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ABSTRACT

This program guide presents civil engineering technology curriculum for technical institutes in Georgia. The general information section contains the following: purpose and objectives; program description, including admissions, typical job titles, and accreditation and certification; and curriculum model, including standard curriculum sequence and lists of courses. The next three sections contain the courses: general core courses (economics, composition, technical communications, college algebra, college trigonometry, calculus and analytic geometry, physics I-III, and introductory psychology); fundamental technical courses (civil engineering drafting I-II, descriptive geometry, computer programming, engineering technology professions, and computer-assisted design I); and specific technical courses (statics and dynamics, construction cost estimating, structural steel design/drafting, basic land surveying, reinforced steel design/drafting, basic land surveying, reinforced concrete design, senior design project, and strength of materials. Each course consists of the following: a course overview (description, competency areas, prerequisites, credit hours, contact hours); course outline with student objectives and class and lab hours; and resource list. An appendix to the guide lists equipment needed for the program. (NLA)

GEORGIA DEPARTMENT OF TECHNICAL AND
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GEORGIA DEPARTMENT OF TECHNICAL
AND ADULT EDUCATION

CIVIL ENGINEERING TECHNOLOGY
PROGRAM GUIDE

CIVIL ENGINEERING TECHNOLOGY PROGRAM GUIDE

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CIVIL ENGINEERING TECHNOLOGY PROGRAM GUIDE

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HOW TO USE THIS MANUAL

Summary

This manual is divided into:

Tabs - major divisions, physically separated by numbered tab dividers

Sections - divisions within a tab

Subjects - divisions within a section

Numbering System

Each document (Subject) has a unique 6-digit number. This number is divided into 3 sets of 2 digits which are separated by dashes.

Example:	04	-	02	-	03
	TAB		SECTION		SUBJECT

Locating a Document

Document numbers appear on the upper right hand corner of each page (see top of this page). To locate a subject:

1. Refer to the Table of Contents.
2. Note the document number for the subject.

   Example: 04-02-03

3. Turn to the tab divider marked 04 and within this tab find Section 02 and Subject 03.

Table of Contents

The table of contents (00-00-01) is intended to give a cover-to-cover overview of the manual contents and organization. It lists contents of a Tab to the Section and Subject level.

Amendments

Registered manual holders are instructed to keep their manuals up-to-date.

Manuals Document Transmittal	All new or revised documents are sent to the registered holder of the manual and are recorded on a Manuals Document Transmittal Form. Transmittals are numbered consecutively, and instructions for use are printed on the form.
Amendment Record	The registered holder of the manual records the receipt of all manual document transmittals on the Amendment Record. This record and instructions are found on the reverse side of the manual title page.

GENERAL INFORMATION

Introduction

Overview

The basic beliefs, attitudes, and concepts that are the foundation of the Civil Engineering Technology program are expressed in the following statements.

Civil Engineering Technology is a program of study which is consistent with the philosophy and purpose of the institution. The program provides academic foundations in communications, mathematics, science, and behavioral/social science as well as technical fundamentals appropriate for a two-year program at the associate degree level. Program graduates are well grounded in the underlying fundamentals of civil engineering technology and are well prepared for employment and subsequent upward mobility.

The civil engineering technician performs those functions between a craftsman and an engineer. Technicians may work alone, or as members of a team. Important attributes for success of program graduates are critical thinking, problem solving, and the ability to apply technology to the work requirement.

The program structure acknowledges individual differences and provides opportunities for persons to seek fulfillment of their educational goals. The program does not discriminate on the basis of race, color, national origin, religion, sex, handicapping condition, academic disadvantage, or economic disadvantage.

To assist each student to attain his or her potential within the program, both the instructor and the student incur an obligation in the learning process. The instructor is a manager of instructional resources and organizes instruction in a manner which promotes learning. The student assumes responsibility for learning by actively participating in the learning process.

This is a dynamic field which requires extraordinary attention to current curriculum and up-to-date instructional equipment. The program promotes the concept of change as the technology evolves. The need for nurturing the spirit of involvement and lifelong learning is paramount.

GENERAL INFORMATION

Introduction

Standard Curriculum

The Civil Engineering Technology program guide presents the standard civil engineering technology curriculum for technical institutes in Georgia. This curriculum addresses the minimum competencies for the Civil Engineering Technology program. The competency areas included in a local Civil Engineering Technology program may exceed what is contained in this program guide, but it must encompass the minimum competencies contained herein.

As changes occur in the Civil Engineering Technology program, this guide will be revised to reflect those changes. Proposed changes are first evaluated and approved by the local program advisory committee and then forwarded to the State Technical Committee for approval and inclusion in the state standard program guide.

GENERAL INFORMATION

Introduction

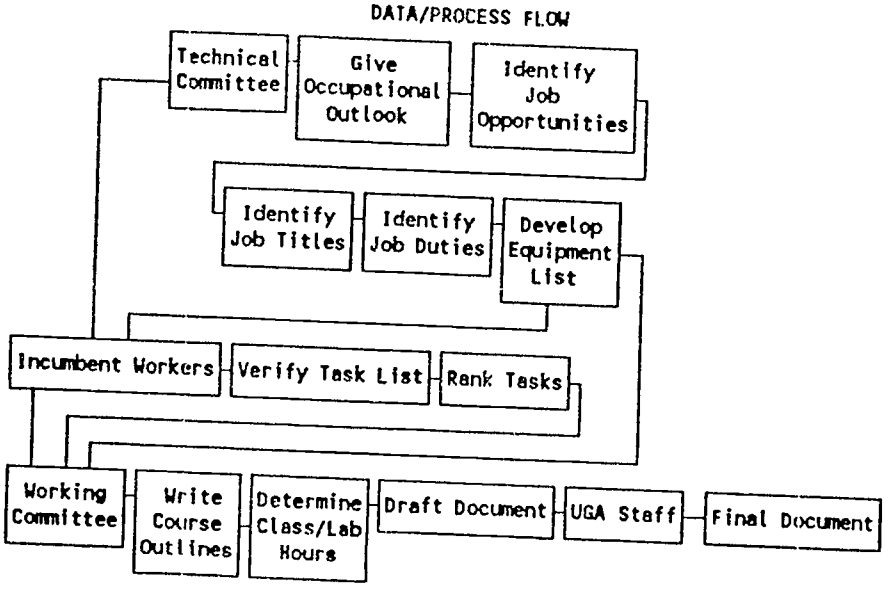
Developmental Process

The development of the Civil Engineering Technology program guide was based on the premise that the people in the industry can best determine program needs. With this in mind, representatives from businesses which would employ program graduates were asked to serve on a State Technical Committee to help identify the technical content and to provide overall guidance to ensure that the resulting program would produce graduates qualified for entry-level technical positions in the industry.

The State Technical Committee verified an occupational task list that had been compiled through extensive research. These representatives included workers who had actually performed the duties and tasks being verified.

Technical institutes which would implement the curriculum were also included in the developmental effort. Representatives from the technical institutes provided the expertise in teaching methodology unique to each discipline and developed the courses contained in this program guide.

The University of Georgia coordinated and directed the development of the curriculum and produced the final program guide. The role of each group in the developmental process is shown in the following diagram.



GENERAL INFORMATION

Introduction

Purpose and Objectives

Purpose

The purpose of the Civil Engineering Technology program is to provide educational opportunities to individuals that will enable them to obtain the knowledge, skills, and attitudes necessary to succeed in the civil engineering technology profession.

The Civil Engineering Technology program provides educational opportunities regardless of race, color, national origin, religion, sex, age, handicapping condition, academic disadvantage, or economic disadvantage.

The Civil Engineering Technology program is intended to provide an ABET accredited, associate degree level program of study which prepares graduates as civil engineering technicians.

Objectives

1. Provide current curriculum, instructional materials, and equipment (in accordance with available funding) which teach knowledge, skills, and attitudes appropriate to industry needs.

2. Provide educational facilities which foster learning and provide safe, healthy environments available and accessible to all students who can benefit from the program.

3. Provide academic instruction which supports effective learning within the program and which enhances professional performance on the job.

4. Provide employability skills which foster work attitudes and work habits that will enable graduates of the program to perform as good employees.

5. Nurture the desire for learning so that graduates will pursue their own continuing education as a lifelong endeavor.

6. Provide an educational atmosphere which promotes a positive self image and a sense of personal well being.

7. Provide education that fosters development of good safety habits.

8. Provide admission, educational, and placement services without regard to race, color, national origin, religion, sex, age, or handicapping condition.

9. Provide information to the public regarding the program that will facilitate recruitment and enrollment of students.

10. Promote good public relations via contacts and regular communications with business, industry, and the public sector.

11. Promote faculty and student rapport and communications to enhance student success in the program.

GENERAL INFORMATION

Program Description

Program Defined

The Civil Engineering Technology program is a planned sequence of carefully developed college-level courses designed to prepare students to work in the field of civil engineering technology. Graduates will receive an associate degree with a major in Civil Engineering Technology. The program of study emphasizes the application of scientific, mathematic, and engineering knowledge and methods combined with technical skills in support of civil engineering activities.

GENERAL INFORMATION

Program Description

Admissions

Admissions Requirements

Admission of new students to the Civil Engineering Technology associate degree program is contingent upon their meeting all of the following requirements:

a) achievement of SAT scores of no less than math 400 and verbal 380 or equivalent scores on a statistically validated test;
b) documentation of high school graduation or satisfaction of High School Equivalency Certificate requirements;
c) demonstration of competencies equivalent to completion of high school, college preparatory algebra and physics; and
d) proper completion of application and related procedures.

Admission of transfer students is contingent upon their meeting the following:

a) regular admission and good standing at a regionally accredited diploma or degree granting institution; and
b) proper completion of application and related procedures.

Provisional Admission

A new student who does not meet the regular admission requirements of the program may be admitted on a provisional basis. The requirements for provisional admission are:

a) documentation of high school graduation, satisfaction of High School Equivalency Certificate requirements, or approval based on evaluation by admissions officers and program faculty; and
b) proper completion of application and related procedures.

GENERAL INFORMATION

Program Description

Typical Job Titles

The Civil Engineering Technology program is assigned a (PGM) CIP code of (PGM) 15.0201 and utilizes essential components designated for that program number statewide.

In general the work role of the engineering technician falls between that of the industrial tradesman and that of the professional engineer. Civil engineering technicians use their knowledge of science, engineering, mathematics, computers, and technical processes to support the functions of civil engineers. They often apply the principles, designs, and procedures developed by engineers to practical situations.

The related job titles follow:

005	TECHNICIAN (profess. & kin.) technical aide; engineering aide; technical assistant
005.281-010	DRAFTER, CIVIL (profess. & kin.) drafter, civil engineering; drafter, construction; drafter, engineering
005.281-014	DRAFTER, STRUCTURAL (profess. & kin.)
017.281-034	TECHNICAL ILLUSTRATOR (profess. & kin.) engineering illustrator; production illustrator
018.167-034	SURVEYOR ASSISTANT, INSTRUMENTS (profess. & kin.)
018.261-026	PHOTOGRAMMETRIST (profess. & kin.) cartographic technician

GENERAL INFORMATION

Program Description

Accreditation and Certification

Accreditation of the institution will be by the Southern Association of Colleges and Schools (SACS). The program at each institution will seek certification by the Technology Accreditation Commission of the Accreditation Board of Engineering and Technology (TAC/ABET).

