

Basic Nuclear Concepts  
LESSON OBJECTIVES

ID # M2-OP-RO-FUND-2111

Rev 0 Date 11-12-85

\*Terminal Objectives: Upon completion of this lesson, the RO will be able to:

1. Describe the basic structure of the atom and the nucleus.
2. Explain the radioactive decay process.
3. Describe and explain the interactions which occur between atoms, subatomic particles, and electromagnetic radiation, including the factors affecting these interactions.

\* These terminal objectives apply to all five Basic Nuclear Concepts lessons.

M2-OP-RO-FUND-2111A STRUCTURE AND FORMATION OF THE NUCLEUS

Enabling Objectives: Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. atom
  - b. molecule
  - c. element
  - d. ionization
  - e. ion
  - f. ground and excited state
  - g. electromagnetic radiation
  - h. atomic mass number
  - i. nuclide and isobar
  - j. abundance
  - k. electron volt
  - l. isomer
  - m. mass defect
  - n. binding energy
2. Describe the structure of the atom.
3. List the properties of the electron, proton and neutron.
4. Describe the difference between X-rays, gamma-rays and visible light.
5. Identify nuclides using standard notation.
6. Use the chart of the nuclides to:
  - a. find the atomic weight of a nuclide
  - b. determine if a nuclide is radioactive
7. List the properties of the strong nuclear force.
8. Describe the shell model and drop model of the nucleus.
9. Convert units of mass to/from units of energy.
10. Calculate the mass defect of any nuclide given its mass and number of protons.
11. Calculate the binding energy of a nuclide.
12. Calculate the change in binding energy that results from a nuclear reaction.
13. State the reason that energy can be released from both fission and fusion reactions.

M2-OP-RO-FUND-2111B ATOMIC MEASUREMENTS AND RADIATION

ENABLING OBJECTIVES: Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Radiation and Radioactive Material
  - b. Mass Density
  - c. Gram Atomic Weight and Gram Molecular Weight
  - d. Atom and Molecular Density
  - e. PPM and PPB
  - f. Half-thickness and Tenth-thickness
2. List the four types of radiation which come from the nucleus and list the properties and characteristics of each.
3. Balance equations involving the spontaneous emission of alpha particles, beta particles and neutrons.
4. Explain how alpha and beta particles and neutrons can cause ionization.
5. Explain the three ways in which photons interact with matter.
6. Given an Avogadro's Number, determine the number of atoms or molecules in a given amount of material.
7. Given Avogadro's Number, calculate the atom or molecular density of a solid or liquid.
8. Use the chart of the nuclides to find:
  - a. type of decay a nuclide undergoes
  - b. what nuclide is produced from various types of decay
  - c. the energy of decay particles or gammas

## M2-OP-RO-FUND-2111C NUCLEAR REACTIONS

ENABLING OBJECTIVES: Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Activity
  - b. Decay Constant
  - c. Curie
  - d. Half-life
  - e. Critical Energy
  - f. Fissionable, Fissile and Fertile
  - g. Photoneutron
2. Given an equation sheet, calculate the activity of a given mass of material and express it in curies.
3. Given an equation sheet, calculate the activity and number of atoms present of a radioactive material at any point in time.
4. Calculate the decay constant of any radionuclide, given its half-life.
5. Determine the half-life of a radioactive nuclide, given its decay curve.
6. State the difference between an induced and a spontaneous nuclear reaction.
7. List the three (3) steps of an induced nuclear reaction.
8. Balance induced nuclear reaction equations and write them in shorthand notation.
9. Explain how Pu-239 is produced from U-238.
10. Draw a typical fission yield curve and use it to determine the probability of the production of a fission fragment with a specific mass number.
11. State the average amount of energy released from fission, list how it is distributed and whether it is released instantaneously or delayed.
12. State the average number of neutrons produced per fission of U-235.
13. Explain the difference between prompt and delayed neutrons.

M2-OP-RO-FUND-2111C NUCLEAR REACTIONS

14. Write the reactions that result in neutron production from an Sb - Be source and a Pu - Be source.
15. Use the chart of the nuclides to determine:
  - a. The half-life of any radioactive nuclide.
  - b. Which nuclides will spontaneously fission.
  - c. Which nuclides are produced by fission.

M2-OP-RO-FUND-2111D NEUTRON INTERACTIONS

ENABLING OBJECTIVES: Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Microscopic Cross-section
  - b. Macroscopic Cross-section
  - c. Mean Free Path
  - d. Black Absorber
  - e. Gray Absorber
  - f. Neutron Density and Flux
  - g. Resonance
2. Given an equation sheet, calculate the probability of a specific interaction occurring.
3. Given an equation sheet, calculate the macroscopic cross-sections of nuclides and mixtures of nuclides.
4. Identify the condition under which a resonance occurs.
5. Classify neutrons by energy level.
6. Discuss the effect of neutron energy on absorption cross-section, scattering cross-section and fission cross-section.
7. Define Doppler Broadening and explain why it takes place.
8. Define self-shielding and explain why it takes place.
9. List the three factors which affect the ability of a material to interact with a neutron and explain their effect.
10. Use the Chart of the Nuclides to determine the various microscopic cross-sections of a nuclide.

M2-OP-RO-FUND-2111E NEUTRON FLUX AND REACTION RATES

ENABLING OBJECTIVES: Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Reaction Rate
  - b. Thermal, Epithermal and Fast Flux
  - c. Power Density
  - d. Fermi Age, Thermal Diffusion Length and Migration Length
2. Given an equation sheet, calculate neutron density and neutron flux.
3. Explain the relationship between reaction rate and neutron flux, microscopic cross-section and atomic density.
4. Given an equation sheet, calculate various reaction rates for any material exposed to a neutron flux.
5. Given an equation sheet, calculate the depletion of a neutron poison.
6. Given an equation sheet, calculate power density and reactor power.
7. State the relationship between neutron flux and reactor power.

REACTOR OPERATING CHARACTERISTICS

ID# M2-OP-RO-FUND-2116

Rev 0 Date 9-23-86

\*Terminal Objectives: Upon completion of this lesson, the RO will be able to:

1. Explain the cause and describe the magnitude of any reactivity changes which occur in the plant.
2. Describe and explain the nuclear response of the plant during all modes of operation.
3. Adequately interpret procedures, tests and Technical Specifications dealing with the nuclear aspects of plant operation.

\*Note: These terminal objectives apply to all seven Reactor Operator Characteristics lessons.

## THE NEUTRON CYCLE

ID# M2-OP-RO-FUND-2116A

Rev 0 Date 9-23-86

Enabling Objectives: Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Critical, subcritical, supercritical
  - b.  $K_{eff}$ ,  $K$ ,  $K_{ex}$
  - c. Each of the factors of the Six-Factor Formula
  - d. Reactivity (Both verbally and mathematically).
2. Describe what is meant by a self-sustaining chain reaction.
3. Describe the neutron lifecycle.
4. List the terms in the six-factor formula.
5. State typical ranges in value for each of the factors in the six-factor formula.
6. Write the equations for:
  - a. Thermal Utilization Factor
  - b. Reproduction Factor
7. State the relationship between  $K_{eff}$  and:
  - a. Criticality
  - b. The Six-Factor Formula
8. Describe the effect, if any, on each of the six factors due to changes in the following parameters:
  - a. Fuel
  - b. Core Poison Concentrations
  - c. Moderation Density
  - d. Core Age

SUBCRITICAL MULTIPLICATION AND POWER CHANGES  
LESSON OBJECTIVES

ID# M2-OP-RO-FUND-2116B

Rev 0 Date 9-23-86

Enabling Objectives: At the completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Subcritical Multiplication
  - b. Reactor Period
  - c. Startup Rate (SUR)
  - d. Extraneous Neutrons
2. State the relationship between a stable subcritical multiplication level and:
  - a. Source strength
  - b. keff
3. Given an equation sheet, perform calculations involving neutron count rate and Keff.
4. Calculate reactivity in  $\Delta K/K$  and  $\% \Delta K/K$  given Keff and an equation sheet.
5. Given an equation sheet, calculate power level changes in terms of either period or SUR.
6. Given an equation sheet, state the relationship between SUR and period both verbally and mathematically.
7. List the sources of neutrons in the core and explain their effect on reactor operation.

DELAYED NEUTRONS  
LESSON OBJECTIVES

ID# M2-OP-RO-FUND-2116C

Rev 0 Date 9-23-86

Enabling Objectives: At the completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a.  $\beta_i$ ,  $\bar{\beta}_i$ ,  $\beta$ ,  $\bar{\beta}$ ,  $\beta_{eff}$ ,  $\bar{\beta}_{eff}$ ,  $\beta_{ieff}$ ,  $\bar{\beta}_{ieff}$
  - b. Importance Factor
  - c. Neutron Lifetime
    1. Prompt
    2. Delayed
    3. Average
  - d. Prompt jump
  - e. Prompt drop
  - f. Prompt critical
2. State the source of delayed neutrons.
3. Given typical values for  $\beta$ , calculate  $\bar{\beta}$  and  $\beta_{eff}$ .
4. Describe and explain the effects of delayed neutrons on reaction control and the fission process.
5. State typical values for  $\beta_{eff}$  at BOC and EOC and explain the reason for the change.
6. Given an equation sheet, solve problems involving reactivity in period or SUR by using the Inhour equation.
7. State the fraction of total core power that is produced by the fission of U-235, U-238, Pu-239 and Pu-241 at BOC and at EOC.
8. Given an equation sheet, calculate the magnitude of a prompt drop or a prompt jump.
9. Given an equation sheet, show mathematically that the most negative stable SUR is  $-1/3$  DPM.

NEUTRON POISONS  
LESSON OBJECTIVES

ID# M2-OP-RO-FUND-2116D

Rev 0 Date 9-23-86

Enabling Objectives: At the completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Differential Rod Worth
  - b. Integral Rod Worth
  - c. Poison Worth
2. State the types of control poisons used in the Millstone Unit 2 core and state the form in which each is used.
3. Explain the effect of control rods on flux shape.
4. Given an equation sheet and appropriate graphs, calculate reactivity insertions due to changes in control rod position.
5. Given an equation sheet and appropriate graphs, calculate reactivity insertions due to changes in RCS boron concentration.
6. Explain how differential and integral rod worth values are used.
7. List the factors affecting inverse boron worth and explain how and why inverse boron worth changes.
8. List the factors affecting control rod worth and explain how and why control rod worth changes.

REACTIVITY COEFFICIENTS AND DEFECTS  
LESSON OBJECTIVES

ID# M2-OP-RO-FUND-2116E

Rev 0 Date 9-23-86

Enabling Objectives: At the completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Reactivity coefficient
  - b. Reactivity defect
  - c. MTC
  - d. FTC
  - e. ITC
  - f. POWER DEFECT
2. Given an equation sheet and values for coefficients/defects, calculate reactivity insertions due to changes in:
  - a. fuel temperature
  - b. moderator temperature
3. List the factors which affect the value of MTC and explain how and why MTC changes.
4. List the factors which affect the value of FTC and explain how and why FTC changes.
5. State the core conditions which can result in a positive MTC.
6. State the approximate values for FTC, MTC, doppler defect, power defect and moderator defect for the current core cycle.
7. Discuss how doppler broadening affects reactor power.

XENON AND SAMARIUM  
LESSON OBJECTIVES

ID# M2-OP-RO-FUND-2116F

Rev 0 Date 9-23-86

Enabling Objectives: At the completion of this lesson, the RO will be able to:

1. State why xenon and samarium are significant fission product poisons.
2. State the mechanism by which xenon and samarium are produced and removed.
3. Sketch a graph of xenon concentration versus neutron flux.
4. Graphically illustrate the changes in xenon and samarium reactivity for core power level changes.
5. State the approximate values for:
  - a. 100% equilibrium xenon reactivity
  - b. 100% peak xenon reactivity
  - c. Equilibrium (at power) samarium reactivity
  - d. Equilibrium (shutdown) samarium reactivity
  - e. Time to reach 100% equilibrium xenon on a startup from xenon-free conditions.
  - f. Time to reach peak xenon after a trip from full power.
  - g. Time after a trip from full power at which the core can be considered xenon free.
  - h. Time to reach equilibrium samarium after a reactor startup.
6. Explain the cause of xenon oscillations.
7. State, in general terms, the method which can be used to control (terminate) xenon oscillations.

## Heat Transfer Processes

ID # M2-OP-RO-FUND-2121B

Rev 0 Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. List the 3 modes of heat transfer.
2. Describe how each mode of heat transfer works.
3. Given the basic equation for each mode of heat transfer, identify the terms of each equation and list the units for these terms.
4. List the 3 commonly used heat transfer equations and define the terms of each equation including their units.
5. Calculate total heat transferred and heat transfer rates for plant processes.
6. List and describe the common types of heat exchangers and list the types used in the plant.
7. Describe and calculate the temperature changes which occur in each type of heat exchanger.
8. Define Log Mean Temperature Difference.
9. Define and describe:
  - a. Black Body Radiation
  - b. White Body Radiation
  - c. Gray Body Radiation

Heat Transfer: Basic Properties and Measurements

ID # M2-OP-RO-FUND-2121A

Rev 0 Date 9-23-86

Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define and list the units and symbols for the following terms:
  - a. Temperature
  - b. Pressure
  - c. Heat
  - d. BTU
  - e. Thermal Conductivity
  - f. Density
  - g. Specific Volume
  - h. Heat Capacity (Specific Heat)
  - i. Enthalpy
  - j. Weight
  - k. Mass
  - l. Energy
2. Given an equation sheet, convert temperature values between °F, °C, °R and °K.
3. Given an equation sheet, convert pressure values between gage, absolute, inches of mercury absolute, inches of mercury vacuum, inches of water absolute and inches of water vacuum.

## Heat Transfer Processes

ID # M2-OP-RO-FUND-2121B

Rev 0 Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. List the 3 modes of heat transfer.
2. Describe how each mode of heat transfer works.
3. Given the basic equation for each mode of heat transfer, identify the terms of each equation and list the units for these terms.
4. List the 3 commonly used heat transfer equations and define the terms of each equation including their units.
5. Calculate total heat transferred and heat transfer rates for plant processes.
6. List and describe the common types of heat exchangers and list the types used in the plant.
7. Describe and calculate the temperature changes which occur in each type of heat exchanger.
8. Define Log Mean Temperature Difference.
9. Define and describe:
  - a. Black Body Radiation
  - b. White Body Radiation
  - c. Gray Body Radiation

Heat Transfer Media

ID # M2-OP-RO-FUND-2121C

Rev 0 Date 9-23-86

Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Fluid
  - b. Gas
  - c. Vapor
  - d. Entropy
  - e. Phase
  - f. Partial Pressure
  - g. Quality
  - h. Percent Moisture
  - i. Vapor Pressure
  - j. Solubility
  - k. Permeability
  - l. Volume Percent
2. List and describe the three phases of water.
3. Explain the change of phase process including the amount of heat transfer that occurs.
4. List and explain the regions and points on both the Mollier and T-S diagrams.
5. Use the Steam Tables, Mollier Diagram and T-S diagram to determine the properties of water/steam if given sufficient initial data.
6. State and describe the Ideal Gas Law.
7. Explain the difference between a Real Gas and an Ideal Gas.
8. Use the Ideal Gas Law to determine Pressure, Volume and Temperature changes in a Gas.

## Fluid Properties

ID # M2-OP-RO-FUND-2121D

Rev 0 Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Viscosity
  - b. Specific Gravity
  - c. Buoyancy
2. Calculate the pressure head of a column of fluid given the column height and the fluid density.
3. State Pascal's Law.

## Fluid Movement

ID # M2-OP-RO-FUND-2121E

Rev 0 Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Reynold's Number
  - b. Head Loss
  - c. Cavitation
  - d. Net Positive Suction Head (NPSH)
  - e. Shutoff Head
  - f. Runout
2. Describe the construction and operational characteristics of:
  - a. Positive Displacement Pumps
  - b. Centrifugal Pumps
  - c. Mixed Flow Pumps
  - d. Multistage Pumps
3. Describe the construction and operational characteristics of:
  - a. Gate Valves
  - b. Globe Valves
  - c. Butterfly Valves
  - d. Ball Valves
  - e. Plug Valves
  - f. Diaphragm Valves
  - g. Needle Valves
  - h. Throttle Valves
  - i. Check Valves
  - j. Relief Valves
4. State and use the three pump laws.
5. Determine the flowrate in a single system given the pump curve and the system characteristics curve.
6. Determine system flowrates for combinations of pumps operating in series or parallel.
7. Describe how system flow is normally changed.
8. Describe Laminar and Turbulent flow and the effects of each on heat transfer.
9. Describe how cavitation is caused, its potential for damage and how it can be avoided.

Fluid Movement

ID # M2-OP-RO-FUND-2121E

Rev 0 Date 9-23-86

10. State the Continuity Equation, identifying each term and the units used for each term.
11. Use the Continuity Equation to determine flow areas and flow velocities at various locations in a system.

First Law of Thermodynamics

ID # M2-OP-RO-FUND-2121F

Rev 0 Date 9-23-86

Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Work
  - b. Energy
  - c. System
  - d. Reversibility
  - e. Adiabatic
  - f. Isothermal
  - g. Isobaric
  - h. Isometric
  - i. Isenthalpic
  - j. Isentropic
2. Define and describe the properties of an Open System and a Closed System.
3. State the General Energy Equation and define and explain each of the terms it contains.

## Plant Processes

ID # M2-OP-RO-FUND-2121G

Rev 0

Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Use the General Energy Equation to describe the energy changes which occur in a turbine, a pump, a steam generator and a condenser.
2. Use the General Energy Equation to explain the pump laws.
3. Use the General Energy Equation and the Continuity Equation to describe flowrate and energy changes taking place in a system.
4. State Bernoulli's Equation, identifying each term and the units used for each term.
5. Determine the state of a fluid after an isenthalpic expansion using either the steam tables or a Mollier Diagram.
6. Describe the energy changes which occur during a throttling process.
7. Describe the flow of a fluid through a nozzle including the energy changes which take place.
8. Lists actions which can be taken to prevent water hammer events.
9. Define the term "Water Hammer" and explain what causes water hammer to occur.

## Plant Cycles

ID # M2-OP-RO-FUND-2121H

Rev 0 Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. Cycle Efficiency
  - b. Calorimetric
2. State the Second Law of Thermodynamics.
3. Describe the Carnot and Rankine heat engine cycles using a T-S diagram.
4. Calculate the efficiency of a heat engine cycle.
5. Explain why Rankine cycle efficiency is lower than Carnot cycle efficiency.
6. State the purpose of the MSRs.
7. State the purpose of the Feedwater Heaters.
8. Perform, given the required initial data, a calorimetric on:
  - a. The Primary Plant
  - b. The Secondary Plant
  - c. The Pressurizer
  - d. A Steam Generator

## Boiling Processes

ID # M2-OP-RO-FUND-2121I

Rev 0 Date 9-23-86

### Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Define the following terms:
  - a. DNB
  - b. CHF
  - c. Burnout
  - d. Dryout
  - e. DNBR
  - f. Evaporation
  - g. Boiling Heat Transfer
2. Sketch the Pool Boiling Curve including labeling of the axes, identification of each of the four (4) regions and indicating the location of the DNB point.
3. Explain the heat transfer processes occurring in each region of the Pool Boiling Curve.
4. Describe and explain the effects of core inlet temperature, core power, core flow, core power distribution, type of channel, and RCS pressure on DNBR.
5. State the Tech. Spec. value for DNBR and basis for using this value.
6. Describe the thermal profile and modes of heat transfer across a fuel pin and a Steam Generator U-tube under normal operating conditions.
7. Describe process of heat transfer in a heated channel.
8. Describe the heat transfer processes which occur in a reactor core channel and a secondary side steam generator channel during normal operation.

