

Industrial Engineering Management Mississippi Curriculum Framework

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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

Engineering technician occupations require an education level of an Associate of Applied Science degree. There is a 9.09% increase in occupational demand at the regional level and an 12.83% increase at the state level. Median annual income for engineering technicians is \$45,177.60 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
Industrial engineering technicians	Associate Degree

Table 2: Occupational Overview

	Region	State	United States
2010 Occupational Jobs	451	499	61,330
2020 Occupational Jobs	492	563	64,015
Total Change	41	64	2,685
Total % Change	9.09%	12.83%	4.38%
2010 Median Hourly Earnings	\$21.72	\$21.72	\$23.18
2010 Median Annual Earnings	\$45,177.60	\$45,177.60	\$48,214.40
Annual Openings	4	6	268

Table 3: Occupational Breakdown

Description	2010 Jobs	2020 Jobs	Annual Openings	2010 Hourly Earnings	2010 Annual Earnings 2,080 Work Hours
Industrial engineering technicians	451	492	4	\$21.72	\$45,177.60
TOTAL	451	492	4	\$21.72	\$45,177.60

Table 4: Occupational Change

Description	Regional Change	Regional % Change	State % Change	National % Change
Industrial engineering technicians	41	9.09%	12.83%	4.38%

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 for the Industrial Engineering Management curriculum and provide assessment strategies to faculty members implementing the curriculum. Additionally, performance tasks 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)

PROGRAM DESCRIPTION

A program that focuses on the application of engineering principles to the planning and operational management of industrial and manufacturing operations, and prepares individuals to plan and manage such operations. This program includes instruction in engineering economy, financial management, industrial and human resources management, industrial psychology, management information systems, mathematical modeling and optimization, quality control, operations research, safety and health issues, and environmental program management.

Upon successful completion of the curriculum, the graduate may earn a Career Certificate, Technical Certificate or an Associate of Applied Science Degree (AAS) in Industrial Engineering Management. The curriculum also has 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 Industrial Engineering Technology. Students will also be prepared to complete the Autodesk AutoCAD Certified User Exam.

SUGGESTED COURSE SEQUENCE

Accelerated Pathway Credential

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Clock Hours	Clock Hour Breakdown		Certification Information
			Lecture	Lab		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

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Clock Hours	Clock Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	Certification Name
ENT 1313	Principles of CAD	3	2	2	90	30	60	AutoDesk AutoCAD Certified User Exam
ENT 1183	Spreadsheet Applications	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 1163	Introduction to Industrial Engineering	3	2	2	90	30	60	
ENT 1173	Fundamentals of Management	3	2	2	90	30	60	
ENT 1833	Manufacturing Processes	3	2	2	90	30	60	
ENT 1823	Design for Manufacturing	3	2	2	90	30	60	
ENT 2273	Facilities Planning	3	2	2	90	30	60	
ENT 1213	Materials	3	2	2	90	30	60	
	TOTAL	30			900	300	600	

Technical Certificate Required Courses

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Clock Hours	Clock Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	Certification Name
ENT 1153	Basic Application for Industrial Safety	3	2	2	90	30	60	
ENT 2243	Cost Estimating	3	2	2	90	30	60	
ENT 2263	Quality Assurance	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 Enhancement¹ 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/2012PrinciplesOfAccreditation.pdf>

Technical Electives

Course Number	Course Name	Semester Credit Hours	SCH Breakdown			Total Clock Hours	Clock Hour Breakdown			Certification Information
			Lecture	Lab	Clinical/ Internship		Lecture	Lab	Clinical/ Internship	Certification Name
ENT 1243	Building Codes and Construction Documents	3	2	2		90	30	60		
ENT 2453	Energy Systems	3	2	2		90	30	60		
ENT 2113	Professional Development	3	2	2		90	30	60		
ENT 1713	Fundamentals of Machine Process	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 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 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: None

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 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 1163 Introduction to Industrial Engineering

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student an introduction to and an overview of the profession, including career planning and communication, ethics, teamwork and selected solution methods for problems in coordination and planning.

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. Present Industrial Engineering career options.
 - a. Explore Industrial Engineering Careers in local area.
 - b. List education and lifelong learning requirements.
 - c. Review ethics and their implications in the work place.
2. List the functions of an Industrial Engineer in an organization.
 - a. Identify what people do within an organization.
 - b. Identify who does the work in an organization.
3. Review the Industrial Engineers approach to production.
 - a. Identify the differences between various systems of operations.
 - b. Determine the various parts of a production system.
4. Identify safety issues in the workplace.
 - a. Identify ergonomic issues in a production system.
 - b. Explore improvements for work methods and systems.
5. Discuss managerial skills required for project management.
 - a. Create written and graphic documents for an organizations use.
 - b. Review basic accounting reports.

