& swaging.

Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

Machine Shop: 1. Study of machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading 6. Single point cutting tool grinding.

Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

Assessment Scheme

Continuous assessments 60%

Final exam 40%

Semester 2

Module Code	ER1703	Title	ANALYTICAL METHODS			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Apply simple statistics and error analysis to determine the reliability of analytical chemical measurements and data

Prepare rock and water sampling plan for mining and environment industry

Compare usability of gravimetric analysis, volumetric analysis and instrumental analysis to analyze rock sample according to the scope of the analysis

Course Outline

Introduction to analytical methods

General Laboratory techniques

Preparing mineral/ore/rocks/sediments/water samples for analytical work

Preparing samples powder/solutions for instrumental, gravimetric and volumetric analysis

Gravimetric and volumetric analysis

Instrumental analysis

Theory and use of Atomic Absorption Spectrophotometer (AAS) , Inductive Couple Plasma(ICP),

Micro probe, scanning Electron microscope, XRF and X-Ray diffraction, UV and IR spectrophotometers, Flame photometer, Gas chromatography and Mass Spectrometry.

Nuclear Techniques

Neutron Activation Analysis (NAA), Alpha, beta and gamma ray counters, Identification of radio isotopes

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 2

Module Code	MN1030	Title	ENTREPRENEURSHIP SKILL DEVELOPMENT			
Credits	2.0	Hours/ Week	Lectures	0.5	Pre-requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Apply their business and entrepreneurial knowledge and skills to education, career and service pursuits

Recognize the significance of personal responsibility and financial literacy in making positive life decisions

Course Outline

Discuss leadership position, business idea, company name, vision and mission, establish company values, company capitalization process.

Working as a company, students conduct officer elections and learn about each department's specific responsibilities during the operation and liquidation phases.

Students use tools such as market surveys and cost-benefit analysis to determine potential products for their target market and develop initial business plan.

Students host Board of Directors meeting to approve the company's Business Plan, review implementation strategies and accept the company Charter, sell shares.

Materials needed for production are ordered and the company business plan is implemented.

Learn about specific sales techniques during selling of their product/service.

Students hold department meetings to share best practices and propose changes to current company operations.

Begin to finalize production, access excess inventory, and prepare for the Board of Directors liquidation meeting.

Students explore steps and learn how to apply what they have learned as a company to personal entrepreneurial pursuits.

Final Board of Directors liquidation meeting and approve the Annual Report.

Assessment scheme

Continuous assessments 70 %

Final exam 30 %

Module Code	CE1812	Title	MECHANICS OF MATERIALS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	ME1032
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Compute the stresses, strains and deformations due to applied forces in beams

Course Outline

Bending stress in beams, Transverse shear stresses, Analysis of stress and strain, Deflection of beams

Assessment scheme

Continuous assessments 30%

Final exam 70%

SEMESTER 3

Module Code	**CE2062**	**Title**	**SURVEYING I**			
Credits	**3.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre – requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**3/1**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Understand the use of survey measurements in civil engineering.
Use chain, level and theodolite in the field for survey measurements.
Produce hand-drawn survey plans and LS/CS drawings.

Course Outline

Introduction to Land Surveying: Classification of surveying; principles of surveying; methods of surveying; true bearing and magnetic bearing; linear and angular measurements; scale and maps; errors in measurements; coordinates on the Earth's surface.

Linear Measurements and Chain Surveying: Chain, tape and accessory instruments; survey stations and lines; offsets, field procedure; booking procedure; plotting; errors and corrections.

Levelling and Contouring: Levels; leveling staff; reduced level and level differences; rise and fall; height of collimation; booking procedures; fly-back; longitudinal and cross-sections; errors and corrections; curvature and refraction; contours and contouring.

Theodolite Surveying: Vernier and Glass-circle Theodolites; measurement of horizontal and vertical angles; bearings; methods of traversing; angular and linear errors; correction of coordinates.

Tacheometry: Principles of optical distance measurement; levels and distances using tacheometry.

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 3

Module Code	CS2812	Title	VISUAL PROGRAMMING			
Credits	2.0	Hours/ Week	Lectures	1.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

appreciate the difference between structured and visual programming approaches
develop simple software applications for engineering and other disciplines using a visual programming environment

Course Outline

Introduction to the VB.NET Framework, Objects, Properties, Events & Methods
Variables, Data Types & Controls, Use of Forms and Controls to create User Interfaces
Program Control Flow, String and file manipulation, Arrays
Procedures & Functions, Exception Handling, Basics of OOP
Database Programming, Further topic

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER2013	Title	PRINCIPLES OF GEMMOLOGY			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Operate gemmological equipment properly
Examine & Identify gems using crystal formations and gemmological properties

Course Outline

Introduction:

Essential qualities of gems, origin of gemstones, classification of gem materials, Crystal systems

Determination of Physical and optical properties using:

Hand lens, Polarisecope, Conoscope, Refractometer, Spectroscope, Dichroscope and Microscope

Properties and Methods of identification of following gem materials:

Beryl, Corundum, Crysoberyl, Diamond, Diopside, Feldspar, Jadeite and Nephrite, Natural glass, Opal, Peridot, Quartz, Topaz, Tourmaline, Zircon, Zoisite, and Synthetic gems

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 3

Module Code	ER2023	Title	PRINCIPLES OF ENVIRONMENTAL ENGINEERING			
Credits	1.5	Hours/ Week	Lectures	1.5	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Define the basic concepts of environmental engineering and explain main topics that an environmental engineer deals with.

Identify the nature and scope of environmental pollution; air, water, land impacts; and relate it with environmental engineering

Explain the fundamental ethical considerations on which environmental engineering is based.

Solve basic engineering calculations involving physical, chemical and biological principles.

Course Outline

Environmental measurements and units, Introduction to environmental engineering.

Introduction to various aspects of environmental problems: air pollution, water pollution, noise pollution, solid waste management, ionizing radiation, disease transmission, and food protection.

Introduction to water quality engineering, solid and hazardous waste management, air quality control, engineering issues associated with noise control, fate and transport of contaminants in the environment, and regulatory issues.

Environmental engineering ethics, Environmental legislation, Sustainable development

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER2033	Title	PRINCIPLES OF RS AND GIS			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Understand concept and fundamentals of Remote Sensing (Aerial, Multi spectral, Hyperspectral and Microwave) and its applications

Understand Pre-processing of soft and hard copy images for interpretations

Understand concept and fundamentals of GIS and its applications

Understand concept and fundamentals of GPS and its applications

Course Outline

Fundamentals of Remote Sensing, Electromagnetic energy and remote sensing

Sensors (Multispectral, hyperspectral and thermal sensors), platforms and remote sensing data acquisition systems, Introduction to: Aerial Photogrammetry, Satellite Remote Sensing, Microwave remote sensing, GIS and GPS

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 3

Module Code	**ER2041**	**Title**	**INDUSTRIAL ROCK BLASTING**			
Credits	**2.0**	**Hours/**	**Lectures**	**2.0**	**Pre -**	**-**
GPA/NGPA	**GPA**	**Week**	**Lab/Tutorials**	**-**	**requisites**	

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Design and implement rock blasting systems for surface and underground workings
Execute blasting in an environmental friendly manner
Safe use of explosives

Course Outline

Explosives properties and selection: Chemistry of explosives, Explosive reaction, Mechanics of detonation, Mechanism of rock breakage

Explosive accessories: Detonators, Safety fuse, Detonating cord, NONEL tube.

Initiation systems: Safety fuse, Electric initiation, Detonating cord, NONEL tube, Other methods.

Blasting practice: Basics of blast design, Open-pit blasting, Underground blasting, Controlled blasting, Underwater blasting, Demolishing structures, and Fragmentation analysis.

Environmental impact of blasting: Mitigation of ground vibration, Fly rock and air-blast over pressure, Conducting pre-blast surveys, Blasting complaint handling.

Safe handling and storage of explosives

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 3

Module Code	**MA2013**	**Title**	**DIFFERENTIAL EQUATIONS**			
Credits	**2.0**	**Hours/**	**Lectures**	**2.0**	**Pre -**	**MA 1023**
GPA/NGPA	**GPA**	**Week**	**Lab/Tutorials**	**-**	**requisites**	

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Approximate periodic function using Fourier series
- Solve various categories of Partial differential equations appears in physical system modeling
- Apply Lap lace Transform and Fourier Transform method to solve differential equation.
- Apply series solution method to differential equation with variable coefficient

Course Outline

Fourier Series approximation

Fourier coefficients, Dirichlet's condition, odd and even function, half range series. Trigonometric approximation to discrete data.

Partial Differential Equations

Classification of second-order partial differential equations. Solutions by separation of variables. Fourier series application to boundary value problems.

Laplace Transform and applications

Laplace transform of elementary functions and some basic theorems on Laplace transform. Application of Laplace transforms to solution of differential equations and system of differential equations, transfer functions, convolution theorem, concepts of stability and controllabity.

Fourier Transform and applications

Non-periodic function, Fourier transform, properties of Fourier transform and applications.

Ordinary linear differential equations with variable coefficients

Solution in series, Special function (e.g. Bessel, Legendre) - singular points, Existence and uniqueness of the solution (elementary discussions without proof.

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 3

Module Code	MA2023	Title	CALCULUS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	MA1023
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Perform vector differentiation and integration and evaluate vector and scalar quantities in various engineering applications.
Apply Divergence, Stokes' and Green's theorem in various situations.
Apply Cauchy's integral formula to solve engineering problems.
Perform contour integration techniques.
Apply conformal mapping in physical system modeling.

Course Outline

Vector Calculus

Double integral, triple integral, vector functions;
Introduction to vector calculus. Vector differentiation and differential operators.
Space curves and line integral, surface integrals;
Divergence theorem, Stokes' theorem and Green's theorem in a plane.
Some basic applications.

Complex Variables

Analytical function and Cauchy-Reimann equation.
Cauchy's integral formula and applications.
Taylor and Laurent's series.
Contour integration.
Introduction to conformal mapping.

Assessment scheme

Continuous assessments 30 %
Final exam 70%

Module Code	EL2952	Title	LANGUAGE SKILLS ENHANCEMNT III			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	EL1022
GPA/NGPA	NGPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Write a report on a subject related issue with reasonable grammatical accuracy

Course Outline

Describing mechanisms
Describing processes
Report Writing

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 3

Module Code	ER2703	Title	COASTAL HYDRODYNAMICS			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	ER1023
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Apply wave theory to derive wave equation
Evaluate the effects of temperature, pressure and salinity on the dynamic of the ocean
Analyze and assist the origin and effects of tides, and ocean currents
Analyze and interpret basic beach process, including variation in sediments size, coastal sediment erosion, transportation, and deposition processes
Analyze and interpret the origin, dynamic of coastal estuaries and lagoons
Prepare coastal bathymetric maps and apply ocean hydrodynamics modeling on tsunami inundation forecasting

Course Outline

Physical and chemical structure of sea water

Waves in the Ocean: Wave theory, standing waves, wave refraction, reflection and deflection

Tides: Tidal characteristics, equilibrium theory of tides, tidal cycle, neap and spring times, dynamic theory of tides, tidal energy

Ocean Atmosphere Interactions: Wind circulation, surface ocean currents, deep ocean circulation

The Dynamic Shoreline and coastal protection: Coastal Water Movement, Beaches, sand budget, coastal dunes, Barrier Islands, cliffed coast, deltas, impact of people on the coastline.