GENERAL INFORMATION

Curriculum Model

Standard Curriculum

The standard curriculum for the Civil Engineering Technology program is set up on the quarter system. Technical institutes may implement the Civil Engineering Technology program using the sequence below or using a locally developed sequence designed to reflect course prerequisites and/or corequisites.

Course			Class Hours	Lab Hours	Weekly Contact Hours	Credits
SUGGESTED SEQUENCE I						
FIRST QUARTER						
CET	110	Civil Engineering Drafting I	2	6	8	4
CIS	191	Computer Programming Fundamentals	3	6	9	5
EEF	190	Engineering Technology Professions	0	3	3	1
ENG	191	Composition	5	0	5	5
MAT	191	College Algebra	5	0	5	5
			15	15	30	20
SECOND QUARTER						
CET	120	Civil Engineering Drafting II	2	6	8	4
ENG	192	Technical Communications	5	0	5	5
MAT	193	College Trigonometry	5	0	5	5
PHY	191	Physics I	4	3	7	5
XXX	xxx	Elective	-	-	-	3
			16	9	25	22

Course	Class Hours	Lab Hours	Weekly Contact Hours	Credits
THIRD QUARTER				
CET 140 Descriptive Geometry	2	6	8	4
MAT 195 Calculus and Analytic Geometry	5	0	5	5
PHY 192 Physics II	4	3	7	5
XXX xxx Elective	-	-	-	3
	11	9	20	17
FOURTH QUARTER				
CET 131 Statics and Dynamics	5	0	5	5
MET 204 CAD I	2	6	8	4
PHY 291 Physics III	4	3	7	5
XXX xxx Technical Elective	-	-	-	5
	11	9	20	19
FIFTH QUARTER				
CET 220 Structural Steel Design/Drafting	4	3	7	5
CET 222 Basic Land Surveying	4	3	7	5
MET 208 Strength of Materials	4	3	7	5
XXX xxx Technical Elective	-	-	-	5
	12	9	21	20

Course	Class Hours	Lab Hours	Weekly Contact Hours	Credits
SIXTH QUARTER				
CET 212 Construction Cost Estimating	2	6	8	5
CET 231 Reinforced Concrete Design	5	0	5	5
CET 232 Senior Design Project	3	7	10	5
ECO 191 Principles of Economics	5	0	5	5
OR				
PSY 191 Introductory Psychology	-	-	-	-
	15	13	28	20

GENERAL INFORMATION

Curriculum Model

General Core Courses

The general core courses provide students with a foundation in the basic skills which enable them to express themselves more clearly, both orally and in writing, and to perform the mathematical functions required in this occupation. The general core courses for the Civil Engineering Technology program are listed below.

ENG	191	Composition	5 Credits
ENG	192	Technical Communications	5 Credits
MAT	191	College Algebra	5 Credits
MAT	193	College Trigonometry	5 Credits
MAT	195	Calculus and Analytic Geometry	5 Credits
PHY	191	Physics I	5 Credits
PHY	192	Physics II	5 Credits
PHY	291	Physics III	5 Credits
PSY	191	Introductory Psychology	5 Credits
	OR		
ECO	191	Principles of Economics	5 Credits

GENERAL INFORMATION

Curriculum Model

Fundamental Technical Courses

The fundamental technical courses provide students with a foundation in the areas of math, physics, and English, which are needed to progress to the more highly specialized courses in civil engineering technology. The fundamental technical courses are listed below.

CET	110	Civil Engineering Drafting I	4 Credits
CET	120	Civil Engineering Drafting II	4 Credits
CET	140	Descriptive Geometry	4 Credits
CIS	191	Computer Programming Fundamentals	5 Credits
EEF	190	Engineering Technology Professions	1 Credit
MET	204	CAD I	4 Credits

GENERAL INFORMATION

Curriculum Model

Specific Technical Courses

The specific technical courses build upon the fundamental technical courses to provide students with the basic knowledge and skill required to work as a civil engineering technician. The specific technical courses offered in the Civil Engineering Technology program are listed below.

CET	131	Statics and Dynamics	5 Credits
CET	212	Construction Cost Estimating	5 Credits
CET	220	Structural Steel Design/Drafting	5 Credits
CET	222	Basic Land Surveying	5 Credits
CET	231	Reinforced Concrete Design	5 Credits
CET	232	Senior Design Project	5 Credits
MET	208	Strength of Materials	5 Credits
		Technical Electives	10 Credits

GENERAL INFORMATION

Curriculum Model

Electives

Elective courses are provided to allow for the different levels of prior knowledge and skills brought to the classroom by students with diverse backgrounds, educational attainment, and specialized interests.

Decisions regarding the selection and appropriateness of any elective are made by the student after consultation with the instructor. Courses from other departments may be taken as electives when considered appropriate for a student's academic circumstances and career goals.

It is recommended that the technical electives be selected with the guidance of the advisor, from the other engineering technology program(s) offered by the institution.

XXX	xxx	Elective	3 Credits
XXX	xxx	Elective	3 Credits

GENERAL CORE

ECO 191 - Principles of Economics

Course Overview

Course Description

Investigates economic principles and applications of economic principles to current trends. Emphasis is placed on principles of the American economic system of free enterprise. Topics include: basic economic principles; economic forces and indicators; capital and labor; business enterprise; factors of industrial production cost; price, competition, and monopoly; personal income management; insurance, personal investments, and social security; money and banking; government expenditures, federal and local; fluctuations in production, employment, and income; and the United States economy in perspective.

Competency Areas

Basic Economic Principles
Economic Forces and Indicators
Capital and Labor
Business Enterprise
Factors of Industrial Production Cost
Price, Competition, and Monopoly
Personal Income Management
Insurance, Personal Investments, and Social Security
Money and Banking
Government Expenditures, Federal and Local
Fluctuations in Production, Employment, and Income
United States Economy in Perspective

Prerequisite

Program admission

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

ECO 191 - Principles of Economics

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
BASIC ECONOMIC PRINCIPLES		**5**	**0**
Economic forces and indicators	List economic forces and indicators.		
Economics defined	Define economics.		
Modern specialization	List economic impacts of modern specialization.		
Increasing production and consumption	Differentiate between and define gross national product, national income, disposable personal income, employment, and unemployment.		
ECONOMIC FORCES AND INDICATORS		**4**	**0**
Economic effects	List the economic functions of government.		
Functions of government	List the criteria of sound taxation.		
Analysis of government spending	Discuss tax revenues in the United States.		
Financing government spending	Outline the history and use of federal and state personal income taxes.		
	Discuss corporate income tax.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
	Discuss property tax.		
	Discuss commodity tax.		
CAPITAL AND LABOR		4	0
Capital tools	State the importance of saving and investment.		
Large scale enterprise	Describe the necessity for markets.		
Labor	List labor population characteristics.		
	Define vocational choice.		
	Differentiate between general education and special education.		
	Define management's role in maintaining labor supply.		
The function of money	List bank sources of deposits.		
The nation's money supply	Define the reserve ratio.		
Bank organization and operation	Discuss expansion of bank reserves.		
The Federal Reserve System	Identify sources of bank reserves.		
The Federal Deposit Insurance Corporation	Describe the service functions of the Federal Reserve System.		
	Discuss the impact of Federal control of the money supply.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Discuss the strengths and weaknesses of the F.D.I.C.		
	Research and identify predicted and current effects of automation on production, employment, and income.		
BUSINESS ENTERPRISE		**4**	**0**
Forms of business enterprise	Differentiate between and define individual proprietorship, partnerships, and corporations.		
Types of corporate securities			
Mechanics of financing business	List economic attributes of common stocks, preferred stocks, and bonds.		
Plant organization and management	List and compare traditional and innovative systems of plant organization and management.		
FACTORS OF INDUSTRIAL PRODUCTION COST		**5**	**0**
Buildings and equipment	Compare initial cost of financing a contemporary operation to traditional production facility costs.		
Materials	Compare repair and maintenance costs in contemporary operations to traditional production facility costs.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Processing and production	Compare depreciation and obsolescence costs in contemporary operations to traditional production facility costs.		
Packaging and shipping	Define initial cost and inventory value.		
Overhead costs	Define economic attributes of the Just-In-Time philosophy and state its applicability in contemporary environments.		
	Discuss handling and storage costs.		
	Describe methods of cost analysis.		
	Define costs of labor, costs of supervising, and process control.		
	Calculate effect of losses in percentage of original product compared to finished produce (yield).		
	Describe the function of prices.		
PRICE, COMPETITION, AND MONOPOLY		**5**	**0**
Function of prices			
Price determination	Describe the role of competitive cost of product in determination of price.		
Benefits and consequences of competition	Evaluate the interactions between supply and demand in determining product price.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
The extent of competition in the United States and global economies	Define and differentiate between the terms monopoly and oligopoly.		
	Identify the forces that modify and reduce competition.		
	Outline the history of government regulation of competition.		
Increasing real income	Differentiate between and define wages, interest, rents, and profits.		
Marginal productivity			
Supply in relation to demand			
Incomes resulting from production			
Income distribution today	Explain supply/demand, income/production, distribution relationships.		
PERSONAL INCOME MANAGEMENT		**5**	**0**
Consumption--the core of economics	Apply quality standards as a tool in analytical buying.		
Economizing defined	Use consumer's research and similar aids in analytical buying.		
Personal and family budgeting	State positive and negative attributes of credit.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Analytical buying	State the advantages of purchasing appreciating goods.		
The use of credit	Differentiate between appreciating and depreciating goods.		
Housing, automobiles, and other major purchases	Discuss emotional factors associated with the lease or purchase of major items.		
INSURANCE, PERSONAL INVESTMENTS, AND SOCIAL SECURITY		**5**	**0**
Insurance defined	Define group, industrial, and ordinary insurance.		
Life insurance	Discuss advantages and disadvantages of various types of insurance policies.		
Casualty insurance			
Investments	Discuss advantages and disadvantages of various types of investments.		
Pension plans	Define role and importance of pension plans and Social Security.		
Social security			
MONEY AND BANKING		**3**	**0**
Functions of money	Explain the meaning of money in economic terms.		
Nation's money supply	Discuss the establishment and control of the nation's money supply.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
Organization and operation of a bank	Describe sources of deposits and reserves, including reserve ratio and expansion of bank deposits.		
The Federal Reserve System	Discuss the service functions and method of control of money supply by the Federal Reserve System.		
Federal Deposit Insurance Corporation (F.D.I.C.)	Explain the function and purpose of the F.D.I.C.		
GOVERNMENT EXPENDITURES, FEDERAL AND LOCAL		**3**	**0**
Economic effect	Discuss effects of federal and local government expenditures on the economy.		
Functions of government	List the major functions of government.		
Analysis of government spending	Analyze and discuss pros and cons of government spending.		
Future outlook	Discuss possibilities for future changes in government spending.		
Financing government spending	Explain criteria for sound taxation and describe the various taxes now used to finance government.		
FLUCTUATIONS IN PRODUCTION, EMPLOYMENT, AND INCOME		**3**	**0**
Changes in aggregate spending	Discuss how changes in aggregate effect production, employment, and income.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Output and employment	Explain the relationship between output and employment.		
Other factors affecting economic fluctuations	Describe effect of factors such as: supply and demand; war; technology and automation; and cost-price relationship as they affect the economy.		
Government debt	Describe how the national debt affects the economy.		
THE UNITED STATES ECONOMY IN PERSPECTIVE		**4**	**0**
Recent economic changes	Explain effects of inflation and recession.		
Present economic problems of U.S. economy	Discuss effects of trade imbalances.		
Communism	Explain the nature of the Soviet State and contrast it to the U.S. economy.		
Common problems	List economic problems common to all forms of government.		
Special economic problems of the U.S.	List and describe major problems which affect the American economy today.		

