2011 Mississippi Curriculum Framework

Postsecondary Civil Engineering Technology

(Program CIP: 15.0201 – Civil Engineering Technology/Technician)

Direct inquiries to

LaNell Kellum Director for Career and Technical Education Mississippi Community College Board 3825 Ridgewood Road Jackson, MS 39211 (601) 432-6518 Ikellum@mccb.edu

Myra Pannell Instructional Design Specialist Research and Curriculum Unit P.O. Drawer DX Mississippi State, MS 39762 (662) 325-2510 myra.pannell@rcu.msstate.edu

Published by

Office of Career and Technical Education Mississippi Department of Education Jackson, MS 39205

Research and Curriculum Unit Mississippi State University Mississippi State, MS 39762

The Mississippi Department of Education, Office of Career and Technical Education does not discriminate on the basis of race, color, religion, national origin, sex, age, or disability in the provision of educational programs and services or employment opportunities and benefits. The following office has been designated to handle inquiries and complaints regarding the non-discrimination policies of the Mississippi Department of Education: Director, Office of Human Resources, Mississippi Department of Education, 359 North West Street, Suite 203, Jackson, Mississippi 39201, 601.359.3511.

Acknowledgments

Writing Team	Philip Ray, Jones County Junior College, Ellisville, MS Tom Watson, Northwest Mississippi Community College, Senatobia, MS
RCU Staff	Myra Pannell – Instructional Design Specialist Robin Parker, EdD, Coordinator of Workforce Education Betsey Smith, Curriculum Project Manager Jolanda Harris, Educational Technology Specialist Theresa Wheeler, Research Specialist Terry Thomas, Editor
Professional Curriculum Advisory Team	Mr. Dwayne Beech, MDOT Mr. Rick Croy, Dunn Roadbuilders Ms. Laura Lee Gann, Mendrop/Wages Engineering Mr. Tim Taylor, US Army Corps of Engineers
Standards in this document are	based on information from the following organizations:
Standards for Civil Engineering Technology	Reprinted with permission from the American Design Drafting Association American Society for Testing and Materials (ASTM) Construction Specifications Institute Manual of Surveying Instructions, Bureau of Land Management Mississippi Water Well Contractors License Examination, Mississippi Department of Environmental Quality
Related Academic Standards	CTB/McGraw-Hill LLC. (2005). <i>Tests of adult basic education,</i> <i>forms 9 and 10</i> . Monterey, CA: Author. Reproduced with permission of CTB/McGraw-Hill LLC. TABE is a registered trademark of The McGraw-Hill Companies, Inc. Copyright © 2005 by CTB/McGraw-Hill LLC. Reproduction of this material is permitted for educational purposes only.
21 st Century Skills	Reproduced with permission of the Partnership for 21 st Century Skills. Further information may be found at <u>www.21stcenturyskills.org</u>
National Educational Technology Standards for Students	Reprinted with permission from National Educational Technology Standards for Students: Connecting Curriculum and Technology, copyright © 2007, ISTE (International Society for Technology in Education), 1.800.336.5191 (U.S. & Canada) or 1.541.302.3777 (International), iste@iste.org, www.iste.org. All rights reserved. Permission does not constitute an endorsement by ISTE.

2

Preface

Postsecondary Civil Engineering Technology Research Synopsis

Articles, books, Web sites, and other materials listed at the end of each course were considered during the revision process. *Surveying Fundamental and Practices; Professional Surveyor Magazine; Highway Materials, Soils, and Concrete; Brown's Boundary Control and Legal Principles;* and *Asphalt Contractor* were especially useful in providing insight into trends and issues in the field. These references are suggested for use by instructors and students during the study of the topics outlined.

Industry advisory team members from colleges throughout the state were asked to give input related to changes to be made to the curriculum framework. Specific comments related to soft skills needed in this program included respect and initiative as well as the ability to work well with others. Occupation-specific skills stated included strong surveying and mapping skills, estimating, and GIS/GPSS proficiency. Safety practices emphasized included personal safety, fire, chemical, job-site safety, and equipment safety.

Instructors from colleges throughout the state were also asked to give input on changes to be made to the curriculum framework. Specific comments from Advisory Committee members suggested that Civil Engineering is a good program that covers the needs of industry. Changes suggested for the curriculum included provide math skills necessary to complete the work and stress employability skills.

Needs of the Future Workforce

Civil Engineering Technology occupations are projected to grow much faster than average over the projection decade, 2010-2020. Mississippi has projected faster growth, 19%, than the United States, 14% (EMSI, 2011). An increasing number of civil engineers and technicians will be necessary to build, restore, and repair infrastructure as the population increases (US Bureau of Labor Statistics, 2010).

Region	2010	2020	Change	%	Openings	2010 Median Hourly
	Jobs	Jobs		Change		Earnings
Regional Total	2,981	3,557	576	19%	1,122	\$28.34
National	360,357	412,078	51,721	14%	118,432	\$31.76
Total						

Civil Engineering Technology Employment Projections and Earnings

Curriculum

The following national standards were referenced in each course of the curriculum:

- CTB/McGraw-Hill LLC Tests of Adult Basic Education, Forms 9 and 10 Academic Standards
- 21st Century Skills

• American Design Drafting Association, American Society for Testing and Materials, Manual of Surveying Instructions from the Bureau of Land Management, Construction Specifications Institute, and Mississippi Department of Environmental Quality

Industry and instructor comments, along with current research, were considered by the curriculum revision team during the revision process; changes were made as needed and appropriate. Many of the skills and topics noted in the research were already included in the curriculum framework. Specific changes made to the curriculum at the January 18, 2011, curriculum revision meeting included:

- The title of the program was changed from "Civil Technology" to "Civil Engineering Technology."
- Webb's Depth of Knowledge (DOK) levels were added to competencies and objectives to aid in assessment alignment.
- Competencies and objectives were reviewed to ensure accuracy and appropriateness.
- References and Advisory Teams were revised.
- The Recommended Tools and Equipment list was reviewed.

Assessment

Students will be assessed using the Civil Engineering Technology MS-CPAS2 test. The MS-CPAS2 blueprint can be found at <u>http://www.rcu.msstate.edu/</u>. All students will test after year one of their program. A second test covering the second year material will be administered to AAS track students upon completion of their program. If there are questions regarding assessment of this program, please contact the STEM Instructional Design Specialist at the Research and Curriculum Unit at 662.325.2510.

There is no alternate assessment at this time.

Professional Learning

It is suggested that instructors participate in professional learning related to the following concepts:

- Computer skills for college credit To learn more about computer skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to <u>http://msvcc.blackboard.com/webapps/portal/frameset.jsp</u>.
- Computer skills for CEU credit To learn more about computer skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to https://cia.rcu.msstate.edu/OnlinePD/.
- Keyboarding skills To learn to keyboard, please go to <u>http://www.learn2type.com/</u> for a free typing tutor.
- Blackboard[®] training To learn more about Blackboard[®] training, please go to <u>https://cia.rcu.msstate.edu/OnlinePD/</u>.
- For the latest in online and yearly Connect training provided by the RCU, please go to <u>http://info.rcu.msstate.edu/</u>.

Program Exceptions

No program exceptions exist at this time.

Foreword

As the world economy continues to evolve, businesses and industries must adopt new practices and processes in order to survive. Quality and cost control, work teams and participatory management, and an infusion of technology are transforming the way people work and do business. Employees are now expected to read, write, and communicate effectively; think creatively, solve problems, and make decisions; and interact with each other and the technologies in the workplace. Career–technical programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world.