Estuarine process: Geomorphic classification, Energy classifications, Hydrodynamic classification, gravitational circulation, stratification and mixing, lagoons, salt marshes, mangrove swamps, coral reefs.

Ocean Hydrodynamic Modeling: Concepts of numerical modeling (Model types, Model forcing, Model validation), Preparation of bathymetric maps and Case Studies

Assessment scheme

Continuous assessments 30%
Final exam 70 %

Semester 4

Module Code	**CE2142**	**Title**	**SURVEYING II**			
Credits	**3.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre – requisites**	**CE2062**
GPA/NGPA	**GPA**		**Lab/Assignments**	**3/1**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Use modern instruments for survey measurements in civil engineering applications;
- Make computations for civil engineering works based on survey measurements;
- Set out civil engineering works; and
- Understand the use of field astronomy for survey and time measurements

Course Outline

Modern techniques and instruments:

Electromagnetic Distance Measurement (EDM): Maximum non-ambiguous distance, principles of modulation and simulation, Total Station (TS) to measure inclined distances, tie distances, coordinates, levels and angles.

Global Positioning System (GPS): Satellite systems, principles of measurement, errors, uses, differential GPS.

Areas, Volumes and Earthwork: Areas using geometrical figures and formulae, areas using planimeter, volumes/ earthwork by end-areas and trapezoidal formulae, by spot levels, and by contours.

Field Astronomy and Time: Movement of Earth in space; celestial sphere; constellations; apparent motion of stars; determination of true north and coordinates; axial tilt of the Earth; seasons; apparent motion of sun in the celestial sphere; solar time and sidereal time; standard time.

Setting-out: Curves; curve ranging using chain/tape, theodolite, and TS; setting-out of buildings; horizontal and vertical alignment.

Introduction to surveying software (03 hours): AutoCAD for survey plans; other surveying software.

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 4

Module Code	**ER2053**	**Title**	**INTRODUCTION TO PETROLEUM ENGINEERING**			
Credits	**1.5**	**Hours/ Week**	**Lectures**	**1.5**	**Pre - requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Explain the scope of the upstream petroleum industry
- Describe the elements and processes of a petroleum system.
- Apply volumetric equation to calculate the reservoir volume
- Work collaboratively in groups to present environment concerns of petroleum industry and petroleum low
- Analyse petroleum fiscal systems with given data

Course Outline

- Nature of oil and gas
- Overview of petroleum industry
- Hydrocarbon formation
- Petroleum systems
- Structures and stratigraphy
- Basic concepts of petroleum exploration
- Heat flow analysis
- Basic volumetric calculation
- Basic concepts related to petroleum engineering
- Petroleum law
- Health, safety and environmental issues

Assessment scheme

Continuous assessments	30%
Final exam	70%

Module Code	ER2063	Title	GEOCHEMISTRY FOR MINERAL EXPLORATION			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Execute knowledge on collection of field data/samples related to minerals and ground water

Interpret data of different exploration techniques

Course Outline

Geochemistry:

Introduction to geochemistry

Geochemical environments

Optimization and planning

Geochemical mineral exploration techniques

Geochemical surveys

Data analysis (geo-statistics, geo-thermatic maps, color contouring)

Geochemical techniques for mineral exploration:

Stream sediment surveys, hydro-geochemical surveys, soil surveys, petrochemical surveys and geo-botanical surveys

Assessment scheme

Continuous assessments 30%

Final exam 70%

Module Code	ER2073	Title	OPTICAL MINEROLOGY AND PETROLOGY			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Demonstrate identification of minerals using optical properties

Classify and identify rocks

Course Outline

Optical mineralogy

Introduction to Petrology

Igneous Petrology

Sedimentary Petrology

Metamorphic Petrology

Petrographic analysis

Geology of Sri Lanka

Assessment scheme

Continuous assessments 30%

Final exam 70%

Module Code	ER2083	Title	MINERAL ENGINEERING I			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre-requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain and compare basic physical separation methods as applied to value addition of minerals.

Design mineral processing and physical separation plants using run of mine raw material and control plant parameters for optimum value addition.

Course Outline

Comminution:

Crushers, Grinding mills, Theory of comminution, Kick's law, Rittinger's law, Calculation of Bond and Work index, Factors controlling comminution.

Sieving:

Types of screens, efficiency screening, factors affecting the efficiency, closed circuit crushing and grinding and simple flow charts using the above.

Flow properties of minerals through orifices:

Silos, Repose angle measurements

The movement of solids in fluids:

Stoke's law, Newton's correction, Rittinger's equation, Reynolds number, Ratios of concentration, Recovery,

Theory of hydrocyclones, hydro cyclone designs, performance curves, flow sheets and applications of hydrocyclone in specific mineral separations.

Industrial applications of Thickeners, Jigs, Tables, Sluices and Classifiers; all supported by industrial visits.

Magnetic Separation and High-Tension Separation:

Magnetic permeability, magnetic susceptibility, magnetic separators- wet and dry separation, high-tension separation, effect of variables and controls (particle size, moisture content, inclusions and their effect on the Recovery).

Filtration:

Darcy's equation, Use of filter presses as a dewatering method, Disk & Drum filters the factors affecting filtration

Drying:

Types of dryers, dryer conveyors, types of kilns, firing techniques, Kiln lining materials (Refractories).

Micromeritics:

Characterization of particles, graphical representation of centre grain size and quartile ratio, particle size measurements- Andreason pipette method, Hydrometer method centrifugal method

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 4

Module Code	**ER2093**	**Title**	**GEOPHYSICS FOR MINERAL EXPLORATION**			
Credits	**2.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre-requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain and compare the basics of geophysics and use techniques

Course Outline

Introduction to geophysics, Geophysical methods: Gravity, Magnetic, Seismic, Electromagnetic, Electrical Resistivity, Self- Potential, Induced-Polarization, and Gamma-ray Spectrometry, Ground Penetrating Radar (GPR), Geophysical applications for mineral exploration

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	**ER2101**	**Title**	**MINE DEVELOPMENT**			
Credits	**2.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre – requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Assignments**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Design and execute opening and development of a mine
Design support systems
Organize and execute the mine opening and development plan with maximum safety and cost effectively

Course Outline

Drilling methods

Surface and underground drilling equipment and their application, Drill bits, basics of core drilling, wire-line/DTH drilling, selection of appropriate drilling method.

Underground Mine Infra-structure, Types of Openings, Dimensions, Location, Design criteria

Tunneling: Tunnel drilling, Designing the blasting pattern, Machine mucking, Mechanical excavation with Tunnel Boring Machines and Road Headers, Tunnel support design - Engineering rock mass classifications (RMR/Q-system)

Shaft sinking: Drilling, Cut-hole rounds, Blasting patterns, Methods of mucking, shaft support systems, Shaft support determination, Special methods of Shaft Sinking (shaft sinking in difficult ground)

Raise excavation: By drilling-and-blasting and with Alimak Raise Climber, Raise boring

Assessment scheme

Continuous assessments 30 %
Final exam 70%

Module Code	MA2033	Title	LINEAR ALGEBRA			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	MA 1023
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Familiarize with the concept of a vector space and its algebraic properties and the manipulative techniques necessary to use matrices and determinants in solving applied problems.

Bridge from the typical intuitive treatment of calculus to more rigorous courses.

Use the software Mathematica to reinforce concepts of matrix multiplication, inverse eigenvalues and eigenvectors

Learning Outcomes

Reduce a matrix using Gauss-Jordan reduction

Solve a system of n equations and m variables

Find the inverse of a matrix

Understand the dimension of a vector space, rank of a matrix and basis for a vector space.

Understand the concept of linear independence, linear transformation and determinants

Find eigenvalues and eigenvectors, and diagonalize quadratic forms.

Course Outline

Vectors spaces, subspaces, linear combinations, spanning sets, linear independence, and bases. Column space and row space and null space of a matrix and application. Linear transformation. Eigen values, Eigen vectors and related topics. Diagonalisation of matrices. Quadratic forms. Applications. Numerical Linear Algebra.

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 4

Module Code	MA3013	Title	APPLIED STATISTICS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	MA1023
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Identify the role of probability and statistics in their discipline area.
Perform a range of statistical procedures related to the manipulation and interpretation of data.
Distinguish between types of statistical tests that may be used to analyze data.
Demonstrate basic knowledge of assessing the appropriateness of statistical models.
Demonstrate practical expertise associated with the use of statistical package in performing basic statistical procedure.

Course Outline

Discrete and continuous random variables:

Bivariate distributions.
Moment generating function.
Introduction to ML estimators.
Basic properties of Geometric, Hyper geometric, Exponential and Gamma, distributions.
Student's t-distribution.
Fisher's distribution and Chi square distribution.

Statistical Inference:

Sampling distributions, central limit theorem, confidence intervals for mean and variance.
Hypothesis tests. Goodness-of-fit tests and contingency table.
Simple linear regression.
Least square estimation and hypothesis tests in simple linear regression.

Practical Work:

Use of MINITAB for statistical testing and regression analysis.

Assessment scheme

Continuous assessments 30%
Final exam 70 %

Semester 4

Module Code	MN2010	Title	ENTREPRENEURIAL LEADERSHIP			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Create a personal inventory of strengths and weaknesses
- Create a vision for what a student wants to achieve
- Develop a mindset to embrace and understand failure rather than fear it
- Develop skills in terms of problem solving and decision making
- Build and lead a team in a competitive environment
- Make professional presentations
- Understand how and why individuals become successful in the business world

Course Outline

- Introduction to entrepreneurial leadership
- Leadership skills, abilities and qualities
- Leader as a team builder
- Leader as a motivator
- Leader as an effective communicator and negotiator
- How leaders play a critical role in shaping an organization's culture
- Ethical behavior of a leader
- Entrepreneur Presentation (by Entrepreneurs with good leadership skills)
- Case Studies and Presentations

Assessment scheme

Continuous assessments 50%
Final exam 50%

Semester 5

Module Code	**CE2812**	**Title**	**SOIL MECHANICS**			
Credits	**2.5**	**Hours/ Week**	**Lectures**	**2.0**	**Pre – requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Assignments**	**3/2**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:
Conduct basic soil classification and related tests
Understand the effect of water in soil with respect to stresses and flow
Understand the basic concepts of strength and consolidation of soils

Course Outline

Formation and types of soils
Basic properties and classification of soils: Mass/volume relationships, particle size analysis, Atterberg limits, Classification of soils by the unified classification system
Compaction of soils: Factors affecting compaction, Standard and modified Proctor Compaction Tests, Control of compaction
Total and effective stresses in soils
Flow of water through soils: Concept of head, Coefficient of permeability, Darcy's Law, Permeability measurements (laboratory and field)
Basic concepts of consolidation of saturated soils
Basic concepts of shear strength of soils

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 5

Module Code	ER3013	Title	EXTRACTION METALLURGY			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Understand the fundamentals of extractive metallurgical processes for ferrous and nonferrous industries. Assess material balance problems on the basis of physico-chemical and metallurgical principles.

Apply the knowledge of basic chemistry and thermodynamics for problem identification and formulation of solutions

Understand the type of furnaces/kilns and their design aspects and limitations

Understand the importance of energy and water foot prints and zero waste flows in modern mineral processing industries and contribute towards environmental friendly and sustainable industry.

