

Rajiv Gandhi ProudlyogikiVishwavidyalaya Bhopal

M.Tech (Mining Engineering)

Second Semester Syllabus

MTMI 201- Mine Safety Management

UNIT I

Mine accidents and their analysis: Accident in mines;- different types, accident investigations; In-depth study of accidents due to various causes; and Human Behavioural Approach in mine safety, accident prevention and corrective action, accident proneness, creating and maintaining safety awareness, ZAP and MAP, job safety analysis, safety meeting and committee.

UNIT II

Health and mine safety: Definition of health and safety, management's role – function; evolution of management involvement, management's training, responsibility, cost of health and safety, role of labour organizations – Union impact and involvement, role of government – statutory controls and directions, spot and regular inspections, enforcement of standards, penalties for violations, collection and distribution of statistical data. Safety audit methods; Safety records management, Training of Miners. Recent trends of development of safety engineering approaches.

UNIT III

Fault tree analysis: Introduction – methodology, symbols and Boolean techniques, qualitative analysis, computerized methods, statistical analysis, safety information, systems design. Appraisal of advance Techniques - fault tree analysis, Failure-Statistical methods of Risk analysis: Appraisal of advanced techniques Mode and Effect Analysis (FMEA); Failure Mode Effect and Critical Analysis (FMECA)

UNIT IV

Risk assessment and disaster management: Principles, risk and hazard control, risk and hazard evaluation and data collection for identified health risks, exposure assessment and risk characterization, probabilistic risk analysis, risk management, safety culture, human factors, reliability evaluation, safety audit. Identification of causes of mine disasters, preventive action.

Concepts of Disaster, Types of Disaster and Dimensions of Natural and Anthropogenic Disasters (landslide, subsidence, fire and earthquake); Principles and Components of Disaster Management. Disaster Management and Mitigation, typical cases of mine disasters in India.

UNIT V

Miner's occupational diseases and enquiry committee: Miner's occupational health and diseases, preventive medical examinations, various types of injuries, compensable diseases, medical attention and removable of causative factors in the mines. Recommendations of inquiry committee carried out for safety and health issues in India.

Text / Reference books:

1. Brown DB. System analysis and design for safety. Prentice Hall. 1976.
2. Stranks J. Management systems for safety. Pitman publishing. 1994.
3. DeReamer R. Modern safety practices. John Wiley and Sons. 1959.
4. Wahab KA. New technology in health and safety. SMME. 1992.
5. Ericson CA. Fault tree analysis primer. Create Space Independent Publishing Platform. 2011.

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M.Tech (Mining Engineering)

Second Semester Syllabus

MTMI 202- Mine Ventilation And Planning

UNIT-I

Mine Gases: Origin, occurrence, physical, chemical and physiological properties of mine gases, instruments used for spot detection of mine gases. Various damps, methane drainage techniques. Gas chromatography.

UNIT-II

Mine Climate and Control: Sources of heat and humidity in mines and their effects, instruments used for measurement of temperature, humidity, pressure and velocity. Heat stress indices, Cooling power and method of improving cooling power.

UNIT-III

Natural Ventilation and Laws of Air flow: Natural ventilation, Factors effecting NVP, Direction of air flow, Derivation of NVP, Motive column, Atkinson law governing airflow in mine openings.

UNIT-IV

Mechanical Ventilation: Definition of Mechanical ventilation, Different types of fans and their characteristics, Operating point, Fan laws, installation. Ventilation appliances, economic size of roadways, determination of quantity and head requirements. Fan selection and evasee. **Ventilation networks:** simple and complex, solutions to simple ventilation network. Introduction to Hardy cross method for solving complex network. Introduction to ventilation softwares.

UNIT-V

Ventilation Planning: Standards of ventilation, ascensional ventilation, descensional ventilation, ventilation planning for different mining methods: Bord and pillar, Longwall mining method and cut and fill, sub level caving and shrinkage stoping method.

