Construction Engineering Technology
Mississippi Curriculum Framework

Program CIP: 15.1001 – Postsecondary Construction Engineering Technology / Technician

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The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

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ADOPTION OF NATIONAL CERTIFICATION STANDARDS

The **Accrediting Board for Engineering and Technology (ABET)** is a nonprofit, non-governmental organization that accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology. ABET accredits over 3,300 programs at more than 680 colleges and universities in 24 countries. ABET provides specialized, programmatic accreditation that evaluates an individual program of study, rather than evaluating an institution as a whole.

ABET was founded in 1932 as the Engineers' Council for Professional Development (ECPD), an engineering professional body dedicated to the education, accreditation, regulation, and professional development of the engineering professionals and students in the United States. It was headquartered at the Engineering Societies Building and then the United Engineering Center in New York City until it relocated to Baltimore in 1996.

In 1936, ECPD evaluated its first engineering degree programs. Ten years later, the council began evaluating engineering technology degree programs. By 1947, ECPD had accredited 580 undergraduate engineering programs at 133 institutions.

Producing guidance and training publications was a large part of ECPD operations. The council produced dozens of books, pamphlets, brochures, and movies. Here are just a few of the many titles:

In 1997, following nearly a decade of development, ABET adopted Engineering Criteria 2000 (EC2000), considered at the time a revolutionary approach to accreditation criteria. EC2000 focused on what is learned rather than what is taught. At its core was the call for a continuous improvement process informed by the specific mission and goals of individual institutions and programs. Lacking the inflexibility of earlier accreditation criteria, EC2000 meant that ABET could enable program innovation rather than stifling it, as well as encourage new assessment processes and subsequent program improvement.

Today, the spirit of EC2000 can be found in the evaluation criteria of all ABET disciplines, and studies like Penn State's Engineering Change (PDF) prove those criteria are having an impact on accredited programs. ABET encourages the EC2000 perspective with other accreditation boards and degree programs, promoting global education and worker mobility through agreements like the Washington Accord, the Seoul Accord, and the Sydney Accord.

ABET accreditation, which is voluntary and achieved through a peer review process, provides assurance that a college or university program meets the quality standards established by the profession for which the program prepares its students. ABET is recognized by the Council for Higher Education Accreditation (CHEA).

ABET provides programmatic quality assurance for graduates of ABET-accredited programs who work in applied science, computing, engineering, and engineering technology and who are seeking professional recognition by enhancing their individual credentials through licensure, registration, and certification programs where appropriate.

For more information related to implementing ABET at your local campus, please visit http://www.abet.org.

INDUSTRY JOB PROJECTION DATA

Construction engineering technology occupations require an education level of an Associate of Applied Science degree. There is an 18.69% increase in occupational demand at the regional level and a 16.52% increase at the state level. Median annual income for engineering technicians is $33,696.00 at the state and regional level. A summary of occupational data from the State Workforce Investment Board Data Center is displayed below:

Table 1: Education Level

Program Occupations	Education Level
Civil engineering technicians	Associate Degree

Table 2: Occupational Overview

	Region	State	United States
2010 Occupational Jobs	904	1,120	76,670
2020 Occupational Jobs	1,073	1,305	89,660
Total Change	169	185	12,990
Total % Change	18.69%	16.52%	16.94%
2010 Median Hourly Earnings	$16.20	$16.20	$22.26
2010 Median Annual Earnings	$33,696.00	$33,696.00	$46,300.80
Annual Openings	16	18	1,299

Table 3: Occupational Breakdown

Description	2010 Jobs	2020 Jobs	Annual Openings	2010 Hourly Earnings	2010 Annual Earnings 2,080 Work Hours
Civil engineering technicians	904	1073	16	$16.20	$33,696.00
TOTAL	904	1073	16	$16.20	$33,696.00

Table 4: Occupational Change

Description	Regional Change	Regional % Change	State % Change	National % Change
Civil engineering technicians	169	18.69%	16.52%	16.94%

ARTICULATION

Secondary curriculum does not cover content to the same depth as the postsecondary curriculum; therefore, there is no statewide articulation agreement. Local agreements and dual credit partnerships are encouraged.