GENERAL CORE

ECO 191 - Principles of Economics

Resources

Amacher, R., & Ulbrich, H. (1989). *Principles of economics* (4th ed.). Cincinnati, OH: South-Western.

Bowden, E. V. (1989). *Economics: The science of common sense* (6th ed.). Cincinnati, OH: South-Western.

Heilbroner, R. L., & Thurow, L. C. (1981). *Economic problem* (7th ed.). Englewood Cliffs, NJ: Prentice Hall.

Hoag, A. J., & Hoag, J. H. (1986). *Introductory economics.* Englewood Cliffs, NJ: Prentice Hall.

Olsen, H., & Kennedy, J. (Latest edition). *Economics: Principles and applications.* Cincinnati, OH: South-Western.

GENERAL CORE

ENG 191 - Composition

Course Overview

Course Description

Emphasizes the development and improvement of written and oral communications abilities. Topics include: idea development; vocabulary; spelling; outlining; sentence elements; revision; unity and coherence in basic paragraph development; research; exploration of communication modes including description, exposition, argumentation, and persuasion; and functional writing as applied to reports, abstracts, and technical papers.

Competency Areas

Fundamentals of Grammar and Composition
Fundamentals of Oral Communications
Modes of Written and Oral Communications
Research

Prerequisite

Program admission level verbal achievement

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

ENG 191 - Composition

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
FUNDAMENTALS OF GRAMMAR AND COMPOSITION		**15**	**0**
Sentence elements	Demonstrate through use a knowledge of grammatical structure, as well as punctuation and other mechanics.		
Review of basic parts of speech			
Complete sentences			
Use and placement of modifiers, phrases, and clauses			
Conciseness in sentences			
Paragraph construction	Demonstrate the ability to write clear, coherent, well-organized paragraphs.		
Topic sentence			
Development			
Unity and coherence			
Transitional devices			

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Spelling	Recognize correct spelling.		
FUNDAMENTALS OF ORAL COMMUNICATIONS		**3**	**0**
Presentation	Present oral summaries of outside readings.		
MODES OF WRITTEN AND ORAL COMMUNICATIONS		**30**	**0**
Description	Write descriptions drawing details from observation.		
Exposition	Write clear, coherent, well-organized explanations.		
Argumentation and persuasion	Demonstrate through writing the ability to successfully employ the various methods of development (including comparison and contrast, cause and effect, illustration, definition, classification and division, argumentation, process), and to choose the appropriate form.		
Oral communication	Articulate clear oral response to reading.		
RESEARCH		**2**	**0**
Steps	Identify the major steps in conducting research.		
References	Locate and use appropriate reference materials for written and oral reports.		

GENERAL CORE

ENG 191 - Composition

Resources

Casty, A., & Tighe, D. J. (1979). *Staircase to writing and reading* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Hodges, J. C., & Whitten, M. E. (1989). *Harbrace college handbook* (11th ed.). New York: Harcourt Brace Jovanovich.

Kirszner, L. G., & Mandell, S. R. (1986). *Patterns for college writing* (3rd ed.). New York: St. Martin's Press.

Lunsford, A., & Connors, R. (1989). *The St. Martin's handbook* (5th ed.). New York: St. Martin's Press.

McCuen, J. R., & Winkler, A. C. (1986). *Readings for writers* (5th ed.). New York: Harcourt Brace Jovanovich.

Stubbs, M., & Barnet, S. (1989). *Little, Brown reader* (5th ed.). Glenview, IL: Scott, Foresman.

Winkler, A. C., & McCuen, J. R. (1988). *Rhetoric made plain* (5th ed.). New York: Harcourt Brace Jovanovich.

GENERAL CORE

ENG 192 - Technical Communications

Course Overview

Course Description

Emphasizes practical knowledge of technical communications techniques, procedures, and reporting formats used in industry and business. Topics include: accepted methods of describing devices and processes by oral and written means; and the proper use of standards manuals, guides, specifications, and interpretations of data in the report format.

Competency Areas

Reference Use and Research
Device Description
Process Description
Formal Technical Report Writing
Oral Technical Report Presentation

Prerequisite

ENG 191

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

ENG 192 - Technical Communications

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
REFERENCE USE AND RESEARCH		**5**	**0**
Conducting preliminary steps	Use appropriate reference material in preparing a technical report.		
Assembling sources			
DEVICE DESCRIPTION		**5**	**0**
Characteristics	Precisely describe in writing the characteristics and components of mechanisms.		
Components			
PROCESS DESCRIPTION		**5**	**0**
Components	Describe in writing characteristics and components of a process.		
FORMAL TECHNICAL REPORT WRITING		**25**	**0**
Format	Prepare a formal technical report using accepted formats and style.		
Style			

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
ORAL TECHNICAL REPORT PRESENTATION		**10**	**0**
Delivery techniques	Deliver orally an informative technical presentation using supportive visual aids.		

GENERAL CORE

ENG 192 - Technical Communications

Resources

Barnet, S., et al. (1985). *Introduction to literature: Fiction, poetry, drama.* Glenview, IL: Scott, Foresman.

Meyer, M. (1987). *The Bedford introduction to literature.* New York: St. Martin's Press.

Moyers, W. (1989). *The power of the word.* PBS Poetry Series available on video tape.

Schrodes, C., Finestone, H., & Shugrue, M. (1988). *The conscious reader* (4th ed.). New York: Macmillan.

GENERAL CORE

MAT 191 - College Algebra

Course Overview

Course Description

Emphasizes problem solving techniques. Topics include: fundamental algebra concepts and operations, linear and quadratic equations and functions, simultaneous equations, inequalities, exponents and powers, graphing techniques, and word problems.

Competency Areas

Fundamental Concepts and Operations
Linear and Quadratic Equations and Functions
Simultaneous Equations
Inequalities
Exponents and Powers
Graphing Techniques
Word Problems

Prerequisite

Program admission level math achievement

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

MAT 191 - College Algebra

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
FUNDAMENTAL CONCEPTS AND OPERATIONS		**10**	**0**
Fundamental laws of algebra	Identify fundamental laws of algebra.		
Algebraic expressions	Utilize fundamental laws of algebra to simplify algebraic expressions.		
Equations and formulas	Solve algebraic equations and formulas.		
LINEAR AND QUADRATIC EQUATIONS AND FUNCTIONS		**15**	**0**
Linear equations	Solve linear equations.		
Factoring	Identify all factors of algebraic expressions.		
Fractions	Convert complex algebraic fractions to equivalent forms.		
Quadratic equations	Calculate sum, difference, product, and quotient of algebraic expressions.		
	Solve quadratic equations.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
SIMULTANEOUS EQUATIONS		**11**	**0**
Graphical solutions	Solve systems of linear equations graphically.		
Algebraic solutions	Solve systems of equations algebraically.		
Solution by determinants	Solve systems of linear equations by using determinants.		
INEQUALITIES		**2**	**0**
Graphical solution	Solve inequalities graphically.		
Algebraic solutions	Solve inequalities algebraically.		
EXPONENTS AND POWERS		**3**	**0**
Laws of exponents	Compute the value of expressions involving exponents.		
Scientific notation	Convert numbers to scientific notation.		
GRAPHING TECHNIQUES		**6**	**0**
Cartesian coordinates	Identify points on a Cartesian plane by given coordinates.		
Graphing functions	Prepare graphs of algebraic equations.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
WORD PROBLEMS		**3**	**0**
Interpretation	Convert written statements to algebraic expressions.		
Solution	Solve word problems.		

GENERAL CORE

MAT 191 - College Algebra

Resources

Ally, J. W. (1990). *Basic technical mathematics with calculus* (5th ed.). Redwood City, CA: Benjamin-Cummings.

Bernice, D. D. (Latest edition). *Basic mathematics for electricity and electronics* (4th ed.). New York: McGraw-Hill.

Christopher, J. (1982). *Introductory technical mathematics.* Englewood Cliffs, NJ: Prentice Hall.

Clar, L. M., & Hart, J. A. (1978). *Mathematics for the technologies.* Englewood Cliffs, NJ: Prentice Hall.

Cooke, N. M., & Adams, H. F. (1986). *Basic mathematics for electronics* (6th ed.). New York: McGraw-Hill.

Fleming, W., & Varberg, D. (1988). *Algebra and trigonometry* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Gilbert, L., & Gilbert, J. (1986). *College algebra and trigonometry.* Belmont, CA: Wadsworth.

Linda, D. (1990). *Technical mathematics with calculus* (1st ed.). Columbus, OH: Merrill.

Paul, R. S., & Shaevel, M. L. (1978). *Essentials of technical mathematics with calculus.* Englewood Cliffs, NJ: Prentice Hall.

Radford, L., et al. (1986). *Introduction to technical mathematics with calculus.* Boston: PWS Kent.

Smith, K. J. (1985). *Precalculus mathematics: A functional approach.* Pacific Grove, CA: Brooks-Cole.

Swokowski, E. W. (1986). *Fundamentals of algebra and trigonometry* (6th ed.). Boston: Prindle, Weber & Schmidt.

Washington, A. J. (1985). *Basic technical mathematics with calculus* (3rd ed.). Menlo Park, CA: Benjamin-Cummings.

GENERAL CORE

MAT 193 - College Trigonometry

Course Overview

Course Description

Emphasizes problem solving techniques. Topics include: trigonometric functions, properties of trigonometric functions, vectors and triangles, exponential functions, complex numbers, identities, inverse functions, and logarithmic functions. Graphs of functions and their inverse are included.

