Missouri University of Science and Technology
Department of Mining and Nuclear Engineering

MI ENG 326 SURFACE MINING METHODS AND EQUIPMENT

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CURRICULUM CONTENT OF MI ENG 326

(Lecture 3.0): Principles of planning, constructing and operating economically viable surface mines. Cost effective mining methods: placer mining, stripping, open pit mining, quarrying; Selection of equipment for surface mining operations; Optimization of mine performance. Field trip is required. Pre-Requisite: MI ENG 215, MI Eng 225; Co-Requisite: MI ENG 331.

COURSE SCHEDULES

- Lectures: Mondays/Wednesdays/Fridays; 8.00 am ~ 8.50 am; 206 McNutt

COURSE FOCUS

- Strategic and Tactical Planning
- Design and Optimization of Surface Mine Layouts
- Cyclic Surface Mine Design Methods and Equipment Deployment
- Continuous Surface Mine Design Methods and Equipment Deployment
- Selection, Productivity and Economic Modeling
- Risk Mitigation and Control

PRE-REQUISITE AND CO-REQUISITE COURSES

- MI ENG 215 Materials Handling in Mines
- MI ENG 225 Surface Mine Design
- MI ENG 331 Rock Mechanics

COURSE NOTES AND REFERENCE MATERIALS

- Complete course notes will be provided to cover all materials in the syllabus
- Students can supplement further reading from the list of reference texts
- References are provided in the syllabus to match the cited references

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MARCHING TOWARD EXCELLENCE IN MI ENG 326

Academic Dishonesty: Plagiarism, cheating, misrepresentation, sabotage and all forms of academic dishonesty are prohibited. Refer to http://campus.mst.edu/registrar/academicregs/ page 30 of the S&T Student Academic Regulations Handbook on student conduct relative to the System's Collected Rules and Regulations, section 200.010 for additional information.

Academic Alert System: www.campus.mst.edu/acalert: This will be used for poor performance and attendance.

Disability Support Services: http://counsel.mst.edu. If you have a documented disability, which requires accommodations in this course, you are strongly encouraged to meet me early in the semester. You must request Disability Services staff to send me a letter verifying your disability and specifying the required accommodation before it can be done.

Class Attendance and Participation: Provide an unbroken chain of discourse and continuity, instructor-student communication without intermediaries and class interactive discussions that are vital to the learning process.

Field Trip Participation: Strengthen the foundation laid in class with hands-on experience that increases the depth of understanding and ensures a long-term positive impact on students. It is a course requirement.

Prompt Submission of Assignments: Detailed attention to assignments and their prompt submission create unequalled familiarity and mastery of the subject matter.

Student-Student and Student- Instructor/GTA Interactions: Continuation of the learning process outside the formal classroom atmosphere, during which discussion boundaries extend beyond the domain of the required course subject matter. This is vital for pushing new frontiers and for satisfying curiosity and inquisitiveness, all necessary components of the pursuit of knowledge. Sometimes a difficult subject may be well-understood under relaxed, one-to-one discussions.