Course Outline

Metallurgical unit processes: Minerals processing for metal extraction, Hydrometallurgy, Pyrometallurgy and Electrometallurgy.

Minerals concentration, leaching, precipitation, reduction of metal oxides, volatile metals, slags and refractories, matte smelting, refining processes.

Chemistry, thermodynamics and process kinetics with reference to the reactor design, operation and functionality.

Current technologies for production of common metals such as iron/steel/ferroalloys, light metals, base metals, and rare and reactive metals

Classification of metallurgical furnaces, review of various types of refractories used, High temperature measurement techniques. Principles of heat transfer in furnaces, Slag metal reactions. Simple binary phase diagrams, Slag attack on refractories and other refractory failures.

Energy and water footprints and zero waste for a environment friendly sustainable metallurgical industry

Professional and ethical responsibilities of the engineering profession to metallurgical industry

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 5

Module Code	**ER3033**	**Title**	**MINING METHODS**			
Credits	**2.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre - requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Select/Design a suitable mining method to mine given mineral deposit
Select appropriate machinery and equipment

Course Outline

Basic principles in the selection of mining methods.
Factors affecting the selection of mining methods.

Surface mining methods: Open-pit, placer, strip and quarry mining, Technological complexes – Machinery and equipment.

Underground mining methods:
Classification, Factors affecting the choice of mining methods,
Unsupported (open stoping), Supported (shrinkage stoping, cut and fill mining, vertical crater retreat) and Caving methods (sublevel caving, block caving and top slicing) and stope ventilation
Room-and-Pillar, Coal mining by conventional and Long-wall Advancing and Retreat mining

Environmental impacts and reclamation work.

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 5

Module Code	ER3043	Title	MINE MACHINERY AND DESIGN OF MINERAL TRANSPORT SYSTEMS			
Credits	3.0	Hours/ Week	Lectures	3.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Introduction of Open cast and Underground Mining Machineries
Describe Mine Communication and Remote control systems
Explain the basics of Mine hoists, wire ropes and their applications.
Designing machine fleet for a mine.

Course Outline

Underground machineries:

Machines used in development and extraction of hard mineral mines, Machines used in, development and extraction of Coal mines
Mine hoists
Mine communication
Remote controlled systems

Open pits:

Machines used in open cast mines and quarries for development and ore extraction
Machines used in exploitation of ore bodies below the water table
Machines used in hydraulicking
Offshore mining machines

Mineral transport:

Underground mines: Locomotive haulage and mine cars, dump trucks, loaders, LHDs and special transport machines, conveyors, rope haulage, hydraulic transport, wire ropes, mine hoists, non-destructive testing of wire ropes and their applications, hoist and wire rope maintenance practices.

Open pits mines: Locomotive haulage, truck haulage, conveyors, rope haulage and hydraulic transport

Design of conveyer transport systems and hoisting systems

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 5

Module Code	MA3023	Title	NUMERICAL METHODS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	MA 1023
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Apply simple search and simple gradient methods in optimizing multivariable function.
Apply Taylor series to derive various implicit and explicit algorithm in solving ODE.
Compare different algorithm in terms of implementation in computers, and accuracy.
Apply different numerical scheme to find solution of different types of PDE.
Apply FEM in solving simple problems

Outline Syllabus

Numerical optimization problems (direct search and simple gradient methods) Solution of set of non-linear equations. Matrix eigenvalue determination including direct, inverse iteration and shift of origin, special methods for dealing with band type and sparse matrices. Simple error analysis, convergence properties. Simple finite difference technique for initial-value and boundary-value problems in ordinary and partial differential equations and systems. Phase plane and isoclinal curves. Taylor series, Runge-Kutta process. Explicit and implicit procedures, simple ideas on errors and stability. Introduction to method of characteristics. Finite Element Methods

Practical Work: Use of published algorithms and packages for solving numerical problems

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 5

Module Code	**MN3042**	**Title**	**BUSINESS ECONOMICS AND FINANCIAL ACCOUNTING**			
Credits	**3.0**	**Hours/ Week**	**Lectures**	**3.0**	**Pre - requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Assignments**			

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Define the basic micro and macro-economic concepts. Identify the links between economy and technology.

Define basic concepts in financial, cost and management accounting.

Apply basic knowledge on these accounting concepts to business environment and to interpret main accounting statements.

Outline Syllabus

Business Economics (12 hrs)

Economics and the economy; Elementary theory of Economics; Tools of economic analysis; Demand, supply and the market; Theory of the firm; Different types of firms; Motivation of firms; Theory of supply; Costs and production; Introduction to macroeconomics and national income accounting.

Financial and cost Accounting (24 hrs)

Basic accounting concepts; Trial balance; Profit & loss account, balance sheet; Cash flow statements; Interpretation of accounts; Cost concepts and terminology; Analysis and interpretation of cost; Allocation of overheads; Marginal costing, CPV analysis; Standard costing; Stock control.

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 5

Module Code	MN3052	Title	INDUSTRIAL MANAGEMENT AND MARKETING			
Credits	3.0	Hours/ Week	Lectures	2.5	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Describe basic concepts and theories of organizational management. To explain the application of these theories for modern organizations.

Describe the fundamentals of technology management, human resource management and legal issues related to modern industrial relations.

Explain basic marketing concepts and theories and their applications.

Course Outline

Organization management (12 hrs)

Introduction to management & systems theory; Organizational theory; stakeholder analysis, organizational vision, mission & objectives. Types of organizations; organizational strategy, structures of modern organization and the concept of learning organization; Different roles of manager; manager & leader. Organizational culture & control; concepts of authority, power, responsibility & their applications and management of conflict. Management of change; importance of change management and conflict management. Modern management techniques; management styles: Japanese vs. Western Systems.

Technology management (6 hrs)

Technology and economic development; Key concepts of technology management and its relation to business management; Technology and competitive advantage; Evaluating technology;

Human Resource Management and Industrial Relations (6 hrs)

Introduction to human resource management, Employee selection, performance evaluation, rewards, Human resource development, Compensation and grievance handling, Labour - Management Relations in Sri Lanka and Business Ethics

Marketing: (12 hrs)

Marketing: overview; Marketing environment, marketing research and product life cycles; Buyer behavior: consumer and organizational; 4Ps of marketing including promotion and communication issues.

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 5

Module Code	ER3703	Title	DIGITAL IMAGE PROCESSING AND PHOTOGRAMMETRY			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Understand the concept and fundamentals of Digital image Processing (Statistical evaluation, Image rectifications, image enhancement)

Understand the concepts of image classification, post classification and accuracy assessments techniques

Understand to develop Digital Elevation Model for 3D visualization and mapping , analyse the morphological feature and evaluate the resource estimate and morphological changes

Usage of image processing software, modifying and develop programmes for image analysis for different applications

Course Outline

Digital image concepts
Image rectification and restoration
Image enhancement
Image classification
SAR image processing
Hyperspectral image processing
Digital Photogrammetry- fundamentals and processing techniques

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER3713	Title	JEWELLERY PRODUCTS DEVELOPMENT			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Create Jewellery Designs manually and using computer software
Produce master models

Course Outline

Jewellery Sketching, technical drawing, principles of Jewellery design, theory and practice of Jewellery designs, design and culture, Jewellery Design using JewelCAD

Proto-typing – Wax carving, master model making, CAM

Markets – Domestic market, international markets, market segments, supply chain, product distribution

Assessment scheme

Continuous assessments 50%
Final exam 50%

Semester 5

Module Code	**ER3700**	**Title**	**PETROLEUM EXPLORATION AND BASIN ANALYSIS**			
Credits	**2.5**	**Hours/ Week**	**Lectures**	**2.0**	**Pre – requisites**	**ER2703**
GPA/NGPA	**GPA**		**Lab/Assignments**	**3/2**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Evaluate problems related to the exploration by interpreting and integrating different types of geology, geophysics and engineering data
- Implementing the use of new technology used in the exploration and production of hydrocarbon that will produce the best results
- Describe basin forming processes and basin architecture
- Review key analytical techniques with the focus on burial history and analysis
- Apply and integrate datasets to model basin evaluation

Course Outline

Petroleum Exploration

- Geological mapping and geochemical exploration
- Geophysical exploration methods for petroleum (Gravity, Magnetic, Resistivity, 2D and 3D seismic)
- Seismic interpretation

Basin Analysis

- Basin formation
- Controls on basin stratigraphy
- Classification of basins
- Datasets
- The concept of megasequences
- Introduction to play fairway analysis techniques, burial history, petroleum systems
- Analogue basin identification

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 5

Module Code	MN3010	Title	MULTIDISCIPLINARY DESIGN, INNOVATION AND VENTURE CREATION			
Credits	02	Hours/ Week	Lectures	1.5	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Analyze a user need critically considering societal, environmental and economic aspects
Design and develop innovative products, processes and complex systems with a multidisciplinary perspective
Use state of the art digital technologies together with conventional technologies for rapid product, process and systems design and development
Develop a product, process, system to meet a client based multidisciplinary design

Course Outline

Introduction to Creativity and Innovation
Role of Design under societal, environmental and economic trends
User Needs Assessment for user centered design
Multidisciplinary Design and creative problem solving
Product Analysis and Innovative Product Development
Analysis of Processes and Innovative Process Development
Complex Systems and Complex System Development
Conventional Technologies for transformation of ideas to new products
State of the Art technologies for rapid transformation of ideas to new products
Social Entrepreneurship and innovations
Sustainability, Green technologies, Cleaner production and Green products
Technological ventures based on design led innovation (Global, Local)
Commercialization strategies for new technologies

Assessment scheme

Continuous assessments 50%
Final exam 50%

Industrial Training

Module Code	ER3992	Title	INDUSTRIAL TRAINING			
Credits	6.0	Hours/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Demonstrate the responsibilities as a professional engineer
Demonstrate the capability to practically implement the knowledge attained
Skill to make correct judgements related to engineering practice
Skill to work in dynamic work environments maintaining good human relationships and contributing to teamwork
Demonstrate the ability to select and recommend the optimal solution to a particular industrial problem
Demonstrate the ability to understand the risky operations, and take safety precautions at work.

Course Outline

Study and gain experience in organizations involved in mining, mineral processing, mineral exploration, rock engineering, tunneling, ground water, oceanographic work, RS & GIS and gem and Jewellery
Study and gain experience in the worksite procedures, equipment and plants used and procedures adopted to get maximum benefits.
Study the environmental impacts associated with such activities.
Study and gain experience in activities related to research in such activities.
Study and gain experience in legal aspects involved in such activities.

Assessment scheme

Report on Industrial Training; Daily Diary; Attendance and conduct during the period of training and the observation of the supervisors. Oral examination

Semester 6

Module Code	ER3022	Title	MINE SURVEYING			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Use 3-D view of underground and open pit mining
- Implement of coordinate transfer in an underground and open pit mining.
- Create plan/elevation views of an underground mine and an open pit mine.