Competency Areas

Trigonometric Functions
Properties of Trigonometric Functions
Exponential Functions
Vectors and Triangles
Inverse of Trigonometric Functions/Graphing
Logarithmic Functions

Prerequisite

MAT 191

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

MAT 193 - College Trigonometry

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
TRIGONOMETRIC FUNCTIONS		**6**	**0**
Signs of the trigonometric functions	Define the six trigonometric functions.		
	Determine the sign of the function of an angle.		
Radians	Perform trigonometric computations with angles measured in radians.		
PROPERTIES OF TRIGONOMETRIC FUNCTIONS		**8**	**0**
Fundamental trigonometric identities	Recognize and verify the basic trigonometric identities.		
Trigonometric equations (conditional)	Prove the validity of trigonometric equations by means of the trigonometric identities.		
EXPONENTIAL FUNCTIONS		**6**	**0**
Positive integers as exponents	Perform algebraic operations with exponents expressed as integers or fractions.		
Zero and negative exponents			
Fractional exponents			

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
VECTORS AND TRIANGLES		**10**	**0**
Vectors	Define vector quantities and give examples.		
Oblique triangles	Solve oblique triangles using the laws of sines and cosines.		
INVERSE OF TRIGONOMETRIC FUNCTIONS/GRAPHING		**10**	**0**
Trigonometric graphs	Solve for an unknown angle using inverse trigonometric functions.		
Trigonometric graphs	Represent trigonometric functions graphically.		
Inverse trigonometric functions	Solve inverse trigonometric functions.		
LOGARITHMIC FUNCTIONS		**10**	**0**
Properties of logarithms	Write numbers as logarithms to Base 10 and Base e.		
Exponential and logarithmic functions	Represent exponential and logarithmic functions graphically.		
Solutions of exponential and logarithmic equations with applications	Solve exponential and logarithmic equations.		

GENERAL CORE

MAT 193 - College Trigonometry

Resources

Ally, J. W. (1990). *Basic technical mathematics with calculus* (5th ed.). Redwood City, CA: Benjamin-Cummings.

Bernice, D. D. (Latest edition). *Basic mathematics for electricity and electronics* (4th ed.). New York: McGraw-Hill.

Christopher, J. (1982). *Introductory technical mathematics.* Englewood Cliffs, NJ: Prentice Hall.

Clar, L. M., & Hart, J. A. (1978). *Mathematics for the technologies.* Englewood Cliffs, NJ: Prentice Hall.

Cooke, N. M., & Adams, H. F. (1986). *Basic mathematics for electronics* (6th ed.). New York: McGraw-Hill.

Fleming, W., & Varberg, D. (1988). *Algebra and trigonometry* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Gilbert, L., & Gilbert, J. (1981). *College algebra and trigonometry.* Belmont, CA: Wadsworth.

Linda, D. (1990). *Technical mathematics with calculus* (1st ed.). Columbus, OH: Merrill.

Paul, R. S., & Shaevel, M. L. (1978). *Essentials of technical mathematics with calculus.* Englewood Cliffs, NJ: Prentice Hall.

Radford, L., et al. (1986). *Introduction to technical mathematics with calculus.* Boston: PWS Kent.

Smith, K. J. (1985). *Precalculus mathematics: A functional approach.* Pacific Grove, CA: Brooks-Cole.

Swokowski, E. W. (1986). *Fundamentals of algebra and trigonometry* (6th ed.). Boston: Prindle, Weber & Schmidt.

Washington, A. J. (1985). *Basic technical mathematics with calculus* (3rd ed.). Menlo Park, CA: Benjamin-Cummings.

GENERAL CORE

MAT 195 - Calculus and Analytic Geometry

Course Overview

Course Description

Emphasizes the use of calculus with an introduction to analytic geometry. Topics include: differentiation and an introduction to integration techniques for algebraic and transcendental functions. Applications of techniques include extreme-value problems and motion, area, and other topics as time allows.

Competency Areas

Elements of Analytic Geometry
Derivatives and Applications
Integration and Applications
Differentiation of Transcendental Functions
Integration Techniques
Limits

Prerequisite

MAT 193

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

MAT 195 - Calculus and Analytic Geometry

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
ELEMENTS OF ANALYTIC GEOMETRY		**5**	**0**
Straight line	Mathematically define straight line, circle, parabola, ellipse, and hyperbola.		
Conics			
DERIVATIVES AND APPLICATIONS		**20**	**0**
Limits	Relate the theory of limits to solving for the slope of the tangent to a curve.		
Differentiation theory--slope of a tangent to a curve			
Techniques of differentiation	Apply methods for differentiation--power rule, chain rule, implicit differentiation.		
Applications	Solve word problems using derivatives.		
Derivative graphing	Employ derivatives for graphing.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
INTEGRATION AND APPLICATIONS		**10**	**0**
Indefinite integral	Evaluate indefinite integrals.		
Definite integral and the area under a curve	Calculate the area under a curve using a definite integral.		
Approximations	Evaluate functions that cannot be integrated using the rectangular method or trapezoid rule.		
Applications	Calculate two-dimensional areas and three-dimensional volumes and surface areas for solids of revolution by using integration.		
DIFFERENTIATION OF TRANSCENDENTAL FUNCTIONS		**2**	**0**
Derivatives of sine and cosine functions	Identify derivatives of these functions.		
Derivatives of exponential and logarithmic functions	Derive exponential and logarithmic functions.		
INTEGRATION TECHNIQUES		**10**	**0**
Differentials and inverse differentiation	Demonstrate use of the differential for inverse differentiation.		
General power formula	Use power rule, substitution to integrate functions.		
Table	Evaluate integrals beyond the scope of this course by using integration tables.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
LIMITS		**3**	**0**
Finite sequences and series	Determine limits for sequences and series.		
Infinite sequences and series			

GENERAL CORE

MAT 195 - Calculus and Analytic Geometry

Resources

Ally, J. W. (1990). *Basic technical mathematics with calculus* (5th ed.). Redwood City, CA: Benjamin-Cummings.

Anton, H. (1988). *Calculus with analytical geometry* (3rd ed.). New York: Wiley.

Clar, L. M., & Hart, J. A. (1978). *Mathematics for the technologies.* Englewood Cliffs, NJ: Prentice Hall.

Edwards, C. H., & Penney, D. E. (1986). *Calculus and analytic geometry* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Leithold, L. J. (1986). *The calculus with analytic geometry* (5th ed.). New York: Harper & Row.

Linda, D. (1990). *Technical mathematics with calculus* (1st ed.). Columbus, OH: Merrill.

Paul, R. E., & Shaevel, M. L. (1978). *Essentials of technical mathematics with calculus.* Englewood Cliffs, NJ: Prentice Hall.

Radford, L., et al. (1986). *Introduction to technical mathematics with calculus.* Boston: PWS Kent.

Washington, A. J. (1990). *Basic technical mathematics with calculus* (5th ed.). Menlo Park, CA: Benjamin-Cummings.

GENERAL CORE

PHY 191 - Physics I

Course Overview

Course Description

Introduces the classical theories of mechanics. Topics include: measurements and systems of units; Newton's laws; work, energy, and power; impulse and momentum; linear motion and two-dimensional motion; equilibrium; and statics and dynamics of fluids. Laboratory exercises supplement class work. Computer use is an integral part of class and laboratory assignments.

Competency Areas

Measurements and Systems of Units
Newton's Laws
Work, Energy, and Power
Impulse and Momentum
Linear Motion and Two-Dimensional Motion
Equilibrium
Statics and Dynamics of Fluids

Prerequisites

CIS 191, MAT 191

Credit Hours

5

Contact Hours Per Week

Class - 4

P.Lab - 3

GENERAL CORE

PHY 191 - Physics I

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
MEASUREMENTS AND SYSTEMS OF UNITS		**5**	**3**
Scientific notation	Change a quantity from one set of units to another.		
Systems of units	Explain the difference between vector and scalar quantities.		
Vector	Add vector quantities.		
NEWTON'S LAWS		**5**	**6**
Newton's laws of motion	State the Newton's laws of motion.		
Newton's law of universal gravitation	Calculate the gravitational attraction between two bodies.		
Mass and weight	Distinguish between force and mass and define their units.		
Applications of Newton's laws	Solve dynamics problems involving constant forces.		
WORK, ENERGY, AND POWER		**5**	**3**
Definition of work	Compute the power given appropriate data.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Kinetic energy	Define work, energy, and power and their units.		
Gravitational potential energy	Compute the work done by a force.		
Law of conservation of energy	Compute the kinetic and gravitational potential energy of an object.		
Power	Use the work-energy theorem in solving problems.		
	State the law of conservation of energy.		
IMPULSE AND MOMENTUM		**5**	**3**
Linear momentum	Define linear momentum and impulse.		
Impulse	Compute the impulse required to cause a given change in momentum.		
Conservation of linear momentum	State the law of conservation of linear momentum.		
Elastic and inelastic collisions	Solve elastic and inelastic collision problems.		
LINEAR MOTION AND TWO-DIMENSIONAL MOTION		**5**	**3**
Velocity and speed	Solve problems involving uniformly accelerated motion.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Acceleration			
Motion with constant acceleration			
Projectile motion	Solve projectile problems.		
Angular displacement, velocity, and acceleration	Convert an angle in degrees, radians, or revolutions into each of the other units.		
Circular motion	Solve rotational kinematic problems.		
	Calculate the centripetal force and the centripetal acceleration of an object in circular motion.		
EQUILIBRIUM		**5**	**6**
Translational equilibrium	Solve translational equilibrium problems.		
Torques	Compute the torque about an axis due to a given force.		
Rotational equilibrium	Solve rotational equilibrium problems.		
Moments of inertia	Determine the moment of inertia of an object about a given axis of rotation.		
Kinetic energy of rotation	Calculate rotational kinetic energy.		
Conservation of angular momentum	State the law of conservation of angular momentum.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
STATICS AND DYNAMICS OF FLUIDS		**10**	**6**
Three states of matter	Define density.		
Density	Define Hooke's law.		
Elasticity	Define pressure and be familiar with common units.		
Pressure	Find the pressure due to a column of fluid whose density is known.		
Archimedes' principle	Determine the buoyant force on an object.		
Bernoulli's equation	Use Bernoulli's equation for solving problems.		

GENERAL CORE

PHY 191 - Physics I

Resources

Bueche, F. (1982). *Principles of physics* (4th ed.). New York: McGraw-Hill.

Sears, F. W., et al. (1985). *College physics* (6th ed.). Reading, MA: Addison-Wesley.

Serway, R. A., & Faughn, J. S. (1985). *College physics*. Philadelphia: Saunders College.

Tipler, P. A. (1987). *College physics*. New York: Worth.

GENERAL CORE

PHY 192 - Physics II

Course Overview

Course Description

Introduces theories of electricity and magnetism. Topics include: electrostatic forces and fields, magnetism, electromagnetic potential, circuit elements and theory, and electromagnetic waves. Laboratory exercises supplement class work. Computer use is an integral part of class and laboratory assignments.