RCS Heat Removal

ID # M2-OP-RO-FUND-2121J

Rev 0 Date 9-23-86

Enabling Objectives

Upon completion of this lesson, the RO will be able to:

1. Explain how Natural Circulation Flow is produced.
2. List the design features of the plant which promote Natural Circulation Flow.
3. Describe the three (3) types of Natural Circulation.
4. List the expected plant parameters for stabilized, single phase Natural Circulation Flow.
5. List and explain the criteria used to determine the existence and adequacy of Natural Circulation Flow.
6. Discuss the operational implications of Natural Circulation Flow.
7. Describe and explain the expected plant response to single loop Natural Circulation Flow.
8. Describe the expected plant response for the following transitions:
  - a. Forced Circulation to Natural Circulation
  - b. Single Phase Natural Circulation to Two Phase Natural Circulation
  - c. Two Phase Natural Circulation to Reflux Boiling
  - d. Reflux Boiling to Two Phase Natural Circulation
  - e. Two Phase Natural Circulation to Single Phase Natural Circulation
  - f. Natural Circulation to Forced Circulation
9. Define steam generator circulation and recirculation flows and their ratio to main steam (or main feed) flow.
10. Describe and explain the expected response of the Steam Generators to changing feedwater and/or steam flows at various power levels.
11. Following an uncomplicated reactor trip/turbine trip, describe and explain the expected response of:
  - a. RCS Tavg
  - b. Pressurizer Level
  - c. Pressurizer Pressure
  - d. Steam Generator Pressure
  - e. Steam Generator Level
  - f. RCS TH
  - g. RCS Tc

## MITIGATING CORE DAMAGE

### LESSON OBJECTIVES

ID# M2-OP-RO-TA-2026

Rev 0 Date 3-10-86

Terminal Objectives: Upon completion of this lesson, the RO will be able to:

1. Describe conditions which can cause core damage.
2. State how the operator can respond in order to prevent core damage and/or radioactive releases.
3. Describe the indications which can be used to determine if core damage is taking place.
4. Explain how the operator can respond in order to mitigate core damage.

Enabling Objectives: Upon completion of this lesson, the RO will be able to:

1. List the four barriers to fission product release.
2. List the five major categories of plant transients and describe how each could lead to core damage.
3. Describe the four categories of LOCAs and the methods of core cooling used during each.
4. List the four conditions required to develop and maintain natural circulation flow.
5. Describe each of the following types of Natural Circulation flow:  
Single Phase  
Two Phase  
Reflux Boiling
6. Explain the difference between a steam generator tube leak and a steam generator tube rupture.
7. Describe the methods which can be used to cooldown and isolated steam generator.
8. Describe the expected plant response to a natural circulation cooldown with one steam generator isolated.
9. List the six indications used to verify single phase natural circulation.
10. List the three indications used to verify adequate core cooling.
11. List four indications of RCS void formation.
12. Identify potential paths for the release of radioactive material from CTMT.
13. Explain and recognize the expected response of the Excore Instrumentation during RCS voiding or core uncover.
14. Explain and recognize the expected response of the Incore Instrumentation during RCS voiding or core uncover.
15. Explain and recognize the expected response of the Core Exit Thermocouples during RCS voiding or core uncover.
16. Explain and recognize the expected response of the Heated Junction Thermocouples during RCS voiding or core uncover.
17. Explain and recognize the expected response of plant radiation monitors, both inside and outside of containment, when they are exposed to a high radiation flux.

MITIGATING CORE DAMAGE

ID# M2-OP-RO-7A-2026

Rev 0 Date 3-10-86

18. Describe how the following plant equipment is expected to respond or be used during RCS voiding or core uncovering:
  - RCS Instrumentation
  - Steam Generator Instrumentation
  - PZR Instrumentation
  - Reactor Coolant Pumps
  - PZR Level and Pressure Control
  - Containment Cooling and Ventilation
  - ECCS
  - CTMT
  - Hydrogen Purge
  - Hydrogen Recombiners
  - PASS
  - Post Accident Monitoring Instrumentation
19. List the five core cooling system design requirements of 10 CFR and discuss the basis for each.
20. Describe how the PORVs and the AFW System are used to ensure core cooling during various small break LOCA transients.
21. Discuss the function of Tech. Spec. LCO's in mitigating the consequences of plant transients.
22. List the six Safety Functions.
23. Describe how the safety function based EOPs are used by the operator to prevent core damage and radioactive releases.
24. Explain the purpose of tripping the RCPs when in a LOCA condition.
25. Explain the purpose of Hot Leg Injection.
26. Explain why an RCS cooldown should be initiated within one hour after a LOCA.



NUCLEAR ENGINEERING TECHNOLOGY  
PROGRAM



Dear Student,

Thank you for your interest in the Thames Valley State Technical College/Northeast Utilities program in Nuclear Engineering Technology.

This package contains the following information:

- o College entrance requirements
- o Northeast Utilities scholarship program
- o Summer employment and careers
- o Nuclear Engineering Technology (NET) curriculum outline
- o Article from NU's SCOPE magazine
- o Application form

If you have a good academic background and an interest in science and technology this may be just the program for you. We suggest that you review the enclosed material and discuss it with your parents and school guidance counselor to get their opinion on your potential in a program of this type.

The application deadline is March 1, 1986 for classes starting next September. If you have any questions, please contact our Nuclear Training Department by calling (203) 665-3617.

We look forward to hearing from you.

Sincerely,

James A. DellaValle  
Program Administrator

B/S



NUCLEAR ENGINEERING TECHNOLOGY  
PROGRAM



COLLEGE ENTRANCE  
REQUIREMENTS

To be accepted into Thames Valley State Technical College students must meet the following admission requirements:

- o Graduation from high school or a vocational/technical school. A State or Federal equivalency diploma is acceptable.
- o Minimum of two years of algebra.
- o A related laboratory science - such as physics, chemistry or computer science.
- o Four units of high school English.
- o Completion of Scholastic Aptitude Test (SAT) is preferred but not required.



## NUCLEAR ENGINEERING TECHNOLOGY PROGRAM



### NORTHEAST UTILITIES SCHOLARSHIPS

Northeast Utilities supports promising high school candidates for the Nuclear Engineering Technology program with annual scholarship awards. Each scholarship consists of:

- Tuition and fees
- Books
- \$400/month during the school year.

This is a generous financial aid package sufficient to enable students who do not come from the Norwich area to pay for housing and other living expenses while attending college. Students from as far away as Hartford, Connecticut, Simsbury, Connecticut and Springfield, Massachusetts have received scholarships and enrolled in the program.

Numerous factors are considered when choosing scholarship winners. Outstanding achievement in a single area does not assure a scholarship award, nor does weakness in some area assure rejection. All factors are evaluated to develop a total picture of high school performance and probable college success.

Factors considered are:

- Grade point average (especially in science courses) and class rank.
- Scholastic Aptitude Test (SAT) scores, especially mathematics.
- Demonstrated mechanical skills, aptitude or interest.
- Extra curricular activities.
- Written essay.
- Personal interview.
- Successful completion of a physical examination and nuclear security clearance.



## NUCLEAR ENGINEERING TECHNOLOGY PROGRAM



### NORTHEAST UTILITIES SUMMER JOBS PROGRAM

Northeast Utilities (NU) has cooperated with Thames Valley State Technical College to develop the Nuclear Engineering Technology (NET) program. In order to augment the classroom aspects of the program with "real world" experience, NU has provided summer employment for NET scholarship winners. During the summer of 1985 twenty-seven (27) students were employed by NU at four nuclear power plants (Connecticut Yankee and Millstone I, II, III) and in the corporate engineering department in Berlin.

Summer employees had temporary positions in areas such as power plant engineering and operations, emergency planning, instrumentation and control laboratory, chemistry laboratory, reactor engineering, health physics, quality assurance, and other related disciplines. Many used micro-computers and main-frames in performing their work, often learning new computer skills in the process. Summer student employees had the opportunity to see nuclear utility operations first hand and to develop significant practical work experience.

Both newly graduated high school scholarship winners and NET students between their first and second year of the program are eligible for summer employment. Recent high school graduates earned \$263 per week and students who have completed the first year of the program earned \$285 per week as summer technicians.

Although there is no guarantee that positions will be available every summer for all students, the Nuclear Training Department will try to place as many students as possible depending on manpower needs and budget limitations.

### CAREER POTENTIAL

Industry surveys project a shortage of manpower over the next ten years and students who complete the Thames Valley NET program with an Associate's Degree will be qualified for a variety of technical positions in the nuclear power industry similar to those mentioned above. Typical entry level salaries for technicians are \$18,000 per year and those with five years experience are currently earning approximately \$25,000 per year. Northeast Utilities anticipates openings in the nuclear engineering and operations area in the coming years. However, NU can only consider job applicants on an as-needed basis and cannot guarantee permanent positions to students graduating from the Thames Valley degree program.

Also, please note that no student in the scholarship program is obligated in any way to accept employment with Northeast Utilities upon graduation.



## THAMES VALLEY DEGREE PROGRAM SCHOLARSHIP APPLICATION



STUDENT

PER5112-1 REV 10-84

-- PRINT OR TYPE INFORMATION ONLY --

PERSONAL	LAST NAME		FIRST	M.I.	SOCIAL SECURITY NO		TELEPHONE NUMBER	
	LEGAL ADDRESS (Number & Street, Town, State, Zip Code)						DO YOU HAVE A RELATIVE EMPLOYED AT NU? <input type="checkbox"/> YES <input type="checkbox"/> NO	
	RELATIVE'S NAME		TITLE			LOCATION		
	ARE YOU A CITIZEN? <input type="checkbox"/> YES <input type="checkbox"/> NO		IF NO, COUNTRY OF CITIZENSHIP					
	VOLUNTARY DISCLOSURE							
	<input type="checkbox"/> FEMALE		<input type="checkbox"/> HISPANIC		<input type="checkbox"/> WHITE		<input type="checkbox"/> BLACK	
	<input type="checkbox"/> MALE		<input type="checkbox"/> ASIAN AME.		<input type="checkbox"/> AMER. INDIAN		<input type="checkbox"/> OTHER (SPECIFY) _____	
	RELATIONSHIP (Check Appropriate Box(es))		LAST NAME, FIRST NAME, MIDDLE INITIAL			OCCUPATION		
	<input type="checkbox"/> FATHER							
	<input type="checkbox"/> GUARDIAN							
<input type="checkbox"/> MOTHER								
<input type="checkbox"/> GUARDIAN								
LIST TWO PERSONAL REFERENCES WHOM WE MAY CONTACT								
NAME		TITLE		ADDRESS		TELEPHONE NO		
NAME		TITLE		ADDRESS		TELEPHONE NO		
NAME OF HIGH SCHOOL ATTENDING/LAST ATTENDED				LOCATION (CITY & STATE)				
MO & YR. YOU TOOK/WILL TAKE S A T TEST		MO & YR. OF HIGH SCHOOL GRADUATION		MO & YR OF EQUIVALENCY DIPLOMA				
GUIDANCE COUNSELOR'S NAME				SCHOOL				
LIST BELOW ANY EDUCATIONAL INSTITUTIONS YOU HAVE ATTENDED BEYOND HIGH SCHOOL								
INSTITUTION NAME		LOCATION (STATE)	DATES ATTENDED (MO & YR) FROM-TO		DEGREE/CERTIFICATE AWARDED (MO & YR)			
COMMENTS								
<p>PLEASE HAVE AN OFFICIAL COPY OF YOUR HIGH SCHOOL ACADEMIC RECORD INCLUDING TRANSCRIPT, CLASS RANK AND S.A.T. SCORES FORWARDED TO:</p> <p style="text-align: center;">NORTHEAST UTILITIES ATTN: NUCLEAR TRAINING BRANCH P.O. BOX 270 HARTFORD, CT 06141-0270</p>								

EDUCATION

SCHEDULE A  
THAMES VALLEY STATE TECHNICAL COLLEGE  
NUCLEAR ENGINEERING TECHNOLOGY

Effective September 1, 1985

FIRST YEAR

FIRST QUARTER	Weekly		Qtr
	CI	Lab	Cr
DP 238 Basic	2	2	3
MA 110 Tech. Math. I	4	0	4
PH 111 Physics (Mech)	3	2	4
CH 122 Princ. of Chem.	3	2	4
XX XXX NET P01	4/3	0/0	4/3
Totals.....	16/15	6	19/18

SECOND YEAR

FOURTH QUARTER	Weekly		Qtr
	CI	Lab	Cr
NS 120 Reactor Theory I	4	0	4
MA 210 Calculus II	4	0	4
MT 231 Appl. Thermo. I	4	0	4
MT 232 Fluid Mechanics	3	2	4
AS 221 Psych. & Hum. Rel.	4	2	4
Totals.....	19	2	20

SECOND QUARTER	CI	Lab	Qtr
ET 225 Elec. & Electr.	3	2	4
MA 120 Tech. Math. II	4	0	4
PH 121 Physics (HSL)	3	2	4
AS 120 Basic. Comm.	4	0	4
NS 110 Atomic Physics	4	0	4
Totals.....	18	4	20

FIFTH QUARTER	CI	Lab	Qtr
NS 210 Reactor Theory II	4	0	4
ET 213 AC/DC Machinery	3	2	4
MT 236 Heat Transfer	3	2	4
AS 212 Economics	3	0	3
MT 133 Appl. Mechanics	4	0	4
Totals.....	17	4	19

THIRD QUARTER	CI	Lab	Qtr
MA 130 Calculus I	4	0	4
AS 130 Tech. Comm.	4	0	4
NS 130 Reactor Chem.	4	0	4
MF 212 Mat. of Engr.	3	3	4
NS 222 Rad. Health & Saf.	3	2	4
Totals.....	18	5	20

SIXTH QUARTER	CI	Lab	Qtr
XX XXX NET P02	3/4	0/0	3/4
NS 220 Nuclear Mat.	3	2	4
ET 239 Auto. Proc. Cont. Systems	3	2	4
NS 231 Topics in Nuc. Power Ops.	3	0	3
AS 232 Sociology	3	0	3
XX XXX NET P03	3/1	0/3	3/2
Totals.....	18/17	4/7	20/20

PROGRAM OPTIONS (PO)			
Reactor Operator (RO)			
P01 IM 210 Per Mgt	4	0	4
P02 MF 115 NDT	3	0	3
P03 IM 232 Prin of Sup	3	0	3
Non-Reactor Operator (NRO)			
P01 WS 221 Nuc Sys	3	0	3
P02 AS 110 Intro to Lit	4	0	4
P03 NS 232 Nuc Reac Sim	1	3	2

TOTAL QUARTER CREDITS - 118/117  
TOTAL CONTRACT HOURS - 131/132

NORTHEAST UTILITIES  
THAMES VALLEY STATE TECHNICAL COLLEGE  
NUCLEAR ENGINEERING TECHNOLOGY

CONTRACT  
AND  
AMENDMENT NO. 1

B/6

THIS AGREEMENT between the Board of Trustees for the State Technical College System, State of Connecticut, pursuant to Section 10a-81 of the Connecticut General Statutes on behalf of Thames Valley Technical College, ("College") and Northeast Utilities Service Company, a Connecticut corporation with offices at Selden Street, Berlin, Connecticut ("Company"),

W I T N E S S E T H :

WHEREAS, the Company requires an academic program which will provide education for its personnel at nuclear generating facilities, and

WHEREAS, the College has agreed to design and offer a two-year program leading to an Associate in Science degree in Nuclear Science Technology,

NOW, THEREFORE, in consideration of the promises and other valuable consideration exchanged between the parties, it is agreed that:

Program Content

1. The College shall offer an Associate in Science degree program in Nuclear Science Technology ("Program") the content of which is set forth in the attached Schedule A.

2. The parties agree that the Program meets the academic guidelines as established by the Institute for Nuclear Power Operations. The College shall attempt to maintain the Program in compliance with all future guidelines of the Institute for Nuclear Power Operations and with any regulations which may in the future be promulgated by the Nuclear Regulatory Commission. The College's obligation under this paragraph is limited to the academic standards established by such guidelines or regulations and shall not be interpreted to warrant any graduate's ability to pass nuclear licensing examinations.

3. The College shall secure licensure of the Program from the Connecticut Board of Governors for Higher Education in sufficient time to begin instruction in the December, 1983 term.

4. The College shall take the necessary steps to acquire accreditation of the Program by the Technology Advisory Committee/Accrediting Board for Engineering and Technology within five years from the commencement of instruction under this Agreement. The College shall at all times maintain full accreditation with the New England Association of Schools and Colleges.

5. The Program shall be provided as a full-time and/or part-time degree program offered to interested students through the College's normal course announcements.

6. The parties shall consult prior to developing or changing faculty, curricula, course content, and required laboratory equipment throughout the term of this Agreement. In order to assure effective communication:

- a. The College shall appoint as its liaison with the Company a Department Chairperson for Nuclear Science Technology. This position shall be filled within one (1) year from commencement of instruction by a full-time faculty member with a minimum of five (5) years of teaching and/or industrial experience related to nuclear science, and in accordance with the College's selection procedures for department chairpersons.
- b. The Company shall identify a representative as liaison to work directly with the Chairperson. This representative will not serve as a member on the Nuclear Science Technology Advisory Committee described in paragraph 6(c).
- c. The Company shall provide two (2) representatives as members to serve on the Nuclear Science Technology Advisory Committee for the Program.

7. Each class in the Program shall be restricted to twenty-five (25) full-time students per term. Program courses

shall be offered primarily between the hours of 8:30 a.m. and 6:00 p.m.

8. Upon written request by the Company, the College shall schedule individual courses within the Program during its evening session. The College shall, whenever possible, provide such courses as part of the College's regularly scheduled evening extension program. If the Company requests courses not then scheduled by the College, such courses shall be provided as "Special Sections" and funded by the Company as provided for in this Agreement.

9. All courses shall be taught by faculty members or individuals hired from industry who meet the College's general qualifications for such teaching assignments.

10. The College shall accept transfer credit under the Program for students who successfully complete, at properly accredited institutions, the optional course (designated in Schedule A as NS232) involving training on an experimental reactor.

#### Program Support

11. The Company shall provide funds equivalent to the minimum reimbursement for Program courses and for Special Sections provided by the College under this Agreement. The term

"minimum reimbursement" shall mean the actual costs incurred by the College to provide Program courses or Special Sections, together with applicable general and administrative expenses. Attached as Schedule B is an itemization of the elements of minimum reimbursement for Program courses, and an estimate of the minimum reimbursement required for the terms beginning December, 1983 and ending November, 1987. The College shall provide the Company at least thirty (30) days prior written notice of any change it proposes to make in any element of such costs. If the College proposes to increase the Company's minimum reimbursement by an amount exceeding ten (10%) percent of the previous years minimum reimbursement per class group, such increase shall require written acceptance by the Company.

12. In recognition of the Company's reimbursement to the College for all costs incurred by the College to provide the program courses or special sections described in this Agreement, the Company shall be permitted to reduce its payment obligation by an amount equal to the tuition and fees paid by students who are not registered by the Company and who attend any such course program or special sections. At the conclusion of each term, the College shall advise the Company of all tuition and fees received from such students and the Company shall reduce its next payment to the College by an equivalent amount.

13. Following the close of registration for each term, the College shall invoice the Company for the minimum reimbursement

for Program courses and Special Sections. The Company shall pay such invoice [less the credit described by paragraph 12] or submit written objections to any invoice or portion of any invoice within forty-five (45) days.

14. Within thirty (30) days following the end of each academic year or termination of this Agreement, the College shall submit to the Company a final accounting to reflect minimum reimbursements less the described credits in paragraph 12 as actually experienced in that academic year. The College shall pay any balance due the Company at the time it submits the accounting. Any balance due from the Company shall be paid or objected to within thirty (30) days following the submittal of the accounting.