Course Outline

- Introduction to mine surveying
- Introduction to Mining Geometry: Projection with numerical point heights.
- Surface reference nets, mine surveying maps, plans and profiles: Surface control for underground surveys, Miner's plans, Field books and notes used in mine surveying.
- Surveys of underground workings: Underground mining reference and survey nets, Measuring vertical and horizontal angles in underground workings, Measuring underground Theodolite traverse lines, Vertical surveys in underground workings: Direct leveling, Indirect leveling, Connection Surveys, Mine surveying in open pits.
- Using AUTOCAD software to draw Plan, Elevation and 3-D views

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER3063	Title	ECONOMIC GEOLOGY			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Demonstrate Formation and occurrence of mineral deposits
- Differentiate the structural features of mineral deposits
- Uses of minerals in industry

Course Outline

Introduction to economic mineral deposits

- Mineral deposits, ore minerals, industrial minerals and gangue minerals
- Economic, political and environment factors influencing to convert a mineral deposit to a mine

Structural features of mineral deposits

- Disseminated type, veins, lodes, lenses, beds, dykes and sills, solution cavity fillings, breccia and pore- space filling

Classification of mineral deposits, Formation of economic mineral deposits, Industrial uses of minerals, Economic mineral deposits of Sri Lanka

Assessment scheme

Continuous assessments 30 %
Final exam 70 %

Semester 6

Module Code	ER3053	Title	STRUCTURAL & FIELD GEOLOGY			
Credits	2.0	Hours/ Week	Lectures	1.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Differentiate various geological structures and rock types in the field

Course Outline

Interpretation of geological structures: Stereonets, Aerial photographs, maps, Principles of geological mapping, Field mapping programme, Deformational features and history of Sri Lankan rocks

Assessment scheme

Continuous assessments 50 %
Final exam 50 %

Module Code	ER3202	Title	DESIGN PROJECT			
Credits	3.0	Hours/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	GPA		Design work	3.0		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Plan and carry out an engineering design according to: the client's requirement, available resources, and other limitations.

Present the design performed.

Demonstrate the methodology adopted in an engineering design

Course Outline

Identification of the problem (objectives)

Rapid assessment of the client requirements, available resources and limitations

Writing Terms of Reference (TOR)

Carrying out an EIA

Brain storming for alternative solutions

Detail investigation of the design

Planning and Preliminary design

Detail design

Negotiation with the stakeholders to comply with the objectives, Preparation of tender documents, Implementation of the project with project management aspects

Note-

Students will be working in small groups (8 – 10 per group). Students are responsible to conduct the design work under the guidance of the assigned academic staff member (supervisor) and submit the project deliverables as a complete document. Guest lecturers presenting related case studies etc. will be organized as necessarily to provide additional insights.

Assessment scheme

Continuous assessments 100%

Semester 6

Module Code	ER3912	Title	GEOLOGY FIELD CAMP			
Credits	1.0	Hours/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	-		
Learning Outcomes Upon successful completion of this module, the student will be able to: Use various geological field techniques. Interpret rocks types and their structures in the field.						
Course Outline Preparation for field programmes Geological mapping in the field. Structural mapping in the field. Identification of rocks in the field area. Identification of minerals in the field area. Preparation of geological maps, reports and presentation						
Assessment scheme Continuous assessments 100%						

Module Code	ER3922	Title	MINE SURVEYING FIELD CAMP			
Credits	1.0	Hours/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	-		
Learning Outcomes Upon successful completion of this module, the student will be able to: Organize surveying and leveling in a mine, and prepare the report.						
Course Outline Familiarization with surveying techniques and instrument used by the Mining enterprise. Conducting of level survey underground. Transferring of co-ordinates from one level to another sub level. Preparation of report and presentation.						
Assessment scheme Continuous assessments 100%						

Semester 6

Module Code	ER3933	Title	MINERAL EXPLORATION FIELD CAMP			
Credits	1.0	Hours/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Handle geophysical equipment and interpret subsurface geological features using geophysical features in the field

Use geochemical sampling techniques and distinguish different geochemical features of mineral deposits in the field

Course Outline

Geophysical exploration:

Selection of the suitable geophysical techniques for the area

Conduction of the following geophysical surveys:

Resistivity survey

Magnetic survey

Interpretation of data

Preparation of reports and presentation

Geochemical exploration:

Planning for Geochemical surveys

Geochemical sampling

Preparation of samples for analytical work

Preparation of reports and presentation

Assessment scheme

Continuous assessments 100%

Module Code	ER3903	Title	INDUSTRIAL VISITS			
Credits	1.0	Hors/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	NGPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain the operational steps and safety measures in underground and open cast mines.

Draw and explain the process flow diagrams in mineral processing plants

Identify mineral deposits through inspection.

Course Outline

Field visits to locations from among the following:

Underground mines

Open-cast mines

Quarries

Processing plants

Open deposits

Assessment scheme

Continuous assessments 100%

Semester 6

Module Code	**ER3942**	**Title**	**OCEANOGRAPHY FIELD STUDIES**			
Credits	**1.0**	**Hours/ Week**	**Lectures**	**-**	**Pre - requisites**	**ER2703**
GPA/NGPA	**NGPA**		**Lab/Tutorials**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Organize a field work program
- Manage safety issues
- Perform and explain sampling techniques
- Explain operation and maintenance of ocean equipment

Course Outline

- Usage and data interpretation of marine instruments
- Usage of Side Scan sonar
- Eco sounder
- Tide and wave gauges
- Navigation GPS
- Current Meters
- Gravity corer
- Grab Sampler
- CTD (Conductivity, Temperature, Depth)

Assessment scheme

Continuous assessments 100%

Semester 7

Module Code	ER4013	Title	ROCK MECHANICS			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Examine the characteristics and the mechanical properties (strength and failure criteria) of rock mass, rock matrix and discontinuities.

Use rock mass classification systems (RMR, Q)

Determine likely rock mass behaviors under different excavation and loading conditions and propose mitigation solutions

Recognize the evolving nature of the discipline and develop skills to access, evaluate and integrate new knowledge and processes

Course Outline

Rock mass classification, Physical and mechanical properties of rocks and their testing methods, Elastic and time dependent behavior of rocks, In-situ stress measurements

Theories of rock failure, Geometric and stress analysis of rocks, Rock slope stabilization and methods of reinforcement

Stress around underground excavations, Underground structural failures and methods of reinforcement

Assessment scheme

Continuous assessments 30%

Final exam 70%

Module Code	ER4023	Title	MINE VENTILATION			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Appraise concepts of mine ventilation, Conduct flow calculations.

Design underground ventilation networks, Selection and location of fans.

Organize and conduct ventilation surveys

Course Outline

Introduction to sub-surface ventilation**,**

Underground atmosphere: Gases in subsurface, Dust, Heat and Psychrometry,

Air flow: Introduction to fluid mechanics and fundamentals of steady–flow thermodynamics. Natural ventilation.

Fan engineering: Centrifugal and axial flow fans, Fan and system characteristics, Fan laws. Drawing –up fan specifications, Fan output control, Main, booster and auxiliary fans.

Mine Refrigeration:

Ventilation surveying: Quantity and Pressure surveys, Measurements with instrumentation

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 7

Module Code	ER4042	Title	MINERAL ENGINEERING II			
Credits	3.0	Hours/ Week	Lectures	3.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain chemical separation techniques in the recovery of minerals of higher grade from mine materials.

Explain the various complications arising from handling of mineral suspensions.

Design suitable processing plants using chemical processing techniques and apply modifications wherever necessary, fulfilling conditions for environmentally sound processing technique/s.

Course Outline

Chemical Processing:

Sintering and pelletizing of iron ores, pellet testing, flow sheets relevant to iron ore preparation

Stability of mineral suspensions, Rheology, zeta-potential, flocculation, selective flocculation and applications in mineral separation.

Theory of flotation, type of flotation cells, activation, depression, modification of mineral surface characteristics, and calculations.

Leaching of minerals:

Treatment of sulphide minerals, Arbeiter process, Sherritt Gordon process, Toth process, Bayer process and its economics.

Gold extraction using Activated Carbon, Gold Recovery methods; Flow sheets.

Theory of Solvent Extraction, Solvent extraction with special reference to Copper and Uranium ores

Tailings and tailings disposal (Radioactive and Hazardous)

Ion exchange process as applied to rare earth separations. Types of iron exchangers (Cat ionic, Anionic)

Air pollution, water pollution and pollution control methods, design of an electrostatic separator. Electroplate separator: theory, Applications in industry.

Physico-Chemical:

In-stream analysis with special reference to radio isotopes. Such as Californium-252 (gamma
emitters), sample geometry (Prior knowledge of Nuclear techniques is essential)

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 7

<table>
<tr><td>Module Code</td><td>ER3950</td><td>Title</td><td colspan="4">SCIENTIFIC WRITING AND PRESENTATION SKILLS</td></tr>
<tr><td>Credits</td><td>1.0</td><td rowspan="2">Hours/ Week</td><td>Lectures</td><td>-</td><td rowspan="2">Pre - requisites</td><td rowspan="2">-</td></tr>
<tr><td>GPA/NGPA</td><td>NGPA</td><td>Lab/Tutorials</td><td>-</td></tr>
<tr><td colspan="7">Learning Outcomes
Upon successful completion of this module, the student will be able to:
Write technical reports, thesis, dissertation, scientific conference/ journal papers
Deliver effective presentation</td></tr>
<tr><td colspan="7">Course Outline
<u>Scientific Writing</u>
Planning and structuring technical reports, thesis, dissertation, scientific conference /journal papers
Writing introduction, materials & methods, results & discussion
Preparing the title, abstract & keywords, Presentation of statistical results, Effective tables and illustrations, Preparing references (referencing software), Submitting your manuscript
Authorship and acknowledgements, How the manuscript is processed
What the reviewer and editor look for in a manuscript, Dealing with Editor’s & Reviewer’s Comments, Proof Reading and Final Submission
Plagiarism and copyrights

<u>Presentation Skills</u>

Planning and Preparation
Criteria for an effective presentation, Establishing your objective, Presentation structure, Tips for effective Power Point presentations

Interactive presentations
Involving and relating to your audience, Presenting your message,
Handling questions, Motivating commitment

Presenting with Impact
Speaking without notes, Vocal Variation, gestures, eye contact</td></tr>
<tr><td colspan="7">Assessment scheme
Continuous assessments 100%</td></tr>
</table>

Semester 7

Module Code	ER4083	Title	MINE PLANNING AND DESIGN			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Accomplish mine optimization, Selecting a suitable mining method
Conduct cost analysis on mine planning
Design a Reclamation/ Rehabilitation plan

Course Outline

Introduction to mine planning and design.
Principals of project management.
Mine capital investment: Fixed capital, Working capital, Capital costs and production costs
Time value of money: Net present value, Pay-back period, Rate of Return on Investment.
Capital recovery and sinking fund, cost-benefit ratio, Basics of mine ventilation, Depletion.
Mine optimization, Equipment fleet selection
Regulatory environment, Mine Closure
Computer-aided mine design

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER4202	Title	RESEARCH PROJECT			
Credits	5	Hours/ Week	Lectures	-	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain the concepts on conducting a scientific research project
Demonstrate writing skills on Research proposals and final reports
Demonstrate the concepts on publications of research

Course Outline

Literature review/ Individual Presentation, Planning of project work/ Preparation of work program, Research proposal and group presentation
Field work (if necessary), Laboratory testing programs (if necessary)
Analysis of data, Interpretation of data
Writing the research project report, Writing the abstract/ Full paper for publications
Individual viva, Draft research project report/ Presentation
Publications on research project/ Full Paper and Conference presentation
Final report