The curriculum framework in this document reflects these changes in the workplace and a number of other factors that impact local career-technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and career skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U.S. Department of Education and Labor, provide career and technical educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document. Referenced throughout the courses of the curriculum are the 21st Century Skills, which were developed by the Partnership for 21st Century Skills, a group of business and education organizations concerned about the gap between the knowledge and skills learned in school and those needed in communities and the workplace. A portion of the 21st Century Skills addresses learning skills needed in the 21st century, including information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. Another important aspect of learning and working in the 21st century involves technology skills. The International Society for Technology in Education, developer of the National Educational Technology Standards (NETS), was a strategic partner in the Partnership for 21st Century Skills. Each postsecondary program of instruction consists of a program description and a suggested sequence of courses that focus on the development of occupational competencies. The MS-CPAS2 blueprints are based upon the suggested course sequences to allow for year 1 and year 2 assessments for all exit options. Please refer to the blueprint online. Each career-technical course in this sequence has been written using a common format, which includes the following components:

- Course Name A common name that will be used by all community and junior colleges in reporting students
- Course Abbreviation A common abbreviation that will be used by all community and junior colleges in reporting students
- Classification Courses may be classified as the following:
 - Career-technical core A required career-technical course for all students
 - Area of concentration (AOC) core A course required in an area of concentration of a cluster of programs
 - o Career-technical elective An elective career-technical course
 - Related academic course An academic course that provides academic skills and knowledge directly related to the program area

5

- Academic core An academic course that is required as part of the requirements for an associate's degree
- Description A short narrative that includes the major purpose(s) of the course and the recommended number of hours of lecture and laboratory activities to be conducted each week during a regular semester
- Prerequisites A listing of any courses that must be taken prior to or on enrollment in the course
- Corequisites A listing of courses that may be taken while enrolled in the course
- Competencies and Suggested Objectives A listing of the competencies (major concepts and performances) and the suggested student objectives that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
 - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
 - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
 - Activities that include integration of academic and career-technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career-technical programs
 - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas
- Sequencing of the course within a program is left to the discretion of the local district. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.
- Programs that offer an Associate of Applied Science degree must include a minimum 15semester-credit-hour academic core. Specific courses to be taken within this core are to be determined by the local district. Minimum academic core courses are as follows:
 - o 3 semester credit hours (sch)
 - o 3 semester credit hours
 - 3 semester credit hours
 - 3 semester credit hours
- Math/Science Elective
 - Written Communications Elective
- Oral Communications Elective
- Humanities/Fine Arts Elective

o 3 semester credit hours

Social/Behavioral Science Elective

It is recommended that courses in the academic core be spaced out over the entire length of the program, so that students complete some academic and career–technical courses each semester. Each community or junior college has the discretion to select the actual courses that are required to meet this academic core requirement.

• Career-technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

In addition, the curriculum framework as a whole may be customized by doing the following:

- Resequencing courses within the suggested course sequence reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district (with MCCB approval)
- Utilizing the career technical elective options in many of the curricula to customize programs

Acknowledgments	2
Preface	3
Foreword	5
Program Description	9
Suggested Course Sequence	10
Suggested Course Sequence	11
Suggested Course Sequence	12
Civil Engineering Technology Courses	14
Route Surveying	14
Road Design and Construction Methods and Materials	17
Road Construction Plans and Specifications	20
Elementary Surveying	23
Legal Principles of Surveying	26
Advanced Surveying Practices	29
Soil Mechanics	32
Concrete and Hot-Mix Asphalt Testing	35
Mapping and Topography	38
Land Surveying	41
GPS Surveying	44
Fundamentals of Geographical Information Systems (GIS)	47
Water and Water Distribution	50
Special Project	53
Supervised Work Experience in Civil Engineering Technology	54
Work-Based Learning I, II, III, IV, V, and VI	55
Recommended Tools and Equipment	56
Assessment	59
Appendix A: Standards for Civil Engineering Technology	60
Appendix B: Related Academic Standards	65
Appendix C: 21 st Century Skills	66
Appendix D: National Educational Technology Standards for Students	67

Program Description

This program prepares a person for entry level positions in the civil engineering field. The curriculum includes surveying, principles of road construction, and general construction practices.

The graduate is prepared to work with the civil engineer and surveyor in the performance of general engineering practices which may include design; drawing and interpreting working drawings; determining equipment, materials, and labor required to complete a project; and performing various tests required for construction. Up-to-date equipment usage is stressed, including use of the surveying computer and electronic distance measuring devices.

A minimum of 64 semester credit hours is required to receive an Associate of Applied Science in Civil Engineering Technology. Students who complete a minimum of 32 semester credit hours in the program may be eligible to receive a career certificate in Civil Engineering Technology.

Industry standards referenced are from the American Design Drafting Association, American Society for Testing and Materials, Manual of Surveying Instructions from the Bureau of Land Management, Construction Specifications Institute, and Mississippi Department of Environmental Quality.

Suggested Course Sequence* Civil Engineering Technology Career Certificate

- 3 sch Fundamentals of Drafting (DDT 1113)
- 3 sch Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413)
- 3 sch Road Design and Construction Methods and Materials (CIT 1213)
- 3 sch Principles of CAD (DDT 1313)
- 3 sch Elective

15 sch

- 3 sch Elective
- 4 sch Route Surveying (CIT 1114)
- 3 sch Road Construction Plans and Specifications (CIT 1223)
- 3 sch Elective
- $\overline{13 \text{ sch}}$

10

Suggested Course Sequence* Civil Engineering Technology Technical Certificate

- 3 sch Fundamentals of Drafting (DDT 1113)
- 3 sch Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413)
- 3 sch Road Design and Construction Methods and Materials (CIT 1213)
- 3 sch Principles of CAD (DDT 1313)
- 3 sch Elective
- 15 sch

- 3 sch Elective
- 4 sch Route Surveying (CIT 1114)
- 3 sch Road Construction Plans and
- Specifications (CIT 1223)
- 3 sch Elective

13 sch

- 4 sch Land Surveying (CIT 2434)
- 3 sch Elective
- 3 sch Legal Principles of Surveying (CIT 2113) or Legal Principles of Surveying (DDT 2433)
- 3 sch Elective
- 13 sch

- 3 sch Elective
- 4 sch GPS Surveying (CIT 2444) or GPS Surveying (DDT 2463)
- 3 sch Mapping and Topography (CIT 2423) or Mapping and Topography (DDT 2423)
- 3 sch Elective

13 sch

Suggested Course Sequence* Civil Engineering Technology Associate of Applied Science Degree

FIRST YEAR

- 3 sch Fundamentals of Drafting (DDT 1113)
 3 sch Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413)
 3 sch Road Design and Construction
- Methods and Materials (CIT 1213)
- 3 sch Principles of CAD (DDT 1313)
- 3 sch Elective

- 3 sch Elective
- 4 sch Route Surveying (CIT 1114)
- 3 sch Road Construction Plans and
- Specifications (CIT 1223)
- 3 sch Math/Science Elective
- 3 sch Written Communication Elective

16 sch

15 sch

SECOND YEAR

- 4 sch Land Surveying (CIT 2434)
- 3 sch Technical Elective
- 3 sch Legal Principles of Surveying (CIT 2113) or Legal Principles of Surveying (DDT 2433)
- 3 sch Social/Behavioral Science Elective
- 3 sch Oral Communications Elective

16 sch

- 3 sch Technical Elective
- 4 sch GPS Surveying (CIT 2444) or GPS Surveying (DDT 2463)
- 3 sch Mapping and Topography (CIT 2423) or Mapping and Topography (DDT 2423)
- 3 sch Technical Elective
- 3 sch Humanities/Fine Arts Elective

16 sch

* Students who lack entry level skills in math, English, science, etc. will be provided related studies.

APPROVED ELECTIVES

- 3 sch Computational Methods for Drafting (DDT 1123)
- 3 sch Descriptive Geometry (DDT 1153)
- 3 sch Construction Materials (DDT 1213)
- 3 sch Intermediate CAD (DDT 1323)
- 3 sch Cost Estimating (DDT 2243)
- 3 sch Advanced CAD (DDT 2343)
- 3 sch Structural Drafting I (DDT 2213)
- 3 sch Statics and Strength of Materials (DDT 2253)
- 3 sch Construction Cost Estimation (CON 2123)
- 4 sch Advanced Surveying Practices (CIT 2124)
- 3 sch Advanced Surveying Practices (DDT 2443)
- 3 sch Soil Mechanics (CIT 2313)
- 3 sch Concrete and Hot-Mix Asphalt Testing (CIT 2413)
- 3 sch Fundamentals of Geographical Information Systems (GIS) (CIT 2453)
- 3 sch Fundamentals of Geographical Information Systems (GIT 2123)
- 3 sch Water and Water Distribution (CIT 2513)
- 1-3 sch Special Project [CIT 291(1-3)]
- 1-6 sch Supervised Work Experience in Civil Engineering Technology [CIT 292(1-6)]
- 1-6 sch Work-Based Learning [WBL 191(1-3), WBL 192(1-3), WBL 193(1-3), WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)]
- 3 sch Professional Development (BOT 1213)
- 3 sch Real Property I (LET 2453)

Note: Any other technical or academic course as approved by the instructor

Civil Engineering Technology Courses

Course Name: Route Surveying

Course Abbreviation: CIT 1114

Classification: Career-Technical Core

Description: This course teaches highway route design and factors in route location. The calculation and layout of simple horizontal and vertical curves, grades, and related earthwork are covered. Modern surveying, measuring, and mapping instruments, including electronic total stations with data collectors, are used. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisite: Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413) or permission from instructor.