Text / Reference books:

1. Mishra GB. Mine environment and ventilation. Oxford University Press. 1992.
2. Hartman HL. Mine ventilation and air conditioning. Wiley Interscience publication.1993.
3. Hall CJ. Mine ventilation engineering. Society of mining engineers, New engineers, New York, 2nd Edition. 1992.
4. Vutukuri VS. Mine environment engineering, Trans tech publishers. 1986.
5. McPherson MJ. Subsurface ventilation and environmental engineering. Chapman and hall publication, London. 1993.

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M.Tech (Mining Engineering)

Second Semester Syllabus

MTMI 203- Numerical Methods In Geotechnical Engineering

UNIT: 1

Introduction: Categories of Problems in Geo technical Engineering, Finite Difference Method, Boundary Corrections for Grids. Accuracy, Convergence and Stability. Idealization of soil behaviour; Linear, Bilinear and multi linear, Hyperbolic, Spline function, Ramberg – Osgood's Model, Polynomials, Higher order elastic models, perfect plasticity, frictional. Elastic models of soil behaviour – The winkler – Filenenko boroditch – Pasternak – Ressiener models.

UNIT: II

Seepage: Finite Difference Solution to Laplace equation for Homogeneous and Layered Soils.

UNIT:III

Consolidation: Finite Difference Solution for One Dimensional, Two and three dimensional consolidations. Multi layered systems. Consolidation of Ground for Construction Load and Static Load.

Unit: IV

Shallow Foundations: Beams on Elastic foundations, solution by Finite Difference and – Finite Element Method (Direct Approach) Limit analysis, Lower Bound and Upperbound theories Method of Finite difference solution of Raft foundations.

UNIT: V

Pile Foundation: Pile Stresses – Static loading – Finite Element Method Solution (Direct approach) of the pile static pile capacity wave equation □ □ Lateral piles by Finite Element Method (Direct Approach) and Finite Difference method.

Text / Reference books:

1. Numerical methods in Geotechnical Engineering by C.S. Desai and J.T. Christian McGraw Hill publications.
2. Analytical and computer methods in foundation engineering, JE Bowles, McGraw Hill publications.
3. Foundation analysis and design, JE Bowles, McGraw Hill publications
4. Foundation analysis by RF Scott, Printice Hall
5. Hytenyi, Beams on Elastic Foundations – university of Michigan Press.
6. Elastic Analysis of Soil – Foundation Interaction, APS Selvadurai – Elsevier
7. Pile Foundation Analalysis& Design by Poulos and Davis.

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M.Tech (Mining Engineering)

Second Semester Syllabus

MTMI 204- Research Methodology And IPR

UNIT 1:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT 3:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT 4:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT 5:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text / Reference books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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M.Tech (Mining Engineering)

Second Semester Syllabus

MTMI 205- Writing Skills For Scientific Communication

Unit-1:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness, Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising.

Unit-2: Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit-3:

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Unit-4:

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

Unit-5:

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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M.Tech (Mining Engineering)

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MTMI 206- Geotechnical Engineering Lab

List of Experiments:

1. Determination of moisture content and specific gravity of soil
2. Grain size distribution analysis and hydrometer analysis
3. Atterberg limits (liquid limit, plastic limit, shrinkage limit)
4. Field identification tests
5. Vibration test for relative density of sand
6. Standard and modified proctor compaction tests
7. Falling head permeability test and constant head permeability test
8. CBR

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Second Semester Syllabus

MTMI 207- Mine Ventilation And Planning Lab

List of Experiments:

1. Determination of air quantity.
2. Determination of air cooling power.
3. Detection of mine gases and construction of mine fans.
4. Performance of evasee.
5. Performance of fans in series and parallel.
6. Determination of weisbach coefficient.
7. Study and analysis of ventilation network.
8. Study of Fire extinguishers, rescue and reviving apparatus.
9. Study of various types of stopings and re-opening a sealed off area.
10. Konimeter, gravimetric dust sampler and personal dust sampler.