Assessment scheme

Continuous assessments 100%

Semester 7

Module Code	MN4022	Title	ENGINEERING ECONOMICS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Identify the most relevant economic concepts for the engineering decisions

Apply these concepts to practical engineering projects and decisions

Outline Syllabus

Fundamentals; time value of money, equivalence and cash flow diagrams; (2 hrs)

Discounted cash flow; time value equivalence, single payment and annuity factors and numerical examples. Cash flows and compounding; (4 hrs)

Comparison methods; assumptions, net present value, annual worth, equivalent annual cost with/without salvage value, equivalent annual worth of fixed asset lives and perpetual lives, internal rate of return (IRR) and minimum acceptable rate of return and IRR irregularities, numerical examples; (6 hrs)

Analysis of alternatives; classification, mutually exclusive alternatives, incremental analysis and preferred method for decision making; (3 hrs)

Project feasibility analysis; financial feasibility, market price analysis, cost of capital and weighted average, economy feasibility, shadow pricing, benefit cost (B/C) analysis, irregularities of B/C analysis and preferred method for decision making; (4 hrs)

Sensitivity analysis and decision trees; What if?, sensitivity graph and interpretation of the analysis, discounted decision trees and application of decision trees; (2 hrs)

Risk management; Risk identification, risk analysis and risk response; (2 hrs)

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 7

Module Code	ER4290	Title	PETROLEUM DRILLING AND FORMATION EVALUATION			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	ER3700
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Identify machinery and methods of petroleum drilling of onshore and offshore wells, for recovery of oil and gas from a petroleum reservoir
- Identify the basic physical principles of the common hole logging measurements in order to evaluate formation properties
- Interpret open hole logging measurements for lithology, porosity, and water saturation estimates
- Calculate basic wire-line log evaluations on a representative, commercial software package

Course Outline

Drilling wells

- Petroleum drilling systems
- Drilling rig components
- Drilling fluids
- Casing design
- Well cementing
- Directional drilling
- Pressure control

Formation Evaluation

- Logging Principles
- Passive logs
- Acoustic logs
- Density / Neutron logs
- Porosity , Lithology Determination
- Resistivity logging
- Capillary pressure and saturation
- Shally – sand Analysis
- Core –log interpretation

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 7

Module Code	ER4350	Title	PETROLEUM RESERVOIR ENGINEERING AND PROJECT DESIGN			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	ER4290
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Calculate the reservoir volume with given data
- Estimate reservoir parameters with given well data
- Analyze the reservoir behavior with time

Course Outline

- Rock and Fluid Properties
- Volumetric Calculation
- Reservoir Types and Drive Mechanisms
- Material Balance
- Decline Curve Analysis
- Fluid Flow in Porous Media
- Well Testing
- Immisicible Displacement
- Offshore Mining Project Design: Student has to carry out a design project on offshore mining

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 7

Module Code	ER4223	Title	HYDROGEOLOGY AND GROUND WATER MODELING			
Credits	3.0	Hours/ Week	Lectures	2.5	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Appraise ground water exploration techniques
- Design tube well and conducting Pumping tests and interpretation
- Distinguish chemical characteristics of ground water and treatments methods
- Demonstrate ground water modelling
- Formulate ground water modelling using computer programme

Course Outline

- Introduction to hydrogeology
- Aquifers, aquifer properties, aquifer types and groundwater environments
- Groundwater exploration – geological, geomorphological and geophysical methods
- Design of shallow and deep tube-wells
- Well drilling
- Water pumps
- Pumping tests (well and aquifer)
- Chemical characteristics of groundwater
- Groundwater treatments
- Mining and groundwater
- Basics of groundwater modeling
- Introduction to groundwater modeling software
- Designing conceptual models, calibrating and forecasting groundwater conditions

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 7

Module Code	ER4313	Title	GIS AND SPATIAL STATISTICS			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	ER 3703
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Distinguish analytical techniques to treat spatial data
- Analyze and interpret spatial data and make final output maps using GIS techniques.

Course Outline

- GIS technology
- Spatial information
- Database concept
- Data quality
- Errors and map projections
- Spatial data analysis (vector and raster based)
- Multi-criteria analysis
- Network analysis
- Decision support system

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER4433	Title	MARINE SURVEYING			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	ER2703 &ER3942
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Apply onshore & offshore surveying techniques, sampling techniques, and off-shore navigation methods to explore mineralization and sub-surface strata.
- Analyze variation of offshore-bathymetry, and differentiate sub-bottom profiles using sonar sounding techniques

Course Outline

- Hydrography; simple bathymetric maps; software related to hydrography.
- Offshore navigational positioning (GPS and DGPS).
- Basic techniques and sampling techniques.
- Tidal variations and measurements.
- Sources of error; instrument calibration and error budgets.
- Side scan sonar imaging
- Beach profiling.

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 7

Module Code	ER4512	Title	JEWELLERY PRODUCTION TECHNOLOGY			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre - requisites	ER3713
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Melt metal and produce alloys

Perform wire drawing, soldering, welding, sawing, filing, and polishing

Prepare a rubber mould, inject wax patterns, carry out the investment procedure and burn-out procedure, and carryout casting

Course Outline

Alloying & Melting – Karatage& fineness, colour, physical and mechanical properties, alloy making, ingot casting, assaying, hallmarking;

Investment Casting - Rubber moulding, wax and tree assembly, investment, casting, defects and
their control;

Joining Technology - Soldering, fusion welding, spot welding, tack welding, laser-welding, pressure welding;

Finishing Technology - Techniques, sawing, filing, abrasive grading systems, polishing process,
mass production methods, matte and mirror finishing, indentation and beaded type textures, etching and electro finishing, setting gemstones;

Annealing and heat treatment - Principals and practice of annealing, metallurgy of precious metals, heat treatment of carat gold alloys;

Metal working technology - Metal working technology, hand working, rolling, wire-drawing,
chain making, Jewellery making, Investment casting, electroforming, EDM (electrical discharge machining), die striking (stamping), Fabrication, CAM;

Electrolytic Processes - Electrolytic processes, techniques & materials, electroforming, electroplating, electro polishing;

Metal refining - Equipment, chemicals, processes, aqua regia process, formic acid method, precipitation methods, electrolytic methods, silver refining, gold refining, platinum refining, hazards, laws and regulations

Assessment scheme

Continuous assessments	50%
Final exam	50%

Semester 7

Module Code	ER4522	Title	FASHIONING OF GEMSTONES			
Credits	2.0	Hours/ Week	Lectures	1.0	Pre - requisites	ER3713
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Determine a suitable cutting Style for a rough gemstone

Cut and polish a gemstone as per the determined cutting style

Course Outline

Coloured Gemstone Fashioning: Gem cutting methods - Traditional (hanaporuwa), jam peg, universal faceter, robotic, tumbling, carving, and laser. Cutting styles - Cabochon, bead, facetted, shapes (standard shapes and fancy shapes), cuts (step, brilliant, rose etc), invisible.

Manufacturing Processes - Sawing, drilling, forming, shaping, calibrating, faceting, polishing, orientation, machinery.

Diamond Fashioning: Manufacturing process - Cleaving, sawing, bruting, cutting, polishing, brilliant cut, girdling machinery.

Management aspects: Supply chain - Local and international supply chain, of gem cutting: Management and control - Production systems, mass production systems, factory and workshop organizing, productivity. management, information systems

Quality Assurance: Attributes, standards, international conventions, inspection and reports.

Assessment scheme

Continuous assessments	50%
Final exam	50%

Semester 7

Module Code	MN3020	Title	ENTREPRENEURSHIP BUSINESS BASICS			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Demonstrate understanding of fundamentals ideas of financial management for entrepreneurs, concepts such as cash flow, financial statements, financial ratios, time value for money, capital budgeting and net present value.

Go through the process of securing entrepreneur's intellectual property, including patents, trademarks, copy rights and trade secrets.

Analyze an industry and identify opportunities for new products/services along with marketing tactics and strategies.

Identify human resource needs for an organization and acquire and maintain required people.

Course Outline

Overview of Corporate Finance: Introduction to corporate finance; Financial statements/taxes/cash flow.

Financial statements and long-term financial planning: Working with financial statements and real world applications; Long-term financial planning and growth

Valuation of cash flows: Time value for money; Net present value

Risk management; Risk identification, risk analysis and risk response;

Patents, trade secrets and copy rights: Introduction to business law; Patents and procedure for obtaining patents; Trade secrets, copy rights and trade marks

Marketing: Introduction to marketing; Consumer behavior; Business and organizational consumers; Production development and management; Pricing objectives and policies; Business ethics; Advertising and sales promotion; Integrated marketing communications

Managing Human Resources; Introduction to Human Resource Management; Manpower planning; Job Analysis and designing; Recruiting and selecting appropriate human capital; Staffing and training people; Reward management; Grievance handling; Transfers promotions and retirements

Managing Operations; Designing new products and processes, Demand forecasting, Planning for production facilities, Production planning, Managing inventories, Managing productivity and quality

Assessment scheme

Continuous assessments 50%
Final exam 50%

Semester 7

Module Code	MN4800	Title	SUPPLY CHAIN MANAGEMENT			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	N/A		

Learning Outcomes

After completing this module, the students should be able to:

- Understand fundamental supply chain management concepts
- Understand how to manage supply chain performance drivers to support the supply chain strategy

Develop supply chain strategy in line with the corporate strategy

Course Outline

- Introduction to supply chain management
- Managing drivers of supply chain such as Information, Inventory, Transportation, Sourcing, Facilities and Technology
- Coordination of stakeholders to maximize supply chain performance
- Supply chain strategy development

Assessment scheme

Continuous assessments 50%
Final exam 50%

Semester 7

Module Code	MN4042	Title	TECHNOLOGY MANAGEMENT			
Credits	02	Hours/ Week	Lectures	1.5	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Recognize basic concepts and theories of management of technology.

Identify the use of MOT concepts and theories in modern organizations and economy.