TECHNICAL SKILLS ASSESSMENT

Colleges should report the following for students who complete the program with a career certificate, technical certificate, or an Associate of Applied Science Degrees for technical skills attainment:

Autodesk AutoCAD Certified User Exam
http://www.certiport.com/portal/DesktopDefault.aspx?page=common/pagelibrary/Autodesk_home.htm

Online and Blended Learning Opportunities

Course content includes lecture and laboratory semester credit hours. Faculty members are encouraged to present lecture related content to students in an online or blended learning environment. Training related to online and blended learning will be available to faculty members through the MS Community College Board.

Instructional Strategies

The ABET standards were adopted and provide instructional strategies to faculty members implementing the curriculum.

Assessment Strategies

The ABET Standards were adopted and provide assessment strategies to faculty members implementing the curriculum. Additionally, standards were included in course content when appropriate.

Credit by Examination

The following certification standards are aligned to courses listed below. Each test will serve as the state recommended exam to reward credit for prior learning experiences. Colleges have the local autonomy to create a college-level exam when awarding credit.

Course Number and Name	National Credential
ENT 1313 Principles of CAD	Autodesk AutoCAD Certified User Exam (with in the past 3 years)

Summary of Curriculum Revision Changes

The Construction Engineering Technology curriculum is a new program. Changes will be documented in following revisions.

PROGRAM DESCRIPTION

The Construction Engineering Technology program emphasizes the management aspects of the construction industry. The key professional in this area of expertise is the construction manager who has the responsibility for planning, scheduling, and building projects designed by architects and engineers. Graduates of this program are employed in both office and field positions in the commercial, industrial, utility, highway, and residential markets.

Upon successful completion of the curriculum, the graduate may earn a Career Certificate, Technical Certificate or an Associate of Applied Science Degree (AAS) in Construction Engineering Technology. The curriculum may also have the option of transfer to a four-year university offering a related course of study thereby leading to a Bachelor of Science Degree (BS) in Construction. Students will also be prepared to complete the Autodesk AutoCAD Certified User Exam.

SUGGESTED COURSE SEQUENCE

Accelerated Pathway Credential

			SCH Breakdown			Clock Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Clock Hours	Lecture	Lab	Certification Name
ENT 1313	Principles of CAD	3	2	2	90	30	60	
ENT 1213	Materials	3	2	2	90	30	60	
ENT 1113	Graphic Communications	3	2	2	90	30	60	
	Electives	6						
	TOTAL	**15**			**270**	**90**	**180**	

Career Certificate Required Courses

			SCH Breakdown			Clock Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Clock Hours	Lecture	Lab	Certification Name
ENT 1313	Principles of CAD	3	2	2	90	30	60	
ENT 1213	Materials	3	2	2	90	30	60	
ENT 1113	Graphic Communications	3	2	2	90	30	60	
ENT 1123	Computational Methods for Drafting	3	2	2	90	30	60	
ENT 1243	Building Codes and Construction Documents	3	2	2	90	30	60	
ENT 1413	Elementary Surveying	3	2	2	90	30	60	
ENT 1613	Architectural Design I	3	2	2	90	30	60	
ENT 1183	Spreadsheet Applications	3	2	2	90	30	60	
ENT 2153	Civil Drafting	3	2	2	90	30	60	
ENT 2623	Architectural Design II	3	2	2	90	30	60	Autodesk AutoCAD Certified User Exam
	TOTAL	**30**			**900**	**300**	**600**	

Technical Certificate Required Courses

			SCH Breakdown			Clock Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Clock Hours	Lecture	Lab	Certification Name
ENT 2243	Cost Estimating	3	2	2	90	30	60	
ENT 2643	Architectural Rendering	3	2	2	90	30	60	
ENT 2463	Grading and Drainage	3	2	2	90	30	60	
	Approved Technical Electives	6						
	TOTAL	**15**			**270**	**90**	**180**	

General Education Core Courses

To receive the Associate of Applied Science Degree, a student must complete all of the required coursework found in the Career Certificate option, Technical Certificate option and a minimum of 15 semester hours of General Education Core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The Southern Association of Colleges and Schools (SACS) Commission on Colleges Standard 2.7.3 from the Principles of Accreditation: Foundations for Quality Enhancement[1] describes the general education core.

