
**MINING AND MINERAL PROCESSING ENGINEERING
EXAMINATIONS SYLLABUS**

**GROUP A
COMPULSORY EXAMINATIONS (6 REQUIRED)**

98-Mmp-A1 General Geology and Exploration

Mineralogy, determination and identification of minerals, with emphasis on ore minerals. Petrology. Structural geology. Internal and external geologic processes. Techniques used to find and delineate ore bodies, airborne methods, geophysical, geochemical, sampling and drilling.

Recommended Texts:

A. E. Kehew, General Geology for Engineers. Prentice Hall Canada Inc., Scarborough, Ontario, 1988., 447 p.

C. Klein And C.S. Hurlbut, Manual of Mineralogy, 20th edition. Wiley and Sons, New York, N.Y., 1985 596 p. (Chapters 1,4,5,8 and 9 only. For Chapters 8 & 9, know only the physical properties and diagnostic features of the 42 minerals named with capital letters).

M.P. Billings, Structural Geology, 3rd edition. Prentice-Hall Inc., Englewood Cliffs, N.J. 1972. 606 p (Study only Chapters 1 to 12, excluding 5, and Chapter 18.)

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394pp (Study only Chapters 4 and Chapters 5.3 & 5.4).

98-Mmp-A2 Mining Methods and Design

Description and usage of the following underground mining methods: room and pillar, long-hole, longwall, open stoping, shrinkage stoping, cut and fill sub-level stoping, timbered stoping, top slicing, underhand and overhand stoping, block caving, sublevel caving, and VCR mining techniques. Underground design C stope development, haulage systems, shafts, hoists, ramp design and multi-level access. Surface mining methods including strip mining, open pit mining, terrace and contour mining, placer mining, hydraulic mining dredging and quarrying. Design criteria for surface mines including scheduling, materials handling, waste dump and pit dewatering.

Recommended Texts:

H.L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394 pp.

B. A. Kennedy (Editor), Surface Mining, 2nd edition. SME Littleton, CO., 1990, 1206p.

H. L. Hartman, Introductory Mining Engineering. J. Wiley, New York, N.Y., 1987.

A.L. Mular & R. Poulin, CAPCOSTS- A Handbook for Estimating Mining and Mineral Processing Equipment Costs and Capital Expenditures and Aiding Mineral Project Evaluations, Special Volume 47. CIM, Montréal, 1998, 319 p.

98-Mmp-A3 Mineral Processing

Material balances. Measures of efficiency of mineral separations. Sampling systems and sampling errors, use of Gy's equation. Particle size measurement and presentation of results. Mineral liberation by crushing, grinding, screening, and classification. Mineral concentration using gravity, dense medium, magnetic and high tension separators. Froth flotation and flotation circuits. Use of reagents C collectors, frothers, depressants, and activators. Precious metals recovery methods C cyanidation, Merrill Crowe, carbon-in-pulp, carbon-in-leach, metal recovery methods. Heap leaching technology for precious metals and base metals. Dewatering techniques C thickening, filtering, drying, flocculants, and filter aids. Flowsheet analysis emphasizing Canadian mineral processing plants.

Recommended Texts:

Prime Texts:

Mineral Processing Technology, 6th edition. Butterworth Heinmann, 1997, 486 p.

H. L. Hartman (Editor), SME Mining Engineering Handbook, 2nd edition, Vol I & II. SME Littleton, CO., 1992, 2394p (Chapters 25.3 & 25.4.1).

Supplementary Texts:

J.W. Leonard, Coal Preparation, 5th edition. SME Littleton, CO, 1997. 1154p.

SME Mineral Processing Handbook, SME Littleton, CO., 1985. 2184 p.

I.P.G. Hutchison & J. E. Kiel (Editors), Introduction to Evaluation, Design and Operation of Precious Metal Heap Leaching. SME Littleton, CO, 1988, 380 p.