Competency Areas

Electrostatic Forces and Fields
Magnetism
Electromagnetic Potential
Circuit Elements and Theory
Electromagnetic Waves

Prerequisites

MAT 193, PHY 191

Credit Hours

5

Contact Hours Per Week

Class - 4

P.Lab - 3

GENERAL CORE

PHY 192 - Physics II

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
ELECTROSTATIC FORCES AND FIELDS		**10**	**9**
Electric charges	State the law of conservation of charge.		
Conductors and insulators	Explain and demonstrate the difference between conductors and insulators.		
Coulomb's law	Use Coulomb's law to calculate the force between point charges.		
Electric potential	Compute the potential difference between two points in an electric field.		
Capacitors	Define capacitance.		
	Calculate the capacitance of two parallel plates.		
MAGNETISM		**10**	**6**
The magnetic field	Define the concepts of magnetic fields.		
Forces on moving charges	Explain forces related to moving electrical current.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Magnetic fields of straight wires, loops, and solenoids	Determine the magnitude and direction of the magnetic field produced by straight wires, loops, and solenoids.		
Mutual and self inductance	Calculate the magnitude and direction of an induced EMF using Faraday's law.		
Generators and transformers	State the principles of motors and generators. Explain the principles of the operation of a transformer.		
ELECTROMAGNETIC POTENTIAL		**5**	**0**
Electric potential	Compute electrical potential.		
Magnetic field	Compute energy stored in a magnetic field.		
CIRCUIT ELEMENTS AND THEORY		**10**	**12**
Direct current circuits			
Ohm's law	Calculate current, EMF, and resistance in series and parallel circuits.		
Kirchoff's rules	Calculate the current at any point and the potential difference between any two points in a circuit using Kirchoff's rules.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Alternating current circuits			
Resistance			
Reactance			
Inductance			
Phase angles			
Capacitance	Calculate the reactions, impedance, current, voltage, power factor, power, and phase angle in AC circuits.		
Resonance	Explain the phenomenon of resonance in AC circuits.		
ELECTROMAGNETIC WAVES		**5**	**3**
Maxwell's equations	Recognize Maxwell's equations.		
EM wave speed	Calculate the relationship between frequency, wavelength, and speed of EM waves.		
EM wave energy	Explain the transport of energy by EM waves.		
EM wave spectrum	List the various types of EM waves according to wavelength.		

GENERAL CORE

PHY 192 - Physics II

Resources

Bueche, F. (1982). *Principles of physics* (4th ed.). New York: McGraw-Hill.

Sears, F. W., et al. (1985). *College physics* (6th ed.). Reading, MA: Addison-Wesley.

Serway, R. A., & Faughn, J. S. (1985). *College physics.* Philadelphia: Saunders College.

Tipler, P. A. (1987). *College physics.* New York: Worth.

GENERAL CORE

PHY 291 - Physics III

Course Overview

Course Description

Introduces classical theories of heat, sound, light, and modern physics. Topics include: gas laws; heat transfer; thermodynamics; simple harmonic motion; wave motion; sound; properties of light; and an introduction to relativity, atomic physics, and nuclear physics concepts. Laboratory exercises supplement class work. Computer use is an integral part of class and laboratory assignments.

Competency Areas

Gas Laws
Heat Transfer
Thermodynamics
Harmonic Motion
Wave Motion
Sound
Light Properties
Relativity Concepts
Atomic Concepts
Nuclear Concepts

Prerequisites

MAT 195, PHY 191

Credit Hours

5

Contact Hours Per Week

Class - 4

P.Lab - 3

GENERAL CORE

PHY 291 - Physics III

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
GAS LAWS		**5**	**3**
Temperature scales	Define the Celsius, Kelvin, and Fahrenheit temperature scales.		
Absolutes	Explain absolute quantities such as absolute pressure and temperature.		
Equation of state	Solve problems using the ideal gas law.		
HEAT TRANSFER		**5**	**6**
Quantity of heat	Distinguish between the terms heat energy and internal energy.		
	Define the usual units for heat energy and how they are related to other energy units.		
Heat capacities	Explain the concepts of specific heat capacity and heats of fusion and vaporization.		
Calorimetry	Solve calorimetry problems.		
Conduction, convection, and radiation	Solve problems in thermal expansion and heat conduction using the appropriate formula.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
THERMODYNAMICS		**5**	**3**
State variables	Explain the meaning of state variable.		
First law of thermodynamics	Solve problems using the first law of thermodynamics.		
Typical processes in gases	Explain the thermodynamic process and thermodynamic cycle.		
	Demonstrate the use of P-V diagrams.		
Heat engines	Determine the efficiency of a heat engine.		
Second law of thermodynamics	Explain the second law of thermodynamics.		
HARMONIC MOTION		**3**	**3**
Simple harmonic motion			
Equations	Demonstrate the use of equations to solve simple harmonic motion problems.		
WAVE MOTION		**2**	**3**
Mechanical waves	Define terms used in describing the properties of waves.		
Reflection of waves	Explain wave reflection and the principle of superposition.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Standing waves	Compute wavelength, frequency, and speed of a wave given two variables.		
	Explain the difference between transverse and longitudinal waves.		
Resonance	Compute the resonant frequency of a system given appropriate data.		
SOUND		**5**	**3**
Sound waves	Explain the nature of sound as a compressional wave.		
Intensity	Explain the concepts of intensity and intensity level.		
Beats	Compute the speed of sound given appropriate data.		
Doppler effect	Explain the Doppler effect and compute frequency shift given appropriate data.		
LIGHT PROPERTIES		**10**	**6**
Speed of light	Demonstrate knowledge of the concepts of light waves and light rays along their spectra.		
Light waves and rays	Describe the speed of light in various media.		
Reflection and refraction	Explain reflection and image formation by plane, concave, and convex mirrors.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Explain image formation by lenses.		
	Solve problems using Snell's law.		
Interference and diffraction	Explain doubt slit interference.		
	Explain the diffraction grating.		
RELATIVITY CONCEPTS		**1**	**3**
Special theory	State postulates of special theory.		
Lorentz contraction	Explain the Lorentz contraction, time dilation, and relativistic mass.		
ATOMIC CONCEPTS		**2**	**0**
Energy levels	Explain energy levels of an atom.		
Quantum theory	Explain quantum nature of light absorption/emission.		
NUCLEAR CONCEPTS		**2**	**0**
Atomic mass unit	Calculate binding energy.		
Atomic particles	Balance nuclear equations.		
	Discuss the subatomic particles.		
Nuclear decay	Discuss modes of decay.		

GENERAL CORE

PHY 291 - Physics III

Resources

Bueche, F. (1982). *Principles of physics* (4th ed.). New York: McGraw-Hill.

Sears, F. W., et al. (1985). *College physics* (6th ed.). Reading, MA: Addison-Wesley.

Serway, R. A., & Faughn, J. S. (1985). *College physics*. Philadelphia: Saunders College.

Tipler, P. A. (1987). *College physics*. New York: Worth.

GENERAL CORE

PSY 191 - Introductory Psychology

Course Overview

Course Description

Emphasizes the basics of human psychology and individual and group behavior. Topics include: social environments; career development; communications and group processes; personality; emotions and motives; conflicts, stress, and anxiety; perception and learning; and case problems and typical relationships.

Competency Areas

Social Environments
Career Development
Communications and Group Processes
Personality
Emotions and Motives
Conflicts, Stress, and Anxiety
Perception and Learning

Prerequisite

Program admission

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

PSY 191 - Introductory Psychology

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
SOCIAL ENVIRONMENTS		**5**	**0**
Definitions	Define social psychology and attitude.		
Attitudes	Differentiate between types of conformity to social norms.		
Attribution theory	Relate attitudes, reputations, and stereotypes to person perceptions.		
Attraction	Describe factors that link attraction and liking.		
Conformity, compliance, obedience, altruism, and deindividuation	Describe how the attribution theory explains behavior and some of its errors.		
CAREER DEVELOPMENT		**5**	**0**
Career clusters	Identify career alternatives appropriate for his/her personality type.		
Leadership skills	Identify psychological skills important for leadership and promotion.		
Work dynamics	Explain the psychological impact of work, loss of work, and change of work.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
COMMUNICATIONS AND GROUP PROCESSES		**5**	**0**
Definitions	Identify the four main factors in the communication process.		
Types of communication	Differentiate between verbal and nonverbal communication.		
Group dynamics	Provide examples of the use of effective and ineffective communications.		
	Practice active listening and nonjudgmental paraphrasing of statements.		
	Define personal space and tell how it affects behavior.		
	List factors in group effectiveness.		
	List stages of group performance.		
PERSONALITY		**9**	**0**
Definition	Define personality.		
Theories	Match major theorists with their approaches to personality.		
Assessment	List three methods of assessing personality.		
	Differentiate between objective and projective personality tests.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Name and describe personality disorders and types of therapy for each.		
EMOTIONS AND MOTIVES		**6**	**0**
Definitions	Define motive and emotion.		
Needs theory	Relate needs and motives.		
Theories of emotion	List Maslow's hierarchy of needs.		
Expression of emotion	Relate motivation to study habits and career choices.		
	Give examples of verbal and nonverbal means of communicating emotions.		
CONFLICTS, STRESS, AND ANXIETY		**10**	**0**
Definitions	Define stress, anxiety, and adjustment.		
Locus of control	Define locus of control and recognize own characteristics as internal or external locus of control.		
Types of conflict	Identify the major types of conflict.		
Effects of stress	Relate conflict to pressure and frustration.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Coping mechanisms	Identify three stages of stress and physiological changes in each.		
Abnormal behavior	Identify direct and defensive coping mechanisms.		
	Name four criteria for labeling behaviors abnormal.		
	Name disorders that result from stress or anxiety and treatments for them.		
PERCEPTION AND LEARNING		**10**	**0**
Definitions	Differentiate between sensation and perception.		
Classical conditioning	Identify perceptual constancies.		
Operant conditioning	Identify observer characteristics in perception.		
Memory	List examples of distance, depth, and movement perceptions and of visual illusions.		
Cognition	Define learning.		
	Compare classical conditioning and operant conditioning.		
	Define latent learning, block, and insight.		
	Define memory.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Differentiate between short-term and long-term memory.		
	Define cognition, image, and concept.		

GENERAL CORE

PSY 191 - Introductory Psychology

Resources

Benjamin, L. T., et al. (1987). *Psychology.* New York: Macmillan.

Calhoun, J. F., & Acocella, J. (1983). *Psychology of adjustment and human relations* (2nd ed.). New York: Random House.

Dworetzky, J. P. (1988). *Psychology* (3rd ed.). St. Paul: West.

Scarr, S., & Zanden, J. V. (1987). *Understanding psychology* (5th ed.). New York: Random House.

Scheier, M., & Carver, C. (1987). *Perspectives on personality.* Needham Heights, MA: Allyn & Bacon.

Shaffer, D. (1987). *Social and personality development* (2nd ed.). Pacific Grove, CA: Brooks-Cole.

Spear, P. D., et al. (1988). *Psychology.* New York: John Wiley & Sons.

Stanovich, K. E. (1989). *How to think straight about psychology* (2nd ed.). Glenview, IL: Scott, Foresman.

Verderber, K. S., & Verderber, R. F. (1989). *Inter-act: Using interpersonal communication skills* (5th ed.). Belmont, CA: Wadsworth.

FUNDAMENTAL TECHNICAL

CET 110 - Civil Engineering Drafting I

Course Overview

Course Description

Introduces engineering drawing. Topics include: introduction to drafting; drafting fundamentals such as use of instruments, linework, lettering, layout, and geometric construction; orthographic projection; dimensioning; sectional views; technical sketching; pictorial drawing; and schematic drawing.