Section 2.7.3 In each undergraduate degree program, the institution requires the successful completion of a general education component at the collegiate level that (1) is substantial component of each undergraduate degree, (2) ensures breadth of knowledge, and (3) is based on a coherent rationale. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. The courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

[1] Southern Association of Colleges and Schools Commission on Colleges. (2012). *The principles of accreditation: Foundations for quality enhancement.* Retrieved from http://www.sacscoc.org/pdf/2012PrinciplesOfAcreditation.pdf

Technical Electives

			SCH Breakdown				Clock Hour Breakdown			Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Clock Hours	Lecture	Lab	Clinical/ Internship	Certification Name
ENT 1523	Landscape Design	3	2	2		90	30	60		
ENT 2133	Professional Development	3	2	2		90	30	60		
ENT 1233	Plans and Document Interpretation	3	2	2		90	30	60		
ENT 1153	Basic Applications of Industrial Safety	3	2	2		90	30	60		
ENT 2453	Energy Systems	3	2	2		90	30	60		
ENT 2723	Digital Studio	3	2	2		90	30	60		
ENT 291(1-3)	Special Projects	1-3		2-6		60-180		60-180		
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-Based Learning	1-3			3-18	135-810			135-810	
	Other Instructor Approved Elective(s)									

CAREER CERTIFICATE REQUIRED COURSES

Course Number and Name: **ENT 1113 Graphic Communications**

Classification: Career Certificate Core Requirement

Description: This course is designed to give student fundamentals and principles of drafting to provide the basic background needed for all other engineering technology courses.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Discuss classroom procedures and drafting occupations.
    a. Describe proper classroom/lab procedures
    b. Describe the various occupations in drafting and their requirements.

2. Explain and apply safety rules and regulations. .
    a. Describe safety rules for drafting occupations.
    b. List and discuss hazardous materials found in the drafting area.

3. Apply proper techniques in technical drawings.
    a. Demonstrate the ability to scale drawings.
    b. Construct various angles.
    c. Recognize and construct the alphabet of lines.

4. Sketch and develop views of basic shapes.
    a. Develop a pictorial view from three principal views.
    b. Develop three principal views from a pictorial view.
    c. Complete three principal views when lines are missing.

5. Use geometric constructions.
    a. Construct tangent arcs and lines.
    b. Divide lines or arcs into equal and/or proportional parts.
    c. Develop geometric shapes.

6. Construct orthographic projections.
    a. Construct a top view, with front and right side views given.
    b. Construct a front view, with top and right side views given.
    c. Construct a right side view, with top and front views given.
    d. Develop a drawing consisting of three principal views.

7. Dimension objects.
    a. Recognize lines, symbols, features, and conventions used in dimensioning.
    b. Recognize and use size and location dimensions.
    c. Recognize and use general and local notes.
    d. Dimension a drawing using contour, chain, and baseline dimensioning.

8. Construct sectional views.
    a. Construct full and half sectional views.
    b. Recognize and construct removed, revolved, offset, and aligned sectional views.

Course Number and Name: **ENT 1123 Computational Methods for Drafting**

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student a study of computational skills required for the development of accurate design and drafting methods.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: None

Student Learning Outcomes:

1. Demonstrate various measurement methods.
    a. Measure distances, including metric and English measurements.
    b. Measure angles, including decimal degrees and degrees, minutes, and seconds.