15. All costs for the optional course designated in Schedule A as NS232 (including but not limited to travel expenses, tuition, and course materials) shall be the responsibility of the student electing to participate in the course and are not included in the costs described in this Agreement.

16. The costs of textbooks are not included as part of the services provided by the College under this Agreement.

Registration of Students

17. The Company shall have the right to preregister up to twenty (20) students in each full-time class under the Program, and up to ten (10) students in any Special Section requested by the Company. The restriction contained in this paragraph shall not, however, limit the Company's ability to register students for any course if, after general registration, maximum class size has not been achieved. The College shall use its best efforts to attract students from the general public to meet the Program limit of twenty-five (25) students in each class of the Program.

18. The Company shall identify the total number of students it intends to preregister for each class in this program at least ninety (90) days prior to the date instruction is scheduled to begin for each class in this Program.

19. The Company shall identify the total number of students it intends to register for each scheduled Special Section at least ten (10) days prior to the date instruction is scheduled to begin for each Special Section.

20. It is the intention of the parties that after thorough evaluation, consideration will be given to have the Program become a part of the College's General Fund Program and that the Company's financial support be reduced to then applicable tuition and fees.

21. The Company's right to register students is subject to each student meeting the College's standards for matriculation into the Program. All students registered by the Company must continuously meet the academic standards of the College in order to remain in the Program.

Term of Agreement

22. This Agreement shall remain in effect from the December 1983 term through the September 1989 term, and thereafter from year-to-year, until terminated or reduced as provided for in this Agreement.

Termination

23. This Agreement shall terminate upon the courses comprising the Program becoming part of the College's General Fund program.

24. The parties shall have the right to terminate this Agreement effective in June of any year, by providing written notice to the other party by May 31 of the year preceding the year in which termination shall be effective.

Laboratory Equipment

25. The parties shall mutually agree prior to purchase of any laboratory equipment necessary for the courses contained in the Program or for any Special Sections requested by the Company. Any capital costs (including installation costs) incurred by the College to provide such equipment for the benefit of such courses, shall be reimbursed by the Company in an amount not to exceed fifty thousand (\$50,000) dollars in each of the calendar years 1984 and 1985, and ten thousand (\$10,000) dollars in any subsequent calendar year.

Miscellaneous

26. The Company shall have the right to inspect the books and records of the Nuclear Science Technology Program on the College campus and in the presence of the Director of Administrative Services to the extent necessary to audit and verify the accuracy of any invoice submitted by the College to the Company pursuant to this Agreement.

27. All notices required by this Agreement shall be delivered or mailed by certified, first class mail to the following addresses:

COLLEGE: Donald R. Welter, President  
Thames Valley State Technical College  
574 New London Turnpike  
Norwich, Connecticut 06360

COMPANY: Jerome T. Maher  
Manager Nuclear Training  
Northeast Utilities Service Company  
P. O. Box 270  
Hartford, CT 06141

Either party may change such address by written notice to the other.

28. The parties agree and warrant that in the performance of this contract they will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, sex, mental retardation, or physical disability including, but not limited to blindness, unless it is shown by the parties that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United

States or of the State of Connecticut, and further agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission concerning the employment practices and procedures of the contractor as relate to the provisions of this section.

*JK 11/1/81*  
29. The Company hereby agrees to indemnify and hold the *JB 12/2/82*  
*HS 1/15/81*  
College harmless from any cost, liability, claim, action or proceeding for injury to persons (including death) or damages to property which may arise or be claimed to have arisen from the Company's negligent actions or omissions, except to the extent such injury or damage may be attributable to the negligent actions or omissions of the College, its employees, agents or those under its control.

30. This Agreement constitutes the entire understanding between the parties, no previous written or oral representations

concerning the subject matter of this Agreement shall bind either party.

31. This Agreement may be modified only by a written Amendment signed by both parties.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their respective, duly authorized representatives as of November 16, 1983.

BOARD OF TRUSTEES FOR THE STATE TECHNICAL COLLEGE SYSTEM, STATE OF CONNECTICUT ON BEHALF OF THAMES VALLEY STATE TECHNICAL COLLEGE

By James J. Long  
James J. Long  
Its Director of Finance and Facilities

NORTHEAST UTILITIES SERVICE COMPANY

By C. Frederick Sears 11/16/83  
C. Frederick Sears  
Its Vice President, Nuclear and Environmental Engineering

By Ralph O. Smith  
Ralph O. Smith  
Its Vice President, Purchasing and Materials Management

By Howard G. Rifkin  
Howard G. Rifkin  
Deputy Secretary, Office of Policy and Management

APPROVED  
AS TO FORM

FEB 16 1984

Elliot F. Gerson  
ELLIOT F. GERSON  
DEPUTY ATTORNEY GENERAL



AMENDMENT NO. 1

AGREEMENT CONCERNING  
ASSOCIATE IN SCIENCE DEGREE PROGRAM

October, 1985

THIS AMENDMENT between the Board of Trustees for State Technical College System, State of Connecticut, pursuant to Section 10a-81 of the Connecticut General Statutes on behalf of Thames Valley Technical College ("College"), and Northeast Utilities Service Company, a Connecticut corporation with offices at Selden Street, Berlin, Connecticut ("Company"),

W I T N E S S E T H :

WHEREAS, the parties entered into an Agreement dated as of November 16, 1983 ("Agreement") to establish an Associate in Science Degree Program at the College, and

WHEREAS, after further negotiation the parties have agreed to amend the Agreement,

NOW THEREFORE, in consideration of the promises and other valuable consideration exchanged between the parties, the Agreement shall be amended as of August 1, 1985 as follows:

1. The title of the Program shall be revised to "Nuclear Engineering Technology".

2. The following new provisions shall be added to the Agreement:

Reimbursement for Textbooks

- a. Within the first two weeks of each term the College shall provide required textbooks to each student registered by the Company. Before the end of each term the College shall submit an invoice to the Company itemizing by student name all books provided during that term. The Company shall pay each invoice or provide its written objections within forty-five (45) days of the date it receives the invoice.

Monthly Scholarship Payments

- b. Prior to the commencement of each term, the Company shall designate in writing to the College each student who will receive scholarship support during that term and the amount of such support. Before each term the Company shall pay to the College's Welfare Fund sums sufficient for the College to make monthly scholarship payments to each scholarship student. The College shall maintain an accounting of all funds received and paid.

Partial Course Fee Reimbursement for Students from the  
General Public

- c. The parties acknowledge that the cost for students participating in the Program presently exceeds the tuition for equivalent full-time day programs offered by the College. In order to encourage participation in the Program by members of the general public, the Company shall pay the College such excess amount for each student from the general public who enrolls in the Program as an element of "minimum reimbursement" described in paragraph 13 of the Agreement. The Company shall have the right to terminate the support described in this paragraph upon one year's prior written notice to the College given on or before June 30, of any year during which the Agreement is in effect.

Company Audit Rights

- d. The College shall maintain the following records for a period of at least three (3) years and shall make such records available during normal business hours for audit by the Company, or its designee:

1. All accounts or records required under this Agreement.
2. The syllabus, attendance record and examination formats for each course consistent with established college procedures.
3. Copies of all materials concerning the Nuclear Engineering Technology Program which are distributed, used for promotional purposes or otherwise provided to third parties.

Full-time Faculty Position

- e. The Company shall, as part of "minimum reimbursement" to the College, fund a full-time faculty member in addition to the Department Chairperson. The teaching assignments of both shall be predominantly dedicated to the Program. The College and Company shall consult in the selection of an individual to fill this position who has at least three (3) years experience in nuclear engineering disciplines either in industry or education.

Use of Regular College Faculty

- f. In order to facilitate scheduling, reduce costs, and enhance the quality of the Program, the College shall use its best efforts to schedule its regular faculty members to teach both nuclear and non-nuclear courses in the Program as part of each person's normal teaching schedule.

Program Evaluations

- g. In order to assure that the Program is meeting its intended purposes, the College and the Company shall periodically conduct evaluations of the instructors, course content, and overall operation of the Program. The parties shall consult concerning the results of the evaluations, and the College shall give full consideration to the Company's recommendations.
3. Paragraph 25 of the Agreement shall be deleted and the following substituted:

Upon mutual agreement, the Company shall reimburse the College for the capital costs (including installation costs) incurred by the College to provide laboratory equipment necessary for the

courses contained in the Program or any Special Sections requested by the Company. Such reimbursement shall not exceed Fifty Thousand (\$50,000) Dollars for each of the calendar years 1985 and 1986, and Ten Thousand (\$10,000) Dollars in any subsequent calendar year through 1991.

4. Schedules A and B are revised as attached. Schedule A or B of the Agreement may, at any time be revised by supplemental schedules accepted in writing by the College's President and the Company's Manager of Nuclear Training, or their respective designees.
5. Except to the extent specifically affected by this Amendment No. 1, the terms and conditions of the Agreement shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this

Amendment No. 1 to be executed by their duly authorized representatives.

BOARD OF TRUSTEES  
THE STATE TECHNICAL COLLEGE SYSTEM,  
STATE OF CONNECTICUT,  
ON BEHALF OF THAMES VALLEY STATE TECHNICAL COLLEGE

By James J. Long  
Its DIRECTOR OF FINANCE & FACILITIES

Dated Nov 25 1985

NORTHEAST UTILITIES SERVICE COMPANY

By C. Frederick Sears  
C. Frederick Sears  
Its Vice President, Nuclear and  
Environmental Engineering

Dated 7 Nov 85

By Keith R. Marvin  
Keith R. Marvin  
Its System Director,  
Purchasing and  
Materials Management

Dated 18 Nov 85

STATE OF CONNECTICUT  
OFFICE OF POLICY MANAGEMENT

By Anthony V. Volante  
Its SECRETARY - OPM

Dated DEC 0 1985

APPROVED AS TO FORM  
DEC 23 1985, 1985

By \_\_\_\_\_  
Deputy Attorney General

SCHEDULE A  
THAMES VALLEY STATE TECHNICAL COLLEGE  
NUCLEAR ENGINEERING TECHNOLOGY

Effective September 1, 1985

FIRST YEAR

SECOND YEAR

<u>FIRST QUARTER</u>	Weekly		Qtr Cr
	CI	Lab	
DP 236 Basic	2	2	3
MA 110 Tech. Math. I	4	0	4
PH 111 Physics (Mech)	3	2	4
CH 122 Princ. of Chem.	3	2	4
XX XXX NET P01	4/3	0/0	4/3
Totals.....	16/15	6	19/18

<u>FOURTH QUARTER</u>	Weekly		Qtr Cr
	CI	Lab	
NS 120 Reactor Theory I	4	0	4
MA 210 Calculus II	4	0	4
MT 231 Appl. Thermo. I	4	0	4
MT 232 Fluid Mechanics	3	2	4
AS 221 Psych. & Hum. Rel.	4	2	4
Totals.....	19	2	20

<u>SECOND QUARTER</u>	CI	Lab	Qtr Cr
ET 225 Elec. & Electr.	3	2	4
MA 120 Tech. Math. II	4	0	4
PH 121 Physics (HSL)	3	2	4
AS 120 Basic. Comm.	4	0	4
NS 110 Atomic Physics	4	0	4
Totals.....	18	4	20

<u>FIFTH QUARTER</u>	CI	Lab	Qtr Cr
NS 210 Reactor Theory II	4	0	4
ET 213 AC/DC Machinery	3	2	4
MT 236 Heat Transfer	3	2	4
AS 212 Economics	3	0	3
MT 133 Appl. Mechanics	4	0	4
Totals.....	17	4	19

<u>THIRD QUARTER</u>	CI	Lab	Qtr Cr
MA 130 Calculus I	4	0	4
AS 130 Tech. Comm.	4	0	4
NS 130 Reactor Chem.	4	0	4
MF 212 Mat. of Engr.	3	3	4
NS 222 Rad. Health & Safety	3	2	4
Totals.....	18	5	20

<u>SIXTH QUARTER</u>	CI	Lab	Qtr Cr
XX XXX NET P02	3/4	0/0	3/4
NS 220 Nuc. Materials	3	2	4
ET 239 Auto. Proc. Cont. Systems	3	2	4
NS 231 Topics in Nuc. Power Ops.	3	0	3
AS 232 Sociology	3	0	3
XX XXX NET P03	3/1	0/3	3/2
Totals.....	18/17	4/7	20/2

PROGRAM OPTIONS (PO)

<u>Reactor Operator (RO)</u>			
P01 IM 210 Per Mgt	4	0	4
P02 MF 115 NDT	3	0	3
P03 IM 232 Prin of Sup	3	0	3

<u>Non-Reactor Operator (NRO)</u>			
P01 NS 221 Nuc Sys	3	0	3
P02 AS 110 Intro to Lit	4	0	4
P03 NS 232 Nuc Reac Sim	1	3	2

TOTAL QUARTER CREDITS - 118/117

TOTAL CONTRACT HOURS - 131/132

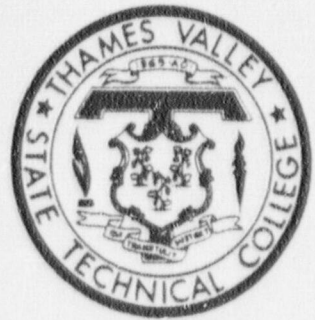
SCHEDULE B  
 THAMES VALLEY SCHOLARSHIP PROGRAM  
 SCHEDULE OF PAYMENTS  
 (ESTIMATED)

	3 GROUPS 9/85-11/85	2 GROUPS 12/85-3/86	2 GROUPS 3/86-5/86	2 GROUPS 9/86-11/86	2 GROUPS 12/86-3/87	2 GROUPS 3/87-5/87	2 GROUPS 9/87-11/87	TOTAL
<b>INSTRUCTIONAL COSTS:</b>								
DEPARTMENT CHAIRPERSON	\$9,683	\$9,683	\$9,683	\$10,458	\$10,458	\$10,458	\$11,294	\$71,716
FULL TIME FACULTY	\$9,683	\$9,683	\$9,683	\$10,458	\$10,458	\$10,458	\$11,294	\$71,716
FRINGE	\$7,746	\$7,746	\$7,746	\$8,366	\$8,366	\$8,366	\$9,035	\$57,171
ADJUNCT/OVERLOAD FACULTY	\$22,513	\$6,517	\$5,312	\$6,717	\$7,037	\$6,078	\$14,509	\$68,704
FRINGE	\$9,005	\$1,629	\$1,333	\$1,679	\$1,759	\$1,519	\$3,627	\$20,553
TUTORING SERVICES	\$2,160	\$2,160	\$2,160	\$2,333	\$2,333	\$2,333	\$2,519	\$15,998
<hr/>								
SUB-TOTAL	\$60,791	\$37,419	\$35,938	\$40,011	\$40,411	\$39,211	\$52,280	\$306,060
G/A EXPENSES	\$11,111	\$11,111	\$11,111	\$12,000	\$12,000	\$12,000	\$12,960	\$87,291
COLLEGE FEES	\$1,740	\$1,160	\$1,160	\$1,253	\$1,253	\$1,253	\$1,353	\$9,171
NON-SCHOLARSHIP STUDENTS	\$9,000	\$6,000	\$6,000	\$6,480	\$6,480	\$6,480	\$6,998	\$44,816
<hr/>								
TOTAL	\$82,642	\$55,690	\$54,209	\$59,744	\$60,144	\$58,944	\$73,591	\$444,961



**1985-87**

THAMES  
VALLEY  
STATE  
TECHNICAL  
COLLEGE  
NORWICH,  
CONNECTICUT



B/7

# Thames Valley State Technical College

*A Two-Year Technical College Founded in 1963*



Co-Educational  
Catalog 1985-1987  
Day and Evening Divisions

# General

## DEGREE PROGRAMS

The day and evening divisions offer programs in technologies leading to an Associate in Science Degree as follows:

- Aviation Maintenance Technology
- Chemical Engineering Technology
- Civil Engineering Technology  
(evenings only)
- Data Processing Technology
- Electrical Engineering Technology
- Fire Technology and Administration  
(evenings only)
- Industrial Management Technology
- Manufacturing Engineering Technology
- Mechanical Engineering Technology
- Nuclear Engineering Technology

## CERTIFICATE PROGRAMS

The College is accredited by the Connecticut Department of Higher Education and by the New England Association of Schools and Colleges.

## SCHOLASTIC ACCREDITATION

The College is accredited by the Connecticut Board of Higher Education and by the New England Association of Schools and Colleges.

## PROFESSIONAL ACCREDITATION

The following listed technologies are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (TAC ABET) formerly Engineering Council for Professional Development (ECPD)

- Chemical Engineering Technology
- Electrical Engineering Technology
- Manufacturing Engineering Technology
- Mechanical Engineering Technology

## POLICY CHANGES

Thames Valley State Technical College reserves the right to change requirements, courses, regulations, fees, and other policies in this catalog without advance notice.

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# Calendar

## QUARTER 1 (55 Days)

1985-1986  
 August 30  
 September 2  
 September 5  
 October 14  
 October 18  
 November 11  
 November 22

Faculty Reports  
 Holiday (Labor Day)  
 Classes Start  
 Holiday (Columbus Day)  
 Mid Term  
 Holiday (Veterans Day)  
 Quarter Ends

Tentative  
 1986-1987  
 September 1  
 September 2  
 September 3  
 October 13  
 October 10  
 November 11  
 November 21

## QUARTER 2 (55 Days)

December 2  
 December 23  
 (after classes)  
 January 2  
 January 13  
 January 24  
 February 12  
 February 17  
 February 28

Classes Start  
 Christmas Recess  
 Classes Resume  
 Holiday (Martin Luther King)  
 Mid Term  
 Holiday (Lincoln's Birthday)  
 Holiday (Washington's Birthday)  
 Quarter Ends

December 1  
 December 23  
 (after classes)  
 January 5  
 January 15  
 January 23  
 February 12  
 February 16  
 February 27

## QUARTER 3 (55 Days)

March 10  
 March 28  
 April 21  
 April 25  
 May 26  
 June 3  
 May 30-June 3

Classes Start  
 Holiday (Good Friday)  
 Spring Mini Break  
 Mid Term  
 Holiday (Memorial Day)  
 Quarter Ends  
 Graduation

March 9  
 April 17  
 April 20  
 April 27  
 May 25  
 May 29  
 June 2

## BOARD OF TRUSTEES STATE TECHNICAL COLLEGES

Joan Carter ..... Fairfield  
 Virginia D. Christian ..... Norwich  
 Charles B. Gilbert III ..... Norwich  
 Lisa Giusti ..... Waterford  
 Richard A. Harmony ..... Greenwich  
 W. Bruce Huyghue ..... Hartford  
 Kevin Jennings ..... Bridgeport  
 Remington W. Katon ..... North Branford  
 Charles D. McCleary ..... Naugatuck  
 Francis E. Phillips ..... Vernon  
 Martin L. Piccirillo ..... North Haven  
 George Franspill ..... Stratford  
 Rosemarie L. Rizk ..... Waterbury  
 John A. Stewart ..... New Haven  
 Adam Taloni ..... Weston  
 Albert B. Verrefeuille ..... South Windham

### Dr. George Harris,

Deputy Executive Director, State Technical Colleges

Thomas Sullivan,

Acting Executive Director, State Technical Colleges

## REGIONAL COUNCIL

A regional council, which is recommended by the president and appointed by the Board of Trustees, meets regularly with the staff to review, initiate and develop the curricula of the college. Leaders in industry, business, labor, education and the professions cooperate in making recommendations to insure that the needs of the community and area industry continue to be met.