Competency Areas

Introduction to Drafting
Drafting Fundamentals
Orthographic Projection
Dimensioning
Sectional Views
Technical Sketching
Pictorial Drawing
Schematic Drawing

Prerequisite

Program admission

Credit Hours

4

Contact Hours Per Week

Class - 2

P.Lab - 6

FUNDAMENTAL TECHNICAL

CET 110 - Civil Engineering Drafting I

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
INTRODUCTION TO DRAFTING		**2**	**6**
Lettering	Describe basic drafting procedures.		
	Identify basic drafting terminology and equipment.		
	Describe techniques for lettering.		
	Use vertical and slant lettering techniques.		
Instruments	Use lettering instruments.		
Alphabet of line	Use the alphabet of line.		
DRAFTING FUNDAMENTALS		**2**	**6**
Geometric construction	Construct elemental polygons and circles using geometric construction techniques.		
ORTHOGRAPHIC PROJECTION		**4**	**12**
Theory and terminology	Discuss orthographic projection theory.		
	Identify terminology used for orthographic projection.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Application	Apply orthographic projection to drawing objects.		
	Interpret orthographic drawings.		
DIMENSIONING		**4**	**12**
Dimensioning and tolerancing	Summarize traditional standard dimensioning rules.		
	Apply geometric dimensioning and tolerancing techniques.		
SECTIONAL VIEWS		**2**	**6**
Application of sectional views	Prepare cutting plane sectional views with section lining and treatment of holes, ribs, webs, spokes, keyways, and aligned sections.		
TECHNICAL SKETCHING		**2**	**6**
Orthographic sketching	Use sketching pad.		
	Prepare simple orthographic sketches.		
Pictorial sketching	Prepare simple pictorial sketches.		
PICTORIAL DRAWING		**2**	**6**
Isometric drawing	Prepare drawings using isometric techniques.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
SCHEMATIC DRAWING		**2**	**6**
Civil engineering and land surveying drawing	Prepare schematic drawings for civil engineering and land surveying.		

Document Number:
03-01-03

FUNDAMENTAL TECHNICAL

CET 110 - Civil Engineering Drafting I

Resources

Groetsch, D., Nelson, J., & Chalk. (1989). *Technical drawing.* Albany, NY: Delmar.

FUNDAMENTAL TECHNICAL

CET 120 - Civil Engineering Drafting II

Course Overview

Course Description

Continues to develop skill in engineering drafting. Topics include: technical sketching, projection dimensioning, advanced orthographic projection, advanced pictorial techniques, and industrial graphics application.

Competency Areas

Technical Sketching
Projection Dimensioning
Advanced Orthographic Projection
Industrial Graphics Application
Advanced Pictorial Techniques

Prerequisite

CET 110

Credit Hours

4

Contact Hours Per Week

Class - 2

P.Lab - 6

FUNDAMENTAL TECHNICAL

CET 120 - Civil Engineering Drafting II

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
TECHNICAL SKETCHING		**2**	**6**
Three-view drawings	Construct a three-view drawing of a complex object.		
Isometric sketches	Prepare and blueprint sketches of three-dimensional objects.		
Missing orthographic views	Prepare drawings of missing views in orthographic projection.		
PROJECTION DIMENSIONING		**4**	**12**
General tolerancing	Apply specified tolerances to mechanical objects in orthographic projection.		
Geometric dimensioning	Apply specified tolerances to mechanical objects in orthographic projection with regard to geometric dimensioning.		
ADVANCED ORTHOGRAPHIC PROJECTION		**6**	**18**
Auxiliary views	Draw auxiliary views, other than standard orthographic views, to show true size.		
Assembly and detail drawing	Draw and dimension separate detail parts.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Draw assembly of detail parts including legend with quantity, description, and material of parts.		
INDUSTRIAL GRAPHICS APPLICATION		**6**	**18**
Cams and gears	Prepare drawings of cams and gears with tolerances.		
Fasteners	Prepare drawings of various industrial fasteners.		
ADVANCED PICTORIAL TECHNIQUES		**2**	**6**
Detail and assembly	Prepare pictorial detail assembly drawings of complex objects.		

Document Number:
03-02-03

FUNDAMENTAL TECHNICAL

CET 120 - Civil Engineering Drafting II

Resources

Groetsch, D., Nelson, J., & Chalk. (1989). *Technical drawing.* Albany, NY: Delmar.

FUNDAMENTAL TECHNICAL

CET 140 - Descriptive Geometry

Course Overview

Course Description

Provides multiview and dimensioning and techniques necessary to develop views that completely describe geometric shapes. Topics include: relations of points, lines, planes, and surfaces; auxiliary views; projection principles; development of surfaces; and intersection of surfaces.

Competency Areas

Relations of Points, Lines, Planes, and Surfaces
Auxiliary Views
Projection Principles
Development of Surfaces
Intersection of Surfaces

Prerequisite/Corequisite

CET 120

Credit Hours

4

Contact Hours Per Week

Class - 2

P.Lab - 6

FUNDAMENTAL TECHNICAL

CET 140 - Descriptive Geometry

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
RELATIONS OF POINTS, LINES, PLANES, AND SURFACES		**6**	**18**
Orthographic projection	Relate orthographic projection and descriptive geometry to construct additional views such as oblique views.		
	Define terminology such as project line, line sight, and other terms.		
	Describe the purpose of multiview drawings.		
	Describe the way projection lines are unfolded.		
	Relate points and lines in space.		
Planes	Describe normal, oblique, and edge views.		
	Construct normal, oblique, and edge views to find the true slope, true length, and true shape of a plane.		
AUXILIARY VIEWS		**2**	**6**
True size and length	Describe the purpose of auxiliary views in determining true size and length.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Construct auxiliary views, perpendicular views other than the standard views, to determine true size and length.		
PROJECTION PRINCIPLES		**4**	**12**
Intersecting and nonintersecting lines	Construct a plane containing intersecting and nonintersecting lines to determine true size and length of the angle between the lines.		
	Determine whether lines are intersecting or nonintersecting.		
Parallel and perpendicular projection lines	Determine the shortest direct or level distance, or the angle, between parallel and perpendicular lines.		
DEVELOPMENT OF SURFACES		**4**	**12**
Parallel line development	Develop right cylinders, truncated right prisms, and/or oblique prisms.		
Radial line development	Develop right truncated cones, oblique cones, right truncated pyramids, oblique pyramids, and/or spheres.		
Triangulation development	Develop a nonpyramidal sheet metal connector, a transition piece, and/or a warped transition piece.		
INTERSECTION OF SURFACES		**4**	**12**
Intersecting lines	Demonstrate how to find an edge view of a plane surface.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Find the shortest distance between two nonintersecting planes.		
	Find the shortest level line connecting two planes.		
	Find the shortest line between two intersecting planes given grade or slope.		
Piercing points	Draw intersection lines of spheres, prisms, cones, and flat planes.		
Development of intersecting surfaces	Develop intersections of spheres, prisms, cones, and flat planes.		

FUNDAMENTAL TECHNICAL

CET 140 - Descriptive Geometry

Resources

Groetsch, D., Nelson, J., & Chalk. (1989). *Technical drawing.* Albany, NY: Delmar.

Stewart, S. A. (1986). *Applied descriptive geometry.* Albany, NY: Delmar.

Stewart, S. A. (1986). *Instructor's guide and solutions manual to applied descriptive geometry.* Albany, NY: Delmar.

FUNDAMENTAL TECHNICAL

CIS 191 - Computer Programming Fundamentals

Course Overview

Course Description

Emphasizes fundamental concepts of problem solving using computers. Students explore flow charts, control structures, subroutines, arrays, strings manipulation, matrices, and files. A high level source language is used. The laboratory portion of the course is designed to acquaint students with computer facilities and software utilities. Topics include: system fundamentals, concepts of structured programming, arrays, functions and subroutines, data files, engineering applications, graphics, matrices, and program editing. Laboratory work parallels class work.

Competency Areas

System Fundamentals
Concepts of Structured Programming (High Level Source Language)
Arrays
Functions and Subroutines
Data Files
Engineering Applications
Graphics
Matrices
Program Editing

Prerequisite

Program admission

Credit Hours

5

Contact Hours Per Week

Class - 3

P.Lab - 6

FUNDAMENTAL TECHNICAL

CIS 191 - Computer Programming Fundamentals

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
SYSTEM FUNDAMENTALS		**3**	**6**
Basic operations	Demonstrate the skills necessary for operating a computer.		
CONCEPTS OF STRUCTURED PROGRAMMING (HIGH LEVEL SOURCE LANGUAGE)		**3**	**6**
Symbols	Identify symbols used for arithmetic operations.		
ARRAYS		**3**	**6**
Use	Demonstate use of arrays in structured programming.		
FUNCTIONS AND SUBROUTINES		**3**	**6**
Development and use	Develop, debug, execute programs using functions and subroutines.		
DATA FILES		**3**	**6**
Development and use	Develop, debug, execute programs using data files.		
ENGINEERING APPLICATIONS		**6**	**12**
Applications	Develop, debug, execute programs using engineering applications.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
GRAPHICS		**3**	**6**
Graphics programs	Develop, debug, execute programs using graphics.		
MATRICES		**3**	**6**
Development and use	Develop, debug, execute programs using matrices.		
PROGRAM EDITING		**3**	**6**
Development and use	Create, save, retrieve programs using editing features of a computer system.		

FUNDAMENTAL TECHNICAL

CIS 191 - Computer Programming Fundamentals

Resources

Bent, R. J., & Sethares, G. C. (1986). *An introduction to computer programming* (3rd ed.). Pacific Grove, CA: Brooks/Cole.

Guldner, F. J. (1985). *BASIC programming for engineers and technicians.* Albany, NY: Delmar.

Quasney, J. S., & Maniotes, J. (1984). *Basic fundamentals and style.* Boston: Boyd & Fraser.

FUNDAMENTAL TECHNICAL

EEF 190 - Engineering Technology Professions

Course Overview

Course Description

Familiarizes students with careers in engineering technology. Representatives of local industry provide an orientation to types of work and employers' expectations in engineering technology. Students will be involved in job site visits and activities utilizing the library and other resources to explore the world of engineering technology. Topics include: careers in engineering technology, careers requirements, and work ethics.

Competency Areas

Careers in Engineering Technology
Career Requirements
Work Ethics

Prerequisite

Provisional admission

Credit Hours

1

Contact Hours Per Week

Class - 0

P.Lab - 3

FUNDAMENTAL TECHNICAL

EEF 190 - Engineering Technology Professions

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
CAREERS IN ENGINEERING TECHNOLOGY		**0**	**10**
Overview of engineering	Discuss the various engineering technologies and their applications.		
Survey of electromechanical engineering technology	Describe electromechanical engineering technology careers.		
Survey of electronic engineering technology	Describe electronic engineering technology careers.		
Survey of mechanical engineering technology	Describe mechanical engineering technology careers.		
CAREER REQUIREMENTS		**0**	**10**
Formula interpretation	Interpret basic formulas commonly used in engineering technology.		
Dimensional analysis	Distinguish between fundamental and derived units and give examples of each from SI and English units.		
	Explain the terms "dimensionless quantity" and "radian."		
	Evaluate the correctness of the units in the solution, given the steps in the solution of an equation.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
	Determine the units of the solution, given an equation and the units of each term.		
	Convert a physical quantity from one set of units to another using the ratio method, given the necessary equivalents.		
International system of units	Identify units used in the international systems.		
	Solve problems utilizing the international system of units.		
Precision, accuracy, and measurement	Discuss the role of precision, accuracy, and measurement in engineering technology.		
Graphs	Interpret graphs.		
	Draw simple graphs.		
Engineering laboratory procedures	Conduct simple laboratory experiments.		
	Record laboratory data.		
Job safety and medical emergencies	Identify job safety hazards.		
	Outline the appropriate first response to medical emergencies.		
WORK ETHICS		**0**	**10**
Philosophy and ethics	Examine the philosophies of engineering technology professions.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Analyze work ethics necessary for careers in engineering technology.		
Systems approach to engineering technology	Describe the use of the systems approach in engineering technology.		
Career advancement	Describe the knowledge, skills, and attitudes necessary for advancement in engineering technology professions.		