2. Apply industry data.
    a. Interpret graphs and charts.
    b. Manipulate gathered information.

3. Analyze complex geometric shapes.
    a. Solve basic algebraic equations and conversions from fraction to decimal and metric.
    b. Calculate area using metric and English systems.
    c. Calculate volume using metric and English systems.
    d. Solve geometric construction based on area/volume solutions.

4. Calculate trigonometric values.
    a. Calculate angle values of a triangle.
    b. Solve geometric construction based on angular solutions.

Course Number and Name: **ENT 1213 Materials**

Classification: Career Certificate Core Requirement

Description: This course is designed to teach students physical properties of the materials generally used in the erection of a structure and the manufacture of products, with a brief description of their manufacture

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe the uses of wood components.
    a. Identify and describe diseases and lumber defects.
    b. Identify different types of lumber and their design factors.
    c. Identify and describe plywood and panel products and their design factors.
    d. Identify and describe products manufactured from wood and their design factors.
    e. Identify and describe heavy timbers and their design factors.
    f. Identify fire retardant treatments.

2. Describe concrete characteristics.
    a. Describe the use of common and special types of concrete.
    b. Classify aggregates.
    c. Explain how the design and control of concrete is maintained.
    d. Describe the psi rating system for concrete.
    e. Review and describe the design applications of admixtures.
    f. Identify and explain typical concrete test applications.
    g. Identify and describe common concrete masonry units.
    h. Explain concrete batching, transportation, handling, placement, finishing, and curing.

3. Describe the characteristics of ferrous metals.
    a. Describe the manufacturing processes of steel.
    b. Review and describe the design applications of ferrous metals.
    c. Identify and describe steel identification systems.
    d. Identify and describe metal testing methods.

4. Describe the characteristics of nonferrous metals.
    a. Describe the manufacturing processes of aluminum and other nonferrous metals.
    b. Review and describe the design applications of nonferrous metals.
    c. Identify and describe identification systems of nonferrous metals.
    d. Identify design solutions to minimize galvanic corrosion.

5. Describe the characteristics of plastics.
    a. Describe the manufacturing processes of plastics.
    b. Review and describe the design applications of admixtures.
    c. Identify and describe multiple types of plastic.

6. Describe various materials used in manufacturing and construction.
    a. Identify and describe different types of protective coatings.
    b. Identify and describe different types of insulating materials.
    c. Identify and describe gypsum products and materials.

Course Number and Name: **ENT 1313 Principles of CAD**

Classification: Career Certificate Core Requirement

Description: This course is designed to instruct students on the basic operating system and drafting skills on CAD.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: None

Student Learning Outcomes:

1. Manage the operating system.
    a. Examine the contents of storage devices.
    b. List, erase, rename, and copy files on storage devices.
    c. Examine, create, remove, and move files between folders and subfolders.
    d. Access information services (e.g., Internet, e-mail, and networks).

2. Use the basic hardware of the CAD system.
    a. Input data using keyboard and graphics tablet, or mouse.
    b. Access files and/or symbols from the hard disk.
    c. Store, retrieve, copy, and delete drawings and files.

3. Perform drafting functions on the CAD system.
    a. Construct single-view and multi-view drawings.
    b. Modify or edit an existing drawing.
    c. Modify the existing system variables.

Course Number and Name: **ENT 1243 Building Codes and Construction Documents**

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student introduction to building code compliance, the role of inspection in building construction, interpretation of construction plans, specifications, symbols, and terms used in the residential, commercial, and heavy construction industry.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: None

Student Learning Outcomes:

1. Discuss and identify code compliance that influences building construction and design.
    a. Explore why building codes are necessary.
    b. Review international, federal and local building, zoning and specialty codes.
    c. Identify the permit process steps.

2. Review specifications and construction contracts.
    a. Research federal, local and trade association influence on specifications.
    b. Review specification organization.
    c. Identify construction contract components.
    d. Explore career opportunities in building contracting.

3. Discuss and identify the role of inspections in building construction.
    a. List the types of inspections required in a building.
    b. Identify the Code of Conduct required of an inspector.
    c. Explore career opportunities in building inspections.