Course Outline

Concept of technology Management

Strategic management of technology:

Technology-strategy relationship; Elements of technology strategy and formulation of a technology strategy; Integration of technology strategy and business strategy for competitive success; Technology, the environment and sustainable development

Organizational Aspects of technology management:

Human dimension of technology and concepts of the entrepreneur and entrepreneur; Organizational cultures and structures for promotion of creativity and innovation; The learning organization; The imperative of knowledge management

Acquiring technology through technology transfer:

Motivations for acquiring technology through technology transfer; Elements of technology transfer process; Success and failure factors in technology transfer

Acquiring technology through research and development:

The concepts of invention and innovation: Definition and classifications of research and development; New product development; Challenges in commercializing research results

National innovation systems for facilitating technology-based development:

Concepts of the national innovation system (NIS) and science and technology infrastructure; Comparison of NISs of developed, developing and first and second tier NIC countries; State involvement and growth of science and technology parks in developed and developing countries

Practical: 4 industry case studies, 2 plant/lab visit

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 8

Module Code	ER4033	Title	ENGINEERING GEOLOGY			
Credits	2.5	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Plan and design site investigation and preparation proposal and reports
- Assemble concepts in geology for engineering applications
- Formulate mitigation option for geological disaster

Course Outline

- Site investigation for engineering projects.
- Drilling, core logging for site investigation
- Mass movements: Landslides, Mudflows, Rock–flows and slides, Creep
- Engineering application of geology in planning and construction of dams and reservoirs
- Importance of geology in planning and construction of tunnels
- Geological considerations involved in construction of roads, railways, bridges and buildings
- Preparation of site investigation proposal and reports

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER4073	Title	MINERAL ECONOMICS			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Select appropriate sampling programme for ore reserve estimation
- Estimate ore reserves from field data
- Assess the market conditions for mineral products

Course outline

Introduction to mineral economics

Ore reserve estimation

- Analytical results, Errors in sampling, Proven and probable ore reserves, Krigging
- Methods of squares, polygons and triangles
- Cross sectional methods
- Principal factors in the conversion of the in-situ to a recoverable reserve

Mine and mill cut-off grades:

- Aspects of market value and costs
- Mineable widths/depths

Marketability of mineral products

- Form of sale

Market analysis for mineral products

- Forms of contract sales and features of them
- Market forecasting and schedule of tariffs

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	ER4093	Title	PLANT PERFORMANCE			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Operate and maintain processing plant
- Develop mineral sampling techniques.
- Implement the 5S system of the plant and waste minimization
- Implement an ISO certification system in processing plant.

Course Outline

- Introduction to plant performance.
- Application of mineralogy for mineral processing industry.
- Evaluation of a concentrate by mineral percentage.
- Sampling techniques, devices and systems.
- Pulp stream analysis.
- Process control and control charts.
- Mass and ingredient balance optimization.
- Effect of specific gravity of media in heavy media separation and washability curves.
- Pulp formulation and recycling of media.
- Recovery calculations.
- Industrial screening and classification.
- Determination of the efficiency of processes.
- Waste minimization and cleaner production.
- Application of 5S for processing plants.
- Quality assurance of ISO certification.
- Introduction to plant performance and stimulation software

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	**ER4130**	**Title**	**MINE WASTE MANAGEMENT AND REHABILITATION**			
Credits	**2.5**	**Hours/ Week**	**Lectures**	**2.0**	**Pre - requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**3/2**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Incorporate sustainability principles in mining industry.
Analyze mine reclamation planning and management.
Implement mine waste treatment technologies.
Conduct environmental management of mine sites.

Course Outline

Mining and Sustainability

Evolution of the principles and theories of sustainability and sustainable development.
Applied sustainability and their applications in the mining industry.
The mining industry and society; the nature of the mining industry in Sri Lanka and around the world, social and cultural issues in mining, mitigation of environmental and social impacts of mining
Environmental management in mining and environmental audits
Cleaner production technologies

Mine rehabilitation

Principles of Mine Closure -Mine closure planning, Stakeholders of mine closure, Environmental and social impacts, Financial aspects
Reclamation planning and management-Site preparation, Restoration, Monitoring and Maintenance, Regulatory authorities

Waste management

Waste reduction technologies -dust suppression in mining and in mineral transport facilities, material recovery and recycling
-Containment
The principles of designing, constructing and operating mine waste storage facilities/impoundment structures
Long-term geotechnical and environmental stability considerations of storage facilities
Case studies of failures of storage facilities
-Treatment
Types of mine waste; waste rock and tailings. Tailings deposition methods.
Wastes, effluents and their point sources in mining and metallurgical processes such as mineral concentration, value extraction and process metallurgy.
Characteristics of wastes and effluents.
Sampling and analysis of tailings,

Fundamentals of unit operations and unit processes

Final disposal and materials recycling, Risk assessment & remedial measures.

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	ER4103	Title	MINE SAFETY AND LEGISLATION			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Examine hazardous situation and develop appropriate measures in hazard control and accident prevention

Conduct accident investigations

Understanding the concepts of legislation related to mining and mineral processing industry including explosives

Course Outline

Introduction to Mine safety, Health and safety environment in mining operations.

Hazards, Accidents and Disasters,

Hazard control approaches: Health and Safety regulations, Medical examinations, Engineering control, Human factors engineering, Systems safety analysis,

Accident investigation and prevention: General principles and means of accident prevention, Risk assessment, Hazard control, Personal protection

Management role in accident prevention: Management philosophy, Safety orientation, Mine safety program, Accident costs, Statistics in accident prevention, Miner training. Underground communication

Causes of Industrial traumatism and their elimination

Personnel protective equipment.

Mine rescue,

Mines and Minerals Act, Explosives Act

Case studies:

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 8

Module Code	MN4900	Title	PROFESSIONAL ETHICS			
Credits	1.0	Hours/ Week	Lectures	1.0	Pre – requisites	-
GPA/NGPA	NGPA		Lab/Assignments	-		

Learning Outcomes

Describe professional ethics and relevant theories.
Identify the code of ethics related to their engineering profession.
Analyze ethical issues and propose solutions.

Outline Syllabus

Introduction to professional ethics and its importance
Code of Ethics by The Institute of Engineers Sri Lanka (including duties, responsibilities, rights and privileges of an engineer)
Ethical theories
Individual ethical decision making – moral philosophies and values
Project feasibility analysis; financial feasibility, market price analysis, cost of capital and weighted average, economy feasibility, shadow pricing, benefit cost (B/C) analysis, irregularities of B/C analysis and preferred method for decision making; (4 hrs)
Organizational ethical decision making – role of ethical culture and leadership
Social responsibility of the organization
Respect for other professions
Workplace ethical issues and possible solutions (such as Civil disobedience and whistle blowing, Privacy, safety and fairness concerns, bullying and harassment at workplace, and Intellectual property and legal issues)
Case studies – Emerging ethical issues in the field of engineering

Text Book

Naagarazan, R.S., (2007), *A Textbook On Professional Ethics And Human Values,* New Age International

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	CH4350	Title	PETROLEUM REFINING AND PETROCHEMICAL INDUSTRY			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:
Select and describe required refining processes for specified fuel specifications
Select suitable fuels for specific applications
Describe production processes for petrochemicals

Course Outline

Processes to transform crude oil into useful products: Distillation processes (atmospheric and vacuum distillations), conversion processes (cracking, and reforming), treating processes (desalting, hydro treating, solvent extraction, amine plants, desulfurization and sweetening)

Properties and qualities of major petroleum refinery products: liquefied petroleum gas (LPG), gasoline, kerosene, aviation fuel, diesel oil, fuel oils, lubricating oils, and asphalt. Liquefied Natural gas (LNG)

Petrochemicals and their derivatives; Polymers, Solvents, Surfactants and Fertilizers

Practical/Assignments

Flash Point and Fire Point
Aniline Point
Viscosity Index
A.S.T.M. Distillation

***Note: Offered to ERE students following Petroleum Engineering focus area in semester 8

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	ER4243	Title	NATURAL DISASTER MANAGEMENT			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Appraise severity of Natural hazards
- Develop hazard and risk assesement methods
- Develop methods for mitigation prevension and preparedness

Course Outline

- Natural and Man-made Hazards and Disasters
- Introduction to plate tectonics
- Geological Disasters
  - Landslides, Earthquakes and tsunami generation, Volcanic eruptions, Meteorological Disasters, Storm Surges, Lightening, Hydrological Disasters, Droughts, Floods
- Hazard Assessment, Risk Assessment, and Risk Management
- Sensor Systems for monitoring, forecasting and warning dissemination
- Prevention, Mitigation and Preparedness

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	ER4253	Title	OFFSHORE MINING AND PROJECT DESIGN			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre - requisites	ER4433
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Apply Law of the Sea
- Evaluate offshore mineral deposits
- Appraise various offshore mineral occurrences
- Design offshore mining projects for exploitation of mineral deposits using dredging techniques.
- Design underwater blasts related to mining projects

Course Outline

Law of the sea

Types of ocean minerals

Minerals of the deep seabed: Ferromanganese nodules, cobalt crusts and pollymetallic sulfides, etc.

Minerals of the continental shelf: Placers, seabed metals, industrial chemicals, etc.

Offshore Mining

Offshore mining/dredging machinery, coastal, shallow water and deep sea mining methods and underwater blasting

Seawater as a resource

Fresh water distillation, sodium chloride, bromine, magnesium, uranium, etc

Offshore Mining Project Design

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 8

Module Code	ER4460	Title	PETROLEUM PRODUCTION			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	ER4350
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Handle the process of petroleum production from a geological formation

Course Outline

Production platforms.

Evaluating inflow and outflow performance between the reservoir and the wellbore.

Designing completion systems, including tubing selection, perforating, sand control, matrix stimulation, and hydraulic fracturing.

Selecting artificial lift equipment, including sucker-rod lift (typically beam pumping), gas lift, electrical submersible pumps, subsurface hydraulic pumps, progressing-cavity pumps, and plunger lift.

Selecting equipment for surface facilities that separate and measure the produced fluids (oil, natural gas, water, and impurities), prepare the oil and gas for transportation to market, and handle disposal of any water and impurities

Aspects of petroleum production law

Assessment scheme

Continuous assessments 30%

Final exam 70%

Module Code	ER4271	Title	ADVANCED GEMMOLOGY			
Credits	2.5	Hour Week	Lectures	2.0	Pre - requisites	ER4512 & ER4522
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Handle advance gemological equipment

Identify natural gems, synthetics and organic gems using advanced gemmological instruments

Course Outline

Man-made gems: Synthetics, Artificial products and composites

Synthetic gemstones: Flame fusion (Vernueil) process,Czochralski method, flux melt growth, skull melting, zone melting &Hydrothermal method, Diamond synthesis.

Organic gem materials: Pearl, coral, amber, ivory, tortoiseshell, shell, jet.

Gemstone Enhancement: Surface treatment, Colourless&Coluored impregnations, heat treatment, Diffusion treatment, Irradiation, laser drilling, HPHT treatment for diamond.

Advanced techniques of gem and inclusion identification:

Electron microprobe, Scanning electron microscope, Ultraviolet-visible and near infrared spectrometry (UV-VIS-NIR), Secondary ion mass spectrometry (SIMS), Fourier-transform infrared (FTIR) spectrometer, Raman spectrometer, Energy Dispersive X-ray fluorescence (EDXRF), Laser Ablation-Inductively Coupled Plasma-mass spectrometry**.**

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 8

Module Code	ER4322	Title	SPACE TECHNOLOGY AND NAVIGATION SYSTEMS			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre - requisites	ER4313
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Understand the major GPS segments
Learn how a GPS receiver computes position and time from the GPS signals.
Understand the major error sources for GPS positioning.
Learn various forms of Differential GPS and equipment and processes for various levels of positioning accuracy

Course Outline

Space crafts and orbits, GPS systems
Navigations systems, Satellite GDOP
Receivers, GPS errors
DGPS, Analysis of GPS data
GPS data processing
GLONASS, EGNOS, MSAS, and GALELIO SYSTEMS

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	ER4532	Title	JEWELLERY PRODUCTION MANAGEMENT			
Credits	3.0	Hours/ Week	Lectures	2.0	Pre - requisites	ER4512 & ER4522
GPA/NGPA	GPA		Lab/Tutorials	3/1		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Manage Jewellery production unit
Assure quality of products

Course Outline

Production - Investment casting, electroforming, EDM (electrical discharge machining), die striking (stamping), Fabrication, CAM, hand crafting, organization, management of metal loss.

