Mechanical Engineering 2 Overview

Content Area: **Engineering**
Course(s): **MECHANICAL ENGINEERING II**
Time Period:
Length: **90 Days**
Status: **Published**

Cover

EAST BRUNSWICK PUBLIC SCHOOLS

East Brunswick New Jersey

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Course Adoption: 1/7/1988

Curriculum Adoption: 1/7/1988

Date of Last Revision Adoption: 9/1/2017

Course Overview

COURSE DESCRIPTION

In this more advanced course, students continue to study the basics of the graphics language. They continue to learn the effects of technology (computer-assisted design) and the role it will play in their professional careers. The topics of study are CAD, understanding dimensioning techniques, sections, pictorials and auxiliary views and revolutions. Through the use of computers and hands-on activities, the students will explore various ways to solve problems that arise in the manufacturing process. Some of the topics of discussion will be beams, structures, materials, bridge design, home layouts, package design, types of motion, mechanisms, reverse engineering, product design and the design process. Individual and group work will be emphasized.

COURSE SCOPE AND SEQUENCE

Sequential Unit Description	Other Pacing Guide References	Proficiency (Summative) Assessments

UNIT 1 COMPUTER AIDED DRAFTING REVIEW
• Introduction to CAD
  ○ Creating Designs
  ○ Planes and Sketches
  ○ Extrusions and projections
  ○ Revolutions
  ○ Chamfers and Rounds
  ○ Sweeps
  ○ Color &Appearance
• Drawings
• Design Challenges
	2 weeks	• Practical test
		• Individual projects

UNIT 2 TYPES OF MOTION • Introduction of motion • Cad Development • Modeling • Design Process	6 weeks	• Practical test • Individual projects
UNIT 3 MECHANISMS	4 weeks	• Practical test • Individual

• Levers and Linkages • Gears and Pulleys • Cams and Followers • Cranks and Shafts • Wheels and axles • Torque vs. speed • Projects		projects
UNIT 4 REVERSE ENGINEERING • Testing • Research and Investigation • Thesis • Presentation	4 weeks	• Practical test • Individual projects
UNIT 5 PRODUCT REDESIGN • Research and Investigation • Develop Ideas • Choose and Idea • Test • Redesign	3 weeks	• Practical test • Individual projects • Group projects

CONTENT FOCUS AREA AND COURSE NAME

Course Name: Engineering and Design Technology 2, #1309

Course Number	School Numbers	Course Level	Grads(s)	Credits	Min. Per Week	Elective/Required	Initial Course Adopted
1309	050	S	10-12	2.50	210	E	01/07/88

Textbooks and Other Resources

Textbooks: (Reference only)

BASIC TECHNICAL DRAWING, SPENCER, DYGDON, et. al., Glencoe Publishing, 1995

DESIGN AND PROBLEM SOLVIING IN TECHNOLOGY, Karsnitz and Hutchinson

Supplemental Materials: Videos, Teacher prepared handouts/worksheets, appropriate websites

Online website resources

Standards

TECH.8.2.12.A.1	Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.A.3	Research and present information on an existing technological product that has been repurposed for a different function.
TECH.8.2.12.B.1	Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
TECH.8.2.12.B.2	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
TECH.8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
TECH.8.2.12.B.4	Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
TECH.8.2.12.B.5	Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.
TECH.8.2.12.C.1	Explain how open source technologies follow the design process.
TECH.8.2.12.C.2	Analyze a product and how it has changed or might change over time to meet human needs and wants.
TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.C.6	Research an existing product, reverse engineer and redesign it to improve form and function.
TECH.8.2.12.C.7	Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process

	through drawings that include data and materials.
TECH.8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
TECH.8.2.12.D.2	Write a feasibility study of a product to include: economic, market, technical, financial, and management factors, and provide recommendations for implementation.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.
TECH.8.2.12.D.4	Assess the impacts of emerging technologies on developing countries.
TECH.8.2.12.D.5	Explain how material processing impacts the quality of engineered and fabricated products.
TECH.8.2.12.D.6	Synthesize data, analyze trends and draw conclusions regarding the effect of a technology on the individual, society, or the environment and publish conclusions.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.2	Analyze the relationships between internal and external computer components.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

Grading and Evaluation Guidelines

GRADING PROCEDURES

In terms of proficiency level the East Brunswick grades equate to:

A Excellent - Advanced Proficient

B Good Above Average - Proficient

C Fair - Proficient

D Poor - Minimally proficient

F Failing - Partially Proficient

COURSE EVALUATION

Each quarter students will be evaluated with tests and programming assignments using a total point basis to determine the quarter average. The semester/course average will be a weighted average of the 2 quarter averages (40% each) and a final exam (20%); in a full year course, each quarter is worth 20% of a student's final grade and each exam (midterm & final) is worth 10% of the student's final grade.

Course achievement will be evaluated based on the percent of all pupils who achieve the minimum level of proficiency (final average grade) in the course. Student achievement levels above minimum proficiency will also be reported. Final grades, and where relevant mid-term and final exams, will be analyzed by staff for the total cohort and for sub-groups of students to determine course areas requiring greater support or modification.

Other Details

71006 Engineering Design

Engineering Design courses offer students experience in solving problems by applying a design development process. Often using solid modeling computer design software, students develop, analyze, and test product solutions models and communicate the features of those models.