4. Interpret construction prints.
    a. Read and interpret typical construction blueprints.
    b. Read and interpret symbols, layout, and organizations of plans.
    c. Identify terms as related to construction prints.

Course Number and Name: **ENT 1413 Elementary Surveying**

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student a basic course regarding the principles and practices of plane surveying, including measurements for distance, direction and elevation including an introduction to the care and use of surveying instruments and equipment.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: None

Student Learning Outcomes:

1. Review technical standards and registration requirements set by the State of Mississippi for Land Surveyors and Civil Engineers.
    a. Explain the rights, duties and liabilities.
    b. Discuss registration laws and examinations.

2. Collect and record various measurements.
    a. Describe the use of the United States Geological Survey benchmark.
    b. Identify, explain and setup basic surveying equipment.
    c. Measure horizontal and vertical angles.
    d. Measure horizontal and vertical distances.
    e. Demonstrate differences in elevation between various points.
    f. Record and interpret field notes.

Course Number and Name: **ENT 1613 Architectural Design I**

Classification: Career Certificate Core Requirement

Description: This course is a study and development of architectural design principles for a residential structure.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Plan a residential structure.
    a. Define architectural terms.
    b. Describe the planning areas.
    c. Identify and apply building codes.

2. Draw a set of working drawings for a residential structure.
    a. Select the correct scale for the different drawings.
    b. Draw a floor plan.
    c. Draw a set of exterior elevations.
    d. Draw a site plan.
    e. Draw an electrical plan.
    f. Draw interior elevations and details as needed.
    g. Create a window and door schedule.
    h. Draw necessary details and section views.
    i. Draw a foundation plan with details.

Course Number and Name: **ENT 1183 Spreadsheet Applications**

Classification: Career Certificate Core Requirement

Description: This course focuses on applications of the electronic spreadsheet as an aid to management decision making.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Demonstrate electronic spreadsheet applications.
    a. Define terminology related to spreadsheet applications.
    b. Design and format effective spreadsheets.
        (1) Enter, edit, insert, delete, and move cell data.
        (2) Find and replace cell data and formats.
        (3) Apply and modify cell formats and row and column settings.
        (4) Use automated tools in formatting.
        (5) Use spell-check.
    c. Create and revise formulas, using functions as well as relative and 3-D references.
    d. Create, modify, position, print, and interpret charts and graphs.
    e. Utilize the database functions of electronic spreadsheet software, including filtering, subtotals, and sorting using multiple fields.
    f. Manage and customize spreadsheet files and folders.
        (1) Create spreadsheets using templates, and save using different names and file formats.
        (2) Insert and delete worksheets in a workbook, and modify worksheet names and positions.
        (3) View and edit comments.
        (4) Protect spreadsheets and spreadsheet elements.
    g. Link and export data to word processing documents, presentations, and CAD drawings.

Course Number and Name: **ENT 2153 Civil Drafting**

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student an introduction to computer-aided design/drafting software for civil, surveying, and land development disciplines. Topics include mapping scales and symbols, civil fundamentals, location and direction of property lines, topographic mapping, and boundary and legal description plats.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Examine fundamental real property definitions.
    a. Define surveying terms.
    b. Describe and identify various types of traverses.
    c. Calculate bearings of property lines when given azimuths.
    d. Calculate azimuths of property lines when given bearings.
    e. Calculate azimuths and bearings from given angular information.

2. Use surveying data to create technical drawings.
    a. Explore various methods of describing and locating property.
    b. Research public records for property descriptions.
    c. Write a metes and bounds legal description of real property.
    d. Write a rectangular system legal description of real property.

3. Design site layout(s) in accordance with local, state or federal regulations.
    a. Review and implement national CAD standards.
    b. Define various maps and surveys.
    c. Define and identify symbols used in civil engineering plans and maps.
    d. Prepare a plat of real property.
    e. Create a site design that incorporates plat information and complies with regulations.
    f. Create a contour plan.