Quality Assurance - Laws and regulations, stamping, assaying, hallmarking, quality attributes, statistical methods, inspection methods, laboratory reports and certificates, hazardous materials.

Assessment scheme

Continuous assessments 50%
Final exam 50%

Semester 8

Module Code	**ER4713**	**Title**	**CONSTRUCTION ENGINEERING PRACTICE**			
Credits	**2.0**	**Hours/ Week**	**Lectures**	**2.0**	**Pre - requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Explain the uses of various constructions materials.

Draw bending moment and shear force diagrams to analyze the behavior of structural elements (steel and reinforced concrete).

Read and interpret the specifications and structural drawings.

Course Outline

Construction materials (steel, timber, masonry, concrete).

Manufacturing process, selection, testing and properties of building material

Bricks, Rubble, Sand,Coarse aggregates, Timber, Roof cover material, Cement blocks, Cement, Lime, Concrete, Steel, New building Materials

Testing:

Bending moment and shear force diagrams (simply supported and continuous beams, cantilevers, typical columns, and arches). Bending stresses and shear stresses in a steel member and a reinforced concrete member.

Typical construction practices (steel construction, pad footings, brick work, R/C slabs, beams and columns), Reading and understanding specifications and structural drawings

Assessment scheme

Continuous assessments 30%

Final exam 70%

Semester 8

Module Code	ER4720	Title	TUNNEL ENGINEERING AND DESIGN			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

Investigate ground conditions and existing structures in specifying support requirements.
Select the appropriate method of tunnel excavation, supporting system, work organization with safe practices in execution.
Evaluate ground movements resulting from underground excavations or ground treatments

Course Outline

Introduction: Tunnel shapes and dimensions, Evaluation of tunneling methods; Conventional methods and mechanical methods of excavation in different ground conditions.

Drilling-and-Blasting method: Full-face and by benching, Drilling round design, Drilling patterns, charging, ventilation, mucking, types of support -Timber, Steel, Shot-crete, Rock-bolting, auxiliary services, work organization.

Tunnel support determination: Support design, Geo-technical factors influencing support design, Support erection.
New Australian Mining Method (NATM)
Tunneling under shields

Assessment scheme

Continuous assessments	30%
Final exam	70%

SEMESTER 8

Module Code	**MA4013**	**Title**	**LINEAR MODELS AND MULTIVARIATE STATISTICS**			
Credits	**3.0**	**Hours/ Week**	**Lectures**	**3.0**	**Pre - requisites**	**MA1023/ MA 3013**
GPA/NGPA	**GPA**		**Lab/Tutorials**	**-**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Develop statistical models to identify influential factors in a given process.
- Understand the concepts of statistical data mining methods.
- Use MINITAB and SPSS for data analysis.
- Select the appropriate multivariate statistical methods to analyze data.

Course Outline

Linear Models

Types of measurement scale, multiple regressions, one-way analysis of variance. Mode partial F-Test, forward selection, Backward elimination and Stepwise techniques.

Multivariate Statistics

Geometric concept of multivariate data.
Introduction to data mining and warehousing.
Multivariate normal distributions.
Principal component analysis, explanatory factor analysis, discriminant analysis, clusters
Multivariate analysis of variance.
Use of MINITAB and SPSS.

Assessment scheme

Continuous assessments	30%
Final exam	70%

Semester 8

Module Code	MA4023	Title	OPERATIONAL RESEARCH			
Credits	3.0	Hours/ Week	Lectures	3.0	Pre - requisites	MA1013
GPA/NGPA	GPA		Lab/Tutorials	-		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Identify appropriate OR techniques in a given real world problem.
- Perform sensitivity analysis in the chosen OR model.
- Choose an appropriate algorithm for the given the OR technique.
- Use the TORA software for engineering problems.

Course Outline

Modeling with linear programming, geometrical solution to problems with two decision var simplex method including Big M-method and two phase method of a solution of problem mixed constraints.

Duality in linear programming, Transportation and assignment problems, trans-shi problems. Theory of zero sum, two person matrix games.

Revised simplex algorithm. Dual simplex algorithm, sensitivity analysis, and para programming.

Integer programming, Gomory's cutting plane, branch and bound, the knapsack problem.

Dynamic programming, the inventory model. Non-linear optimization.

Introduction to network algorithm including minimum connector problems: Shortest and l path algorithms and critical path analysis.

Assessment scheme

Continuous assessments 30%
Final exam 70%

Module Code	MN4010	Title	BUSINESS PLAN DEVELOPMENT			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre - requisites	-
GPA/NGPA	GPA		Lab/Tutorials	3/2		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Exploit business opportunities
- Prepare marketing, production, human resource and finance plans
- Write and present a business plan attractively

Course Outline

- Introduction to the Business Plan
- Marketing Planning
- Production Planning
- Planning for HR
- Planning for Finance
- Writing a Business Plans
- Presenting a Business Plan for donors and other related institutions

Assessment scheme

Continuous assessments 70 %
Final exam 30%

Semester 8

Module Code	**MN4072**	**Title**	**SMALL BUSINESS MANAGEMENT AND ENTREPRENEURSHIP**			
Credits	**2.0**	**Hours/ Week**	**Lectures**	**1.5**	**Pre – requisites**	**-**
GPA/NGPA	**GPA**		**Lab/Assignments**	**3/2**		

Learning Outcomes

Upon successful completion of this module, the student will be able to:

- Describe the theoretical and empirical framework of small business management.
- Explain the applications of these concepts & theories for own business.
- Identify the necessary skills to become a successful entrepreneur.

Outline Syllabus

Small Business Management

- Scale, nature & role of small business in a developing country;
  - Characteristics of small businesses;
  - Role of small businesses;
  - Reasons for failure of small businesses & barriers in establishing and managing small businesses.
- Business environment and industrial supporting system in Sri Lanka.
- Relevant concepts to understand business creation and growth such as;
  - Identification of market opportunities;
  - Developing a business plan;
  - Managing small business operations
  - Marketing in small businesses

Entrepreneurship

- Identifying who the entrepreneur is;
  - Definition;
  - Relevant economic, psychological and sociological theories of entrepreneurship;
  - Characteristics and functions of the entrepreneur;
- Entrepreneurship development;

Practical: 6 industrial case studies, guest lectures and assignments

Assessment scheme

Continuous assessments 30%
Final exam 70%

Semester 8

Module Code	MN4150	Title	PROJECT MANAGEMNET			
Credits	2.0	Hours/ Week	Lectures	2.0	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	-		

Learning Outcomes
Understand the basic concepts and theories of Project Management.
Acquire and develop capabilities in Project Management concepts and applications

Outline Syllabus
Definition of project management and relationship to other management disciplines
Project management context
Project planning
Key management skills
Project management process
Management of the project scope, time, cost, quality, risk and communications
Project integration management
Project procurement management
Project assessment and stakeholder marketing

Text Book
Greene J. and Stellman A., (2013) Head First PMP, O'Reily Media

Assessment scheme
Continuous assessments 50%
Final exam 50%

Floor Plan of the Department

The office, laboratory, lecture theaters and other spaces allocated to the Department of Earth Resources Engineering are located in the Applied Science Building as illustrated below in Fig.1, Fig.2 and Fig.3 (not to scale).

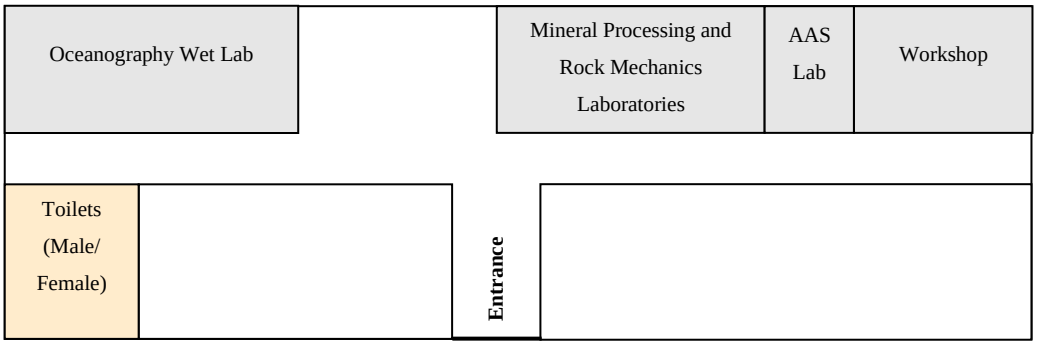

FIG.1 – GROUND FLOOR

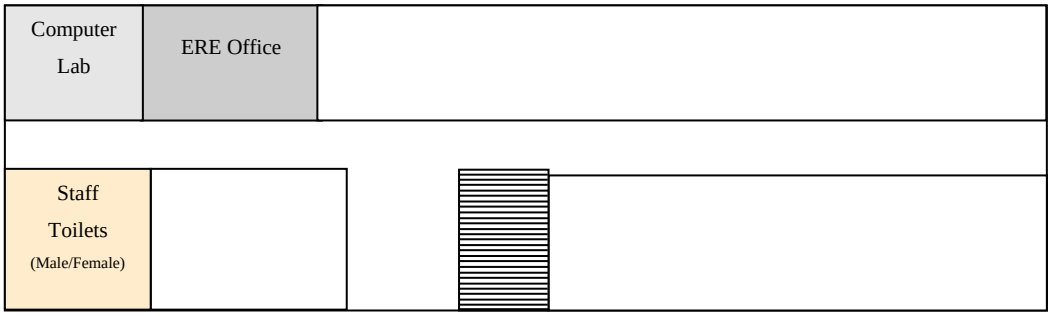

FIG.2 – FIRST FLOOR

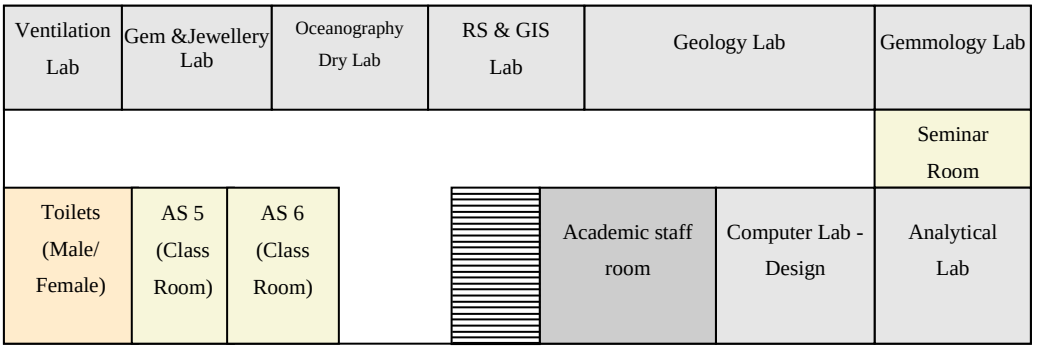

FIG.3 – SECOND FLOOR

Equipment and Facilities

The Department of Earth Resources Engineering is open for general academic works from 8.15 am to 4.15 pm. Laboratory facilities in the department are available for students during the scheduled practical sessions. Students are advised not to use any equipment without permission from the lecturer in-charge or under the guidance of the technical officer-in-charge. Laboratories are kept open during afterhours for project/design /research work with special permission from the Head of the Department and supervisors. The computer laboratory is open from 8.30 am to 9.30 pm on weekdays and from 8.30 am to 6.30 pm on Saturdays.