COURSE SCHEDULES **SPRING 2011**

Module 1	**Introduction to Course Requirements and Surface Mining Methods**	**Expected Lecture Dates**
Part 1	***Objectives:*** (i) Introduction of Course Scope and Requirements; (ii) Laying the Course Foundations; (iii) Significance of Surface Mining Methods and Equipment in the Mining Industry ***Scope:*** Course Materials (Scope, Objectives, Lecture Notes, Assignments & Submissions; Practical Relevance; Significance of Surface Mining; General Surface Mining Methods; Global Surface Mining Operations	01/12-14/11
	Martin Luther King, Jr. Recognition Holiday/ Faculty Retreat	***01/17/11***
Module 2	**Surface Mine Planning, Design and Optimization**	
Part 1	***Surface Mine Layouts Design and Optimization*** ***Objectives:*** Provide Understanding into Surface Mine Design and Optimization; (ii) Equip Students with the Design and Optimization of Surface Mine Layouts. ***Scope:*** Surface Mine Design (Geomechanics and Geometrical); Surface Mine Layouts Optimization (Floating Cone and Lerchs-Grossmann's Algorithm) ***[Frimpong, 2011; Hustrulid and Kuchta, 1995]***	01/19 – 31/11
Part 2	***Surface Mine Planning*** ***Objectives:*** Provide Understanding into Strategic and Tactical Plans and their Significant Role in Surface Mine Planning. ***Scope:*** Strategic and Tactical Mine Plans; Surface Facility Layouts and Optimization; Mine Operating Schedule Plan; Mine Production Plan; Preventive Maintenance Plan; Equipment Procurement and Retiring; Logistics, Warehousing and Inventory Management. ***[Frimpong, 2011; Hustrulid and Kuchta, 1995]***	02/02 – 11/11
Module 3	**Surface Mining Methods and Equipment Deployment**	
Part 1	***Surface Mining Methods*** ***Objective:*** Provide Understanding into Basic Surface Mining Methods. ***Scope:*** Surface Mining Methods Classification; Surface Mining Methods Input and Outputs; Surface Mining Methods Applications. ***[Frimpong, 2011; Hustrulid and Kuchta, 1995; Kennedy, 1990]***	02/14 -16/11
Part 2	***Cyclic Surface Mining Methods and Equipment Deployment*** ***Objectives:*** (i) Provide Understanding into Cyclic Methods Applications; (ii) Equip Students with the ABILITY to Design and Implement Cyclic Methods. ***Scope:*** Dragline Mining Methods; Shovel-Truck and FEL-Truck Mining Methods; Production and Productivity Modeling and Analysis; Design and Implementation; Equipment Selection; Risk Modeling, Analysis and Mitigation. ***[Frimpong, 2011; Bucyrus-Erie. 1979; CAT, 2007; Hartman, 1992; P&H MinePro Services, 2004; P&H Mining, 1997]***	02/18 - 03/18/11
	EXAMINATION #1	***TBA***
	SME AGM AND CONFERENCE	***02/26 – 03/05/11***
	EXAMINATION #2	***TBA***
	FIELD TRIP	***TBA***
Part 3	***Continuous Surface Mining Methods and Equipment Deployment*** ***Objectives:*** (i) Provide Understanding into Continuous Methods Applications; (ii) Equip Students with the ABILITY to Design and Implement Continuous and Hybrid Mining Methods. ***Scope:*** BWE/Conveyor; In-Pit Crushing/Conveyor; Shovel/Truck/Conveyor; Shovel/Truck/Slurry Pipelines; Shovel/In-Pit Crushing/Slurry Pipelines Production and Productivity Modeling and Analysis; Design and Implementation of Methods; Equipment Selection; Risk Modeling, Analysis and Mitigation. ***[Frimpong, 2011; CEMA, 2007]***	03/18 – 04/13/11
	SPRING BREAK	***03/27 – 04/04/11***
Part 4	***Support Operations and Equipment Deployment*** ***Objectives:*** (i) Provide Understanding into Support Operations; (ii) Equip Students with the ABILITY to Design and Implement Support Operations. ***Scope:*** Dozing and Ripping; Road Grading, Maintenance and Dust Control; Scraping Support Operations.	04/15 – 25/11

	[Frimpong, 2011; CAT, 2007	
Module 4	**Review and Conclusions**	***04/27 – 29/11***
	EXAMINATION #3	***TBA***

OVERALL GRADING (MI ENG 326)		**EXPECTED GRADE ASSIGNMENTS**	
• Assignments	= 20%	• A	= 90 – 100%
• Project		• B	= 80 – 89%
• Examination #1	= 20%	• C	= 65 – 79%
• Examination #2	= 20%	• D	= 50 – 64%
• Examination #3	= 20%	• F	< 50%

LATE SUBMISSIONS
All submissions for assignments and reports will be subject to 5% reduction per day of late submission unless with a tangible reason obtained prior to submission deadline. All submissions will be worth zero after the submission is marked and handed back to students.

