**KING SAUD UNIVERSITY**

**COLLEGE OF ENGINEERING**

**MECHANICAL ENGINEERING DEPARTMENET**

**Course Title:** Safety in Mechanical Systems; SFE-511

**Semester:** Second- 1433 / 1434 H- 2012/ 2013 G

**Lecturer:** Dr. Magdy El Rayes [Room 2C- 44]

**Textbook:** Fire Protection Handbook, Nineteenth edition, Volumes I and II, National Fire Protection Association (NFPA), Quincy, Massachusetts, 2003.

**Credit Hours:** [3] Lecture.

**Course Outline:**

Chemistry and Physics of Fire

* Basic Definitions and Properties
* Atoms and Molecules
* Atomic Number of an Element
* Atomic Weight of an Element
* Isotope
* Molecule
* Chemical Formula
* Molecular Weight of a Compound
* Mole

Physical Properties

* Density
* Specific Gravity
* Gas Specific Gravity
* The Ideal Gas Law

Combustion

* Oxidation Reactions
* Ignition (Piloted Ignition and Auto-ignition)
* Explosions

Principles of Fire

* Ignition and Combustion

Boiler furnaces

* Introduction
* Fuels
* Oil and gas burning systems
* Natural gas burners
* Boiler furnace hazards
* Fire and explosion protection

Industrial and commercial heat utilization equipment

* Introduction
* Types of industrial heat utilization equipment
* Ovens and furnaces
* NFPA classification of ovens and furnaces
* Oven and furnace heating systems
* Sources of heat
* Fuel hazards

Oil quenching and molten salt baths

* Introduction
* Quenching oils
* Quench tanks
* Emergency drains
* Tank location
* Oil temperature control
* Safety considerations [safety controls-fire protection]
* Molten salt baths [types, applications]
* Salt bath hazards
* Safety control equipment

Stationary combustion engines

* Introduction
* Engine types
* Potential fire hazards
* Engine installations [locations- exhaust systems]

Metal working processes

* Introduction
* The machine tool
* Fire hazards

Welding, cutting and other hot work

* Introduction
* Processes using electricity [arc welding- resistance welding- flash welding- arc cutting]
* Oxy-fuel gas welding and cutting
* Oxy-fuel gas welding and cutting equipment
* Thermal spraying
* Oxy-fuel gas equipment [safeguards]
* Arc welding equipment [safeguards]
* Precautions for work area
* Personnel protection and ventilation

Spray finishing and powder coating

* Introduction
* Types of coatings
* Spray process equipment and components
* Powder coating process equipment and components
* Fluid spray process hazards and control
* Powder coating process hazards and control

Storage of flammable and combustible liquids

* Introduction
* Tank storage
* Aboveground storage tanks
* Underground storage tanks
* Cleaning tanks
* Hazardous material storage lockers

Storage of gases

* Introduction
* Gas containers [gas cylinders- gas tanks- pipelines]
* Container/ gas hazard safeguards

Transportation of chemicals

Fire hazards of materials

* Fire hazards of gases and dusts
* Fire hazards of liquids
* Fire hazards of solids
* Hazards of smoke

Combustion products and their effects on life safety

* Introduction
* Pyrolysis and combustion
* Flammability properties of materials
* Fire gases

Wood and wood based products

Fibers and textiles

Flammable and combustible liquids

Gases

Oxygen enriched atmospheres

Plastics and rubber

Metals

**Grade Distribution:**

Quiz and assignments 10%

Project 20%

1st. Mid-Term exam 15%

2nd. Mid-Term exam 15%

Final Term exam 40%

Total 100%

**Minimum Attendance is 75 % in Lectures.**

**ATTENDANCE**

Attendance is very important. If happens, and the student is absent for whatever the reason is, he is responsible for obtaining class notes and any other materials that he may have missed.

**ASSIGNMENTS**

Late assignments are NOT normally accepted. Any student who has any difficulty with anything that would affect his academic performance should talk to the instructor as early as possible.

**Activities:**

One industrial trip is organized to a typical local industry within the semester.

**Computer Usage:**

Students are encouraged to make their laboratory and homework calculations and type their reports using software available on PCs.

**Assessment Tools:**

1. Homework assignments
2. Quizzes
3. Mid-Term exams
4. Final Term exam
5. Project

**Revised 30.01.2013**