Course Number and Name: **ENT 2623 Architectural Design II**

Classification: Career Certificate Core Requirement

Description: This course is designed to emphasize standard procedures and working drawings. Details involving architectural, mechanical, electrical, and structural drawings are covered, along with presentation of drawings and computer-aided design assignments.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Create a set of custom residential or light commercial working drawings.
    a. Develop and draw a plot plan.
    b. Design and draw a foundation plan and details.
    c. Design and draw a floor plan and schedules.
    d. Draw all four elevations.
    e. Design and draw cabinets and sectional views.
    f. Lay out and draw an electrical plan.

2. Develop a presentation drawing.
    a. Construct a plan view of property with rendering and landscaping.
    b. Construct a front elevation with rendering and landscaping.
    c. Construct a sales proposal utilizing the floor plan.

TECHNICAL CERTIFICATE REQUIRED COURSES

Course Number and Name: **ENT 2243 Cost Estimating**

Classification: Technical Certificate Core Requirement

Description: This course is designed to give the student preparation of material and labor quantity surveys from actual working drawings and specifications

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Prepare a cost estimate of an assigned building.
    a. Define the different types of estimates and specific purposes of each.
    b. Prepare estimates of various kinds of foundations.
    c. Estimate wall, ceiling, and roof frames.
    d. Estimate exterior and interior finishes.
    e. Estimate sub-contract items.

2. Discuss the best construction methods based on project requirements.
    a. List the different types of construction in residential and commercial buildings.
    b. Discuss the best method of construction in residential and commercial buildings.

3. Complete a materials list for a structure.
    a. Describe the procedures of doing a materials list.
    b. Explain the purposes for a materials list.
    c. Complete a materials form for a construction project.

Course Number and Name: **ENT 2463 Grading and Drainage**

Classification: Technical Certificate Core Requirement

Description: This course is designed to give the student computer-aided design drafting for civil engineering, surveying and land development technicians. Industry standard civil engineering software program will be utilized in this course. Creation of grading and drainage plans, digital terrain models, underground utilities and engineering details.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Layout and develop a grading plan
    a. Establish site control point(s) with spot elevation(s) information.
    b. Design appropriate swales, drainage flow, and above ground retention areas.
    c. Identify storm water collection points and catch basin locations.
    d. Design underground storm water sewers that route drainage to retention areas.
    e. Size retention pond based upon watershed and storm design criteria.

2. Prepare a profile drawing to represent contours and storm water sewers.
    a. Determine appropriate engineering scale(s).
    b. Provide storm sewer size, slope and invert elevations.

3. Create engineering detail drawings.
    a. Draw a typical storm sewer catch basin.
    b. Draw a typical storm sewer pipe "t" intersection detail.
    c. Draw a typical curb and gutter detail.

Course Number and Name: **ENT 2643 Architectural Rendering**

Classification: Technical Certificate Core Requirement

Description: This course is designed to give the student visual expression or architectural principles and structures. This course includes perspective, shade, shadow and color using pencil, pen & ink, paint and new media.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe various methods and media available to architects.
    a. Describe types of paper and use for each.
    b. Describe various drawing styles.
    c. Identify methods for application of color and shade.
    d. Describe the method for computer rendering.

2. Draw a rendered drawing of a simple architectural structure with entourage.
    a. Select the correct media for projects.
    b. Demonstrate the ability to use pencils, watercolors, and the computer to draw, render, and shade.
    c. Demonstrate the ability to use perspectives and utilize proper proportions in drawing compositions.

TECHNICAL ELECTIVE COURSES

Course Number and Name: **ENT 1523 Landscape Design**

Classification: Technical Elective

Description: This course is designed to give the student an introduction to the concepts, principles, and elements of landscape design; this course includes instruction and practice in the use of CAD and in conducting a site analysis.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Demonstrate the use of CAD in the preparation of landscape plans.
    a. Complete various landscape drawings using CAD software.
    b. Define and apply drawing terms related to plant materials and structures.
    c. Draw standard landscape symbols and associated structures to scale.
    d. Create a plant schedule and label plants.