Course Number and Name: **ENT 1173 Fundamentals of Management**

Classification: Career Certificate Core Requirement

Description: This course addresses organizational management and the dynamic role managers play in the success of businesses.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe the role of managers and management in an organization.
 - a. Define management terminology.
 - b. Identify economy changes and these influences on management decisions.
 - c. Outline society’s expectations of managers and organizations.

2. Discuss the foundations of planning and decision-making.
 - a. Analyze the decision making process.
 - b. Identify methods of decision making by managers and groups.
 - c. Determine why planning is significant in organizations.
 - d. Identify how goals are set and plans are developed.

3. Assess basic organization, staffing, building your career and managing change.
 - a. Identify common organizational designs.
 - b. Define organizational culture and its significance to the organizations structure.
 - c. Research how managers identify competent employees.
 - d. Identify how organizations retain competent, high-performing employees.
 - e. Define organizational change and its effect on managers and employees.

4. Understand individual and group behavior, motivating and rewarding employees, leadership, trust and communication.
 - a. Identify the foundations of individual and group behavior.
 - b. Determine how groups turn into effective teams.
 - c. Identify how employees are motivated.
 - d. Define leaders and leadership.
 - e. Explore how to effectively communicate and improve interpersonal skills.

5. Describe the foundation of control and operations management.
 - a. Define control and why it is important to an organizations success.
 - b. Define Value Chain Management and its role in operations management.

Course Number and Name: ENT 1833 Manufacturing Processes

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student a study of modern manufacturing processes with an emphasis on flexible manufacturing and computer integrated manufacturing.

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. Identify and explain manufacturing processes.
 - a. Explain various types of material forming.
 - b. Identify and explain casting processes.
 - c. Identify and explain heat treatment.
 - d. Explain broaching and various types of sawing.
 - e. Identify and explain turning and boring processes.
 - f. Explain various drilling and reaming processes.
 - g. Explain milling methods and grinding.
2. Survey multiple nontraditional machining processes.
 - a. Identify mechanical processes and their design applications.
 - b. Identify electrical processes and their design applications.
 - c. Identify thermal processes and their design applications.
 - d. Identify chemical processes and their design applications.
3. Examine the control of working processes.
 - a. Compare and analyze variations in programmable controls.
 - b. Identify CNC system elements.
4. Differentiate the design uses of various fastening systems.
 - a. Identify typical manufacturing joining processes.
 - b. Identify typical manufacturing cutting processes.
 - c. Compare welding processes for various design applications.
5. Identify typical uses of various mechanical fastening systems.
 - a. Compare functions of integral, threaded, non-threaded, and special purpose fasteners and fastening systems.
 - b. Identify joining process that uses heat and filler metals to produce bonding.
 - c. Identify adhesive joining processes and applications.

Course Number and Name: ENT 1823 Design for Manufacturing

Classification: Career Certificate Core Requirement

Description: This course is designed to offer instruction in various methods of manufacturing with emphasis on the drafter's role in manufacturing.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: Components of the Autodesk AutoCAD Certified User Exam

Prerequisite:

Student Learning Outcomes:

1. Discuss different types of manufacturing processes.
 - a. Describe different types of plastic processing.
 - b. Describe different types of metal processing.

2. Apply manufacturing requirements to the design process.
 - a. Apply association standards/guidelines to a design.
 - b. Apply dimension/tolerancing techniques according to the manufacturing process.
 - c. Evaluate a design drawing as to conformance to manufacturing requirements.

Course Number and Name: ENT 2273 Facilities Planning

Classification: Career Certificate Core Requirement

Description: This course deals with the techniques and procedures for developing an efficient facility layout and introduces some of the state-of-the-art tools involved, such as 3-D design and computer simulation.

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. Collect data for a manufacturing facility.
 - a. Identify product(s) to be produced and number of units per unit of time.
 - b. Determine which parts will be made or purchased.
 - c. Determine the necessary process planning; include tools, equipment, and workstation design.
 - d. Determine the assembly sequencing and set time standards for each operation.
 - e. Determine the takt time.
 - f. Determine the number of machines needed.
2. Analyze data for a manufacturing facility.
 - a. Balance assembly lines or work cells.
 - b. Establish the best material flow possible.
 - c. Determine activity relationship between material and people movement.
3. Design a manufacturing facility.
 - a. Layout workstations and departments.
 - b. Identify and layout personal and plant services.
 - c. Identify and layout office needs.
 - d. Select material handling equipment and determine space requirement needs.
 - e. Develop a building shape on a plot plan.
 - f. Create a master plan for the manufacturing facility.
4. Use applications of computer technology and techniques.
 - a. Use CAD for producing and editing prints of facility plans.
 - b. Research the Internet for updated technology (i.e., software) for the design of facility plans.
 - c. Run computer simulations to show product paths in the manufacturing facility.

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: None

Prerequisite: None

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.