Competencies and Suggested Objectives	
1. Discuss the various types of curves. (DOK1, 2-17 to 2-73)	
a. Describe simple, compound, reverse, and spiral curves. (DOK1)	
b. Describe vertical curves. ^(DOK 1)	
2. Develop the ability to lay out highways and transportation routes. (DOK 2, 3-124, 6-19 to 6-24)	
a. Calculate and stake circular curves. ^(DOK2)	
b. Calculate and stake vertical curves. ^(DOK2)	
c. Calculate and stake construction grades. (DOK2)	
d. Calculate quantities from profiles and cross sections. (DOK2)	
STANDARDS	

Standards for Civil Engineering Technology

Manual of Surveying Instructions

The Direction of Lines	(2-17 to 2-52)
The Direction of Lines	(2-53 to 2-73)
Limits of Closure	(3-124)
General Field Methods	(6-19 to 6-24)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)

- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Route Surveying

- Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.
- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established.* Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual.* Belmont, CA: Professional Publications, 4th edition.

- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.
- Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.
- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.
- Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

- POB, Point of Beginning Magazine. Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>
- *Professional Surveyor Magazine*. Frederick, MD: CITC America. Retrieved March 22, 2011, from <u>http://www.profsurv.com/</u>

The American Surveyor The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Name: Road Design and Construction Methods and Materials

Course Abbreviation: CIT 1213

Classification: Career-Technical Core

Description: A study of equipment, construction methods, and materials used in the construction of roadways and drainage structures. (3 sch: 3 hr. lecture)

Prerequisite: None

Co	mp	etencies and Suggested Objectives
1.	Ide	entify the types of road construction methods and equipment. (DOK1, D 34)
	a.	Describe the nature, properties, and use of road construction materials and equipment. (DOK2)
	b.	Discuss the principles of roadbed construction. (DOK1)
	c.	Explain the environmental impact of highways. (DOK2)
	d.	Describe the techniques of highway maintenance and rehabilitation. (DOK2)
	e.	Explain the construction of cuts and fills. (DOK2)
	f.	Calculate granular base courses and treated base courses. (DOK2)
2.	Ide	entify the types of drainage structure, construction methods, and materials. (DOK1, D 34)
	a.	Describe the nature, properties, and use of drainage structure materials and equipment. (DOK2)
	b.	Describe the construction procedures and processes of drawing drainage and structures. $_{\mathrm{(DOK2)}}$
	c.	Calculate grade cutoff of pilings. (DOK2)
	d.	Calculate flow line of drainage structures. (DOK2)

STANDARDS

Standards for Civil Engineering Technology

Construction Specifications Institute

Division 34 – Transportation

34 70 00 Transportation Construction and Equipment

34 71 00 Roadway Construction

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)

- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Road Design and Construction Methods and Materials

- Atkins, H. (2003). *Highway materials, soils, and concretes*. Upper Saddle River, NJ: Pearson Prentice Hall, 4th edition.
- Kosmatka, S., & Panarese, W. (2008). *Design and control of concrete mixtures*. Skokie, IL: Portland Cement Association.

- Nunnally, S. (2011). *Construction methods and management*. Upper Saddle River, NJ: Pearson Prentice Hall, 8th edition.
- Palmerton, J. (n.d.). A guide to understanding the offset stakeout program for the TDS 48 GX survey card. Unpublished manuscript.

Trade Journals

- Asphalt Contractor. Ft. Atkinson, WI: Cygnus Business Media. Retrieved March 22, 2011, from http://www.forconstructionpros.com/cover/Asphalt-Contractor/2FCP
- Pavement Maintenance & Reconstruction. Ft. Atkinson, WI: Cygnus Business Media. Retrieved March 22, 2011, from http://www.forconstructionpros.com/cover/Pavement/3FCP

Course Name: Road Construction Plans and Specifications

Course Abbreviation: CIT 1223

Classification: Career-Technical Core

Description: A course to provide students with an introduction to the plans and specifications for the construction of streets and highways. Includes instruction in the interpretation of plans and specifications, the bidding process, and estimation of material and labor costs. (3 sch: 3 hr. lecture)

Prerequisite: None

Co	mp	etencies and Suggested Objectives
1.	Int	erpret and develop construction prints. (DOK3, D 34)
	a.	Read and interpret typical construction blueprints. (DOK3)
	b.	Read and interpret symbols, layout, and organizations of plans and specifications. (DOK3)
	c.	Discuss the development of site construction plans and specifications. (DOK1)
2.	Ap	ply principles of contracts. (DOK2)
	a.	Describe the bidding procedure of competitive and negotiated contracts. (DOK2)
	b.	Identify the parties involved in the construction process. (DOK1)
	c.	Estimate the costs of material and labor required to complete a simple road construction contract. (DOK3)

STANDARDS

Standards for Civil Engineering Technology

Construction Specifications Institute

Division 34 – Transportation

34 70 00 Transportation Construction and Equipment

34 71 00 Roadway Construction

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)

21

- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Road Construction Plans and Specifications

- Atkins, H. (2003). *Highway materials, soils, and concretes*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Kosmatka, S., & Panarese, W. (2008). *Design and control of concrete mixtures*. Skokie, IL: Portland Cement Association.
- Nunnally, S. (2007). *Construction methods and management*. Upper Saddle River, NJ: Pearson Prentice Hall.

Palmerton, J. (n.d.). A guide to understanding the offset stakeout program for the TDS 48 GX survey card. Unpublished manuscript.

Trade Journals

Asphalt Contractor. Ft. Atkinson, WI: Cygnus Business Media. Retrieved March 22, 2011, from http://www.forconstructionpros.com/cover/Asphalt-Contractor/2FCP

Pavement Maintenance & Reconstruction. Ft. Atkinson, WI: Cygnus Business Media. Retrieved March 22, 2011, from http://www.forconstructionpros.com/cover/Pavement/3FCP

Course Name: Elementary Surveying

Course Abbreviation: CIT 1413

Classification: Career-Technical Core

Description: Basic course dealing with principles of geometry, theory, and use of instruments, mathematical calculations, and the control and reduction of errors. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: Consent of Teacher

Competencies and Suggested Objectives
1. Measure and record various measurements. (DOK2, 1-20 to 1-21, 2-1 to 2-7)
a. Describe the use of the United States Geological Survey benchmark. (DOK2)
b. Measure horizontal and vertical angles. (DOK2)
c. Measure horizontal and vertical distances in English and metric measurements. (DOK2)
d. Demonstrate differences in elevation between random points. (DOK2)
e. Record and interpret field notes. (DOK3)
f. Explain the various duties of each member of a survey party. (DOK2)
2. Use surveying equipment, terms, and signals. (DOK2, 1-20 to 1-21, 9-38 to 9-40)
a. Identify and explain the basic surveying equipment. (DOK2)
b. Set up the equipment, shoot elevations, and record. (DOK2)
STANDARDS

Standards for Civil Engineering Technology

Manual of Surveying Instructions

Generals Rules	(1-20 to 1-21)
Distance Measurement	(2-1 to 2-7)
Lettering	(9-38 to 9-40)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)

- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Elementary Surveying

- Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.
- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established*. Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual*. Belmont, CA: Professional Publications, 4th edition.
- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.

Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.

- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.
- Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

- *POB, Point of Beginning Magazine.* Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>
- *Professional Surveyor Magazine*. Frederick, MD: CITC America. Retrieved March 22, 2011, from <u>http://www.profsurv.com/.</u>

The American Surveyor The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Name: Legal Principles of Surveying

Course Abbreviation: CIT 2113

Classification: Career-Technical Core

Description: A study of the legal aspects of boundary controls for the survey and resurvey of real property. (3 sch: 2 hr. lecture, 2 hr. lab)

Corequisite: Land Surveying (CIT 2434)

Competencies and Suggested Objectives

- Apply the principles of the legal aspects of surveying. (DOK2, 1-16 to 1-19, 3-47 to 3-73, 3-74 to 3-92)

 a. Define legal terms as used in surveying. (DOK1)
 - b. Describe the legal aspects of boundary control. ^(DOK2)
 - c. Prepare survey plats. (DOK3)
 - d. Write a legal description of real property. ^(DOK3)
 - e. Research public records for property descriptions. (DOK1)
- 2. Comply with the minimum standards for land surveying and land surveyor registration requirements set by the State of Mississippi. ^(DOK2, 1-16 to 1-19, 3-47 to 3-73, 3-74 to 3-92)
 - a. Discuss the legal authority and liability of the land surveyor. ^(DOK1)
 - b. Apply Code of Ethics in work situations. (DOK2)
 - c. Explain the surveyor's rights, duties, and liabilities. (DOK2)
 - d. List the minimum standards for land surveying in Mississippi. (DOK1)
 - e. Discuss land surveying registration laws and examinations in Mississippi. (DOK1)

STANDARDS

Standards for Civil Engineering Technology

Manual of Surveying Instructions

Laws Relating to Surveys	(1-16 to 1-19)
Subdivision of Townships	(3-47 to 3-73)
Subdivision of Sections	(3-74 to 3-92)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)

- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Legal Principles of Surveying

- Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.
- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established*. Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual.* Belmont, CA: Professional Publications, 4th edition.

- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.
- Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.
- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.
- Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

- POB, Point of Beginning Magazine. Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>
- Professional Surveyor Magazine. Frederick, MD: CITC America. Retrieved March 22, 2011, from http://www.profsurv.com/

The American Surveyor The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Name: Advanced Surveying Practices

Course Abbreviation: CIT 2124

Classification: Career-Technical Elective

Description: A course designed to provide the student with practical applications of skills and knowledge gained in other surveying and related courses. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413), Route Surveying (CIT 1114), and Land Surveying (CIT 2434)

Competencies and Suggested Objectives

- 1. Design and perform the necessary layout of private properties and/or commercial sites according to city, county, state, and/or federal regulations. ^(DOK4, 2-74 to 2-83, 3-8 to 3-16)
 - a. Obtain preliminary field data. (DOK2)
 - b. Create preliminary design using horizontal curves and cul-de-sacs. (DOK3)
 - c. Create a finished design according to specifications. (DOK4)

STANDARDS

Standards for Civil Engineering Technology

Manual of Surveying Instructions

The Geodesy of Large Scale Cadastral Surveys	(2-74 to 2-83)
Principal Meridian	(3-8 to 3-9)
Base Line	(3-10 to 3-11)
Standard Parallels	(3-12 to 3-13)
Guide Meridians	(3-14 to 3-16)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations

- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Advanced Surveying Practices

- Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.
- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established*. Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual.* Belmont, CA: Professional Publications, 4th edition.
- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.
- Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.
- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.

Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

- *POB, Point of Beginning Magazine.* Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>
- *Professional Surveyor Magazine*. Frederick, MD: CITC America. Retrieved March 22, 2011, from <u>http://www.profsurv.com/</u>

The American Surveyor. The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Abbreviation: CIT 2313

Classification: Career-Technical Elective

Description: Elementary study of exploring, sampling, testing, and evaluating sub-surface materials and their effect on types of foundations and construction. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Co	ompetencies and Suggested Objectives
1.	Index and classify soils. (DOK2, 7-100 to 7-104)
	a. Define terms used in indexing and classifying of soils. (DOK1)
	b. Describe tests utilized in testing soils. (DOK2)
2.	Perform soil tests. (DOK2, D422-63(2002)e1, D4318-05, D698-00ae1, D1557-02e1)
	a. Conduct a plastic limit test. ^(DOK2)
	b. Conduct a liquid limit test. (DOK2)
	c. Conduct a proctor test. (DOK2)
	d. Conduct a sand cone test. (DOK2)

STANDARDS

Standards for Civil Engineering Technology

ASTM Standards

- D422-63(2002) e1 Standard Test Method for Particle-Size Analysis of Soils, ASTM International
- D4318-05 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM International
- D698-00ae1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³), ASTM International
- D1557-02e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³), ASTM International

Manual of Surveying Instructions

Soil Classification (7-100 to 7-104)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

<u>Soils</u>

- Atkins, H. (2003). *Highway materials, soils, and concretes*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Brady, N. & Weil, R. (2004). *Elements of the nature and properties of soils*. Upper Saddle River, NJ: Pearson Prentice Hall.
- McCarthy, D. (2007). *Essentials of soil mechanics and foundations*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Gardiner, D. & Miller, R. (2004). *Soils in our environment*. Upper Saddle River, NJ: Pearson Prentice Hall.

Course Name: Concrete and Hot-Mix Asphalt Testing

Course Abbreviation: CIT 2413

Classification: Career-Technical Elective

Description: A course which emphasizes standard procedures for sampling, testing, and evaluating materials used in concrete and hot-mix asphalt mixtures. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives

1. Sample, test, and evaluate concrete mixtures^{(DOK2, 1188-96(2002)e1, C143/C143M-05a, C39/C39M-05e1)}

- a. Describe the characteristics and functions of concrete ingredients including additives. (DOK2)
- b. Perform aggregate tests. (DOK2)
- c. Describe properties of fresh concrete. (DOK2)
- d. Proportion concrete mixes. (DOK2)
- e. Describe the procedures for placing and curing of concrete. (DOK2)
- f. Perform strength of concrete tests using concrete cylinders. (DOK2)
- h. Identify and describe concrete construction forms and joints. (DOK2)
- Sample, test, and evaluate hot-mix asphalt mixtures. (DOK2, 1188-96(2002)e1, C143/C143M-05a, C39/C39M-05e1) 2.
 - a. Describe the characteristics and functions of hot-mix asphalt ingredients. (DOK2)
 - b. Identify and describe hot-mix design criteria using recycle materials. (DOK2)
 - c. Perform mineral aggregate tests for hot-mix asphalt mixtures. ^(DOK2)
 - d. Perform the Marshall test for hot-mix asphalt or an alternative superpave test. (DOK2)
 - e. Identify and explain the hot-mix asphalt manufacturing procedures. (DOK2)
 - f. Identify and explain the hot-mix asphalt paving procedures. (DOK2)

STANDARDS

Standards for Civil Engineering Technology

ASTM Standards

- 1188-96(2002) e1 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens, ASTM International
- C143/C143M-05a Standard Test Method for Slump of Hydraulic Cement Concrete, ASTM International
- C39/C39M-05e1 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, ASTM International

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Concrete and Hot Mix

- Atkins, H. (2003). *Highway materials, soils, and concretes*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Kosmatka, S., & Panarese, W. (2008). *Design and control of concrete mixtures*. Skokie, IL: Portland Cement Association.
- Nunnally, S. (2007). *Construction methods and management*. Upper Saddle River, NJ: Pearson Prentice Hall.