98-Mmp-A4 Mine Valuation and Mineral Resource Estimation

Aspects of geological conditions and geological control that relate to mineral resource estimates. Mineral resource estimation using conventional and geostatistical techniques. Mine valuation and preliminary feasibility studies. Marketing and smelter contracts. Financial models, capital and operating cost estimations, and control.

Recommended Texts:

D.W. Gentry and T.J. O'Neil, Mine Investment Analysis. SME Littleton, CO., 1984, 510 p.

E.H. Isaaks and R.M. Srivastava, An Introduction to Applied Geostatistics. Oxford University Press, 1989.

W.R. Gocht, H. Zantop and R. G. Eggert, International Mineral Economics. Springer-Verlag, 1988.

W.A. Vogely (editor), Economics of the Mineral Industries. SME, Littleton, CO, 1985.

H. L. Hartman (editor), SME Mining Engineering Handbook, 2nd edition, Vol I & II. SME Littleton, CO., 1992, 2394 pp (Chapters 5.6 & Chapter 6).

H.F. King, A Guide to the Understanding of Ore Reserve Estimation. Australian Inst. of Mining and Met., Supplement to Proceedings #281, 1982.

Canadian Mining Taxation, latest edition. Price Waterhouse, P.O. Box 190, Stn 1st Can. Place, Toronto, M5X 9Z9.

98-Mmp-A5 Mine Management and Systems Analysis

Mine organization and mine management. Budgeting and management accounting. Industrial engineering C work design and scheduling, work study and sampling, development of standard practices. Organizational structure of business in the mining industry. Contracting procedures. Labour/management relations. Operations Research methods C control networks (CPM, PERT), linear programming and simulation techniques. Optimization and experimental design.

Recommended Texts:

F.A. Starke, R.W. Sexty, Contemporary Management in Canada. Prentice Hall Canada Inc., 1992. ISBN 0-13-174509-3.

W.L. Winston, Operations Research, 3rd edition. Duxbury Press, 1994.

D.C. Carmichael, Engineering Queues in Construction and Mining. Horwood, 1987.

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394 pp.

Johnston, R.B. and Barnes, R.J. (Editors), Applications of Computers and Operations Research in the Mineral Industry. SME, Littleton, CO, 1982.

Spinner, M., Elements of Project Management. Prentice Hall Inc., Englewood Cliff, N.J., 1981.

98-Mmp-A6 Environmental Protection

Tailings disposal systems: impoundment on surface, treatment of recycle or decant water, sub-aqueous discharge to fresh and marine waters. Construction, maintenance and stability of embankments, waste piles, dams, and dikes. Prediction, prevention and control of acid rock drainage from exposed faces or waste dumps. Control of dust, noise, and gas emissions. Reclamation and revegetation. Government regulations concerning environmental protection in the design, operation and closure of mines and mills.

Recommended Texts:

Williams, R.E., Waste Production and Disposal in Mining Milling and Metallurgical Industries. Miller Freeman, 1975.

S.G. Vick, Planning, Design and Analysis of Tailing Dams. J. Wiley & Sons, Toronto, 1983.

Chalkley, M.E., Conard, B.R., Lakshmanan, V.L and Wheeland, K.C. (Editors.), Tailing and Effluent Management. Pergamon, 1989.

Argall, C.O. (editor), Tailing Disposal Today: Proceedings, Volume 2. International Tailing Symposium. (Second, Denver, Colorado, 1978), Miller Freeman, 1979.

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394pp, (Chapter 12.1 - 12.3).

GROUP B
ELECTIVE EXAMINATIONS (3 REQUIRED)

98-Mmp-B1 Applied Rock Mechanics

Determination of rock properties. Field instrumentation. Structural surveys, rock mass classification. In situ stress determination. Modelling stress fields around openings, including finite element and boundary element techniques. Mine support systems. Mine subsidence. Monitoring and control techniques, including seismic events, ground waters.

Recommended Texts:

Prime Texts:

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394 pp.