FUNDAMENTAL TECHNICAL

EEF 190 - Engineering Technology Professions

Resources

Center for Occupational Research and Development. (1982). *Fundamentals of engineering technologies.* Waco,TX: Author.

FUNDAMENTAL TECHNICAL

MET 204 - CAD I

Course Overview

Course Description

Emphasizes the use of interactive computing techniques in engineering drafting and design. Topics include: use of system hardware and software, concepts of basic dimensional computer aided drafting (CAD), and engineering applications. Laboratory work parallels class work.

Competency Areas

CAD System Hardware
CAD System Software
Dimensional CAD Concepts
CAD Engineering Design Applications

Prerequisite

CET 110

Prerequisite/Corequisite

MAT 193

Credit Hours

4

Contact Hours Per Week

Class - 2

P.Lab - 6

FUNDAMENTAL TECHNICAL

MET 204 - CAD I

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
CAD SYSTEM HARDWARE		**4**	**6**
CPU			
Disk memory			
Interactive terminal			
Plotters			
Related peripheral devices	Describe the functions of a typical CAD hardware system.		
CAD SYSTEM SOFTWARE		**4**	**6**
Operating systems			
Application packages	Describe the functions of typical software in the CAD system.		
Language support			
DIMENSIONAL CAD CONCEPTS		**8**	**14**
CAD database management	Operate a micro CAD workstation.		
Drawing and editing with CAD	Manage a typical CAD database.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Draw and edit typical CAD drawings.		
Outputting to peripheral devices	Generate a hardcopy of CAD drawings.		
CAD ENGINEERING DESIGN APPLICATIONS		**4**	**34**
Mechanical design	Describe CAD/CAM applications in industry.		
Architectural design	Describe CAD/CAM applications in construction.		

FUNDAMENTAL TECHNICAL

MET 204 - CAD I

Resources

Berghauser, T. W., & Schlieve, P. L. (1988). *Illustrated autoCAD* release 10. Plano, TX: Wordware.

Groover, M. P., & Zimmers, E. W., Jr. (1984). *CAD-CAM: Computer-aided design and manufacturing.* Englewood Cliffs, NJ: Prentice Hall.

Hoetsch, D. (1988). *MICROCADD: Computer-aided design and drafting on microcomputers.* Englewood Cliffs, NJ: Prentice Hall.

Merickel, M. (1986). *Stepping into CAD.* Thousand Oaks, CA: New Riders.

Micro CADDS geometric construction and detailing user guide. (1988). Bedford, MA: Computervision.

Omura, G. (1988). *Mastering autoCAD* (2nd ed.). San Francisco: Sybex.

Schaefer, A. T., & Brittain, J. L. (1986). *The autoCAD productivity book* (2nd ed.). Piedmont, CA: Ventana.

Wahlers, R. T. (1988). *Applying auto CADD--A step-by-step approach.* Mission Hills, CA: Glencoe.

SPECIFIC TECHNICAL

CET 131 - Statics and Dynamics

Course Overview

Course Description

Emphasizes the study of forces and their effects on bodies at rest and in motion. Topics include: Newton's laws, scalars and vectors, concurrent forces and nonconcurrent forces, analysis of structures, inertia and friction, and kinematics and kinetics of particles and rigid bodies.

Competency Areas

Newton's Laws
Scalars and Vectors
Concurrent Forces and Nonconcurrent forces
Analysis of Structures
Inertia and Friction
Kinematics and Kinetics of Particles and Rigid Bodies

Prerequisites

MAT 193, PHY 191

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

SPECIFIC TECHNICAL

CET 131 - Statics and Dynamics

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
NEWTON'S LAWS		**5**	**0**
Introduction to Newton's laws	Discuss Newton's laws of statics and dynamics. Use Newton's laws of static equilibrium.		
SCALARS AND VECTORS		**5**	**0**
Introduction to scalar and vector	Define scalars and vectors.		
Scalar and vector problems	Apply the laws of static equilibrium to solve problems involving scalars and vectors.		
CONCURRENT FORCES AND NONCONCURRENT FORCES		**10**	**0**
Basic principles of statics	Define concurrent and nonconcurrent force systems.		
Coplanar, parallel force systems	Use examples of force systems to analyze loads on structures.		
Coplanar, concurrent force systems	Resolve concurrent force systems into equivalent (resultant) forces for use in analysis of loads on structures.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
Coplanar, nonconcurrent force systems	Resolve nonconcurrent force systems into equivalent (resultant) forces for use in analysis of loads on structures.		
ANALYSIS OF STRUCTURES		**10**	**0**
Analysis of loads	Apply principles of force systems to analyze loads on structures. Apply vectors to analyze loads of individual members in various structures.		
Free bodies	Isolate structures into free bodies for analysis purposes.		
INERTIA AND FRICTION		**10**	**0**
Inertia	Relate inertia to Newton's law, F=MA, to resolve the forces and motion of an object.		
Friction	Apply the principles of the motion of an object according to Newton's laws of motion.		
Motion problems	Use the basic principles of differential and integral calculus to solve problems relating to distance, velocity, and acceleration of an object.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
KINEMATICS AND KINETICS OF PARTICLES AND RIGID BODIES		**10**	**0**
Kinematics and kinetics	Define kinetics and kinematics as branches of dynamics.		
Application of dynamics to particles and rigid bodies	Use the principles of dynamics and calculus to resolve forces and motion of an object with respect to displacement, velocity, and acceleration.		

SPECIFIC TECHNICAL

CET 131 - Statics and Dynamics

Resources

Jensen, A. E., & Chenoweth, H. H. (1983). *Applied engineering mechanics* (4th ed.). New York: McGraw-Hill.

Levinson, I. J. (1984). *Introduction to mechanics.* New York: Prentice Hall.

SPECIFIC TECHNICAL

CET 212 - Construction Cost Estimating

Course Overview

Course Description

Introduces construction project drawings and plans, specifications, construction methods, and building codes; and methods and practices used in estimating building costs based on a complete set of plans and specifications. Topics include: plans, such as floor plans, elevations, wall sections, electrical plans, heating and cooling plans, and site plans; and unit cost concepts, including material take-offs and pricing adjustments for materials and labor based on geographic area and annual cost indices.

Competency Areas

Plans
Unit Cost Concepts

Prerequisite

MAT 191

Credit Hours

5

Contact Hours Per Week

Class - 2

D.Lab - 6

SPECIFIC TECHNICAL

CET 212 - Construction Cost Estimating

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
PLANS		**15**	**40**
Floor plans	Interpret floor plans.		
Elevations	Interpret elevations.		
Wall sections	Interpret wall sections.		
Electrical plans	Interpret electrical plans.		
Heating and cooling plans	Interpret heating and cooling plans.		
Site plans	Interpret site plans.		
UNIT COST CONCEPTS		**5**	**20**
Material take-offs	Compute total material costs.		
Pricing adjustments	Compute total labor costs.		
	Adjust pricing for materials based on geographical area annual cost indices.		
	Adjust pricing for labor based on geographical area annual cost indices.		

SPECIFIC TECHNICAL

CET 212 - Construction Cost Estimating

Resources

Lisa, A. (Ed.). (1987). *National construction estimator, 1989.* Carlsbad, CA: Craftsman.

Sundberg, E. W. (1989). *Building trades printreading* (Part I). Homewood, IL: American Technical.

SPECIFIC TECHNICAL

CET 220 - Structural Steel Design/Drafting

Course Overview

Course Description

Presents steel design concepts and practices based on the AISC *Manual of steel construction.* Emphasis is placed on steel shapes; bending theory used in design of beams; design of roof trusses, columns, and floor framing; design of beams by elastic theory and by plastic theory; and design of bolted and welded connections. Topics include: steel stress analysis, beam and truss design, column and floor framing design, connections, and truss design drawings. Truss design and drawings are to be done by computer aided drafting and design (CADDS).

Competency Areas

Steel Stress Analysis
Beam and Truss Design
Column and Floor Framing Design
Connections
Truss Design Drawings

Prerequisites/Corequisites

CET 131, MAT 193

Credit Hours

5

Contact Hours Per Week

Class - 4

P.Lab - 3

SPECIFIC TECHNICAL

CET 220 - Structural Steel Design/Drafting

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
STEEL STRESS ANALYSIS		**14**	**0**
Structural shapes properties	Identify available structural shapes and their section properties, and allowed stresses for available steels in the AISC Manual.		
Stresses	Recognize unit stresses on structural members from given loads.		
	Compute unit stresses on structural members from given loads.		
Bending theory	Discuss the concepts, use, and limitations of the bending theory.		
BEAM AND TRUSS DESIGN		**14**	**0**
Beams	Classify beam types and design beams of different types to support combined loadings usually encountered.		
Trusses	Select the span and the truss type and design a roof truss.		
COLUMN AND FLOOR FRAMING DESIGN		**4**	**0**
Column and column failures	Define column and column failures in column theory.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
	Design column members for given compression loads.		
Floor framing	Design a floor framing comprising beams, girders, and supporting columns.		
CONNECTIONS		**8**	**0**
Bolted connections	Design bolted connections.		
Welded connections	Design welded connections.		
TRUSS DESIGN DRAWINGS		**0**	**30**
Truss member load	Determine load on the truss members.		
Structural members detailing	Detail structural members of truss and bolted and welded connections.		

SPECIFIC TECHNICAL

CET 220 - Structural Steel Design/Drafting

Resources

American Institute of Steel Construction. (1983). *Detailing for steel construction.* Chicago: Author.

McCormac, J. C. (1981). *Structural steel design* (3rd ed.). New York: Harper & Row.