Trade Journals

- Asphalt Contractor. Ft. Atkinson, WI: Cygnus Business Media. Retrieved March 22, 2011, from http://www.forconstructionpros.com/cover/Asphalt-Contractor/2FCP
- Pavement Maintenance & Reconstruction. Ft. Atkinson, WI: Cygnus Business Media. Retrieved March 22, 2011, from <u>http://www.forconstructionpros.com/cover/Pavement/3FCP</u>

Course Name: Mapping and Topography

Course Abbreviation: CIT 2423

Classification: Career-Technical Core

Description: Selected drafting techniques are applied to the problem of making maps, traverses, plot plans, plan drawings, and profile drawings using maps, field survey data, aerial photographs, and related references and materials including symbols, notations, and other applicable standardized materials. (3 sch: 2 hr. lecture, 2 hr. lab)

Pre/corequisites: Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413) and Intermediate CAD (DDT 1323), or by permission of instructor

Competencies and Suggested Objectives

- 1. Plan and draw a map. (DOK3, DDS1, DDS2, DDS3, 9-41 to 9-51)
 - a. Explain and draw a plan and profile. ^(DOK3)
 - b. Define the various maps and symbols used in mapping. (DOK1)
 - c. Prepare a contour map. (DOK3)
- 2. Transform field notes into engineering drawings. (DOK3, DDS1, DDS5, DDS8, 9-52 to 9-56)
 - a. Explain an engineering drawing. ^(DOK2)
 - b. Determine the correct scale size. ^(DOK2)
 - c. Explain what information is needed from the field notes to complete a drawing. ^(DOK2)
 - d. Complete a drawing from field notes. (DOK3)

STANDARDS

Standards for Civil Engineering Technology

American Drafting and Design Association

- DDS1 General Drafting Terminology
- DDS2 View Identification
- DDS3 Dimensioning Standards & Terminology
- DDS5 Orthographic Projections Standards & Terminology
- DDS8 Pictorial View Standards & Terminology

Manual of Surveying Instructions

Topography (9-41 to 9-51) Field Sketch (9-52 to 9-56)

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)

M1 Addition of Whole Numbers (no regrouping, regrouping)

Recall Information (details, sequence)

- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)

Words in Context (same and opposite meaning)

- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations

R2

R3

R4 R5

- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)

Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)

Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)

- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Mapping and Topography

Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.

- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established.* Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual*. Belmont, CA: Professional Publications, 4th edition.
- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.
- Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.
- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.
- Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

- POB, Point of Beginning Magazine. Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>
- *Professional Surveyor Magazine*. Frederick, MD: CITC America. Retrieved March 22, 2011, from <u>http://www.profsurv.com/newpsm/</u>

The American Surveyor. The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Name: Land Surveying

Course Abbreviation: CIT 2434

Classification: Career-Technical Core

Description: This course teaches aspects of boundary controls, principles for land surveying, methods of land boundary location, and land description in accordance with original surveys and resurveys. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisite: Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413) or permission from instructor.

Co	mpetencies and Suggested Objectives
1.	Explore the history of the U.S. public land surveying system. (DOK1, 1-9 to 1-15, 1-23)
	a. Discuss the establishment of initial points. ^(DOK1)
	b. Explain the method of laying out townships, ranges, and sections. (DOK2)
	c. Discuss reestablishing section corners with single and double proportion methods. ^(DOK1)
	d. Explain the principle of convergence of meridians. (DOK2)
2.	Make and record measurements. (DOK2, 1-9 to 1-15, 1-23, 3-6 to 3-7)
	a. Chain a distance, record measurements, and make pertinent notes. (DOK2)
	b. Complete a level traverse circuit, record, and plot data. (DOK2)
	c. Read angular measurements and record data. (DOK1)
	d. Run a traverse requiring elevations, traverse points, and locations of major details. ^(DOK2)
3.	Compute survey data. (DOK2, 1-9 to 1-15, 1-23, 3-6 to 3-7)
	a. Compute horizontal curve from established data. (DOK2)
	b. Determine traverse computations. (DOK2)
	c. Calculate distances in a specified geographical area from field notes using appropriate
	geometric principles. (DOK2)
4.	Complete a given survey. (DOK3, 1-9 to 1-15, 1-23, 3-6 to 3-7)
	a. Survey a given area. (DOK3)
	b. Resurvey a given area to determine accuracy. (DOK3)
	c. Subdivide property using total stations and data collector.
5.	Establish a true azimuth using celestial observation methods.
	a. Discuss the celestial sphere concept and its application. (DOKI)
	b. Discuss universal time. (DOK1)
	c. Determine an observer's longitude and latitude using celestial means. (DOK3)

STANDARDS

Standards for Civil Engineering Technology

Manual of Surveying Instructions

The Public Lands	(1-9 to 1-15)
Public Land States	(1-23)
Initial Points	(3-6 to 3-7)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

CS2 Financial, Economic, Business and Entrepreneurial Literacy

- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Land Surveying

- Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.
- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established*. Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual*. Belmont, CA: Professional Publications, 4th edition.
- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.
- Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.
- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.
- Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

POB, Point of Beginning Magazine. Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>

Professional Surveyor Magazine. Frederick, MD: CITC America. Retrieved March 22, 2011, from <u>http://www.profsurv.com/newpsm/</u>

The American Surveyor. The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Name: GPS Surveying

Course Abbreviation: CIT 2444

Classification: Career-Technical Core

Description: This course teaches principles of surveying utilizing artificial earth orbit satellites. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisite: Elementary Surveying (CIT 1413) or Elementary Surveying (DDT 1413), Route Surveying (CIT 1114), and Land Surveying (CIT 2434), or by permission of instructor

Competencies and Suggested Objectives

1. Use GPS equipment. (DOK2, 2-1 to 2-7, 2-17 to 2-73, 8-1 to 8-6)

a. Define terminology. ^(DOK1)

- b. Transfer data between engineering software systems. (DOK2)
- 2. Define and utilize data generated by GPS. (DOK2, 2-1 to 2-7, 2-17 to 2-73, 8-1 to 8-6)
 - a. Define how GPS is specifically designed for spatial analysis to fully analyze geographic data. ^(DOK2)
 - b. Define GPS used in federal and state government, utilities, private engineering consulting firms, and corporations. ^(DOK2)

STANDARDS

Standards for Civil Engineering Technology

Manual of Surveying Instructions

Distance Measurement	(2-1 to 2-7)
The Direction of Lines	(2-17 to 2-52)
The Direction of Lines	(2-53 to 2-73)
Purpose and Style	(8-1 to 8-6)

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)

- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS1 Global Awareness
- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

GPS

- Anderson, J., & Mikhail, E. (1998). *Surveying: Theory and practice*. New York: Glencoe/McGraw-Hill.
- Gay, P. (2002). *Fundamentals of boundary surveying: How boundaries are established.* Frederick, MD: Professional Surveyors.
- Cole, G. M. & Harbin, A. (2006). *Land surveyor reference manual*. Belmont, CA: Professional Publications, 4th edition.
- Kavanagh, B. (2006). *Surveying principles and applications*. Upper Saddle River, NJ: Pearson Prentice Hall, 7th edition.

Moffitt, F., & Bossler, J. (1998). Surveying. Upper Saddle River, NJ: Pearson Prentice Hall.

- Nathanson, J., Lanzafama, M., & Kissam, P. (2011). *Surveying fundamentals and practices*. Upper Saddle River, NJ: Pearson Prentice Hall, 6th edition.
- Wolf, P., & Ghilani, C. (2012). *Elementary surveying: An introduction to geomatics*. Upper Saddle River, NJ: Pearson Prentice Hall, 13th edition.

Trade Journals

- POB, Point of Beginning Magazine. Troy, MI: BNP Publications. Retrieved March 22, 2011, from <u>http://www.pobonline.com/</u>
- *Professional Surveyor Magazine*. Frederick, MD: CITC America. Retrieved March 22, 2011, from <u>http://www.profsurv.com/newpsm/</u>

The American Surveyor. The American Surveyor - Vol.7, No.9 2010, Cheves Media.

Course Name: Fundamentals of Geographical Information Systems (GIS)

Course Abbreviation: CIT 2453

Classification: Career-Technical Elective

Description: This course includes the use of computer mapping and databases in multiple applications. Included is incorporation of imagery and data into a graphical oriented database system. Also included are the fundamentals of geographical information systems techniques, approaches, and applications. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: Principles of CAD (DDT 1313)

Competencies and Suggested Objectives

- 1. Identify the basic components of a geographical information system. (DOK1, DDS10)
 - a. Identify and define a geographical information system. (DOK1)
 - b. Describe how GIS is used to collect, analyze, and present data. ^(DOK2)
- 2. Explore careers in GIS. (DOK1, DDS10)
 - a. Describe GIS use in public and private agencies. (DOK1)
 - b. Describe and compare the duties of GIS manager, GIS database manager, cartographer, and GIS technician. ^(DOK2)
- 3. Perform basic operations and procedures using GIS software. (DOK2, DDS10)
 - a. Define themes and layers, attributes, and other terms related to GIS. (DOK1)
 - b. Define and compare vector data versus raster data. ^(DOK1)
 - c. Create vector data using raster data. (DOK2)

STANDARDS

Standards for Civil Engineering Technology

American Drafting Design Association

DDS10 Computer/CADD Terminology

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)

- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS1 Global Awareness
- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Fundamentals of Geographical Information Systems

- Bolstad, P. (2008). *GIS fundamentals—A first text on geographic information systems*. White Bear Lake, MN: Elder, 3rd edition.
- Clarke, K. C. (1999). *Getting started with geographic information systems*. Upper Saddle River, NJ: Prentice Hall.
- Ormsby, T., Napoleon, E., Burke, R., Groessl, C., & Feaster, L. (2001). *Getting to know ArcGISTM desktop*. Redlands, CA: ESRI.