Hoek, E. and Bray, J.N., Rock Slope Engineering, 3rd edition. Institution of Mining and Metallurgy, London, 1981.

Hoek, E. and Brown, E.T., Underground Excavations in Rock. Institution of Mining and Metallurgy, London, 1981.

Supplementary Text:

Brady, B.H.E. and Brown, Rock Mechanics for Underground Mining, 2nd edition. E.T. George Allen and Unwin, London, 1993.

98-Mmp-B2 Rock Fragmentation

Principles and technologies of cutting, drilling, boring, and blasting, including vibrational and shock effects. Explosives, including properties and classification, selection of chemical explosives and explosive mixtures, regulations and approved procedures for handling, storing, loading, and detonating. Blasting design, including detonators, delay systems, control blasting methods.

Recommended Texts:

Chiappetta, R.F. and Berg, D.G., Explosives and Rock Blasting. Atlas Powder Company, Maple Press, 1987.

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394 pp.

Explosives Handbooks. Manufacturers (e.g. C.I.L and DuPont).

Konya, C.J. and Walter E.J., Surface Blast Design. Prentice Hall, New Jersey, 1990.

Clark, G.B., Principles of Rock Fragmentation. John Wiley & Sons, New York, 1987.

98-Mmp-B3 Mine Equipment Selection and Maintenance

Selection, sizing and matching of mining equipment: shovels, excavators (BW and hydraulic), draglines, loaders, tramming equipment (trucks, LHD, trains, etc.). Conveyors, feeders, stackers, bins, pipelines and hoists. Automation and robotic control of mining equipment. Applications of GPS. Maintenance principles and practices C preventative and predictive maintenance.

Recommended Texts:

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394 pp.

Crawford, J.T. and Hustrulid, W.A., Open Pit Mine Planning and Design. SME, Littleton, CO, 1972.

Hustrulid, W.A., Underground Mining Methods Handbook. SME, Littleton, CO, 1982.

98-Mmp-B4 Occupational Health, Safety and Loss Management

Control and detection of hazards in mines: rock falls, slope failure, radiation, heat, noise, dust and gas. Ventilation C air flow through mine openings, air quality and control. Health, safety and industrial hygiene. Risk analysis, risk management, and loss control.

Recommended Texts:

H.L. Hartman and others, Mine Ventilation and Air Conditioning, 2nd edition. John Wiley and Sons Inc., 1982.

M.J. McPherson, Subsurface Ventilation & Environmental Engineering. Chapman & Hall, 1993.

H. L. Hartman (Editor), SME Mining Engineering Handbook, Vol I & II, 2nd edition. SME Littleton, CO., 1992, 2394 pp (Chapter 3.3).

Provincial Mine Regulations (for Province of Registration).

Laird Wilson, Basic Learnings in Industrial Safety and Loss Management. APEGGA, Edmonton, 1998, 72 p.

98-Mmp-B5 Mill Design, and Operations

Flowsheet synthesis and circuit design. Selection and sizing of milling equipment: comminution, classification, size separations, froth flotation, dewatering, solids and slurry storage and transport. Modelling and new developments in mill design: Tower, AG and SAG mills, column flotation, coal preparation practices, pre-concentration techniques. Sampling, data logging and material balances. Capital, and operating cost estimations.

Recommended Texts:

Mular, A.L. and Bhappu, R.B., Mineral Processing Plant Design, 2nd Edition. SME, Littleton, CO, 1980.

B.A. Wills, Mineral Processing Technology, 5th edition. Pergamon Press, 1992.

PG. Claridge (ed.), Operation and Maintenance in Mineral Processing Plants. CIM, Vol 40, 1989.

Lynch, A.J. Johnson, N.W., Manlapic, E.V. and Thorne, C.G., Mineral and Coal Flotation Circuits. Elsevier, New York, 1981.

Mular, A.L. and Jergensen, G.V., Design and Installation of Communication Circuits. SME, Littleton, CO, 1982.