2. Describe and utilize site inventory/analysis processes and elements/principles of design to create a landscape plan.
    a. Conduct a site inventory and analysis.
    b. Appraise client needs, preferences and interests.
    c. Identify spatial needs/uses and appropriate plant materials based upon landscape design principles.
    d. Create a basic landscape design plan using basic presentation methods and media and the elements and principles of design.

3. Describe and explore sustainable practices in the green industry.

Course Number and Name: **ENT 2133 Professional Development**

Classification: Technical Elective

Description: This course emphasizes an awareness of interpersonal skills essential for job success.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop skills for personal and professional development.
    a. Describe the benefits of professional affiliations and certification programs.
    b. Develop a plan for personal, educational, and professional growth.

2. Demonstrate essential skills for the employment process.
    a. Identify techniques to build a positive self-image.
    b. Research sources for locating job opportunities.
    c. Explore effective employment skills.

3. Demonstrate interpersonal skills that affect personal and professional development.
    a. Discuss principles of effective time, stress, and money management.
    b. Apply problem-solving and conflict-resolution skills to given case studies.

4. Develop tools to enhance career outlook opportunities.
    a. Create a professional resume.
    b. Create a professional portfolio.

Course Number and Name: **ENT 2723 Digital Studio**

Classification: Technical Elective

Description: This course is designed to give the student a general overview of current issues in digital media; a study of how digital media can assist in the work environment; provides a basis for further study in graphic design and production.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Produce multimedia pictures using multimedia software with a scripted presentation.
    a. Define terms associated with multimedia.
    b. Sketch a layout of a multimedia presentation.
    c. Explain the use of the software.
    d. Develop a picture using the software.
    e. Compose a script.
    f. Make a presentation.

2. Construct computer-generated animation.
    a. Define terms associated with computer-generated animation.
    b. Identify animation software.
    c. Create an animation storyboard.
    d. Prepare and present a computer-generated animation project.

3. Research and develop projects that are a culmination of training specifically related to the Engineering industry.
    a. Investigate and formulate conceptual ideas for industry needs.
    b. Employ computer-generated graphics to create professional artwork to meet industry needs.
    c. Manipulate current software to generate graphics to meet industry needs.

Course Number and Name: **ENT 1233 Plans and Document Interpretation**

Classification: Technical Elective

Description: This course is designed to give the student an introduction to graphic techniques used in the construction industry. This course includes computation of areas and volumes, interpretation of construction plans and specifications, and symbols and terms used in the residential, commercial, and heavy construction industry.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Interpret construction prints.
    a. Read and interpret typical construction blueprints.
    b. Read and interpret symbols, layout, and organizations of plans.
    c. Identify terms as related to construction prints.

2. Recognize construction plans as contract documents.
    a. Using a site plan, determine if the amount of dirt to be moved will balance.
    b. Explain the technical specifications as per construction plans.
    c. Identify quantities from plans and obtain volumes and areas for concrete, coatings, and so forth.

3. Interpret specifications.
    a. Identify the basic specifications of a contract document.
    b. Explain the specifications as they relate to money.

Course Number and Name: **ENT 1153 Basic Applications of Industrial Safety**

Classification: Technical Elective

Description: This course introduces the concepts of health and safety in engineering technology related fields. It aims to make the students safety conscious in relation to personal safety, accident prevention, and methods of compliance

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Introduction to basic safety and related laws.
    a. Study various types of accidents.
    b. Rights and responsibilities of employees and employers.
    c. Learn concepts about OSHA and EPA regulations.

2. Introduction of the human element.
    a. Introduction to specific job Personal Protection Equipment (PPE).
    b. Study of ergonomics.

3. Hazard assessment, prevention, and control.
    a. Introduction to chemical safety.
    b. Introduction to tool safety.
    c. Introduction to machine safety.
    d. Introduction to electrical safety.
    e. Introduction to safe materials handling.