Trade Journals

ARC News. Site from Esri.com/arcnews

- Blackwell Publishing. *Transactions in GIS* [online journal]. Retrieved October 20, 2005, from <u>http://www.blackwellpublishing.com/journal.asp?ref=1361-1682&site=1</u>
- Enterprise for Innovative Geospatial Solutions. (2005). *The sensor* [Online journal]. Retrieved October 21, 2005, from <u>http://www.eigs.olemiss.edu/sensor/index.htm</u>

Videos

Lewin, V. E. (Producer/Writer), & Lewin, C. (Director/Writer). (2001). *The world in a box: Geographic information systems—A public television documentary* [videotape]. United States: Opticus Corporation.

Web Sites

Dempsey, C. (2011). GIS lounge. Retrieved March 22, 2011, from http://gislounge.com/

- Hoehn, P., & Larsgaard, M. L. (2011). Dictionary of abbreviations and acronyms in geographic information systems, cartography, and remote sensing. Retrieved March 22, 2011, from <u>http://www.lib.berkeley.edu/EART/abbrev.html</u>
- MARIS. (2011). *Mississippi automated retrieval information system*. Retrieved March 22, 2011, from <u>http://www.maris.state.ms.us/</u>
- United States Geological Survey. (2011). USGS data download. Retrieved March 22, 2011, from <u>http://edc.usgs.gov/</u>.

Course Name: Water and Water Distribution

Course Abbreviation: CIT 2513

Classification: Career-Technical Elective

Description: A study of the hydrological principles in the distribution and movement of water on and under the earth's surface and in water distribution systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Co	mpetencies and Suggested Objectives
1.	Describe water wells. (DOK2, MWW1, MWW2)
	a. Identify and describe basic hydraulic and hydrological terms. ^(DOK1)
	b. Describe the standards which determine where water wells or water distribution
	sources are located, designed, or constructed. (DOK2)
2.	Calculate various hydrological units. (DOK2, MWW5, MWW7)
	a. Calculate pressure-velocity-head relationships. (DOK2)
	b. Calculate gravity flow in pipes. (DOK2)
	c. Calculate flow in pipes under pressure. (DOK2)
	d. Calculate flow in pipe networks. ^(DOK2)
3.	Determine various hydrological events. (DOK2, MWW8, MWW9, MWW11)
	a. Distinguish between natural and man-made hydrological cycles. (DOK2)
	b. Describe the relationship among rainfall, surface water, and water availability. ^(DOK2)
	c. Estimate surface water or storm runoff. ^(DOK2)
	d. Explain the relationship between droughts and reservoirs. (DOK2)
	$\overline{DOK2}$

e. Describe the principles of groundwater flow. (DOK2)

STANDARDS

Standards for Civil Engineering Technology

Mississippi Department of Environmental Quality: Mississippi Water Well Contractors License

- MWW1 Capabilities of Rigs used in MS
- MWW2 Documentation for MS Regulations
- MWW5 Geology/Hydrology of MS
- MWW7 Operation of Drill Equipment
- MWW8 Regulatory Issues for MS
- MWW9 Selection of Materials Troubleshooting
- MWW11 Well Development

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)

- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M9 Algebraic Operations
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Copyright © 2005 by CTB/McGraw-Hill LLC

21st Century Skills

- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS6 Initiative and Self-Direction
- CS7 Critical Thinking and Problem Solving
- CS9 Information Literacy

SUGGESTED REFERENCES

Water

Finnemore, E., & Franzini, J. (2002). *Fluid mechanics with engineering application*. New York: Glencoe/McGraw-Hill.

- Schwartz, F. W., & Zhang, H. (2002). *Fundamentals of ground water*. Hoboken, NJ: John Wiley and Sons.
- Simon, A., & Korom, S. (2002). Hydraulics. Upper Saddle River, NJ: Pearson Prentice Hall.
- Todd, D. K., & Mays, L. W. (2004). *Groundwater hydrology*. Hoboken, NJ: John Wiley and Sons.

Video

American Ground Water Trust (Producer). (1999). *Water well basics* [Video]. (Available from American Ground Water Trust, 16 Centre Street, Concord, NH 03301, <u>http://www.agwt.org/index.htm</u>)

Course Name: Special Project

Course Abbreviation: CIT 291(1-3)

Classification: Career-Technical Elective

Description: A course designed to provide the student with practical application of skills and knowledge gained in other Civil Engineering Technology courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisite: Minimum of 12 sch Civil Engineering Technology related courses

Competencies and Suggested Objectives

- 1. Develop a written plan which details the activities and projects to be completed.
 - a. Utilize a written plan which details the activities and projects to be completed.
 - b. Perform written occupational objectives in the special project.
- 2. Assess accomplishment of objectives.
 - a. Prepare a daily written assessment of accomplishment of objectives.
 - b. Present weekly written reports to instructor in activities performed and objectives accomplished.
- 3. Utilize a set of written guidelines for the special project.
 - a. Develop a set of written guidelines for the special project.
 - b. Follow the guidelines throughout the project development.

STANDARDS

Specific standards and DOK levels for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.

Course Name: Supervised Work Experience in Civil Engineering Technology

Course Abbreviation: CIT 292(1-6)

Classification: Career-Technical Elective

Description: A course which is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of one semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisite: Consent of instructor and the completion of at least one semester of coursework in the Civil Engineering Technology program.

Competencies	and Suggested	Objectives
--------------	---------------	------------

- 1. Apply technical skills needed to be a viable member of the workforce.
 - a. Prepare a description of technical skills to be developed in the supervised work experience.
 - b. Develop technical skills needed to be a viable member of the workforce.
- 2. Apply skills developed in other program area courses.
- a. Perform skills developed in other program area courses.
- 3. Apply human relationship skills.
 - a. Use proactive human relationship skills in the supervised work experience.
- 4. Apply and practice positive work habits and responsibilities.
 - a. Perform assignments to develop work habits and responsibilities.
- 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
 - a. Perform written occupational objectives in the supervised work experience.
- 6. Assess accomplishment of objectives.
 - a. Prepare daily written assessment of accomplishment of objectives.
 - b. Present weekly written reports to instructor in activities performed and objectives accomplished.
- 7. Utilize a set of written guidelines for the supervised work experience.
 - a. Develop and follow a set of written guidelines for the supervised work experience.

STANDARDS

Specific standards and DOK levels for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.

Course Name: Work-Based Learning I, II, III, IV, V, and VI

Course Abbreviation: WBL 191(1-3), WBL 192(1-3), WBL 193(1-3), WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)

Classification: Free Elective

Description: A structured work-site learning experience in which the student, program area teacher, Work-Based Learning Coordinator, and worksite supervisor/mentor develop and implement an educational training agreement. Designed to integrate the student's academic and technical skills into a work environment. May include regular meetings and seminars with school personnel and employers for supplemental instruction and progress reviews. (1-3 sch: 3-9 hours externship)

Prerequisite: Concurrent enrollment in career-technical program area courses

Competencies and Suggested Objectives

- 1. Apply technical skills and related academic knowledge needed to be a viable member of the workforce.
 - a. Demonstrate technical skills necessary to complete job requirements.
 - b. Demonstrate academic skills necessary to complete job requirements.
 - c. Perform tasks detailed in an educational training agreement at the work setting.
- 2. Apply general workplace skills to include positive work habits necessary for successful employment.
 - a. Demonstrate appropriate human relationship skills in the work setting to include conflict resolution, team participation, leadership, negotiation, and customer/client service.
 - b. Utilize time, materials, and resource management skills.
 - c. Use critical thinking skills such as problem solving, decision making, and reasoning.
 - d. Acquire, evaluate, organize, maintain, interpret, and communicate information.