Laboratories and Equipment

Analytical and Geo-Environmental Engineering Laboratory

Inductively Coupled Plasma –MS, Atomic absorption spectrometer, UV-Visible spectrometer, COD apparatus, BOD apparatus, BOD incubator, Drying oven, Water quality parameter meters (Conductivity meter, pH meter, Dissolved-oxygen meter, Turbidity meter, Chlorine meter), Magnetic stirrer, Laminar Flow cabinet, Fume hood, Analytical balance and micro balance, Muffle furnace.

Computer Laboratory-Design

Twenty Five Hi-End computers with appropriate modern design software to facilitate the modeling capabilities of different subject components.

Gemmology Laboratory

Gemological microscopes (Horizontal and Vertical), Refractrometers, Polariscopes, Spectroscopes, Dichroscope, Ultra violet unit, Gas furnace for heat treatment of gemstones.

Geology Laboratory

GPR, Hydraulic earth drill, Magnetometer, Petrological microscope, Rock cutting and thing section machine, Stereoscope and field survey equipment, Rock and mineral samples on display.

Jewellery Design Laboratory

PCs equipped with, Jewel CAD software and Laser color printers.

Mineral Processing Laboratory

High tension separator, Wilfley table, Humphry spiral, Magnetic separator, Hydro cyclone, Mineral jig, Sieve shaker, Electric furnace, Electric oven, Electronic balance, Froth flotation cell, Tema mill

Mine Ventilation Laboratory

Airflow demonstration equipment with wind tunnel, Airflow testing set (MK4 apparatus), Gravimetric dust sampler, Personal air sampling pump, Open jet wind tunnel, Anemometers, Hygrometers, Kata thermometer, Aneroid barometer and mine surveying equipment, ground vibration monitoring equipment (Blastmate) is also available in the lab.

Oceanography Wet & Dry Laboratory

Sub bottom profiler, Seismograph, Reflection – refraction polarizing microscope, Particle size analyzer, Echo sounder, Grab sampler, Sieves & Sieve Shaker, Niskin bottles, Gravity corer, Gamma ray spectrometer, Tide gauge, Wave gauge, Current meters, Side scan sonar, CTD, Spectrophotometer, Navigational GPS, Research Boat & Life Jackets, Softwares-'Global Mapper, Surfer,Techlog, Petrel, Eclipse, Sonarwiz, Mat Lab'.

Rock Mechanics Laboratory

Rock crushers (Jaw crusher, Cone crusher), Triaxial testing machine, Point load tester, UCS testing machine, Ball mill, Rock coring machine, Rock cutter, Rock grinder, Lapping machine.

RS & GIS Laboratory

PCs with RS and GIS software, Scanner, Printer, Stereoscopes, Aerial and Satellite images, Topographical maps, Global Positioning Systems.

Students' Computer Laboratory

PCs with Internet access. Provides facilities for students' project work, assignments and general internet access.

Workshop

Boxford lathe machine, Pedestal electric drilling machine, Pedestal grinder, Power saw for metal cutting, Electric arc welding plant, Gas welding plant, basic tools for wood and metal work. This is a common facility for all students of the department, especially to conduct project work.

Code of Conducts for Laboratories

- Read the SOPs/instruction manuals of instruments/devices prior to use.
- Handle equipment, specimens and chemicals with extreme care for personal and equipment safety.
- Strictly follow the instructions given when using laboratories.

Expertise Services Offered by Dept. of ERE

- Borehole logging
- Designing and planning of underground and surface mines/quarries.
- Designing and planning of drilling and blasting for road construction and civil works.
- Designing of mineral processing plants.
- Economic viability reports (EVR) for mining and mineral industry.
- Environmental assessment report for mining and quarry projects.
- Flood hazards assessment.
- Gem identification and valuation.
- Geochemical analysis.
- Geological and engineering geological mapping.
- Heat treatment of semi-precious gem stones.
- Minerals and rock analysis.
- Minerals exploration inland and offshore.
- Mine waste management and treatment.
- Resource management using RS and GIS.
- Rock/ aggregate testing and petrographic analysis.
- Site investigations for engineering geological projects.
- Geophysical investigation.
- Slope stability assessment/landslide investigation.
- Tunneling and shaft sinking.
- Water quality analysis (including sample collection for testing).



Academic Awards

Annual academic award is offered to the most outstanding grandaunt fulfilling the following criteria of the Department of Earth Resources Engineering.

Á **Gold Medal donated by Geological Survey and Mines Bureau**

Awarded to the Earth Resources Engineering graduand who obtains the highest overall Grade Point Average of 3.8 or above at the B.Sc. Engineering Degree examinations.

OR

Á **National Gem and Jewellery Authority Award**

Awarded to the Earth Resources Engineering graduand who obtains the highest overall Grade Point Average of 3.7 or above at the B.Sc. Engineering Degree examinations.

Special Events

Mentoring Programme

The mentoring programme at the Department of Earth Resources Engineering is conducted with the intention of improving the undergraduates with soft skills such as leadership, communication, team work, positive attitudes, etiquette, personal grooming, etc. The young graduate's employability and chances of success need to be addressed in competitive environment. The Program is conducted on two parallel lines during 6th and 7th semesters, as a series of guided activities conducted by senior professionals in industry and as a series of in-house lectures delivered by specialists on topics related to key skills developed.

Department Mentoring Coordinator: Professor HMR Premasiri

International Symposium on Earth Resources Management and Environment (ISERME)

This is the annual conference organized by the department to bring together mining engineers and related professionals to present their research findings for constructive discussion and paving the way for applications of those findings for betterment of the trade, industry and standards of public life.

In 2017, Department organized the first-ever International Symposium jointly with Hokkaido University, Japan and in future this annual symposium will be held as an international event.

Earth Resources Engineering Society (ERES)

Earth Resources Engineering Society was established in 2002, to enhance peer interaction among the students of Earth Resources Engineering. The Society organizes annual fund raising programs, which contribute to student activities such as student get together, guest lectures and community projects (Guru Gedarata Arunellak).

In the past ERES have organized 'Shramadana' campaigns as well as tutorial classes for A/L students in remote areas. The annual "Sports and Cultural Festival" is the biggest venture organized by the ERES.

The ERES is also continuing to offer a financial assistance for few students in the Department of Earth Resources Engineering since 2014. The students registered in the Department are eligible to apply. ERES financial assistance program provides a monthly stipend to each successful applicant for a period of two academic semesters with the support of Mr. Chirantha Weerawardana, Mr. Sagara Kelaniya and ERE Society Fund.

As an undergraduate student of the Department of Earth Resources Engineering, you are welcome to extend fullest support and take active participation for all activities.

Annual Sports and Cultural Festival

An annual sports and cultural festival is organized by the Earth Resources Engineering Society (ERES), under the guidance of the Department of Earth Resources Engineering. The objective of this annual event is to enhance the social, cultural and religious harmony among the undergraduates, through engagement in extracurricular activities.

The sports festival consists of badminton, table tennis, volley ball, netball and cricket tournaments with a musical show and a colorful award ceremony concluding the grand event. The sports festival attracts students, academics as well as non-academic staff from all faculties of University of Moratuwa.

Postgraduate Prospects

Postgraduate Research

The research areas of interest of the department includes; quarrying and bulk material handling, drilling and blasting, environmental studies on mining activities, mineral and petroleum exploration, geological and engineering geological studies, landslide and slope stability, groundwater studies, coastal hydrodynamics and sediment dynamics, RS & GIS, geological disaster, mineral processing, heat treatment of gem stones, tunnel support economics, ventilation, mine waste treatment, etc.

The department has qualified academic staff with postgraduate qualifications. They are actively involved in research and development activities which have been well recognized locally as well as internationally. Graduate students are encouraged to join the postgraduate programs of the department to broad base the knowledge while gaining industrial experience to widen the horizons.

Postgraduate Degree Programs Offered by the Department

- MSc/Postgraduate Diploma in Mining and Mineral Exploration
- MSc/Postgraduate Diploma in RS and GIS
- MSc (by research)
- MPhil (by research)
- PhD (by research)

Other Courses Offered by the Department

- Diploma in Gemmology
- Certificate Course on Gemmology
- Certificate Course on Geology
- Short Course on Tunneling

At the beginning of each semester, the students must:

- Enroll in appropriate subjects through LearnOrg for each semester, according to the credit requirement stipulated in the ERE curriculum. The students have to check;
    - Pre-requisites.
    - Departmental GPA credit requirement of the subject stream.
    - Non-Departmental GPA credit requirement.
    - Non-GPA credit requirement.
- Verify the accuracy of initial student registration details published on the departmental notice board.
- Add/drop subjects within 2 weeks from the commencement of each semester and finalize the subject selection for a particular semester.
- Make sure to sign on final student registration list provided by the level coordinator.
- Collect previous semester result sheets from the examinations division.

During the stay at the department, students are advised to contact academic advisers, level coordinators and university student counsellors for advice regarding streams/subject selections and in any other matters that requires assistance.

Students may contact Industrial training coordinator at the department to search available training opportunities. Industrial training division will assist the students on monthly training report submission, updating training diary, regular inspections, final training report submission and oral examinations.

Details of all academic criteria and bylaws refer performance criteria for the Honors Degree of the Bachelor of the Science of Engineering in Faculty of Engineering. Details of student counsellors and procedure for submission of medical certificates by students refer the first year handbook, Faculty of Engineering.

Conduct Yourself

- **Follow, 'Student code of conduct'**
- **Refer: By-law for the conduct at the examinations (By-law No 15:2013)**

Industrial Training Placements Offering Organizations for Our Undergraduates

1. Access Engineering
2. Ananda Miners Pvt. Ltd.
3. Bogala Graphite Lanka PLC
4. Central Engineering Consultancy Bureau
5. Centre for Urban Water, Ministry of Megapolis and Western Development
6. Ceylon Petroleum Storage Terminals
7. CML Edwrads Pvt. Ltd.
8. Disaster Management Centre
9. Engineering and Laboratory Services (Pvt) Ltd
10. Foundation & Waterwells Eng.Pvt. Ltd.
11. Geo Informatics Centre - Thailand
12. Geotech Pvt. Ltd.
13. Greater Colombo Waste Water Mgt. Project
14. Geological Survey and Mines Bureau
15. Hayles Energy Pvt. Ltd.
16. Illuka Resources Pvt. Ltd. -Australia
17. Irata Holding Pvt. Ltd.
18. Irrigation Department
19. Lanka Mineral Sands Ltd.
20. Lanka Hydraulic Institute
21. MAGA Engineering Pvt. Ltd.
22. Master Divers Pvt. Ltd.
23. Metal Mix Pvt. Ltd.
24. National Gem & Jewellery Authority
25. Nawaloka Costruction Pvt Ltd.
26. National Building Research Organization
27. Petroleum Resources Development Secretariat
28. ROCELL Pvt. Ltd.
29. Sanken Construction Pvt. Ltd. | San Piling
30. Senarath Group of Companies

31. Siam City Cement [Lanka] Ltd. [Formerly HOLCIM Lanka Pvt. Ltd.]
32. Sierra Piling
33. Sri Lanka Ports Authority
34. Urban Development Authority
35. Water Board- Ratmalana

Contact

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