Arthur C. Carlson, Naval Underwater Systems Center  
Jon Christianson, Navy Campus for Achievement  
Peter W. Dinger, Monsanto Chemical  
Sam R. Elam, Analysis & Technology, Inc.  
Joshua H. Goldman, Hadlyme Engineering Laboratory  
Robert Herlihy, Rogers Corporation  
George W. Jahstorfer, Chandler Evans Inc.  
David Joslow, Special Consultant  
Joseph Levanto, Norwich Free Academy  
Gene Lohrs, Lee Company  
Myrna Miller, Mohegan Community College  
William J. Mitchell, U.N.C. Naval Products, Division of United Nuclear Corp.  
John E. Mullen, III, Fleet National Bank  
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John Ritter, Hydrospace Systems, Inc.  
Gladys Rivera, Brand Rex Company  
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Paul Sikorski, Data Systems Division Eastern Center, General Dynamics  
Lawrence H. Smith, Orcomatic  
Edwin A. Sylvia, General Dynamics Electric Boat Division  
Annie Wilder, Chesbrough-Ponds, Inc.  
James G. Wright, Naval Underwater Systems Center

## Technology Advisory Committees

### CHEMICAL ENGINEERING TECHNOLOGY ADVISORY COMMITTEE

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Hartford Plaza, Hartford, CT 06115 WILLIAM H. SEBRELL
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67 Sandy Desert Rd., Uncasville, CT 06382 RICHARD D. TUSCHICK

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4. HARRIS CORPORATION,  
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ARNOLD R. ROBY
6. S.N.E. TELEPHONE CO.,  
127 Washington Street, No. Haven, CT 06518  
ARMAND TARANTO
7. SPECIAL CONSULTANT,  
P.O. Box 267, Chester, CT 06412  
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PETER KARPINSKI

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New London, CT 06320  
JOHN MCGOVERN
8. NAVAL UNDERWATER SYSTEMS CENTER,  
New London, CT 06320  
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ADVISORY COMMITTEE FREDERICK GOULD**

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400 Main St., Hartford, CT 06108  
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8. CONSULTANT,  
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RUSS BOGUE
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Thermos Avenue, Norwich, CT 06360  
JERRY THEIVE
10. WYRE-WIND,  
Anthony Street, Jewett City, CT 06351  
LAWRENCE TAUB

**MECHANICAL ENGINEERING TECHNOLOGY  
ADVISORY COMMITTEE ROBERT LANTZ**

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Fort Trumbull, New London, CT 06320  
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2. CHANDLER EVANS INC.,  
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3. CHESEBROUGH-PONDS INC.,  
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RAYMOND RIGAT
4. CONSULTING MECHANICAL ENG.,  
Hadlyme Eng. Laboratory, E. Haddam, CT 06423  
JOSH GOLDMAN
5. FEDERAL PAPER BOARD CO.,  
Versailles, CT 06383  
ROBERT D. CHARETTE
6. LEE COMPANY,  
2 Pettipaug Rd., Westbrook, Ct 06498  
GENE LOHRS
7. TERRY CORPORATION,  
Industrial Road, Niantic, CT 06357  
HERB SIROIS
8. UNITED NUCLEAR CORP.,  
67 Sandy Desert Rd., Uncasville, CT 06382  
RICHARD B. ANDREWS
9. VEEDER ROOT CO.,  
28 Sargeant St., Hartford, CT 06102  
WILLIAM BROPHY

NUCLEAR ENGINEERING TECHNOLOGY  
ADVISORY COMMITTEE

# The College

1. NORTHEAST UTILITIES,  
Nuclear Training, NU South, 2nd Floor, PO Box 270, Hartford, CT 06101  
JEROME T. MAHER, JR.

2. NORTHEAST UTILITIES,  
Nuclear Training, NU South, 2nd Floor, PO Box 270, Hartford, CT 06101  
BRADLEY W. RUTH

3. UNIVERSITY OF CONN. (UCONN),  
Storrs, CT 06268  
DR. ROBERT JEFFERS,  
HEAD OF MECHANICAL ENGINEERING

4. UNIVERSITY OF NEW HAVEN,  
300 Orange Avenue, W. Haven, CT 06516  
DR. KONSTANTIN LAMBRAKIS,  
HEAD OF ENGINEERING

## HISTORY

The history of engineering technician education in Connecticut dates back to April 1946 when the Connecticut Engineering Institute was organized. The program, inaugurated on a pilot basis, was initiated in response to the demands of Connecticut industry which, through experience gained during World War II, saw the need for a new type of industrial personnel. This specific person, called the engineering technician, requires a level of education between that of the skilled craftsman and the graduate engineer. The state technical college concept of an engineering technician is that defined by the Accreditation Board for Engineering and Technology, Inc. — namely, "An engineering technician is one whose education and experience qualify him/her to work in those areas of engineering which require the application of established scientific and engineering knowledge and methods, combined with technical skills, in the support of engineering or scientific activities toward the accomplishment of engineering objectives."

The Connecticut Engineering Institute functioned as a post-secondary institute under that name for several years. This highly successful program, coupled with the continuing need for engineering technician personnel, led to the expansion of technical institute facilities in the state, with Hartford State Technical Institute moving to a new building in 1960, Norwalk State Technical Institute opening in 1961, Thames Valley State Technical Institute opening in 1963, and Waterbury State Technical Institute opening in 1964. A new wing was added to Thames Valley in 1968 and in 1972 a gymnasium, additional classrooms, and intensive library facilities were completed.

The 1967 General Assembly upgraded the four technical institutes, making them a division of the state system of higher education and renaming them technical colleges. Greater New Haven State Technical College was added to the technical college system in September 1977.

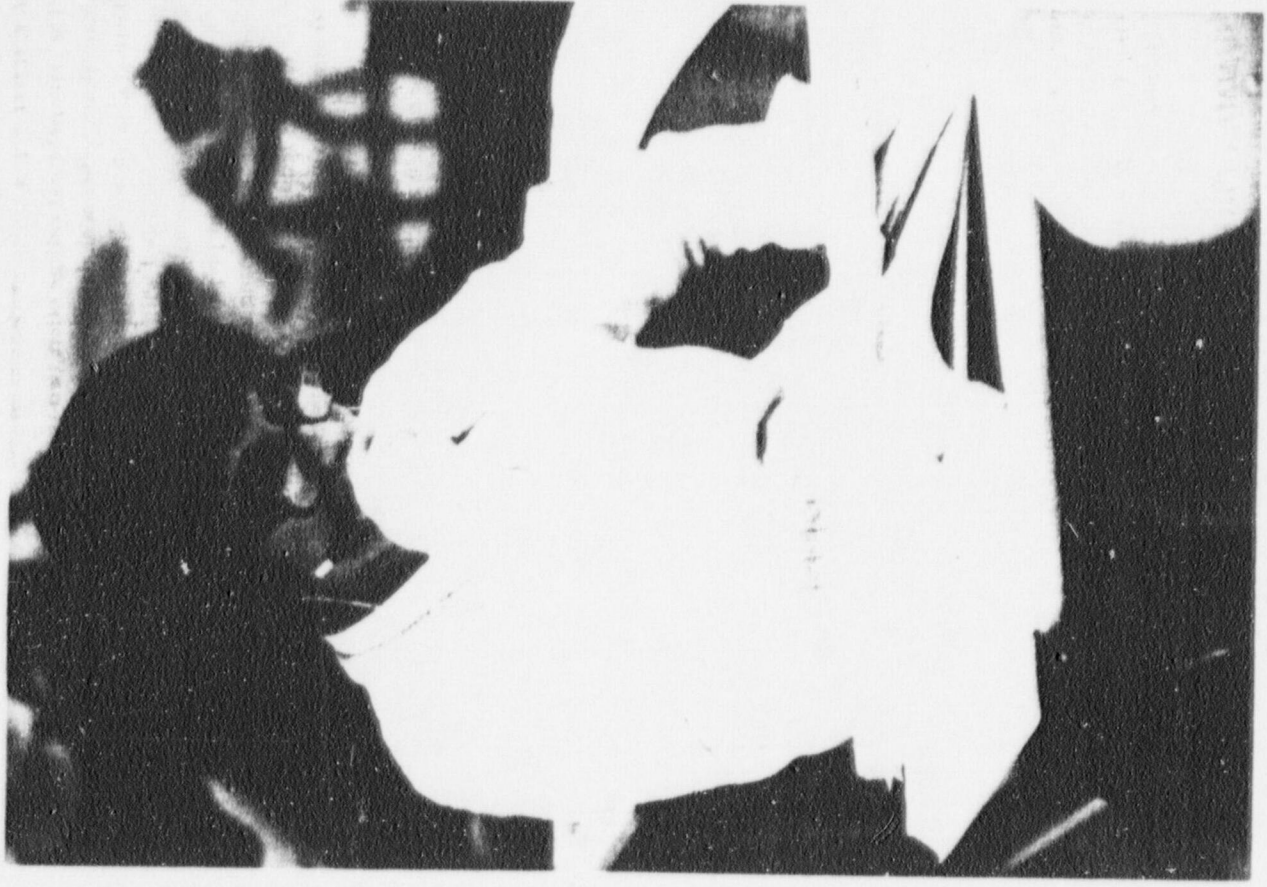
## MISSION/OBJECTIVES

The mission of Thames Valley State Technical College, is to provide an educational center of technical facilities and well qualified staff whose courses and programs of study prepare men and women for employment opportunities in the business/industrial community of the broad region served by the college. The college operates with a full equal opportunity/affirmative action commitment.

The objectives of Thames Valley in fulfilling this mission are:

1. To provide college level courses of high academic quality in mathematics, science, and engineering technology that result in:  
Specialized Associate Degree programs utilizing these courses to provide curricula of engineering technology designed for the graduates' immediate employment opportunities.
2. To provide courses to assist the student in becoming a responsible citizen

# The Educational Program



- through an appreciation of our society, culture, the art of communication and human relations.
3. To provide a program of continuing education on a college level for those already employed who want skills upgrading, to improve their knowledge and abilities in applied science, engineering technology, management and data processing.
  4. To provide postsecondary certificate programs to prepare students for technical positions.
  5. The college also recognizes the special needs of educationally disadvantaged students and provides a college preparatory, pre-technical program to prepare them for entrance into the Associate Degree programs.

## **LOCATION AND FACILITIES**

The Thames Valley State Technical College is located at 574 New London Turnpike, Norwich. It is readily accessible from Route 2 and from the Connecticut Turnpike. See map on inside back cover.

The college occupies a two-story complex housing classrooms, gymnasium, library, and well-equipped laboratories for physics, chemistry, computers, electronics, electronics, engineering design, materials testing, metallurgy, manufacturing equipment and other engineering equipment. These laboratories provide extensive opportunity for the study and application of the scientific and engineering principles learned in the classrooms.

## **LIBRARY**

Thames Valley State Technical College Library is termed a "Special Library," since, by its nature, it is designed to serve a restricted clientele for a special and limited purpose.

Through class assignments, students gain familiarity with and appreciation for the resources of the library.

Library skills thus become an appropriate and meaningful part of the total college program.

To this end, the library lists among its collection over 8,500 technical publications in the various engineering technologies.

## **LODGING**

Thames Valley State Technical College is designed for commuters and does not have dormitory facilities. Students who cannot commute usually reside at local private residences in the area served by the college.

## **PARKING**

Students are assigned parking in designated areas. Motor vehicle violations within the college area are subject to disciplinary action.

# The Educational Program

## *CURRICULA*

The state technical college offers two-year, associate degree curricula in aviation maintenance, chemical, data processing, electrical, industrial management, manufacturing, mechanical, and nuclear science engineering technologies. These curricula have been developed with the assistance of advisory committees composed of members of the major engineering societies, educators, engineers and industrialists. They are designed to prepare the kind of engineering technician needed by the manufacturing, engineering and research industries of Connecticut.

The courses required in each curriculum are shown in the Academic Programs section of this catalog beginning on page 34. On occasion, a course may be offered in a term other than that shown, and courses may be added to or dropped from a curriculum if conditions warrant. Some curricula list technical options. Courses to fill these options are chosen by the college from the list of available options to meet the needs of the industries in which the graduates will normally seek employment.

## *ARCHITECTURAL, INDUSTRIAL DRAFTING, AND INDUSTRIAL ELECTRONICS TECHNOLOGY PROGRAMS*

In an effort to serve a broader spectrum of technical students, one-year certificate programs are offered to prepare students to become Industrial Drafting, Architectural Drafting, and Industrial Electronics Technicians. Major drafting curriculum emphasis is on engineering drawing, mathematics, elements of science and communications. These are full-time day programs aimed primarily toward preparing for employability. However, some students may transfer into a degree program with some transfer credit. The Architectural Drafting Program is also offered evenings.

## *PRE-TECHNICAL COURSES*

Pre-Technical preparatory courses are generally offered to students who have course deficiencies for entry into the associate-degree courses, and also to students who have been absent from school for a period of time. Pre-Technical courses include reviews of the foundations in mathematics, science, and communication skills. The student may also take some introductory courses in the chosen technology for orientation and/or for credit.

One Pre-Technical group is for Data Processing; the other is for the other technologies.

## *SUMMER PROGRAM*

Credit and non-credit summer courses are offered through the Evening Division. Some of these courses are designed to prepare students for admission into a degree program.

## *CHOICE OF CURRICULUM*

Students are required to state a choice of curriculum on the application for admission. This choice may be changed prior to registration by consulting the Director of Admissions. After classes start, changes may be made only in consultation with the department chairperson and the college counselor.

## *COLLEGE YEAR*

The college day program is a full-time program requiring approximately 25 hours a week in classrooms and laboratories plus a considerable amount of outside study time. Each class generally meets four or five days a week. The college year, which is divided into three quarters, usually starts just after Labor Day, and terminates at the end of May.

## *COORDINATED HIGHER EDUCATION OPPORTUNITIES*

The State Technical Colleges and the State Regional Community Colleges have adopted a coordinated policy of instruction which may broaden the student's education at a reduced total cost to the student.

Full-time day students only (those paying maximum tuition) in one college may enroll for courses at the other college tuition free, if the home college does not offer the course, and subject to the space availability in the host college course.

A student wishing to enroll for tuition-free courses must present a receipt at registration to show that the maximum full-time tuition was paid. This policy does not apply to self-supporting extension and evening courses.

Thames Valley State Technical College is cooperating in this coordinated program with its nearest community college neighbors — Mohegan, Quinebaug Valley, and Middlesex Community Colleges.

# Admissions

## FREE PROGRAMS

Candidates for admission to the Associate Degree Program must be high school or vocational-technical school graduates. Candidates may be accepted with a state school or a government equivalency certificate. There is a \$10 application fee.

### Requirements

1. Graduation from high school or vocational-technical school. State or Federal equivalency diploma is acceptable.
2. A minimum of two years of high school algebra.
3. A related lab science — physics, chemistry, or computer science.
4. Four units of high school English.

### Admissions Procedure

1. Receipt of completed application with \$10 fee.
  2. Invitation to math placement test.
  3. Development of admissions profile — math background, grades, placement test score, SAT verbal and math scores, and class rank.
  4. Admission decision.
  5. Applications received after March 1 will be treated on a space-available basis.
- For GED applicants, a copy of the diploma will be required and, in addition to the math placement test, these applicants may be required to take the ACT Assessment tests in math and science in lieu of submitting SAT scores.

## PRE-TECHNICAL COURSES

Candidate for admission who may be deficient in some of the admission requirements listed should follow the normal application procedure. If evaluation of the application, including test results, indicates the advisability of enrolling in Pre-technical courses, the applicant will be required to do so.

## CERTIFICATE PROGRAMS

Applicants for admission to the one-year certificate programs must be high school vocational-technical school graduates or have a high school equivalency certificate. Certificate applicants are required to take the entrance examination administered by the college.

## TRANSFER STUDENTS

1. Transfer students will be accepted based on prior post-secondary experience. A formal evaluation of transfer credit will be conducted upon receipt of the completed application.
2. Transfer credit will be granted for up to 50% of the required degree work. The department chairperson will be consulted for credit where substitution is required.
3. Transfer students with no prior math credit will be required to take the Math Placement Test.

## CONTINUING STUDENTS

1. Students who are assigned to Pre-Technical courses and those in the certificate programs will be admitted to the degree courses if they meet the requirements established by the department of their choice.
2. In general, minimum requirements would include successful completion of the certificate program and/or the assigned Pre-Technical courses (no failures or WD's) with a recommended cumulative QPR of 2.5 and demonstrated positive attitudes toward attendance and industry.

## WRITING AND READING REQUIREMENTS

*Enrollment in Developmental Writing (AS 060) and Reading Skills Development (AS 050):* For some students, supplemental instruction in writing fundamentals, reading skills, or both, will be required. In order to determine which students require additional instruction in reading and writing, all incoming freshmen, certificate and pre-technical students, and other students, after acceptance by the Humanities Department, will take placement tests. There is no fee for the tests. Students will not be allowed to register for Basic Communication (AS 120) or Introduction to Literature (AS 110) unless they take these placement tests.

Based on their performance, students will be:

1. waived from Reading Skills Development (AS 050) and enrolled in Reading Skills Development (AS 050) or referred to a regular section of Introduction to Literature (AS 110)
2. waived from Developmental Writing (AS 060) and enrolled in Developmental Writing (AS 060) or referred to Basic Communication (AS 120).

Enrollment in Reading Skills Development (AS 050) and/or Developmental Writing (AS 060) may be required, based on test results.

**NOTE:** All results of the reading and writing placement test will be communicated to students in writing. Most students will complete all reading and writing requirements by the end of the first year; some may require an additional term to do so.

All applicants with foreign credentials will be required to submit TOEFL scores or comparable evidence of English proficiency.

## VETERANS' BENEFITS

The college is approved by the state approving agency for the education and training of veterans and their eligible dependents for student benefits under the Veterans and War Orphans Acts and participates in the Veterans Readjustment Act of 1966 (Public Law 98-358).

Veterans enrolling at the college under any applicable program should first obtain from the Veterans Administration a Certificate of Eligibility for processing by the college Admissions Office. Upon completion of the enrollment certificate by the college, the veteran-student will become eligible for benefits in accordance with the law and his particular status. Tuition for general fund subsidized courses is waived for the Connecticut Viet-Nam Era veteran.

## OUT OF STATE STUDENTS

The state technical colleges are authorized by their board of trustees to participate in a program to encourage interstate enrollment in publicly supported, two-year associate degree granting colleges. A reciprocal agreement has been arranged among the six New England states to implement this program. Under the agreement, students enrolled in the technical colleges will be charged the resident fee, plus a 25% supplement fee. All other out of state students are required to pay the non-resident fee. Such students are enrolled on a space available basis.

## FOREIGN STUDENTS

Thames Valley is authorized under Federal law to enroll non-immigrant alien students. Under this authorization a small number of foreign students are usually admitted each year. Inquiries should be addressed to the Director of Admissions.

## COLLEGE LEVEL EXAMINATION PROGRAM (CLEP)

Credit will be given to students who take (CLEP) examinations provided they score higher than the 50th percentile or receive a minimum score of 3 depending on the date of the examination. Credit will only be given for required courses in a specific curriculum. Some courses at the college for which CLEP examinations may be taken are as follows:

Technical Mathematics I	(MA 116)
Technical Mathematics II	(MA 126)
Principles of Chemistry	(CH 122)
Introduction to Literature	(AS 110)
Psychology & Human Relations	(AS 221)
Economics	(AS 212)
Sociology	(AS 232)
Basic Communication	(AS 120)

Those who want more information concerning CLEP may telephone 1-800-842-2220.