A.L. Mular & R. Poulin, CAPCOSTS - A Handbook for Estimating Mining and Mineral Processing Equipment Costs and Capital Expenditures and Aiding Mineral Project Evaluations, Special Volume 47. CIM, Montréal, 1998, 319 p.

98-Mmp-B6 Mill Process Control

Basic process control and analysis: PID loops, feedback, feed forward, cascade and interacting control systems. Controller settings C analytical and loop-tuning techniques. Computer control: modelling, adaptive, and supervisory. On-stream analysis and sampling for control; strategies for control of crushing, grinding, flotation, and dewatering circuits. Instrumentation for bin and sump level sensing, solids and slurry flowrates, pulp density, power draw, reagent addition, pH measurement. Alarm and interlock systems, sequencing problems. Benefits and justification of automatic control.

Recommended Texts:

Borer, J., Instrumentation and Control for the Process Industries. Elsevier, London, 1985.

Coughanowr, D.R. and Koppel, L.B., Process Analysis and Control, 2nd edition. McGraw-Hill, 1979.

Considine, D.M. (ed), Process Instruments and Controls Handbook, 3rd edition. McGraw-Hill, New York, 1985.

P.G. Claridge (ed.), Operation and Maintenance in Mineral Processing Plants. CIM, Vol.40, 1989, Section 9.

98-Mmp-B7 Extractive Metallurgy

Thermodynamics of pyro- and hydro-metallurgical extraction processes. Kinetics of extraction processes. Slag and mattes. Pyrometallurgical processes including calcining, roasting, and smelting. Hydrometallurgical processes, including leaching (autoclave, agitation, and heap), purification and concentration via ion exchange, and solvent extraction, metal recovery via electrowinning, electrolysis or precipitation. Refining processes. Flowsheet studies.

Recommended Texts:

J. J. Moore, Chemical Metallurgy, 2nd edition. Butterworths, 1990, 435 p.

Gilchrist, J.D, Extraction Metallurgy, 2nd edition. Pergamon, 1979, 455 p.

**The Association of
PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
of British Columbia**

1998 MINING & MINERAL PROCESSING ENGINEERING SYLLABUS
Checklist for Self Evaluation
(Not for candidates who are assigned
confirmatory exams)

Name: _____

Exam Number	Exam Name	Applicant's Self-Evaluation - Course Equivalent	For Office Use Only
<i>Basic Studies (6 Required)</i>			
98-BS-1	Mathematics		
98-BS-2	Probability and Statistics		
98-BS-6	Mechanics of Materials		
98-BS-7	Mechanics of Fluids		
98-BS-11	Properties of Materials		
98-BS-14	Geology		
<i>Basic Studies (2 required)</i>			
98-BS-3	Statics and Dynamics		
98-BS-4	Electric Circuits and Power		
98-BS-5	Advanced Mathematics		
98-BS-8	Digital Logic Circuits		
98-BS-10	Thermodynamics		
<i>Group A (6 required)</i>			
98-Mmp-A1	General Geology and Exploration		
98-Mmp-A2	Mining Methods and Design		

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98-Mmp-A3	Mineral Processing		
98-Mmp-A4	Mine Valuation and Mineral Resource Estimation		
98-Mmp-A5	Mine Management and Systems Analysis		
98-Mmp-A6	Environmental Protection		
Group B (3 Required)			
98-Mmp-B1	Applied Rock Mechanics		
98-Mmp-B2	Rock Fragmentation		
98-Mmp-B3	Mine Equipment Selection and Maintenance		
98-Mmp-B4	Occupational Health, Safety and Loss Management		
98-Mmp-B5	Mill Design and Operations		
98-Mmp-B6	Mill Process Control		
98-Mmp-B7	Extractive Metallurgy		
Complementary Studies (All Required)			
98-CS-1	Engineering Economics		
98-CS-2	Engineering in Society - Health, Safety, and the Environment		
98-CS-3	Management Concepts for Engineers		