SPECIFIC TECHNICAL

CET 222 - Basic Land Surveying

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
SURVEY INSTRUMENT USE		**4**	**3**
Introduction	Define construction and boundary types of surveying, principles of measurement, and error and expected accuracy.		
Field notes	Prepare proper field notes for surveying project.		
Linear measurements	Apply principles and practices used in linear measurement.		
Theory and practice in the use of wye, dumpy, and three and four screw levels	Discuss the theory of wye, dumpy, and three and four screw levels.		
	Use wye, dumpy, and three and four screw levels.		
DIFFERENTIAL LEVELING		**8**	**6**
Use of level accessory equipment, level rods, and range poles	Discuss the theory and practices in the use of levels and accessory equipment.		
	Use levels and accessory equipment.		
Field practice in differential leveling and note keeping	Demonstrate field practice and note keeping in differential leveling.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Problem solving in differential leveling	Demonstrate problem solving ability with leveling.		
BOUNDARY SURVEYS		**20**	**15**
Compass, bearing, azimuth, magnetic declination, and agonic line	Develop knowledge and problem solving skills in dealing with the compass, bearing and azimuths, magnetic declination, and the agonic line.		
Theory and practice in the use of transits and theodolites	Discuss the theory and practice in the use of transits and theodolites.		
	Use transits and theodolites.		
Boundary traverse procedures and computations	Use boundary traverse procedures and computations.		
Problem solving in traversing	Solve problems in traversing.		
FIELD DATA RECORDS		**4**	**3**
Traversing by interior angles, azimuths, deflection angles, traversing accuracy, and stadia	Demonstrate traversing by interior angles, azimuths, deflection angles, and required traversing accuracy.		
	Demonstrate methods of computing area enclosed by traverse.		
FIELD DATA INTERPRETATION		**4**	**3**
Application in the field	Demonstrate field practice and note keeping in differential leveling.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Demonstrate field practice and note keeping in problem solving.		
	Demonstrate field practice and note keeping in boundary traverse procedures.		
	Perform boundary traverse procedures computations.		
	Solve problems in traversing.		

SPECIFIC TECHNICAL

CET 222 - Basic Land Surveying

Resources

Brinker, R. C., & Wolf, P. (1984). *Elementary surveying* (7th ed.). New York: Harper & Row.

SPECIFIC TECHNICAL

CET 231 - Reinforced Concrete Design

Course Overview

Course Description

Presents reinforced concrete design concepts and the principles of design for concrete beams, slabs, columns, footings, and framing. Topics include: reinforced concrete stress analysis, beam design, column and footings design, and connections.

Competency Areas

Reinforced Concrete Stress Analysis
Beam Design
Column and Footings Design
Connections

Prerequisite/Corequisite

MET 208

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

SPECIFIC TECHNICAL

CET 231 - Reinforced Concrete Design

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
REINFORCED CONCRETE STRESS ANALYSIS		**12**	**0**
Introduction to concrete composition and reinforcement design	Describe concrete characteristics and composition including workability, strength, and principles of unit stress.		
Design of beams	Identify types of beams.		
	Use prescribed procedures in beam design.		
BEAM DESIGN		**12**	**0**
Working stress design	Distinguish between two methods of design.		
	Define principles of working stress design.		
Strength design	Define principles of strength design.		
Types of beams	Identify types of beams.		
	Design T-beams and slabs for tension, compression, and shear.		
Reinforcing requirements	Determine bonding, anchorage requirements, and splicing of reinforcement bars.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
COLUMN FOOTINGS DESIGN		**13**	**0**
Concrete columns	Design rectangular, concrete, square-tied columns for compression loads.		
	Apply techniques for concentric and eccentric compression loadings.		
Footings	Design a spread footing to support columns, given an allowed soil pressure.		
	Design pile capped footings for poor soil.		
CONNECTIONS		**13**	**0**
Bolted connections	Identify bolt grades and bolt sizes for combined shear and bearing loads.		
Welded connections	Determine the strength of various sizes and types of welds.		
	Design welded connections for concentric and eccentric loaded patterns.		
Centroidal and eccentric bolt pattern loadings	Size the bolts required in connections for concentric and eccentric loaded patterns.		

SPECIFIC TECHNICAL

CET 231 - Reinforced Concrete Design

Resources

Leet, K. (1984). *Reinforced concrete design.* New York: McGraw-Hill.

McCormac, J. (1985). *Design of reinforced concrete* (2nd ed.). New York: Harper & Row.

SPECIFIC TECHNICAL

CET 232 - Senior Design Project

Course Overview

Course Description

Develops skills in designing and preparing civil engineering drawings using structural steel and reinforced concrete. Design and drawings for an industrial or commercial building or for a civil structure on a construction project are to be done using computer aided drafting and design (CADDS). Topics include: applications of computer aided drafting and design (CADDS), structural design and drafting, and drawing and design presentation.

Competency Areas

Applications of Computer Aided Drafting and Design (CADDS)
Structural Design and Drafting
Drawing and Design Presentation

Prerequisites

CET 220, MET 204

Credit Hours

5

Contact Hours Per Week

Class - 3

P.Lab - 7

SPECIFIC TECHNICAL

CET 232 - Senior Design Project

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
APPLICATIONS OF COMPUTER AIDED DRAFTING AND DESIGN (CADDS)		**15**	**35**
Hardware	Identify components of CADDS work station equipment and plotters. Use CADDS workstation equipment and plotters.		
Software	Use architectural software techniques for preparing a set of drawing plans.		
DOS	Describe file management procedures.		
STRUCTURAL DESIGN AND DRAFTING		**7**	**17**
Stress analysis	Apply principles of structural design to steel and/or masonry for a civil project.		
Drafting	Prepare necessary drawings for a civil project using board or CADDS drafting.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
DRAWING AND DESIGN PRESENTATION		**8**	**18**
Design calculations	Use principles established in previous civil engineering and structural courses to prepare a report of all necessary calculations and specifications for the senior design project.		
Drawing	Prepare a sequenced set of drawings for a civil engineering design project using acceptable procedures.		

SPECIFIC TECHNICAL

CET 232 - Senior Design Project

Resources

American Institute of Steel Construction. (1983). *Detailing for steel construction.* Chicago: Author.

American Institute of Steel Construction. (1989). *Manual of steel construction* (9th ed.). Chicago: Author.

National Fire Protection Agency. (1988). *National safety codes.* Quincy, MA: Author.

National Fire Protection Agency. (1990). *National electrical code.* Quincy, MA: Author.

National Fire Protection Agency. (1990). *National fire codes.* Quincy, MA: Author.

Ramsey, C., & Sleeper, H. (1988). *Architectural graphic standards* (8th ed.). New York: Wiley.

Seeylye, E. (1959). *Data book for civil engineers* (3rd ed.). New York: Wiley.

Southern Building Code Congress International (SBCCI). (1985). *Standard building code.* Birmingham, AL: Author.

SPECIFIC TECHNICAL

MET 208 - Strength of Materials

Course Overview

Course Description

Provides an overview of the behavior of materials when subjected to different loadings and restraints, and the prediction of materials behavior in different situations. Topics include: stress, strain, torsion, moments of inertia, column analysis, and beam bending. Laboratory work parallels class work.

Competency Areas

Concepts of Stress
Concepts of Strain
Torsion
Moments of Inertia
Column Analysis
Beam Bending

Prerequisites

CET 131, MAT 193

Credit Hours

5

Contact Hours Per Week

Class - 4

P.Lab - 3

SPECIFIC TECHNICAL

MET 208 - Strength of Materials

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
CONCEPTS OF STRESS		**10**	**9**
Simple stress	Determine simple stress.		
Yield strength	Determine yield strength by using the handbook of material properties.		
Safe loads	Determine safe loads.		
Allowable stress	Determine allowable stress.		
Shear stress	Determine shearing stress.		
Thermal stress	Determine thermal stress.		
CONCEPTS OF STRAIN		**4**	**3**
Simple strain	Determine simple strain.		
Hooke's law	Apply Hooke's law.		
Poisson's ratio	Determine Poisson's ratio.		
Dimension changes	Determine change in dimension.		
Shear modules	Determine shear modules.		
TORSION		**4**	**3**
Torsion	Determine shearing stress resulting from torsion.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Angle of twist	Determine angle of twist.		
Shafts	Determine shafts subject to torsion.		
MOMENTS OF INERTIA		**4**	**0**
Moments	Determine moment of inertia of areas.		
COLUMN ANALYSIS		**4**	**3**
Euler's formula	Apply Euler's formula.		
Empirical column formulas	Design compression members.		
BEAM BENDING		**14**	**12**
Diagrams	Develop shear and moment diagrams.		
Bending stresses	Determine bending stresses in beams.		
Deflection	Determine deflection of beams.		

SPECIFIC TECHNICAL

MET 208 - Strength of Materials

Resources

Bauld, N. (1986). *Mechanics of materials.* Boston: PWS Kent.

Morrow, H. W. (1981). *Statics and strengths of materials.* Englewood Cliffs, NJ: Prentice Hall.

Muvdi, B. B., & McNabb, J. W. (1984). *Engineering mechanics of materials* (2nd ed.). New York: Macmillan.

Thrower, J. R. (1986). *Technical statics and strength of materials* (2nd ed.). Boston: Prindle, Weber, & Schmidt.

Wolf, L. J. (1988). *Statics and strength of materials.* Columbus, OH: Merrill.

APPENDIX A

APPENDIX A

Civil Engineering Technology

Equipment List

Adding machine
Architect's scale
Basic reference manual
Beam sets
Brush, dusting
CAD software program
CAD reference manual
CAD user's manual
Chair, posture type
Cleaning, pad, dry
Compass sets
Computer
Curves, french
Curves, adjustable
Curves, irregular
Cutter, paper
Cutting edge, metal
Decals
Digitizer
Disk operating system
Diskettes
Dispenser, paper
Dividers
Drafting table
Drafting machine
Drafting board
Duplicator, xerographic
Duplicator, thermographic
Eraser, cleaning (gum)
Eraser, soft pencil
Eraser, electric
Eraser, plastic
Erasing shield
File, flat
File, blueprints
Files, letter files, blueprint
Grid sketch
Ink, drawing
Input device
Keyboard
Knife, utility
Lamp, desk lead cleaner (stab me)
Lead holder
Lead pointer
Leads, graphite
Leads, plastic
Lettering sets
Lettering guide
Magnifying glass
Monitor
Output devices
Pantograph
Papers, drafting
Pen cleaner, ultrasonic
Pen, felt-tip "pentel"
Pencils, mechanical
Pencils, drafting (grades)
Pencils, colored
Pens, ruling
Pens, technical
Planimeter
Plotter or output device
Pounce (pumice soap)
Printer, diazo (ozalid)

Protractors
Rod, "philadelphia" surveying
Rosin bag
Rubber stamp, graphic (trees, shrubs, etc.)
Rule, parallel
Sanding pad
Scales, engineering
Scales, proportional
Scales, architectural
Scales, metric
Scissors
Scriber, adjustable
Sharpener, pencil
Sheeting, acetate
Standards, architectural graphic
Stapler
Stone, sharpening
Stool, drafting
Straight edge, parallel t-square
Table, tracing (light) optional
Tape, drafting
Templates, square
Templates, structural
Templates, lettering
Templates, utility
Templates, architectural
Templates, hexagonal
Templates, elliptical
Templates, triangle
Templates, furniture
Templates, circular
Transit, level
Transit, surveying
Triangles, standards
Triangles, adjustable
Trimmer, table
Tubes, shipping
Tweezers

Additional Equipment: Range poles, Level rods, Engineer's chains, Arrows, Hubs, Tripods, Computer-aided drafting system, Drafting tables, Handicap drafting station, Left-handed drafting equipment, Parallel bars

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