## EXEMPTION EXAMINATIONS

Students are permitted to take Course Exemption examinations at any time during the academic year and are encouraged to take them as early as possible to facilitate their program planning. Students who fail a course are not permitted to subsequently take an exemption examination in that course. Only students who are registered with the College will be permitted to take exemption examinations. In the absence of extenuating circumstances, the exemption examinations will not be given to students who have received a "WD" in the course or in the last quarter before graduation.

Thames Valley State Technical College supports the efforts of secondary school officials and governing bodies to have their schools achieve regional accredited status to provide reliable assurance of the quality of the educational preparation of its applicants for admission.

# Costs and Financial Aid

## COSTS

As of this printing there is a tuition of \$570 per year for Connecticut residents, payable in installments at the start of the first, second and third terms. The resident fee per course for part-time students is prorated based on the registered quarter hours of credit. As of this printing out-of-state residents pay a tuition of \$1,860. Part-time out-of-state students pay a prorated fee based on registered quarter hours of credit. Write to the Director of Admissions for information. See section on out-of-state students. Fees and tuition are subject to change.

There are nonrefundable student fees of approximately \$14 per term and a laboratory fee of \$10 per term. Annual cost of books and equipment is approximately \$300. A charge of \$10 is made for late registration. Individuals making payment by check should be sure of sufficient funds in their accounts. A penalty fee of \$10 will be charged to any individual who has presented a bad check. All transactions are final and there is no refund of any fees except as noted on page 20.

## FINANCIAL AID

The college has a program of financial assistance to provide aid to those students who find it difficult to meet college costs or commuting and living expenses. Students are encouraged to apply for financial aid.

All applicants for financial aid must complete the following procedures:

1. File a Financial Aid Form (FAF) with the College Scholarship Service in Princeton, New Jersey. The FAF is available at your own high school guidance counselor's office or from the college's Financial Aid Officer.
2. If a student wishes to be considered for financial aid at Thames Valley, the student must apply for the PELL Grant. This is done by filling out the Federal Student Aid section on the Financial Aid Form.
3. A copy of the parents' and/or student's previous year's income tax form must be presented to the college's Financial Aid Officer.

## TYPES OF AID

The college participates in a number of state and federal student financial aid programs including grants, part-time work and loans.

## GRANTS

1. THE PELL GRANT PROGRAM is a federal program with the student applying directly to the program for the grant. The college has no control over the amount awarded, but arranges for the payment of the grant to the student. All students applying for financial aid must apply for this grant and even if rejected, turn the reply form in to the Financial Aid Officer in order to be considered for other aid if eligible.

2. **SUPPLEMENTAL EDUCATIONAL OPPORTUNITY GRANT PROGRAMS**, both federal and state, are controlled by the college and awarded to students who exhibit financial need as based on the analysis of the Financial Aid Form.

### **PART-TIME WORK**

**COLLEGE WORK-STUDY PROGRAMS**, both federal and state, are controlled by the college and awarded to students who exhibit financial need as based on the analysis of the Financial Aid Form. Part-time employment is made available at the college in various areas such as laboratory aides, programmers in the various college offices, library aides, and assisting in building maintenance.

### **GUARANTEED STUDENT LOAN PROGRAM**

The college participates in the Connecticut Student Loan Foundation Program. The student receives an application from a local bank and fills out the necessary information required. As of October 1, 1981, student loans are based on financial need. Students must fill out the FAF to be considered for the Student Loan Program and provide a copy of the parents' previous year's 1040 Income Tax Statement to the Financial Aid Officer. The College's Financial Aid Officer fills out the section relating to the college. The student returns the application to the bank for processing for the loan. Students may borrow up to \$2,500 a year if they qualify.

### **RENEWAL OF AWARDS**

Financial aid is made on a yearly basis. Continuation of financial aid will depend on financial need and evidence of satisfactory academic progress at the college. Application must be made each year for consideration.

For further information contact:

Financial Aid Officer  
Thames Valley State Technical College  
574 New London Turnpike  
Norwich, CT 06360  
Tel. 886-0177

### **SCHOLARSHIPS**

Scholarships are available from parents, employers or community groups such as volunteer fire, police and church organizations, Chamber of Commerce, Rotary and other civic groups. In addition, many high schools administer scholarship funds which might be available. Students in need of financial aid are encouraged to consult their high school counselors for such local sources.

### **REFUND OF TUITION FEES**

For students who have paid the quarter term tuition in advance, a full refund will be made if the request for such a refund is made at least two weeks before the start of each term. Otherwise, refunds will be made as follows:

1. Within the last two weeks prior to beginning of each term, 80% refund.

- b. Within the first two weeks after the beginning of each term, 60% refund.
  - c. No refunds will be made after this period.
- All refund requests must be made in writing.

For students inducted into military service or for those with a serious illness, full refund of tuition fees will be made within two weeks after the beginning of each term. A written request must be made and must be supported by evidence of entering military service or by a certificate signed by a medical doctor attesting to the illness.

Tuition paid in advance for the following term by any student who is unable to continue at the College due to academic reasons initiated by the College will be refunded in full.



# College Regulations

## GRADING SYSTEM

The quality of student work is measured by a system of grades and by a computed quality point ratio.

Passing Grades	Value	Description
A (90-100%)	4	Excellent
B (80-89%)	3	Superior
C (70-79%)	2	Average
D (60-69%)	1	Below Average — course may be repeated to raise grade. Refer to "Quality Points" on following page.
I (Incomplete)	0	Given to students who, due to circumstances acceptable to the instructor, failed to complete all of the requirements of a course. Must be made up by the middle of the following term or the "I" will be changed to an "F" (failure).
EX (Exempt)	0	Given for courses for which credit has been granted either through examination, or waiver.
IR (Transfer)	0	Given for courses for which transfer credit has been granted.
E (50-59%)	0	Conditional—a final grade of D or F will be assigned depending upon results of a make-up examination or completion of a sequential course.
F (below 50%)	0	Failing—may be made up through repetition or through passing the course at an approved institution. Refer to "Quality Points" on following page.
WD	0	Withdrawal before mid-term or discretion of the instructor (non-credit).
WF	0	Withdrawal after mid-term (failing). Refer to "Quality Points" on following page.
AU (Audit)	0	Attendance at classes with no credit given.

## ATTENDANCE

Regular attendance is required of all students. Students with excessive absences may be asked to withdraw from a course or from the college.

## DISMISSAL

A student may be dismissed from the college for unsatisfactory conduct, excessive absences or unsatisfactory progress. Any student who has been dismissed may apply for readmission. If accepted, he will be on probation during the first term.

## QUALITY POINTS

Quality points are computed by multiplying the number of hours of credit for a course by the weighted value of the mark for the course. Example: An "A" (4 value) in Technical Mathematics I (4 credit hours) counts as 4 x 4 = 16 quality points. The cumulative quality point ratio is obtained by dividing the total number of quality points achieved by the number of credit hours of work completed. Exceptions: When a student repeats a course for which a "D", "F" or "WF" was received, both grades will appear on the transcript, but only the higher grade will be used in calculating the quality point ratio (QPR).

## HONORS

Students achieving at least a 3.0 quality point ratio for a quarter will be placed on the Honors List and those achieving at least a 3.4 ratio will be placed on the High Honors List providing the student completes a minimum of 12 credit hours for the quarter. Students whose two-year cumulative quality point ratios are honors or high honors will be given special recognition at graduation.

## INCOMPLETE

Incompletes must be made up by the middle of the quarter following that quarter during which the incomplete was obtained or the incomplete will be changed to a failing grade (F).

## WITHDRAWAL

If a student withdraws from a course or courses before mid-term, the grade shown on the transcript will show as a WD (no penalty). If the withdrawal occurs after mid-term, the grade may be a WD or a WF (counts as failure) at the discretion of the instructor. The student should discuss his intent to withdraw with the instructor, and if withdrawing from college, must have a personal interview with the Dean of Students.

## PROBATION FOR SCHOLASTIC REASONS

Any time a student's cumulative Quality Point Ratio falls below 2.0, the student will be considered as being on *academic warning*. Any student who fails to achieve a 1.6 cumulative and/or current QPR during any given term is automatically placed on probation during the following term, and this action is noted on the transcript. Students on probation may be requested to meet with the college counselor or the

Dean of Students to discuss a plan of remediation. A student who is on academic probation for *two consecutive* terms may be *dismissed* from the College. Removal from probation occurs when *both* the cumulative *and* the current QPR's are 1.6 or higher.

#### **MULTIPLE DEGREES**

The transcript of a student who completes the requirements for more than one degree will be a continuous one and the Quality Point Ratio will be cumulative.

#### **PROGRESS REPORTS**

Formal grades are issued at the end of each term. Grades are based on student achievement in home, classroom and laboratory assignments, and in tests and term examinations.

During the term, students are kept informed of their progress by their instructors. Students requiring additional assistance are encouraged to seek individual help from their instructors, each of whom has at least three hours per week scheduled for this purpose.

#### **COUNSELING SERVICES/HEALTH SERVICES**

The Counseling Center in Student Services is available to assist all students in reaching an understanding of academic, vocational, and personal problems. Emphasis is placed on helping each student to make the best possible adjustment and on the utilization of individual abilities and interests to attain meaningful goals for the future.

There are no health services available at the College. Basic accident insurance covering accidents at school, school functions, or traveling directly to or from school is provided through the student fees. Extended 24-hour, 12-month sickness and accident insurance (including family coverage) may be obtained at a modest additional cost.

#### **PUBLIC NOTICE DESIGNATING DIRECTORY INFORMATION**

Thames Valley State Technical College hereby designates the following categories of student information as public or "Directory Information." Such information may be disclosed by the institution for any purpose at its discretion.

- Category I Name, address, telephone number, dates of attendance, class.
- Category II Previous institution(s) attended, major field of study, awards, honors (includes Dean's List), degree(s) conferred (including dates).
- Category III Past and present participation in officially recognized sports and activities, physical factors (height, weight of athletes), date and place of birth.

Currently enrolled students may withhold disclosure of any category of information under the Family Educational Rights and Privacy Act of 1974, as amended. To withhold disclosure, written notification must be received in the Office of the Registrar, within 14 calendar days after the first day of class at Thames Valley State Technical College, 574 New London Tpk., Norwich, CT, or 14 days after the date of the original notification of these rights. Forms requesting the withholding of "Directory Information" are available in the Registrar's Office.

Thames Valley State Technical College assumes that failure on the part of any student to specifically request the withholding of categories of "Directory Information" indicates individual approval for disclosure.

#### **NONDISCRIMINATION AND AFFIRMATIVE ACTION**

Thames Valley State Technical College enforces its policy of nondiscrimination on the basis of race, color, creed, age, sex, marital status, national origin, ancestry, criminal record, mental disorder or physical disability. The Federal and State laws regulating the intent of this policy are listed in the Affirmative Action Plan of the college, a copy of which is available in the president's office on campus.

The coordinator of our Title IX and Affirmative Action efforts can be reached at the main office on campus (203) 886-0177.

#### **NOTICE OF NONDISCRIMINATION AND APPOINTMENT OF COMPLIANCE OFFICER PURSUANT TO SECTIONS 503 AND 504 REHABILITATION ACT OF 1973 (NONDISCRIMINATION ON THE BASIS OF HANDICAP)**

Thames Valley State Technical College hereby provides notice to its students, employees, student applicants, and applicants for hire that it supports the language and intent of Sections 503 & 504 of the Rehabilitation Act of 1973 effective June 3, 1977, which prohibits discrimination in educational programs and employment activities on the basis of handicap.

This policy and requirement of nondiscrimination extends to admissions, access and to employment at the College.

Pursuant to Sections 503 & 504 and implementing regulations, Thames Valley State Technical College has designated a coordinator of our compliance efforts under Sections 503 and 504 who can be reached at the main office on campus, telephone (203) 886-0177.

#### **AGE OF MAJORITY**

Under Connecticut law, the age of majority is 18 and students that age and older have the full rights and responsibilities of adults. The College will communicate directly with students in matters pertaining to grades, academic credit, academic and disciplinary status and college bills.

## FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT OF 1974

Thames Valley State Technical College in compliance with the Family Educational Rights and Privacy Act of 1974 will afford present and former students "the right to inspect and review" their "education records"; and protect students' rights to privacy by limiting the transfer of their records without their consent.

The Act specifically excludes from education records: "financial records of the parents of the student or any information contained therein"; confidential letters and statements of recommendation placed in the education records prior to January 1, 1975; confidential recommendations (I) respecting admission to any educational agency or institution, (II) respecting an application for employment, and (III) respecting the receipt of an honor or honorary recognition if the student has signed a waiver of right to access. The Act also specifically excludes from education records: records of instructional, supervisory, and administrative personnel, "which are in the sole possession of the maker thereof" and which are not accessible or revealed to other parties; records on a student created or maintained by "a physician, psychiatrist, psychologist, or other recognized professional or paraprofessional acting in his/her recognized professional or para-professional capacity," created and maintained in connection with the provision of treatment to the student. Finally, the Act specifies that it does not alter confidential communications otherwise protected by law.

The Act requires Thames Valley State Technical College to make education records not excluded above available to students within a reasonable time, but in no case to exceed forty-five days after the request has been made. Officials have been instructed to record the name of the student making a request, together with the date. Students wishing to challenge the accuracy of their records should present their comments in writing to the Registrar. If informal efforts to resolve areas of disagreement fail, the student may request a hearing.

Except as permitted by the Act, transcripts of, or information concerning a student's education record will be released to parties outside the college only with the written consent of the student, or "in compliance with judicial order, or pursuant to any lawfully issued subpoena," in which case an attempt to notify the student will be made. The Act also allows the college to issue "directory information." This would include name, address, telephone number, dates of attendance, degrees and awards received, major field of study, and similar information. Any student objecting to the release of "directory information" should bring this in writing to the attention of the Registrar; accordingly, release of "directory information" for the particular student will be withheld.

## Graduation

### YOUR FUTURE

The State Technical Colleges award an Associate in Science Degree upon successful completion of a curriculum. Each graduate also receives a transcript indicating the courses taken and the grades attained. Additional copies of transcripts are furnished free upon request.

To be eligible for graduation, a student must satisfactorily complete all courses listed in the curriculum pursued, have a cumulative quality point ratio of 1.7, receive the recommendation of the Faculty Committee, and complete any remedial course assignments. All financial obligations must be discharged.

### TRANSFER CREDIT

The main objective of the technical college is education for gainful employment. However, experience has shown that about 25 percent of technical college graduates continue their education at four-year colleges. Graduates of the State Technical Colleges have received as much as two years' credit for work done at the college.

The following colleges are among those that have accepted recent graduates of Thames Valley:

Central Connecticut State University  
Eastern Connecticut State University  
Northeastern University  
Rochester Institute of Technology  
Roger Williams College  
Rutgers University  
Southern Connecticut State University

University of Bridgeport  
University of Connecticut  
University of Hartford  
University of Lowell  
University of Maryland  
University of Massachusetts  
University of New Haven  
University of Rhode Island  
Western New England College

## PLACEMENT SERVICE

The College has a placement service which assists students and alumni in securing employment. The objective of this service is to guide and assist the student or graduate in obtaining the type of position for which the individual is best suited.

Active contacts are maintained with industries throughout Connecticut. Informative booklets, brochures, and industrial directories are available to students and alumni in the College library. Group and individual job interviews are arranged.

The following companies are representative of those who have recruited recent graduates from the college:

Analysis and Technology  
Bell Communications Research  
Brand-Rex Corporation  
Bureau of Business Practices  
Capitol Temporal  
Custom Marine  
Davis Standard  
Digital Equipment Company  
Dynamic Controls  
Eastern Data Center of General Dynamics  
Electric Boat Division of General Dynamics  
Harris Corporation  
Harris Graphics  
Hartford Insurance  
Heublein, Incorporated  
International Business Machines  
Masi-Kure  
McLaughlin Research  
Monsanto Company  
Naval Underwater Systems Center  
Northeast Utilities  
Pfizer, Incorporated  
Pratt & Whitney Aircraft Division of United Technologies  
Preferred Plastics  
Radio Shack  
Rogers Corporation  
Ship Analytics  
Southern New England Telephone Company  
Stone & Webster Engineering Corporation  
Thomas G. Faria Corporation  
United Illuminating Company  
United Nuclear Corporation and  
UNC Naval Products  
Upjohn Company

# Organizations and Sports

## STUDENT COUNCIL

The Student Council is elected by the student body, and is charged with the dual role of student government and the promotion of all student activities on the campus. The Council plans and sponsors social events, college tours, publications, clubs, and other activities. The disbursement of the Student Activity Fee (collected each term) is under the control of the Student Council. These funds are used to support the various activities.

## CLUBS

Club activities are coordinated by the Student Council and are established in response to the interest and needs of the student body. Groups are active in such areas as skiing, aerobics, and intramural sports from basketball to volleyball.

## PROFESSIONAL SOCIETIES

Membership in student chapters of professional societies at the College are available to interested students. Such organizations as the Society of Manufacturing Engineers, the American Chemical Society, and Tau Alpha Pi (the national junior college honor society) are active at the College. Other active groups include the Data Processing Club and the Society of Women in Engineering Technologies.

## YEARBOOK

Membership on the staff of the Thames Valley yearbook, the Epoch, is open to all interested students.

## INTERCOLLEGIATE ATHLETICS

Thames Valley usually fields intercollegiate teams in men's and women's basketball. The varsity teams compete with other colleges in the Connecticut Small College Conference.

# Evening Division

## OBJECTIVE

The college conducts an evening division which allows employed personnel to continue their education and improve their technical background without giving up wage earning time during the day. These programs are designed to meet the educational needs of men and women who want to prepare themselves to fill the increasing number of industrial positions requiring personnel with technical and supervisory knowledge.

Through associate degree and certificate programs, the division provides opportunities for adults to continue their education for:

1. Preparation—to prepare for employment as engineering technicians.
2. Specialization—to learn more specialized phases of their respective fields.
3. Up-dating—to keep abreast of developments and to improve themselves in the technical area in which they are presently working.
4. Up-grading—to make themselves technically competent for promotion to higher level positions.
5. Retraining—to gain entry into areas of current industrial technical need.

## DEGREE PROGRAM

The Evening Division offers curricula leading to the Associate in Science Degree in Aviation Maintenance, Civil, Data Processing, Electrical, Industrial Management, Manufacturing, Mechanical and Nuclear Engineering Technologies. An associate degree program in Fire Technology and Admission is also offered by the Evening Division. Many of the courses in this program are given on special schedules and at locations which are convenient to the students.

These curricula have been developed with the assistance of advisory committees composed of members of the major engineering societies, educators, engineers and industrialists. They are designed to prepare the kind of engineering technicians needed by the manufacturing, engineering and research industries of Connecticut.

## UNIT COURSE PROGRAM

This program is designed to meet particular and more specialized educational and training needs of individuals and industries. The unit courses are structured to meet the needs for up-dating, up-grading and advanced specialization generated by rapid technological changes and advances in various areas within the engineering and industrial fields. For example, chemical engineers might need a course in chemical instrumentation, and production supervisors, a course in numerical tape control devices. Since the courses are designed to meet specialized needs as they develop, the course offerings may be varied and changed to meet requirements.

Courses are offered in the fields of Civil, Mechanical, Electrical, Industrial Management, Data Processing, Manufacturing, Mechanical, and Fire Technol-

ogy and Administration. Included are such courses as engineering drawing, technical mathematics, tool and machine design, semiconductors, servomechanisms, instrumental analysis, statistical quality control, numerical control, computer systems, time-methods analysis, and data control processing. Courses being offered in degree programs also may be taken as unit courses.

In addition, special non-credit courses are periodically offered in areas of local interest.

## COURSE OFFERINGS

Certificate courses and courses required for the associate degree in the curriculums offered are given at the college. However, it may be necessary at times to offer particular courses at one or two of the technical colleges rather than in all of them. Students will then have to take these courses at the technical colleges where they are being given.

