Butler Community College
Career and Technical Education Division

Buford Pringle
Revised Fall 2008
Implemented Spring 2009

COURSE OUTLINE
Introduction to Composites

Course Description
IT 135. Introduction to composites. 4 hours credit. This course will enable the student to understand and apply basic principles in the fabrication, repair and design of composite structures

Course Relevance
The principles learned in this course will allow the student to understand basic concepts and methods used in the production, repair and manufacture of composite materials and structures.

Required Materials
Strong, A.B. (2008). *Fundamentals of composites manufacturing*. Dearborn, MI: Society of Manufacturing Engineers.

Learning Outcomes
The intention is for the student to be able to:
1. Understand the role of composite materials in manufacturing.
2. Manufacture a basic composite part.
3. Repair a damaged composite part.

Learning PACT Skills that will be DEVELOPED and/or documented in this course
Through the student's involvement in this course, the student will develop ability in the following PACT skill area(s):

Technology Skills
1. Discipline-specific technology
   - Through the analysis of various composite materials currently used in industry, the student will be able to determine best process available to complete the repair, manufacture or design of composite parts.

Major Summative Assessment Task(s)
These learning outcome(s) and the Learning PACT skill(s) will be demonstrated by
1. Design, fabricate and repair a composite part to meet pre-established engineering requirements.

Course Content
I. Skills/Competencies – Actions that are essential to achieve the course outcomes:
   A. Demonstrate ability to perform basic manufacturing skills in the use of composite materials.
   B. Demonstrate ability to perform basic repair skills in the use of composite materials.

II. Themes – Key recurring concepts that run throughout this course:
   A. Accuracy
   B. Repeatability
   C. Safety
III. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
   A. Understanding of basic chemical processes used in the manufacture and repair of composite materials
   B. Choosing the appropriate composite for engineering requirements
IV. Concepts – Key concepts that must be understood to address the issues:
   A. Achieving weight and strength advantages through the use of composite materials.
   B. Leveraging material engineering qualities toward optimum design.

Learning Units

I. Introduction to Composites
   A. Basic concepts of composites
   B. Role of the Matrix and Reinforcement in Composites

II. Matrices and their properties
   A. Polymers, plastics and resins
   B. Thermo plastics and thermo sets

III. Unsaturated Polyesters
   A. Polyester resins and their uses
   B. Cure control
   C. Molding compounds

IV. Epoxies
   A. Overview of epoxy uses
   B. Physical and mechanical properties of cured epoxy composites

V. Specialty and High Performance Thermosets
   A. Vinyl Esters
   B. Phenolics
   C. Polyurethanes
   D. Silicones

VI. Thermoplastic Composites
   A. Engineering Thermoplastics
   B. High-performance Thermoplastic composites

VII. Ceramic and Metal Composites
   A. Properties and uses of Ceramic Matrix composites
   B. Manufacturing of metal matrix composites

VIII. Reinforcements
- A. Fiber characteristics
- B. Boron, silicone and other specialty fibers
- C. Natural fibers

IX. Reinforcement forms
- A. Filaments, strands, rovings and yarns
- B. Preforms and Hybrids

X. Quality and testing
- A. Quality Control Principles
- B. Mechanical testing

Learning Activities

Student will design, manufacture and repair a composite part. Lecture, class exercises and individual research will be used to enable the student to gain a thorough understanding of basic composite processes.

Grade Determination

The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: daily work, quizzes, chapter or unit tests, comprehensive examinations, student projects student presentations, class participation, and other methods of evaluation employed at the discretion of the instructor.