STANDARDS

Specific standards and DOK levels for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.

Recommended Tools and Equipment

CAPITALIZED ITEMS

- 1. CAD stations with current release surveying and civil engineering software (20)
- 2. Plotters (2)
- 3. Flat files (30 drawers)
- 4. CAD station desk with chairs (20)
- 5. Total station with data collector, software, and accessories to include solar observation capabilities (1 per 4 students)
- 6. Robotic Total Station System and appropriate accessories (1)
- 7. Land leveling laser system and accessories (1)
- 8. GPS base station with software including data collector (1 per 4 students)
- 9. Levels with tripods and elevation rods both in English and metric units (1 per 4 students)
- 10. Programmable calculator with surveying card (1 per student)
- 11. Blueprint machine (1)
- 12. Wide frame copier (1)

NON-CAPITALIZED ITEMS

- 1. Inkjet/Laser printers (5)
- 2. Paper cutters (2)
- 3. GPS hand-held receiver (1 per 4 students)
- 4. Surveying accessories, prism pole with prisms, 25 ft. tapes in both English and metric units (2 per total station)
- 5. Hammers (2 pound) (1 per 4 students)
- 6. Two-way radio (1 per student)
- 7. Plumb bobs with sheath and string (2 per student)
- 8. 100 ft. reel engineer's tape (2)
- 9. 66 ft. Gunter's chain (2)
- 10. 100 ft. engineer's rope (2)
- 11. 100 ft. engineer's tape (2)
- 12. Sets of surveyor arrows with holders (10)
- 13. Roto-tape in English units (1)
- 14. Roto-tape in metric units (1)
- 15. Time-cube radio (for WWV time) (1)
- 16. Bush axe (2)
- 17. Bush blades (2)
- 18. Metal detector (1)

ASPHALT

CAPITALIZED ITEMS

- 1. Bench ovens (2)
- 2. Large floor oven (1)
- 3. Bench mixer with asphalt attachments (1)
- 4. Sieve master sieve shaker (2)
- 5. Water bath (1)
- 6. 4 ft. x 12 ft. lab tables with chemistry comparable tops, base and top (9)
- 7. Gyratory Compactor (1)

NON-CAPITALIZED ITEMS

- 1. Set of coarse sieves (1)
- 2. Set of fine sieves (1)
- 3. Hot plates (2)
- 4. Specific gravity set (1)
- 5. Vacuum pump (1)

SOILS

CAPITALIZED ITEMS

1. Standard soils testing oven (1)

NON-CAPITALIZED ITEMS

- 1. Liquid limit device set (1 per 2 students)
- 2. Plastic limit set (1 per 2 students)
- 3. Proctor set (1 per student)
- 4. Sand cone set (1 per student)
- 5. Specific gravity set (1 per student)
- 6. Microwave oven (1)

CONCRETE

CAPITALIZED ITEMS

- 1. Laboratory concrete mixer (1)
- 2. Concrete cylinder compression machine (1)
- 3. Concrete air meter and yield test set with strike plate (1)
- 4. Curing tank with heater for concrete cylinders (1)
- 5. AASHTO and ASTM standards (1 set each)
- 6. Air compressor, 22 hp (1)

NON-CAPITALIZED ITEMS

- 1. Specific gravity set for fine (1 per student)
- 2. Specific gravity set for coarse (1 per student)
- 3. Metal storage cabinet (1)
- 4. Capping sets (2)
- 5. Stop watches (2)
- 6. Laboratory vibrator (1)
- 7. Concrete cylinder micrometer (1)
- 8. Slump cone testing set (1 per 4 students)
- 9. Roll-a-meter (2)
- 10. Concrete thermometer (1 per student)

RECOMMENDED INSTRUCTIONAL AIDS

It is recommended that instructors have access to the following items:

- 1. Laptop computer (1)
- 2. Computer with operating software with multimedia kit (1)
- 3. Data projector (1)
- 4. VCR/DVD Player(1)
- 5. TV
- 6. Smart Board
- 7. Overhead projector

ASSESSMENT

Students will be assessed using the Media Technology MS-CPAS2 test. The MS-CPAS2 blueprint can be found at <u>http://info.rcu.msstate.edu/services/curriculum.asp</u>. If there are questions regarding assessment of this program, please contact the STEM instructional design specialist at the Research and Curriculum Unit at 662.325.2510.

Appendix A: Standards for Civil Engineering Technology¹²³⁴⁵

Manual of Surveying Instructions from the Bureau of Land Management

Chapter I – The General Plan

The Manual	(1-1 to 1-8)
The Public Lands	(1-9 to 1-15)
Laws Relating to Surveys	(1-16 to 1-19)
Generals Rules	(1-20 to 1-21)
Organization	(1-22)
Public Land States	(1-23)
Chapter II – Methods of Survey	
Distance Measurement	(2-1 to 2-7)
Photogrammetry	(2-8 to 2-16)
The Direction of Lines	(2-17 to 2-52)
The Direction of Lines	(2-53 to 2-73)
The Geodesy of Large Scale Cadastral Surveys	(2-74 to 2-83)

Chapter III - The System of Rectangular Surveys

General Scheme	(3-2 to 3-5)
Initial Points	(3-6 to 3-7)
Principal Meridian	(3-8 to 3-9)
Base Line	(3-10 to 3-11)
Standard Parallels	(3-12 to 3-13)
Guide Meridians	(3-14 to 3-16)
Township Exteriors	(3-17 to 3-46)
Subdivision of Townships	(3-47 to 3-73)
Subdivision of Sections	(3-74 to 3-92)
Fractional Townships	(3-97 to 3-99)
Extensional Completion Surveys	(3-100 to 3-114)
Meandering	(3-115 to 3-123)
Limits of Closure	(3-124)
Marking Lines Between Corners	(3-125)
Summary of Objects to be Noted	(3-126)

¹ *Manual of Surveying Instructions.*. Retrieved March 22, 2011, from http://www.blm.gov/cadastral/Manual/73man/id2.htm

² American Society for Testing and Materials. Retrieved March 22, 2011, from <u>http://www.astm.org/cgi-bin/SoftCart.exe/index.shtml?E+mystore</u>

³ Division 34 – Transportation. Retrieved March 22, 2011, from <u>http://www.csinet.org</u>

⁴ Juneau, J. (2005). *Mississippi Department of Environmental Quality—Mississippi Water Well Contractors License Examination*. Summit, MS: Author.

⁵ American Design Drafting Association. (2004). *Drafter certification examination as a competency program*. Newbern, TN: Author.

Chapter IV – Monumentation	(4-1)
Legal Significance of the Monument	(4-2 to 4-3)
General Requirements	(4-4 to 4-6)
Corner Material	(4-7 to 4-8)
Construction of Monuments	(4-9 to 4-14)
Special-Purpose Monuments	(4-15 to 4-19)
System of Marking	(4-20 to 4-22)
Marks on Corner Monuments	(4-23 to 4-81)
Marks on Specials-Purpose Monuments	(4-82)
Corner Accessories	(4-83 to 4-96)
Arrangement and Marking of Corner Acc.	(4-97 to 4-114)
Chapter V – Restoration of Lost – Obliterated	Corners (5-1 to 5-3)
Identification of Existent Corners	(5-4 to 5-19)
The Restoration of Lost Corners	(5-20 to 5-47)
Chapter VI – Resurveys	
The Nature of Resurveys	(6-1 to 6-8)
Jurisdiction	(6-9 to 6-10)
Limit of Authority of Surveyor	(6-11)
Bona Fide Rights of Claimants	(6-12 to 6-18)
General Field Methods	(6-19 to 6-24)
The Dependent Resurvey	(6-25 to 6-32)
The Independent Resurvey	(6-33 to 6-56)
Chapter VII – Special Surveys and Instruction	s
Special Instructions	(7-1 to 7-3)
Special Surveys	(7-4 to 7-45)
Special Surveys – Water Boundaries	(7-46 to 7-94)
Swamp and Overflowed Lands	(7-95 to 7-99)
Soil Classification	(7-100 to 7-104)
Chapter VIII – Field Notes	
Purpose and Style	(8-1 to 8-6)
Titles	(8-7 to 8-8)
Index	(8-9)
Headings	(8-10)
Abbreviations	(8-11)
The Detailed Field-Note Record	(8-12 to 8-18)
Specimen Field Notes	(8-19 to 8-21)