## ADMISSION REQUIREMENTS AND PROCEDURES

Courses are open to all residents of Connecticut. Individuals must have the educational background necessary to meet the enrollment requirements of the particular course or curriculum they wish to study.

Candidates to the degree programs must be high school graduates or must have an equivalency certificate. Each applicant should have completed at least two units of mathematics and one unit of a laboratory science.

A special non-credit course in pre-technical mathematics is offered for those who may be deficient in their mathematics preparation.

Each individual is asked to register personally so that he may be assisted in arranging an educational program best suited to meet his needs.

To apply for admission, the applicant is required to:

1. Submit an application for admission. (This may be obtained from the college.)
2. Provide the college with a high school transcript. (You should ask the high school to send the transcript to the evening division at the college.)
3. Come for a personal interview if counseling is required.

The applicant is requested to state on his application for admission the technology he wishes to pursue. Once he has started on the program of his choice, the technology may be changed only after consultation with the Associate Dean.

Applicants for admission to non-degree credit certificate courses must possess the knowledge necessary to pursue the courses. Tests may be given to determine whether an individual has the required proficiencies. Applicants for these courses are not required to furnish a transcript

## ADMISSION WITH ADVANCED STANDING

A degree program applicant may be admitted with advanced standing by transfer of credits from other technical institutes, colleges or universities. In cases of transfer of credits, applicants must provide an official transcript and catalog of courses from

the former institution. Transfer credit will be granted only for courses which closely parallel courses in the technical college's curriculum and for which at least a "C" grade was earned. In some cases examinations may be required before credit is given.

Degree credit may be given for technical college curriculum courses taken as unit courses provided the applicant has met the admission requirements and the prerequisite requirements for each of the courses.

The total transfer credit allowable may not exceed 50 percent of the total credit hours required for the associate degree in the particular curriculum. This maximum does not apply to credit for transferable courses taken at the State Technical Colleges or at their Extension Centers. Full credit may be given for all such courses. All credits for advanced standing must be validated by the college.

### **COSTS**

At the time of this printing a fee of \$31 per quarter hour of credit is payable at the time of registration. Students must also purchase books, instruments and instructional materials required in the respective courses. A nonrefundable Auxiliary fee of \$2.00 is payable upon registration each term and a \$5.00 laboratory fee is payable each term by students enrolling in one or more evening courses with a laboratory requirement. All bookstore sales are final.

Individuals making payment by check should ensure that sufficient funds are in their accounts. A penalty fee of \$10.00 will be charged to any individual who presents an unhonored check. A charge of \$10.00 is made for late payment of course fee(s).

### **REFUND OF COURSE FEE(S)**

A full refund of appropriate payments will be granted to persons who withdraw (in writing) from a course before the first scheduled meeting of that course, after which **no refund** will be granted. The Auxiliary fund fee and the laboratory fee are not refundable.

### **ATTENDANCE**

Regular attendance is required of all students. Students with three consecutive absences or excessive absences (at least 25% of total class time) may be asked to withdraw from the college.

### **MARKING SYSTEM**

The marking system and computation of quality points is similar to that of the day division as described on page 22. Courses for which a student has received transfer credit or advanced standing will not be considered in computing his quality point ratio. These courses will merely be recorded with the notation "Tr" on his record.

Students whose cumulative quality point ratios are Honors or High Honors will be given special recognition at graduation.

## **ASSOCIATE DEGREE CURRICULA**

The State Technical Colleges award an Associate in Science Degree for the Successful completion of a curriculum. Upon request, graduates may receive a transcript indicating the courses taken and the grades attained.

To be eligible for graduation, a student must satisfactorily complete all required courses in the curriculum he is pursuing, have a cumulative quality point ratio of 1.7, and receive the recommendation of the Faculty Committee.

### **PROGRESS REPORTS**

A grade report (Transcript) is issued to each student who completes a course.

### **INFORMATION**

The courses offered in any particular term in the technical college are determined by need as evidenced by enrollments. Hence, the courses to be given and the class schedules in the technical college and centers are subject to change. They will be listed before the start of each term. In some cases it may be necessary to combine groups and offer required courses in other technical colleges.

The school year is divided into three terms. Each degree curriculum may be completed in a minimum of five years by pursuing a class schedule of three or four nights per week per term.

It is the responsibility of each student to determine his course schedule with the advice and assistance of the Associate Dean.

In general, the evening curricula closely parallel the day programs as shown in this catalog.

## Academic Programs

## Aviation Maintenance Technology

A student in this program to be eligible for an A.S. degree must successfully complete a Federal Aviation Agency "F.A.A." approved Airframe and Powerplant mechanics program and have an active license for which 54 qtr. hrs. credit will be granted. In addition, 59 qtr. hrs. of college instruction must also be obtained as prescribed in the curriculum below.

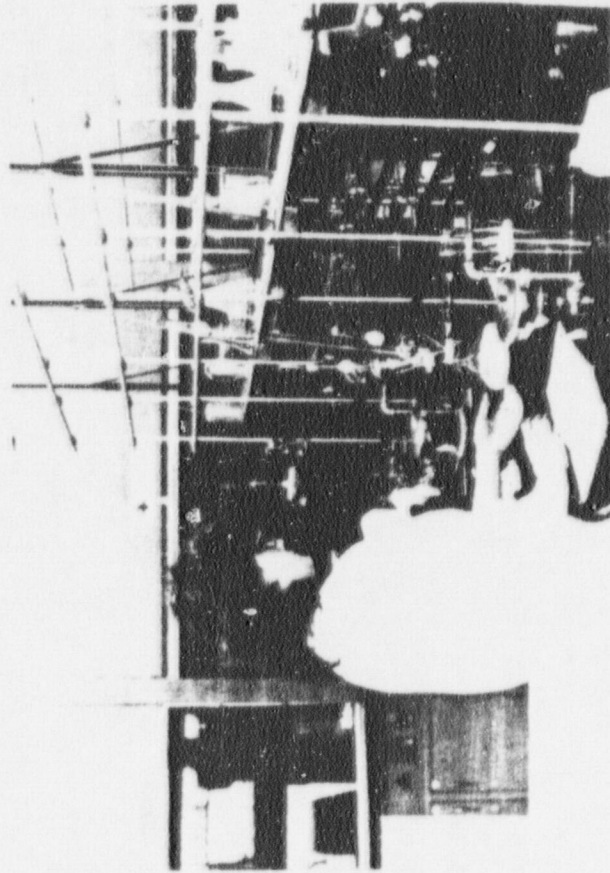
Graduates of this program may obtain employment as mechanics at airports or technicians with aircraft and powerplant companies or they may continue their education toward a B.S. degree in the industrial or manufacturing field.

### AVIATION MAINTENANCE TECHNOLOGY CURRICULUM

FIRST QUARTER	C L Q	THIRD QUARTER	C L Q
AS 110 Intro. to Lit.	4 0 4	MA 130 Calculus I	4 0 4
MA 110 Tech. Math I	4 0 4	*PH 131 Physics (Light & Modern)	3 2 4
*PH 111 Physics (Mechanics)	3 2 4	CH 122 Prin. of Chemistry	3 2 4
*MT 113 Tech. Dwg. I	1 5 3	AS 232 Sociology	3 0 3
*MT 212 Mat. of Eng.	3 3 4	AS 130 Tech. Comm.	4 0 4
Totals	19	Totals	19

SECOND QUARTER	C L Q
AS 120 Basic Comm.	4 0 4
MA 120 Tech. Math II	4 0 4
*PH 121 Physics (Heat, Sound, Light)	3 2 4
DP 238 BASIC	2 2 3
AS 212 Economics	3 0 3
AS 221 Psych. & Hum. Rel.	4 0 4
Totals	22

\*Denotes courses which must be taken at Thames Valley S.T.C. Other courses may be taken at Thames Valley or some other college of your choice. The above curriculum may be completed in one year fulltime days subject to scheduling and time availability.



# Chemical Engineering Technology

Chemical Technology students (male and female) study the fundamentals of general chemistry and organic chemistry and learn how to perform qualitative, quantitative and analytical analysis. They study substances and the reactions between them and learn the methods and procedures used in the discovery and development of new products. In the unit operation laboratory, one section of which is two stories high, they study chemical machinery and methods used in extraction, distillation, evaporation, drying, absorption and heat transfer, and they devise, install and operate chemical manufacturing processes. The chemical technologist finds employment in a wide variety of fields such as:

- Foods
- Metals
- Glass
- Rubber
- Paper
- Dyes
- Lubricants and Heavy Chemicals
- Pharmaceuticals
- Paints
- Plastics
- Fuel and Oils
- Building Products
- Sales

# CHEMICAL ENGINEERING TECHNOLOGY CURRICULUM

## (Two Year Sequence)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST YEAR</b>			
<b>FIRST QUARTER</b>			
AS 110 Intro. to Lit.....	C L Q		C L Q
MA 110 Tech. Math I.....	4 0 4		4 0 4
PH 111 Physics (Mech.).....	4 0 4		4 0 4
CH 111 Chemistry I.....	3 2 4		3 3 4
DP 238 BASIC.....	3 3 4		4 0 4
Totals.....	2 2 3		2 4 4
	16 7 19		17 7 20
<b>SECOND QUARTER</b>			
AS 120 Basic Comm.....	4 0 4		3 0 3
MA 120 Tech. Math II.....	4 0 4		3 0 3
PH 121 Physics (HSL).....	3 2 4		3 3 4
CH 121 Chemistry II.....	3 3 4		1 4 3
ET 225 Electricity & Electronics.....	3 2 4		3 3 4
Totals.....	17 7 20		3 0 3
<b>THIRD QUARTER</b>			
AS 130 Tech. Comm.....	4 0 4		0 3 1
MA 130 Calculus I.....	4 0 4		10 14 16
PH 131 Physics (L & M).....	3 2 4		3 0 3
CH 131 Chemistry III.....	3 3 4		3 0 3
CH 134 Environ. Science.....	3 2 4		0 4 2
Totals.....	17 7 20		0 3 1
71 Contact Hours	59 Quarter Credits		10 14 16
<b>SECOND YEAR</b>			
<b>FOURTH QUARTER</b>			
AS 221 Psychology & H.R.....			3 0 3
MA 210 Calculus II.....			3 0 3
CH 212 Organic Chemistry I.....			1 4 3
CH 211 Ind Chem Calc.....			3 3 4
CH 225 Instr. & Quant. Analysis I.....			3 0 3
Totals.....			0 4 2
			0 3 1
			10 14 16
<b>FIFTH QUARTER</b>			
AS 212 Economics.....			3 0 3
CH 226 Instr. & Quant. Analysis II.....			3 3 4
CH 222 Org Chemistry II.....			1 4 3
CH 223 Unit Operations I.....			3 3 4
CH 224 Unit Oper Lab I.....			3 0 3
CH 112 Chem Eng Basics.....			0 4 2
Totals.....			0 3 1
			10 14 16
<b>SIXTH QUARTER</b>			
AS 232 Sociology.....			3 0 3
CH 236 Instr. & Quant. Analysis III.....			1 4 3
CH 232 Organic Chem III.....			3 3 4
CH 233 Unit Operations II.....			3 0 3
CH 234 Unit Oper Lab II.....			0 4 2
MA 213 Statistics.....			3 0 3
Totals.....			13 11 18
72 Contact Hours	54 Quarter Credits		
<b>TOTAL CURRICULUM</b>			
Qtr. Credits—113			
Contact Hours—143			

Accredited by Technology Accreditation Commission Accrediting Board for Engineering & Technology (TAC-ABET)

# Data Processing Technology

The student (male and female) in Data Processing Technology will learn the programming of electronic computers. Experience will be obtained in actual machine operation in the computer laboratory which consists of IBM PCS and a DEC 1170 electronic computer with all the necessary supporting equipment.

Stress will be placed upon converting business, mathematical, statistical, scientific and data processing problems into workable computer programs. Various computer languages will be employed and analyzed for usefulness and applicability in specific areas.

The curriculum includes instruction in basic science, business, and industrial organization in order to provide the students with a broad background from which computer applications may be drawn and to equip them for a wide range of employment opportunities.

Graduates may find employment as:

- Programmers
- Computer operators
- Systems analysts
- Other responsible positions in  
Commercial, Scientific, Civil  
Service and Manufacturing  
Concerns

# DATA PROCESSING TECHNOLOGY CURRICULUM

(Two Year Sequence)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST YEAR</b>			
<b>FIRST QUARTER</b>			
AS 110 Intro. to Lit.....	4 0 4		C L Q
MA 110 Tech. Math I.....	4 0 4		3 0 3
DP 111 Accounting I.....	4 0 4		2 2 3
DP 113 Computer Data Proc.	4 0 4		4 0 4
DP 116 Intro. to Prog Fortran	3 0 3		5 2 4
Totals.....	18 3 19		3 3 4
<b>SECOND QUARTER</b>			
AS 120 Basic Comm.....	4 0 4		3 3 4
MA 120 Tech. Math II.....	4 0 4		15 7 18
DP 121 Accounting II.....	4 0 4		
DP 123 Software Design.....	4 0 4		
DP 114 Cobol I.....	3 0 3		
Total.....	18 3 19		
<b>THIRD QUARTER</b>			
AS 130 Tech Comm.....	4 0 4		
MA 130 Calculus I.....	4 0 4		
DP 211 Ind. Syst. & Proc.....	4 0 4		
DP 135 Data Base Syst. Des.	3 0 3		
DP 124 Cobol II.....	3 3 4		
Totals.....	18 3 19		
63 Contact Hours	57 Quarter Credits		
<b>SECOND YEAR</b>			
<b>FOURTH QUARTER</b>			
AS 212 Economics.....	3 0 3		
DP 227 RPG Programming.....	2 2 3		
DP 213 Anal. & Mig. Costs I	4 0 4		
DP 221 Num Methods I.....	3 0 3		
DP 217 Algorithms & Data Structures I.....	3 3 4		
Totals.....	15 7 18		
<b>FIFTH QUARTER</b>			
AS 221 Psych. & Hum. Rel.....	4 0 4		
MA 213 Statistics.....	3 0 3		
DP 233 Anal. & Mig. Costs II	4 0 4		
MA 210 Calculus II.....	4 0 4		
DP 229 Syst Anal & Design/D.P.....	3 3 4		
Totals.....	18 3 19		
<b>SIXTH QUARTER</b>			
AS 232 Sociology.....	3 0 3		
DP 222 Num Methods II.....	3 2 4		
DP 220 Applications.....	4 0 4		
DP 237 Assembler Prog.....	3 3 4		
DP 242 Microcomputers.....	2 2 3		
Totals.....	15 7 18		
65 Contact Hours	55 Quarter Credits		
<b>TOTAL CURRICULUM</b>			
Qtr. Credits—112			
Contact Hours—128			

# Electrical Engineering Technology

The program in Electrical Technology has been developed to prepare young men and women for engineering technician careers in the electrical and electronic field. An intensive study is made of the fundamentals of electric circuits, electromechanical energy conversion, solid state electronics and their application in electronics circuits and control systems. This comprehensive study of the technical specialties coupled with training in English, mathematics, physics and chemistry assures the student of a good background for advancement in industry.

Graduates in electrical technology are prepared for employment in both the electrical power and the electronics fields.

Typical positions which these graduates hold are:

- Field Representatives—Sales
- Laboratory Technicians
- Test Equipment Maintenance Technicians and Service Writers of Technical Manuals
- Liaison Men between Engineering and Manufacturing
- Electronic Technicians
- Power Plant Technicians
- Engineering Assistants
- Computer Customer Engineer

# ELECTRICAL ENGINEERING TECHNOLOGY CURRICULUM

(Two Year Sequence)

	C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST YEAR</b>				
<b>FIRST QUARTER</b>				
AS 110 Intro. to Lit.....	4	0	4	C
MA 110 Tech. Math I.....	4	0	4	L
CH 122 Prin. of Chem.....	3	2	4	Q
PH 111 Physics (Mech).....	3	2	4	C
ET 111 Electricity I.....	3	3	4	L
Totals.....	17	7	20	
<b>SECOND YEAR</b>				
<b>SECOND QUARTER</b>				
AS 120 Basic Comm.....	4	0	4	C
MA 120 Tech. Math II.....	4	0	4	L
PH 121 Physics (H.S.I.).....	3	2	4	Q
ET 121 Electricity II.....	3	3	4	C
ET 223 Projects I.....	1	4	3	L
Totals.....	15	9	19	
<b>THIRD QUARTER</b>				
AS 130 Tech. Comm.....	4	0	4	C
MA 130 Calculus I.....	4	0	4	L
ET 135 Intro. to Electronics.....	3	2	4	Q
ET 131 Electric Ckts I.....	3	3	4	C
ET 215 Elect Machinery.....	3	3	4	L
Totals.....	17	8	20	
<b>FOURTH QUARTER</b>				
AS 212 Economics.....	3	0	3	C
MA 210 Calculus II.....	4	0	4	L
ET 211 Electric Ckts II.....	3	3	4	Q
ET 212 Electronics I.....	3	3	4	C
ET 224 Digital Circuits I.....	3	3	4	L
Totals.....	16	9	19	
<b>FIFTH QUARTER</b>				
AS 221 Psy. & Hum. Rel.....	4	0	4	C
ET 226 Adv. Applied Math.....	3	3	4	L
ET 222 Electronics II.....	3	3	4	Q
ET 221 Intro. to Microcomputers.....	3	2	4	C
ET 236 Digital Ckts II.....	3	3	4	L
Totals.....	16	11	20	
<b>SIXTH QUARTER</b>				
AS 232 Sociology.....	3	0	3	C
ET 234 Elec. Circ. & Appl.....	3	3	4	L
ET 232 Microcomputers.....	3	3	4	Q
ET 235 Control Systems.....	3	3	4	C
ET 230 Communications.....	3	3	4	L
Totals.....	15	12	19	

73 Contact Hours	59 Quarter Credits	58 Quarter Credits
<b>TOTAL CURRICULUM</b>		
Qtr. Credits—117		
Contact Hours—152		

Accredited by Technology Accreditation Commission/Accrediting Board for Engineering & Technology (TAC/ABET)

# Industrial Management Technology

The objective of the Industrial Management Technology curriculum is to prepare students (male and female) for career positions in supervision and management. The curriculum provides education and training in the effective utilization of the human and production resources of an enterprise. The student learns to supervise and coordinate activities of workers, to interpret company policies, to establish and adjust work procedures, to recommend and initiate production improvement methods and personnel actions, and to analyze and resolve industrial problems. Graduates of the Industrial Management Technology curriculum may be employed as:

- Section Chiefs
- Group Leaders
- Supervisors
- Superintendents
- Foremen
- Department Managers

# INDUSTRIAL MANAGEMENT TECHNOLOGY CURRICULUM

(Two Year Sequence)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credits
<b>FIRST YEAR</b>			
<b>FOURTH QUARTER</b>			
AS 110 Intro. to Lit.	4 0 4	AS 221 Psych. & H.R.	4 0 4
MA 110 Tech. Math I	4 0 4	IM 210 Pers. Management	4 0 4
PH 111 Physics (Mech.)	3 2 4	MF 235 Stat. Qual. Cont.	4 0 4
DR 113 Tech. Drawing I	1 5 3	DP 238 BASIC	2 2 3
MF 112 Mfg. Proc. I	2 3 3	DP 213 Anal. & Mfg. Costs I	4 0 4
Totals	14 10 18	Totals	18 2 19
<b>SECOND QUARTER</b>			
AS 120 Basic Comm.	4 0 4	<b>FIFTH QUARTER</b>	
MA 120 Tech. Math II	4 0 4	AS 212 Economics	3 0 3
PH 121 Physics (HSL)	3 2 4	MF 232 Mot. Time & Meth.	2 2 3
DR 123 Tech. Drawing II	1 5 3	DP 233 Anal. & Mfg. Costs II	4 0 4
MF 122 Mfg. Proc. II	2 2 3	IM 226 Conf. Lead. Tech. *Dept. Tech. Options	3 0 3
Totals	14 9 18	Totals	12 2 13
<b>THIRD QUARTER</b>			
AS 130 Tech. Comm.	4 0 4	<b>SIXTH QUARTER</b>	
DP 111 Accounting I	4 0 4	AS 232 Sociology	3 0 3
IM 132 Ind. Org. & Mgt.	3 0 3	IM 231 Job. Inst. Trg.	3 0 3
ET 225 Elect & Electronics	3 2 4	IM 232 Prin. of Superv.	3 0 3
CH 122 Prin. of Chem	3 2 4	IM 120 Ind. Safety & Hyg.	3 0 3
Totals	17 4 19	IM 230 Prod Plan & Contr.	3 0 3
68 Contact Hours	55 Quarter Credits	Totals	15 0 15
		49 Contact Hours	47 Quarter Credits

**\*DEPT. TECH. OPTIONS**

	C	L	Q
Nondestructive Test. I	3	0	3
Computer Aided Mfg. I	1	2	2

**TOTAL CURRICULUM**

Qur. Credits—102  
Contact Hours—117

# Manufacturing Engineering Technology

In Manufacturing Technology, the student (male and female) learns to design cutting tools, gages, jigs, fixtures and dies. He/she studies production line layout, production forecasting, planning, inventory control and statistical quality control. He/she learns methods of determining and distributing expenses and estimating material, labor and tool costs. He/she makes flow charts and process sheets showing each step required in the manufacture of a product and makes time studies of manufacturing operations. He/she also studies hydraulic control, manufacturing processes, engineering materials and numerical control.