PROJECTS
Each student will complete one short project in surface mining methods. Example projects will be suggested by instructor, however, students have the option of creating a project from their work place and approved by instructor. **PROJECTS**
Each student will complete one short project in surface mining methods. Example projects will be suggested by instructor, however, students have the option of creating a project from their work place and approved by instructor. ***Report must contain Executive Summary or Abstract; Introduction; Literature Survey; Theoretical Modeling; Experimentation; Discussion and Analysis of Results, Conclusions and Recommendations; References and Appendices.***

PROJECT REPORT FORMAT AND ORGANIZATION
- ❑ Place tables, figures and graphs in the text immediately before or after the referenced section or at the end of each chapter.
- ❑ Engineering drawings of designed layouts and large geological maps must be placed at the end of the report and clearly marked and referred to in the text.
- ❑ Page numbers must be chapter-specific (e.g., 1-1, 2-1, etc.) for ease of organization.
- ❑ All appendices must be referenced in the text. Any table, figure, graph or appendix materials not referenced in the report are irrelevant and must not be part of the report.
- ❑ All chapters must begin on new pages; Margins: Left = 1.5"; Top, Bottom, Right = 1"; Top Margin for a Chapter = 1.5". Use Times Roman Size 12 pts or Arial 11 pts.

REFERENCES
All sources of information must be properly referenced in the text and under the reference section to avoid plagiarism.
- ❑ Textual Referencing: *Cited references in text could be by numeric order, e.g., [**1, 2**]; **OR** by surname of authors and the year of publication [e.g.,* Reeves and Angle, 2006 or Reeves and Angle (2006) as subject of a sentence*]. Communications with experts on various subjects and website information must also be referenced appropriately.*
- ❑ Reference Citation: ***Journal and Conference:*** Awuah-Offei, K. and S.Frimpong**,** 2006, "Numerical Simulation of Cable Shovel Resistive Forces in Oil Sands Excavation"; *International Journal of Mining, Reclamation & Environment*, Vol. 20, No. 3; © Taylor & Francis, Oxfordshire, UK (September): 223 – 238. ***Textbook:*** Erdman, A.G., G.N.Sandor and S.Kota. 2001. *Mechanism Design Analysis and Synthesis, Vol. I*. © Prentice Hall, Upper Saddle River, NJ. ***Conversation:*** Richey, D. 2007. "Explosives Field Tests on Sedimentary Formations". *Conversation with David Richey*, Mine Manager, Atlantic Mineral Resources, Columbus, OH (November 15). ***Website:*** MatWeb. 2006. *Material Property Data.* © MatWeb Inc. http://www.matweb.com/search/ SearchSubcat.asp.

COURSE NOTES
1. Frimpong, S., 2011, *Course Notes on MI ENG 326 (Surface Mining Methods and Equipment)*; Blackboard (http://blackboard.mst.edu/webapps/portal/frameset.jsp); Missouri S&T, Rolla, MO.

REFERENCE TEXTBOOKS
2. Bucyrus-Erie. 1979. Surface Mining Supervisory Training Program. © Bucyrus-Erie Company, Milwaukee, WI.
3. CAT. 2007. Caterpillar Performance Handbook, Edition 37. © Caterpillar Inc., Peoria, IL.
4. CEMA, 1997, Belt Conveyors for Bulk Materials, 6th Edition; © Conveyor Equipment Manufacturing Association, Naples, FL.
5. Hartman, H.L. (Sr. Editor), 1992, SME Mining Engineering Handbook, 2nd Ed., Vol. 2; Sect. 13~16; © SME, Littleton, CO.
6. Hustrulid, W. and M.Kuchta, 1995, *Open Pit Mine Planning and Design: Fundamentals, Vol. 1*; © Balkema, Rotterdam.
7. Kennedy, B.A. (Editor), 1990, Surface Mining, 2nd Edition; © SME, Littleton, CO.
8. P&H MinePro Services. 2004. Excavator Selection for High-Production, Low-Cost Operations. © MinePro Services, Milwaukee, WI.
9. P&H Mining. 1997. MS-270A: Electric Mining Shovel Operations. © Harnischfeger Corporation, Milwaukee, WI.