4. Management of safety and health.
    a. Introduction to electrical protection.
    b. Introduction to basic fire protection.
    c. Introduction to personal health protection.

5. Basic safe work practices.

Course Number and Name: **ENT 2453 Energy Systems**

Classification: Technical Elective

Description: This course covers an overview of the past, present and future of energy systems and the technologies they employ.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Compare and contrast the technologies of different energy systems.
    a. Identify energy usage and trends in our world.
    b. Describe the by-products of energy production.
    c. Describe renewable energy systems.
    d. Describe nonrenewable energy systems.

2. Discuss the impacts and benefits of the different energy systems.
    a. Identify economic impacts and benefits.
    b. Identify environmental impacts and benefits.
    c. Identify social impacts and benefits.
    d. Identify political impacts and benefits.
    e. Identify transportation methods, impacts and constraints.
    f. Identify geographical issues and constraints.

Course Number and Name: **ENT 291(1-3) Special Project**

Classification: Technical Elective

Description: This course is designed to give the student practical application of skills and knowledge gained in other drafting courses. The instructor works closely with the student to ensure that the selection of a project will enhance the student's learning experience.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
1		2	60
2		4	120
3		6	180

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop a written plan that details the activities and projects to be completed.
    a. Utilize a written plan that 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 weekly written assessment of accomplishment of objectives.
    b. Present weekly written reports of activities performed and objectives accomplished to the instructor.

3. Utilize a set of written guidelines for the project.
    a. Develop and follow a set of written guidelines for the special project.

RECOMMENDED TOOLS AND EQUIPMENT

Capitalized Items

1. Drafting stations/chairs, computer with Internet access (1 per student)
    a. CAD software
    b. Building Information Modeling software with parametric
    c. Architectural software
    d. Civil software
    e. Applications and multimedia software
2. Estimating software
3. Rendering software
4. B&W, High Capacity Inkjet printer/laser printer (1)
5. Total station with data collector, software, and accessories (1 per 4 students)
6. GPS Equipment with data collector and controller, software, and accessories (1 per 4 students)
7. A-E inkjet color plotter (1)
8. A-B flatbed scanner (2)
9. A-B Color Printer (2)
10. 3-D Printers with accessories (1 per 4 students)

Non-Capitalized Items

1. Large Format Paper cutter (1)
2. CAD station desk with chairs (1 per student)
3. Survey rods (1 per 4 students)
4. Range poles (1 per 4 students)
5. Prism with Tripod (1 per 4 students)
6. Chains, steel tapes S 100 ft or 200 ft (1 per 4 students)
7. Chaining pins, set of 11 with holder (1 set per 4 students)
8. Hammers (2 lb) (1 per 4 students)
9. Wooden Stakes (1 lot)
10. Ribbon flags (1 lot)
11. Survey Markers (1 lot)
12. Plumb bobs with holder and string (2 per 4 students)
13. GPS handheld units (1 per 2 students)
14. Surveying metal detector (1)
15. Light Tables (2)
16. Color Pencils, set of 96 (1)
17. Color Markers, set of 100 (1)
18. Trace Paper, 12" – 18" roll (1 per 4 students)
19. Vellum, A size (100 sheets per 4 students)

Recommended Instructional Aids

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

1. Scientific calculator/construction calculator (1)
2. Computer with operating software with multimedia kit and Internet access (1)
3. Inkjet/Laser printer
4. Video/Audio data projector (Lightbox) (1)
5. Laptop computer (1)
6. Digital camera/video camera (1)
7. A-B Size Scanner (1)

CURRICULUM DEFINITIONS AND TERMS

- Course Name – A common name that will be used by all community 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 Certificate Required Course – A required course for all students completing a career certificate.
    - Technical Certificate Required Course – A required course for all students completing a technical certificate.
    - Technical Elective – Elective courses that are available for colleges to offer to students.

- Description – A short narrative that includes the major purpose(s) of the course

- 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

- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) 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 college. 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 all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

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

- Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
- Revising or extending the student learning outcomes
- 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)