Manufacturing Technology graduates are employed in the fields of design and manufacturing engineering. Starting as technicians and rising with experience to management positions, they hold positions in the following departments.

- Tool Design
- Numerical Control
- Quality Control
- Sales Engineering
- Methods
- Production Control
- Plant Layout
- Materials and Testing
- Time Study
- Supervision
- Insurance Engineering

# MANUFACTURING ENGINEERING TECHNOLOGY CURRICULUM

(Two Year Sequence)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST YEAR</b>			
<b>FIRST QUARTER</b>			
AS 110 Intro. to Lat.	4 0 4		
MA 110 Tech. Math I	4 0 4		
PH 111 Physics (Mechanics)	3 2 4		
MF 112 Mfg. Processes I	2 5 3		
DR 113 Tech. Drawing I	1 5 3		
Totals	14 16 18		
<b>SECOND YEAR</b>			
<b>SECOND QUARTER</b>			
AS 120 Basic Comm.	4 0 4		
MA 120 Tech. Math. II	4 0 4		
PH 121 Physics (HSL)	3 2 4		
MF 122 Mfg. Processes II	2 2 3		
DR 123 Tech. Drawing II	1 5 3		
Totals	14 9 18		
<b>THIRD QUARTER</b>			
AS 130 Tech. Comm.	4 0 4		
MA 130 Calculus I	4 0 4		
CH 122 Prin. of Chemistry	3 2 4		
MT 133 Applied Mechanics	4 0 4		
ET 225 Elect. & Electronics	3 2 4		
Totals	18 4 20		
69 Contact Hours	56 Quarter Credits		
<b>FOURTH QUARTER</b>			
AS 221 Psy. & Hum. Relations			4 0 4
MT 215 Str. of Materials I			4 0 4
MT 213 Mechanisms			3 3 4
MF 212 Mat. of Engineering			3 3 4
DP 238 Basic			2 2 3
Totals			16 8 19
<b>FIFTH QUARTER</b>			
AS 212 Economics			3 0 3
MF 232 Motion, Time & Methods			2 2 3
MF 221 Cutting Tool Princ.			2 2 3
MF 230 Comp. Aided Mfg. (CAM) I			1 2 2
MF 223 Fluid Controls			3 2 4
MF 222 Jig & Fixture Design			2 2 3
Totals			13 10 18
<b>SIXTH QUARTER</b>			
AS 232 Sociology			3 0 3
MF 235 Stat. Qual. Control			4 0 4
IM 230 Prod. Plan. & Control			3 0 3
MF 115 Nondestructive Test. I			3 0 3
MF 236 Comp. Aided Mfg. (CAM) II			2 2 3
MF 231 Die Design			2 4 4
Totals			16 6 19
69 Contact Hours	56 Quarter Credits	56 Quarter Credits	

**TOTAL CURRICULUM**  
 Qtr. Credits—113  
 Contact Hours—139

## Mechanical Engineering Technology

The Mechanical Technology student (male and female) is concerned with a broad range of subjects involved in the design, manufacture, testing and development of various products, machines and systems. They study machine and product design, hydraulic control, power plant systems, manufacturing processes, properties of materials and automated machinery. They make engineering drawings and gain experience working with manufacturing equipment, hydraulic test units, tension-compression machines, power plant dynamometers and other devices. They are prepared to further their education in the engineering and scientific fields to promote their activities in industry.

Starting as technicians and rising with experience to management positions, Mechanical Technology graduates can expect to hold positions in the following fields of design and mechanical engineering technology.

Product and Machine Design	Mechanical and Metallurgical
Research and Development	Testing
Plant, Field Service and Sales Engineering	Layout and Detail Drafting

## MECHANICAL ENGINEERING TECHNOLOGY CURRICULUM

(Two Year Sequence)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credits
<b>FIRST YEAR</b>			
<b>FIRST QUARTER</b>			
AS 110 Intro. to Literature	4	0	4
MA 110 Tech. Math I	4	0	4
PH 111 Physics (Mechanics)	3	2	4
MF 112 Mfg. Processes I	2	3	3
DR 113 Tech. Drawing I	1	5	3
Totals	14	10	18
<b>SECOND QUARTER</b>			
AS 120 Basic Communication	4	0	4
MA 120 Tech. Math II	4	0	4
PH 121 Physics (HSL)	3	2	4
MF 122 Mfg. Processes II	2	2	3
DR 123 Tech. Drawing II	1	5	3
Totals	14	9	18
<b>THIRD QUARTER</b>			
AS 130 Tech. Communication	4	0	4
MA 130 Calculus I	4	0	4
CH 122 Pr. of Chemistry	3	2	4
MT 133 Applied Mechanics	4	0	4
ET 225 Elect. & Electronics	3	2	4
Totals	18	4	20
69 Contact Hours	56 Quarter Credits		
<b>SECOND YEAR</b>			
<b>FOURTH QUARTER</b>			
AS 221 Psychology & H.R.	4	0	4
MA 210 Calculus II	4	0	4
MT 215 Strength of Mat. I	4	0	4
MT 213 Mechanisms	3	3	4
MF 212 Materials of Eng.	3	3	4
Totals	18	6	20
<b>FIFTH QUARTER</b>			
AS 212 Economics	3	0	3
MT 227 Strength of Mat. II	3	2	4
MT 237 Dynamics	4	0	4
MT 225 Metal Bonding	2	3	3
MT 223 Computer Aided Design I	2	2	3
Totals	14	7	17
<b>SIXTH QUARTER</b>			
AS 232 Sociology	3	0	3
MT 235 Machine Design	3	2	4
MT 232 Fluid Mechanics	3	2	4
MT 211 App. Thermo	3	2	4
MT 239 Computer Aided Design II	2	3	3
Totals	14	9	18
68 Contact Hours	56 Quarter Credits		
<b>TOTAL CURRICULUM</b>			
Quarter Credits—111			
Contact Hours—137			

# Nuclear Engineering Technology

The Nuclear Engineering Technology program is designed to give students a broad background in the basic sciences with specific nuclear applications to prepare them for careers in the nuclear power industry. Possible positions include health physics technician, reactor engineering technician, and nuclear power plant maintenance technician. The program is also good academic preparation for the reactor operator career path which, however, requires further training and successful completion of a licensing examination administered by the Nuclear Regulatory Commission.

## NUCLEAR ENGINEERING TECHNOLOGY

(2 year A.S. Degree Program)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST YEAR</b>			
<b>FIRST QUARTER</b>			
MA 110 Tech. Math. I.....	4 0 4		
PH 111 Physics (Mech).....	3 2 4		
CH 122 Princ. of Chem.....	3 2 4		
AS 221 Psych. & Hum Rel....	4 0 4		
DP 116 Intro. to Prog.....	5 3 4		
Totals.....	17 7 20		
<b>SECOND QUARTER</b>			
MA 120 Tech. Math. II.....	4 0 4		
PH 121 Physics (HLS).....	3 2 4		
ET 225 Electr. & Electr.....	3 2 4		
AS 120 Basic Comm.....	4 0 4		
NS 110 Atomic Physics.....	4 0 4		
Totals.....	18 4 20		
<b>THIRD QUARTER</b>			
MA 130 Calculus I.....	4 0 4		
AS 130 Tech. Comm.....	4 0 4		
NS 130 Reactor Chem.....	4 0 4		
MF 212 Mat. of Eng.....	3 3 4		
NS 120 Reactor Physics.....	4 0 4		
Totals.....	19 3 20		
<b>FOURTH QUARTER</b>			
MA 210 Calculus II.....	4 0 4		
IM 210 Pers. Mgmt.....	4 0 4		
NS 210 Reactor Theory.....	4 0 4		
MT 231 App. Thermo. I.....	4 0 4		
MT 232 Fluid Mech.....	3 2 4		
Totals.....	19 2 20		

<b>SECOND YEAR</b>			
<b>FIFTH QUARTER</b>			
MT 236 Heat Transfer.....	3 2 4		
ET 213 AC/DC Mach.....	3 2 4		
NS 220 Nuclear Mat.....	2 2 3		
NS 221 Intro. to Nuclear Systems.....	3 0 3		
NS 222 Nuclear Rad. Health & Safety.....	3 3 4		
AS 212 Economics.....	3 0 3		
Totals.....	17 9 21		
<b>SIXTH QUARTER</b>			
ET 239 Auto. Proc. Control Systems.....	2 2 3		
IM 232 Princ. of Superv.....	3 0 3		
NS 231 Elem. of Nuclear Power Gen.....	3 0 3		
AS 231 Sociology.....	3 0 3		
Dept. Tech. Option			
Totals.....	11 2 12		

<b>Department Technical Options:</b>			
MF 115 Nondestructive Testing I.....	3 0 3		
MA 213 Statistics.....	3 0 3		
NS 232 Nuclear Reactor Simulation.....	1 3 2		

Total Quarter Credits—113

\*Totals do not include tech. option.

# Special Programs Fire Technology and Administration

(Evening Division Only)

The Fire Technology and Administration program is designed to provide post-secondary level training which will develop more competent individuals who are or will become leaders in fire protection, prevention and administration. This program has been developed in cooperation with the Connecticut Fire Chiefs' Association, Connecticut Fire Marshals' Association, Connecticut Fire Department Instructors' Association, Connecticut State Firemen's Association, Public Safety Division of the Connecticut State Police Department, Factory Inspection Division, of the Connecticut State Department of Labor and Fire Insurance Companies.

Specifically, this program is designed for:

1. More and better basic operational training for firefighters;
2. Advanced training for present and potential fire company officers in fire protection, prevention, administration and fire training techniques. It also will provide training for personnel of insurance companies involved in fire prevention and protection practices.

## FIRE TECHNOLOGY AND ADMINISTRATION CURRICULUM

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Hours	Credit
<b>MATHEMATICS AND SCIENCE</b>				
MA 110	Technical Mathematics I	4	0	4
MA 120	Technical Mathematics II	4	0	4
PH 111	Physics (Mechanics)	3	2	4
PH 121	Physics (H. S. & L.)	3	2	4
CH 122	Principles of Chemistry	3	2	4
ET 225	Electricity & Electronics	3	2	4
<b>ACADEMIC</b>				
AS 120	Basic Communication	4	0	4
AS 130	Technical Communication	4	0	4
AS 110	Introduction to Literature	4	0	4
AS 221	Psychology and Human Relations	4	0	4
AS 212	Economics	3	0	3
AS 222	Political Science	3	0	3
<b>TECHNICAL SPECIALTIES</b>				
•FT 111	Introduction to Fire Technology I	3	0	3
•FT 121	Introduction to Fire Technology II	3	0	3
•FT 131	Fire Dept. Organization and Management	3	0	3
IM 211	Job Instruction Training	3	0	3
•IM 232	Principles of Supervision	3	0	3
•FT 212	Building Construction I	3	0	3
•FT 213	Building Construction II	3	0	3
FT 312	Fire Alarm and Communication Systems	3	0	3
•FT 322	Industrial Processes and Hazards	4	0	4
•FT 332	Hydraulic Technology	3	0	3
FT 413	Fire Dept. Financial Administration	3	0	3
FT 414	Labor Relations	3	0	3
FT 415	Fire Protection and Inspection	3	0	3
FT 416	Fire Insurance Principles	3	0	3
•FT 253	Water Supply and Sprinkler Systems	3	3	4
FT 511	Legal Problems in the Fire Service (General)	3	0	3
•FT 518	Fire Investigation	3	0	3
FT 522	Fire Dept. Specifications and Purchasing	3	0	3
•FT 534	Fire Fighting Strategy	3	0	3

•Required (Plus Six Elective Specialty Courses)

Successful completion of Emergency Medical Technician—Ambulance training, as evidenced by the State Department of Health, May be accepted for up to six quarter-hour credits toward electives.

# Civil Engineering Technology

(Evening Division Only)

Civil engineering is responsible for the efficient use of personnel and materials to design, erect, and manage systems that include structures, transportation, water supply and sewage treatment.

At the present time, Thames Valley State Technical College concentrates its efforts in the area of transportation and provides the student (male and female) with a blend of physical concepts and present day applications.

## CIVIL ENGINEERING TECHNOLOGY CURRICULUM

(Two Year Sequence)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>MATHEMATICS AND SCIENCE</b>			
MA 110 Technical Mathematics I			4 0 4
MA 120 Technical Mathematics II			4 0 4
MA 130 Calculus I			4 0 4
MA 210 Calculus II			4 0 4
PH 111 Physics (Mechanics)			3 2 4
CH 122 Principles of Chemistry			3 2 4
<b>ACADEMIC</b>			
AS 120 Basic Communications			1 0 4
AS 130 Technical Communications			1 0 4
AS 110 Introduction to Literature			1 0 4
AS 221 Psychology and Human Relations			4 0 4
AS 212 Economics			3 0 3
AS 232 Sociology			3 0 3
DP 116 Introduction to Programming FORTRAN			3 3 4
<b>TECHNICAL SPECIALTIES</b>			
CE 110 Civil Drafting			2 1 4
CE 115 Construction Field Practice			4 0 4
CE 122 Construction Cost Estimating			4 0 4
CE 123 Elementary Surveying			3 3 4
CE 131 Contracts and Specifications			4 0 4
CE 132 Advanced Surveying			4 3 5
CE 133 Statics			5 0 5
CE 210 Strength of Materials			1 2 5
CE 211 Soils			3 2 1
CE 214 Route Surveying			3 3 4
CE 215 Highway Planning			3 2 4
CE 221 Civil Hydraulics			4 0 4
CE 222 Basic Properties of Concrete			3 2 4
CE 224 Highway Construction			4 0 4
CE 232 Properties of Asphaltic Concrete			4 2 5
CE 233 Water Supply and Sewage			3 2 4
CE 235 Highway Design			4 3 5

# Computer Systems Technology

The Computer Systems Technology Program is open to both male and female students. The program is an interface between digital electronics and computer programming.

The objective of the program is to prepare computer systems technicians for employment in setting-up specific computer systems, computer repair, robotics, and systems sales.

Surveys indicate that future needs of this type of a graduate will be in demand to meet our future high technology needs.

## COMPUTER SYSTEMS TECHNOLOGY CURRICULUM

(Two-Year Sequence)  
Tentative

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST YEAR</b>			
<b>FIRST QUARTER</b>			
AS 110 Intro. to Lit.			4 0 4
MA 110 Tech. Math. I			4 0 4
PH 111 Physics (Mech.)			3 2 4
ET 111 Electricity I			4 2 5
DP 116 Intro to Prog. Fortran			3 3 4
Totals	18	7 21	
<b>SECOND YEAR</b>			
<b>FOURTH QUARTER</b>			
AS 212 Economics			3 0 3
MA 215 Statistics			3 0 3
MA 210 Calculus II			4 0 4
ET 212 Electronics I			3 3 4
DP 136 Fortran I			3 3 4
Totals	16	6 18	
<b>FIFTH QUARTER</b>			
AS 221 Psych. & Hum. Rel.			4 0 4
CH 122 Princ. of Chem.			3 2 4
ET 222 Electronics II			3 3 4
ET 224 Digital Ckts I			3 3 4
ET 234 Elec Ckts & Appl.			3 3 4
Totals	16	11 20	
<b>SIXTH QUARTER</b>			
AS 232 Sociology			3 0 3
ET 236 Digital Ckts II			3 3 4
DP 237 Assembler Prog.			3 3 4
DP 242 Microcomputers Applications & Systems			2 2 3
Totals	13	10 17	
69 Contract Hours	60 Qtr. Credits	72 Contract Hours	55 Qtr. Credits

**TOTAL CURRICULUM**  
Quarter Credits—115  
Contact Hours—141

## Industrial Drafting Technology

The industrial drafting technician (male and female) translates notes or sketches usually made by engineers into complete working plans and detail drawings so that the part, machine, or product may be manufactured or built.

Entry assignments may be in tracing plans and drawings and in preparing simple drawings. As the draftsman gains experience he/she works on more complicated plans including detailed drawings showing exact dimensions, tolerances, finish, material, number required, and all other necessary information for production. With additional education, he/she may become a design draftsman. Draftspeople possessing artistic and creative ability may become technical illustrators or product designers. Excellent career opportunities await qualified draftspeople. Practically all manufacturing industries employ some draftspeople. In addition there are a considerable number of concerns who do drafting for industry.

### INDUSTRIAL DRAFTING CURRICULUM (One-year Diploma Program)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours Credit	C	L	Q
<b>FIRST QUARTER</b>					
MA 013 Basic Math A	.....	4 0 4	4	0	4
PH 041 Elements of Science A	.....	3 2 4	3	2	4
DR 111 Engineering Graphics	.....	2 8 5	2	8	5
<b>TOTALS</b>		<b>9 10 13</b>	<b>9</b>	<b>10</b>	<b>13</b>
<b>SECOND QUARTER</b>					
AS 120 Basic Communication	.....	4 0 4	4	0	4
MA 023 Basic Math B	.....	4 0 4	4	0	4
PH 051 Elements of Science B	.....	3 2 4	3	2	4
MF 122 Manufacturing Process I	.....	2 3 3	2	3	3
DR 121 Industrial Drafting I	.....	2 6 4	2	6	4
<b>TOTALS</b>		<b>15 11 19</b>	<b>15</b>	<b>11</b>	<b>19</b>
<b>THIRD QUARTER</b>					
AS 130 Technical Communication	.....	4 0 4	4	0	4
MA 033 Basic Math C	.....	4 0 4	4	0	4
PH 061 Elements of Science C	.....	3 2 4	3	2	4
MF 122 Manufacturing Process II	.....	2 2 3	2	2	3
DR 131 Industrial Drafting II	.....	2 6 4	2	6	4
<b>TOTALS</b>		<b>15 10 19</b>	<b>15</b>	<b>10</b>	<b>19</b>

\* Denotes credit toward certificates only.

## Architectural Drafting Technology

The architectural drafting technician (male and female) is involved in the planning and construction of all kinds of buildings. Technicians in this field find a wide variety of positions to suit their individual talents. They work in offices of architects and engineers, with construction companies or government agencies, and with building supply companies.