Chapter IX – Plats

The Importance of the Plat	(9-1 to 9-5)
Plat Requirements	(9-6)
Specimen Township Plat	(9-7 to 9-10)
Drafting the Base Drawing	(9-11 to 9-23)
Computation of Areas	(9-24 to 9-34)
Inking the Drawing	(9-35 to 9-37)
Lettering	(9-38 to 9-40)
Topography	(9-41 to 9-51)
Field Sketch	(9-52 to 9-56)
Titles and Subtitles	(9-57 to 9-58)
Memorandum	(9-59 to9-60)
Certificates	(9-61
Reproduction and Distribution of Plats	(9-62 to 9-64)
Supplemental Plats	(9-65 to 9-75)
Plats of Mineral Segregation Surveys	(9-76 to 9-77)
Plats of Fragmentary Surveys	(9-78 to9-83)
Resurvey Plats	(9-84 to 9-111)
Chapter X – Mineral Surveys	
Distinguishing Features – Mineral Survey	(10-1 to 10-2)
Requirements of Field Work	(10-3 to 10-16)
Lode Lines and End Lines	(10-17 to 10-18)
Method and Order of Procedure	(10-19 to10-25)
Conflicts	(10-26 to 10-31)
Location Monuments	(10-32 to10-34)
Corner Monuments	(10-35 to 10-38)
Topography	(10-39
Field Notes and Preliminary Plat	(10-40 to 10-47)
Amended Surveys	(10-61 to10-63)
Plats	(10-64 to10-65)

Appendix I

American Society for Testing and Materials (ASTM) STANDARDS

<u>D422-63(2002) e1 Standard Test Method for Particle-Size Analysis of Soils</u>, ASTM International

D4318-05 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM International

D698-00ae1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort [12,400 ft-lbf/ft³ (600 kN-m/m³)], ASTM International

D1557-02e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)), ASTM International

D1188-96(2002)e1 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens, ASTM International

C143/C143M-05a Standard Test Method for Slump of Hydraulic Cement Concrete, ASTM International

C39/C39M-05e1 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, ASTM International

Construction Specifications Institute

Division 34 - Transportation

34 70 00 Transportation Construction and Equipment

34 71 00 Roadway Construction

Mississippi Department of Environmental Quality Mississippi Water Well Contractors License

- MWW1 Capabilities of Rigs used in MS
- MWW2 Documentation for MS Regulations
- MWW3 Drill Bit Selection for MS formations
- MWW4 Fluid Selection
- MWW5 Geology/Hydrology of MS
- MWW6 Grouting Regulations for MS
- MWW7 Operation of Drill Equipment
- MWW8 Regulatory Issues for MS
- MWW9 Selection of Materials Troubleshooting
- MWW10 Understanding Drill Equipment
- MWW11 Well Development

American Design Drafting Association

- DDS1 General Drafting Terminology
- DDS2 View Identification
- DDS3 Dimensioning Standards & Terminology
- DDS4 Sections View Standards & Terminology
- DDS5 Orthographic Projections Standards & Terminology
- DDS6 General Drafting Standards
- DDS7 Manufacturing Processes & Welding
- DDS8 Pictorial View Standards & Terminology
- DDS9 Auxiliary View Standards, Definitions & Terminology
- DDS10 Computer/CADD Terminology

Appendix B: Related Academic Standards⁶

Reading

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)

Mathematics Computation

- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations

Applied Mathematics

- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)

Language

- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

Spelling

- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

⁶ CTB/McGraw-Hill LLC. (2005). Tests of adult basic education, Forms 7 and 8. Monterey, CA: Author. Reproduced with permission of CTB/McGraw-Hill LLC. TABE is a registered trademark of The McGraw-Hill Companies, Inc. Copyright © 2005 by CTB/McGraw-Hill LLC. Reproduction of this material is permitted for educational purposes only.

Appendix C: 21st Century Skills⁷

CSS1-21st Century Themes

CS1 Global Awareness

- 1. Using 21st century skills to understand and address global issues
- 2. Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts
- 3. Understanding other nations and cultures, including the use of non-English languages

CS2 Financial, Economic, Business and Entrepreneurial Literacy

- 1. Knowing how to make appropriate personal economic choices
- 2. Understanding the role of the economy in society
- 3. Using entrepreneurial skills to enhance workplace productivity and career options

CS3 Civic Literacy

- 1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
- 2. Exercising the rights and obligations of citizenship at local, state, national and global levels
- 3. Understanding the local and global implications of civic decisions

CS4 Health Literacy

- 1. Obtaining, interpreting and understanding basic health information and services and using such information and services in ways that enhance health
- 2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance and stress reduction
- 3. Using available information to make appropriate health-related decisions
- 4. Establishing and monitoring personal and family health goals
- 5. Understanding national and international public health and safety issues

CS5 Environmental Literacy

- 1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems
- 2. Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)
- 3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions
- 4. Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)

⁷ 21st century skills. (n.d.). Washington, DC: Partnership for 21st Century Skills.

CSS2-Learning and Innovation Skills

CS6 Creativity and Innovation

- 1. Think Creatively
- 2. Work Creatively with Others
- 3. Implement Innovations

CS7 Critical Thinking and Problem Solving

- 1. Reason Effectively
- 2. Use Systems Thinking
- 3. Make Judgments and Decisions
- 4. Solve Problems

CS8 Communication and Collaboration

- 1. Communicate Clearly
- 2. Collaborate with Others

CSS3-Information, Media and Technology Skills

CS9 Information Literacy

- 1. Access and Evaluate Information
- 2. Use and Manage Information

CS10 Media Literacy

- 1. Analyze Media
- 2. Create Media Products

CS11 ICT Literacy

1. Apply Technology Effectively

CSS4-Life and Career Skills

CS12 Flexibility and Adaptability

- 1. Adapt to Change
- 2. Be Flexible

CS13 Initiative and Self-Direction

- 1. Manage Goals and Time
- 2. Work Independently
- 3. Be Self-directed Learners

CS14 Social and Cross-Cultural Skills

- 1. Interact Effectively with Others
- 2. Work Effectively in Diverse Teams

CS15 Productivity and Accountability

- 1. Manage Projects
- 2. Produce Results

CS16 Leadership and Responsibility

- 1. Guide and Lead Others
- 2. Be Responsible to Others

Appendix D: National Educational Technology Standards for Students⁸

⁸ ISTE: National educational technology standards (NETS). (2007). Retrieved March 12, 2011, from <u>http://www.iste.org/standards/nets-for-students/nets-student-standards-2007.aspx</u>

1. Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

a. apply existing knowledge to generate new ideas, products, or processes.

b. create original works as a means of personal or group expression.

c. use models and simulations to explore complex systems and issues.

d. identify trends and forecast possibilities.

2. Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:

a. interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.

b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.

c. develop cultural understanding and global awareness by engaging with learners of other cultures.

d. contribute to project teams to produce original works or solve problems.

3. Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students:

a. plan strategies to guide inquiry.

b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

d. process data and report results.

4. Critical Thinking, Problem Solving, and Decision Making

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:

a. identify and define authentic problems and significant questions for investigation.

b. plan and manage activities to develop a solution or complete a project.

c. collect and analyze data to identify solutions and/or make informed decisions.d. use multiple processes and diverse perspectives to explore alternative solutions.

5. Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:

a. advocate and practice safe, legal, and responsible use of information and technology.

b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.

c. demonstrate personal responsibility for lifelong learning.

d. exhibit leadership for digital citizenship.

6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:

- a. understand and use technology systems.
- b. select and use applications effectively and productively.
- c. troubleshoot systems and applications.
- d. transfer current knowledge to learning of new technologies.