TECHNICAL CERTIFICATE REQUIRED COURSES

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

Classification: Technical Certificate Core Requirement

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 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 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 2263 Quality Assurance**

Classification: Technical Certificate Core Requirement

Description: This course emphasizes the application of statistics and probability theory in quality assurance programs. Various product-sampling plans as well as the development of product charts for defective units will be studied.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Utilize basic quality assurance procedures.
 - a. Discuss the history, development, and current trends of quality assurance and the use of quality circles.
 - b. Describe the concept of probability.
 - c. Compute the following measurements of central tendency: mean, median, and mode for a given set of data.
 - d. Describe the frequency distribution for a normal population.
 - e. Distinguish among the terms “accuracy,” “precision,” and “accuracy and precision.”
 - f. Compute the standard deviation and the square of the residuals for a given set of data.

2. Effectively use sampling techniques.
 - a. Describe the process of random sampling as applied to quality assurance.
 - b. Compare single and multiple sampling plans.
 - c. Describe the characteristics of the sampling plans.

3. Effectively use various charts.
 - a. Describe the general theory of a control chart.
 - b. Describe the development and use of fraction defective charts.
 - c. Discuss special applications of control charts.
 - d. Apply quality assurance procedures in a laboratory setting.

TECHNICAL ELECTIVE COURSES

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

Classification: Technical Elective

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: None

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 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: None

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 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 1713 Fundamentals of Machine Processes

Classification: Technical Elective

Description: This course is designed to give the student basic machining equipment and safety procedures. Emphasis is placed on measurement techniques, machine technology, machine tools, and applications.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Discuss and identify basic machining processes.
 - a. Define machining terminology.
 - b. Recognize basic machining symbols.
 - c. Identify basic manufacturing machines and tools.
 - d. Identify welding symbols used on welding prints.
 - e. Read and interpret geometric dimensioning and tolerancing (GD&T).
2. Identify and apply skills to basic machining processes.
 - a. Describe the concept of interchangeable parts and their contribution to mass production.
 - b. Discuss the manufacturing processes for a typical industry.
 - c. Identify the major systems for measurement used in industry.
 - d. Identify and demonstrate instruments and tools used to make measurements in industry.
3. Discuss the safe use of basic tools and machines.
 - a. Identify and describe the safe use of common bench and hand tools.
 - b. Discuss the safe use parts and accessories of machines.

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: None

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 2633 Programmable Logic Controllers

Classification: Technical Elective

Description: This course covers the use of programmable logic controllers (PLCs) in a modern industrial setting, as well as the operating principles of PLCs. Discussion and practice in the programming, installation, and maintenance of PLCs.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Explain principles of PLCs.
 - a. Identify components and operational principles of PLCs.
 - b. Differentiate between a PLC and a computer.
2. Identify different types of PLC hardware.
 - a. Identify and wire different types of input and output modules.
 - b. Identify different types of PLC processor modules, memory capabilities, and programming devices.
3. Explain numbering systems, encoding/decoding, and logical operations.
 - a. Convert numbers from one system to another.
 - b. Explain logical operations using truth tables and ladder logic diagrams.
4. Program all types of internal and discrete instructions.
 - a. Program examine on and off instructions.
 - b. Program on-delay and off-delay instructions.
 - c. Program up-counter and down-counter instructions.
 - d. Program sequencer instructions for real-world output devices.
 - e. Program latch and unlatch instructions.
5. Troubleshoot and maintain programmable controller systems.
 - a. Identify and troubleshoot the power supply.
 - b. Identify and troubleshoot the inputs and outputs (I/O) cards.
 - c. Identify and troubleshoot real-world inputs and outputs.

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	30
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. CAD stations with Internet access (20 per instructor)
 - a. CAD software
 - b. Parametric software
 - c. Multimedia software
2. Estimating software
3. Plotters (2)
4. B&W, High Capacity Inkjet printer/laser printer (1)
5. Large format copier (1)
6. A-E inkjet color plotter (1)
7. 3D Printer/Plotter (1 per 4 students)
8. 3D Laser Scanner (1 per 10 students)
9. CAD station desk with chairs (1 per student)
10. A/B size Color printer.

NON-CAPITALIZED ITEMS

1. Digital caliper, English (1 per 4 students)
2. Digital caliper, Metric (1 per 4 students)
3. Dial calipers, English (1 per 4 students)
4. Dial calipers, Metric (1 per 4 students)
5. Metal protractor (1 per 4 students)
6. Radius gauge set, English (1 per 4 students)
7. Radius gauge set, Metric (1 per 4 students)
8. Thread gauge set, English (1 per 4 students)
9. Thread gauge set, Metric (1 per 4 students)
10. Digital Micrometer, English (1 per 4 students)
11. Digital Micrometer, Metric (1 per 4 students)

RECOMMENDED INSTRUCTIONAL AIDS

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

1. Scientific 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)