Architectural draftspeople work on teams which translate architects' and engineers' design and systems solutions into complete contract drawings and specifications. They are engaged in preparing construction drawings, plans, elevations, sections, and details. They work on developmental or working drawings.

### ARCHITECTURAL DRAFTING CURRICULUM (One-year Diploma Program)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours Credit	C	L	Q
<b>FIRST QUARTER</b>					
MA 013 Basic Math A	.....	4 0 4	4	0	4
PH 041 Elements of Science A	.....	3 2 4	3	2	4
DR 111 Engineering Graphics	.....	2 8 5	2	8	5
<b>TOTALS</b>		<b>9 10 13</b>	<b>9</b>	<b>10</b>	<b>13</b>
<b>SECOND QUARTER</b>					
AS 120 Basic Communication	.....	4 0 4	4	0	4
MA 023 Basic Math B	.....	4 0 4	4	0	4
PH 051 Elements of Science B	.....	3 2 4	3	2	4
DR 110 Building Material & Est.	.....	4 0 4	4	0	4
DR 120 Architectural Drafting I	.....	2 6 4	2	6	4
<b>TOTALS</b>		<b>17 8 20</b>	<b>17</b>	<b>8</b>	<b>20</b>
<b>THIRD QUARTER</b>					
AS 130 Technical Communication	.....	4 0 4	4	0	4
MA 033 Basic Math C	.....	4 0 4	4	0	4
PH 061 Elements of Science C	.....	3 2 4	3	2	4
DR 131 Elements of Surveying	.....	1 3 3	1	3	3
DR 130 Architectural Drafting II	.....	2 6 4	2	6	4
<b>TOTALS</b>		<b>14 11 19</b>	<b>14</b>	<b>11</b>	<b>19</b>

\* Denotes credit toward certificate only.

# Industrial Electronics Technology

## INDUSTRIAL ELECTRONICS CURRICULUM

(One-year Certificate Program)

C—Class Hours      L—Laboratory Hours      Q—Quarter Hours Credit

FIRST QUARTER		C	L	Q	Assoc. Degree Credit Course Options
AS 060	Developmental Writing .....	4	0	4	(AS 110)
MA 015	Basic Math A .....	4	0	4	(MA 110)
PH 041	Elements of Science A .....	3	2	4	(PH 111)
ET 010	Fund. of Electricity I .....	3	3	4	
ET 011	Electrical Drafting .....	0	4	2	
Total .....		11	9	18	
SECOND QUARTER		C	L	Q	Assoc. Degree Credit Course Options
AS 120	Basic Communication .....	4	0	4	
MA 023	Basic Math B .....	4	0	4	(MA 120)
PH 051	Elements of Science B .....	3	2	4	(PH 121)
ET 020	Fund. of Electricity II .....	3	3	4	
ET 021	Electrical Lab .....	0	4	2	
Total .....		14	9	18	
THIRD QUARTER		C	L	Q	Assoc. Degree Credit Course Options
MA 033	Basic Math C .....	4	0	4	
ET 030	Integrated Electronics .....	3	3	4	
ET 031	Digital Electronics .....	3	3	4	
ET 032	Electronic Lab .....	0	4	2	
ET 033	Motors & Indus. Controls .....	3	3	4	
Total .....		13	13	18	

Completion of all the courses in this program with a good quality point ratio should prepare the graduate for entry employment in the electrical or electronic field. Graduates with a 2.5 Q.P.R. may enter the Associate Degree program subject to the approval by the Department.

Credit for ET-223 (Projects I) will be given for successful completion of ET-011 and ET-021.

Students who score well on tests may take the Associate Degree credit course options.

All courses with a (0) first digit number are certificate courses.

# Pre-Technical Programs

This one-year preparation program is generally offered to students (male & female) who have course deficiencies for entry into the associate degree program and also to students who have been absent from school for a period of time. The program offers students a good review of the foundation in mathematics and science and allows the student to take some introductory courses in the various technologies for orientation and/or for credit.

## PRE-TECHNICAL CURRICULUM

(Non-Data Processing Option)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours Credit
FIRST QUARTER		
AS 050	Reading Skill Development .....	4 0 4
MA 013	Basic Math A .....	4 0 4
PH 041	Elements of Science A .....	3 2 4
IM 132	Industrial Org. & Mgmt. ....	3 0 3
Total .....		14 2 15
SECOND QUARTER		
AS 060	Developmental Writing .....	4 0 4
MA 023	Basic Math B .....	4 0 4
PH 051	Elements of Science B .....	3 2 4
CH 122	Principles of Chemistry .....	3 2 4
Total .....		14 4 16
THIRD QUARTER		
AS 231	Psychology & Human Rel. ....	4 0 4
MA 033	Basic Math C .....	4 0 4
ET 225	Electricity and Electronics .....	3 2 4
DR 050	Fundamentals of Engr. Graphics .....	2 2 3
Total .....		13 4 15

### ASSOCIATE DEGREE CREDIT COURSE OPTIONS

AS 110	Developmental Writing .....	(AS 110)
MA 110	Basic Math A .....	(MA 110)
PH 111	Elements of Science A .....	(PH 111)

### ASSOCIATE DEGREE CREDIT COURSE OPTIONS

AS 120	Basic Communication .....	(AS 120)
MA 120	Basic Math B .....	(MA 120)
PH 121	Elements of Science B .....	(PH 121)

(1) Do not take if you completed MA 120.

Students who score well on tests may take the Associate Degree credit course options. All courses with a (0) first digit are certificate courses.

NOTE: Students who complete all courses, have a high Q.P.R., and have department faculty approval will be considered for the A.S. program.

# Course Descriptions

## PRE-TECHNICAL CURRICULUM (D.P. Option)

C—Class Hours	L—Laboratory Hours	Q—Quarter Hours	Credit
<b>FIRST QUARTER</b>			
Assoc. Degree Credit Course Options			
AS 050 Reading Skill Development	4 0 4	(AS 110)	
MA 013 Basic Math A	4 0 4	(MA 110)	
DP 238 Basic	2 2 3		
DP 113 Comp. Data Processing	3 0 3		
Total	13 2 14		
<b>SECOND QUARTER</b>			
AS 060 Developmental Writing	4 0 4	(AS 120)	
MA 023 Basic Math B	4 0 4	(MA 120)	
AS 221 Psychology & Hum. Rel.	4 0 4		
DP 123 Software Design	3 0 3		
Total	15 0 15		
<b>THIRD QUARTER</b>			
AS 232 Sociology	3 0 3	(1)	
MA 033 Basic Math C	4 0 4		
DP 135 Data Base Systems Design	3 0 3		
AS 212 Economics	3 0 3		
Total	13 0 13		

(1) Do not take if you completed MA 120.

• Students who score well on tests may take the Associate Degree credit course options. All courses with a (0) first digit number are certificate courses.

NOTE: Students who complete all courses, have 2.5 Q.P.R., and have department faculty approval will be considered for the A.S. program.

## Academic

**AS 050 READING SKILLS DEVELOPMENT 4 Quarter Credits**  
The course is designed to improve reading and study. The objectives of this course are to help students read better and enjoy it more. The course is designed to help students read more actively, intelligently, critically, and study more effectively. The student's reading progress is measured by pre and post-testing.

**AS 060 DEVELOPMENT WRITING 4 Quarter Credits**  
To facilitate freedom and confidence in developing thoughts, and in transmitting thought through the written word. To develop a strong grasp of fundamental sentence structures, and the ability to compose coherent paragraphs.

**AS 110 INTRODUCTION TO LITERATURE 4 Quarter Credits**  
To survey literature—the novel, short story, play, and poetry; to develop the ability to read with insight and understanding and to convey that understanding; to test the ideas of literature against the issues and concerns of today; and to develop and deepen an appreciation for the values of literature.

**AS 120 BASIC COMMUNICATION 4 Quarter Credits**  
To review rhetorical fundamentals in order to facilitate the student's ability with written and spoken language. To stress brevity and clarity to produce vigorous, concise writing and speaking. To expose students to definite, specific concrete communication techniques.

**AS 130 TECHNICAL COMMUNICATION 4 Quarter Credits**  
To make an intensive study of the principles of effective communication, with particular emphasis on technical communications. A major technical report and several lesser written and oral reports are required of each student.  
*Prerequisite: (AS 120)*

**AS 212 ECONOMICS 3 Quarter Credits**  
To develop a basic understanding of the principles of Economics. The law of supply and demand, the law of diminishing returns, the institutions and practices by which people gain a livelihood are related to each other and the environment in which the student finds himself.

**AS 221 PSYCHOLOGY AND HUMAN RELATIONS 4 Quarter Credits**  
To present the basic tenets of human behavior, with emphasis on the development of personality, self-understanding, learning and social relationship.

To acquaint student with the ramifications of government and its processes and to prepare the firefighter for his quasi-government position.

To present the basic tenets of human society. Emphasis will be placed on the work group, ethnic group, cultural diversity and group opinion.

## Mathematics

An introductory mathematics course including arithmetic, approximate numbers and simple equations, inequalities and algebraic manipulations. This sequence is intended for one year technology students.

A continuation of MA 013 including geometry factoring, exponent and radicals and quadratic equations. This course is intended for one year technology students.

A continuation of MA 023 including logarithms graphing, simultaneous linear equations, additional geometry topics, right and oblique triangles and radian measure.

To develop the skills and understanding needed in the engineering technologies by reviewing and extending basic algebra, such as linear and quadratic equations, factoring and graphs. Trigonometry is introduced.

*Prerequisite: High School Algebra*

A continuation of Technical Mathematics I. It logarithms the J-operator, exponents, non-linear equations, and in trigonometry—graphs of the functions, identities and equations.

*Prerequisites: (MA 110) Tech Math I, (MA 119) Tech Math B*

This course is designed to develop an understanding of basic concepts of differential and integral calculus limited to algebraic functions. Applications are stressed.

*Prerequisite: (MA 110) Tech. Math I*

To develop an understanding of the basic concepts of the subject and a familiarity with the many special formulas that are needed. The acquisition of a ready facility in the use of these special formulas and methods in the solution of engineering and technical problems.

*Prerequisite: (MA 130)*

A basic course in the nature of statistical methodology. Included are permutations, combinations, random numbers, standard deviation, confidence intervals, the testing of hypotheses and binomial and normal distributions. Applied problems in various technologies will be used.

*Prerequisite: MA 120*

## Physics

An introductory course to develop an understanding of physical principles, but emphasizing practical applications. Topics include measurement, forces, motion, energy, simple machines, and fluids.

*Prerequisite: High School Algebra*

A course on physical principles that emphasizes practical applications. Topics include temperature and heat, thermal expansion, gas laws, AC and DC electricity, motors, generators, and light.

*Prerequisite: PH 041*

A course in statics and strength of materials. Topics include the determination of internal and external loads for trusses, centroids and moment of inertia, and axial and bending stresses in simple members.

*Prerequisite: PH 051*

To provide a firm foundation for further technical work by incalculating logical thought patterns and good experimental work habits; and to teach physics principles for use in technical courses. Topics included are Vectors, Force Systems, Torque, Velocity and Acceleration, Newton's laws, work and energy, and gravitation and circular motion.

*Prerequisite: High School Algebra*

A continuation of Physics (Mechanics), including pressure, specific heat, expansion, heat balance, change of state, heat transfer, vibrations, waves, sound, and an introduction to light.

*Prerequisites: PH 111, MA 110*

A continuation of Physics (HSL) including lenses, interference, diffraction, polarization, relativity, quantum theory, X-rays, radioactivity, the nucleus and nuclear reactions.

*Prerequisite: Physics PH 121*

## Drafting and Architectural

DR 050 FUNDAMENTALS OF ENGINEERING GRAPHICS 3 Quarter Credits

To develop a basic understanding of the use of instruments, orthographic projection, isometrics and oblique drawings, sections, and sketches. Emphasis is placed on line weights, accuracy, and neatness.

DR 108 ENGINEERING GRAPHICS A (Evenings) 2 Quarter Credits  
To develop a working knowledge of the fundamental concepts of Architectural Drawing (line work symbols and projection) which will be used in the preparation of "house plans" that will convey information about size and layout needed for construction of the structure. Emphasis is placed on current architectural standards.

DR 109 ENGINEERING GRAPHICS B (Evenings) 2 Quarter Credits  
This course is a continuation of DR 109 consisting of development of a working knowledge of the fundamental concepts of architectural drawing. Emphasis is placed on the principles of accuracy, neatness and communication with regard to the information necessary for the production of a structure.  
*Prerequisite: DR 108*

DR 110 BUILDING MATERIAL AND ESTIMATING 4 Quarter Credits  
To learn the source, cost, use and limitations of materials and labor used in building construction.

DR 111 ENGINEERING GRAPHICS 5 Quarter Credits  
To develop a working knowledge of the fundamental concepts of drafting (line work and projection) which will be used in the preparation of final drawings that will convey information about size and shape. Emphasis is placed on the principals of accuracy, neatness and communication with regard to graphic language. Topics include lettering, geometric construction, orthographic projection, pictorial drawing and descriptive geometry.

DR 113 TECHNICAL DRAWING I 3 Quarter Credits  
To develop basic understanding of orthographic projection; skill in orthographic, isometric, oblique drawing and sketches, understanding of principles and appropriate applications of descriptive geometry; and use of simplified drafting practices in industry.

DR 118 ARCHITECTURAL DRAFTING IA (Evenings) 2 Quarter Credits

To develop a working knowledge of the fundamental concepts of Architectural Drawing (line work, symbols, and projection) which will be used in the preparation of "house plans" that will convey information about size and layout needed for construction of the structure. Emphasis is placed on current architectural standards.

DR 119 ARCHITECTURAL DRAFTING IB (Evenings) 2 Quarter Credits

This course is a continuation of DR 118.  
*Prerequisite: DR 118*

DR 120 ARCHITECTURAL DRAFTING I 4 Quarter Credits  
To develop a working knowledge of the fundamental concepts of Architectural Drawing (line work, symbols and projection) which will be used in the preparation of "house plans" that will convey information about size and layout needed for construction of the structure. Emphasis is placed on current architectural standards.  
*Prerequisite: DR 111*

DR 121 INDUSTRIAL DRAFTING I 4 Quarter Credits  
To develop a working knowledge of the concepts of drafting, which will be used in preparation of final drawings that will convey information about size and shape needed to fabricate parts and assemble the structure. Emphasis is placed on current industrial requirements, principals of accuracy, neatness and communication. Topics include sectional views, auxiliary views, developed surfaces, intersections, threads and dimensioning.  
*Prerequisite: DR 111*

DR 123 TECHNICAL DRAWING II 3 Quarter Credits  
This course is a continuation of Technical Drawing I, consisting of free hand sketching, inking, intersection and development of surfaces and representation of conventional fasteners. Assembly and detail drawings are made with specification for material, surface finishes, dimensioning, etc., in accordance with the latest industrial practices for manufacture.  
*Prerequisite: DR 113*

DR 128 ARCHITECTURAL DRAFTING IIA (Evenings) 2 Quarter Credits  
To develop a working knowledge of the fundamental concepts of Architectural Drawing. Emphasis is placed on the principles of accuracy, neatness, and communication with regard to the production of a structure.  
*Prerequisite: DR 119*

DR 129 ARCHITECTURAL DRAFTING IIB (Evenings) 2 Quarter Credits  
This course is a continuation of DR 128.  
*Prerequisite: DR 128*

DR 130 ARCHITECTURAL DRAFTING II 4 Quarter Credits  
This course is a continuation of CE 020 consisting of development of a working knowledge of the fundamental concepts of Architectural Drawing. Emphasis is placed on the principles of accuracy, neatness and communication with regard to the production of a structure.  
*Prerequisite: DR 120*

**DR 131 INDUSTRIAL DRAFTING II** 4 Quarter Credits  
Continue development of a working knowledge of the fundamental concepts of drafting. (drawing of gears, cams, welding symbols, simple fixtures and gauges). Also coverage of structural and piping drawings. Applications of geometric dimensioning, material specifications, surface finishes, using data from mfg's catalogs and tables. Preparation of sets of working drawings.  
*Prerequisite: DR 121*

**DR 132 ELEMENTS OF SURVEYING** 2 Quarter Credits  
To familiarize the student with the use of the transit as an aid to preparing architectural drawings and in the actual construction process following the preparation of the drawings.  
*Prerequisite: MA 023*

## Chemical

**CH 111 CHEMISTRY I** 4 Quarter Credits  
This course is designed to develop an understanding of the fundamental principles of chemistry including atomic structure, periodic tables, chemical bonds, gas laws, and the study of oxygen and hydrogen. Emphasis is placed on the mole concept and basic chemical calculations. The application of these principles is studied in the laboratory.  
*Prerequisite: Knowledge of Algebra*

**CH 112 CHEMICAL ENGINEERING BASICS** 1 Quarter Credit  
This course introduces the student to the field of engineering graphics assignments and projects in which data must be assimilated and presented in a technical report.

**CH 121 CHEMISTRY II** 4 Quarter Credits  
This course is designed to give the student basic fundamental knowledge of the molecular orbital theory, hybridization solutions, acids, bases, and oxidation-reduction. It also serves as an introduction to analytical courses to be taken in subsequent quarters at the college.  
*Prerequisite: CH 111*

**CH 122 PRINCIPLES OF CHEMISTRY** 4 Quarter Credits  
To present the non-chemical majors a basic knowledge of general inorganic chemistry supplemented by appropriate laboratory experimentation to highlight chemical symbolism and nomenclature, atomic theory, stoichiometry, bonding, oxidation-reduction, electrochemistry, and basic laboratory techniques.  
*Prerequisite: Knowledge of Algebra*

**CH 131 CHEMISTRY III** 4 Quarter Credits  
This course is designed to give the student a basic fundamental knowledge of electrochemistry and solution equilibria. Selected subject areas such as, coordination chemistry are also featured. A review problem of all Chemistry II and Chemistry III subjects completes the course.  
*Prerequisite: CH 121*

## CH 134 ENVIRONMENTAL SCIENCE

The basic objective of this course is to present to the student a development of the biological interrelationships, biochemical cycles, and the environmental dependencies which govern the relationships of ecosystems.

**CH 211 INDUSTRIAL CHEMICAL CALCULATIONS** 4 Quarter Credits

The objective of this course is to introduce chemical engineering type problems and develop the necessary background for Unit Operations. Analysis and solution of material balances and enthalpy problems are stressed.  
*Prerequisites: CH 121, MA 130*  
*Note: Equivalent to Stoichiometry*

**CH 212 ORGANIC CHEMISTRY I** 4 Quarter Credits  
To familiarize the student with the basic categories of organic compounds, nomenclature, preparations. The fundamental types of organic reactions are considered for the alkanes, cycloalkanes, alkynes, and aromatic hydrocarbons.  
*Prerequisite: Chemistry III*

**CH 222 ORGANIC CHEMISTRY II** 4 Quarter Credits  
To continue the students familiarization with organic compounds, particularly those compounds with functional groups. Halogen Compounds, Ethers, Carbonyl Compounds, Carboxylic Acids and Carboxylic Acid derivatives are covered. I.R. refraction index, boiling point and melting point data are interpreted. The lecture theory is reinforced with extensive Laboratory work.  
*Prerequisite: CH 212*

**CH 223 UNIT OPERATIONS I** 3 Quarter Credits  
An introduction to the concept of Unit Operations during which the principles of fluid mechanics are studied. Application is made of the Bernoulli flow equation with emphasis placed on the theoretical horsepower of pumps and the evaluation of fluid friction.  
*Prerequisites: MA 130, CH 211*

**CH 224 UNIT OPERATIONS LABORATORY I** 2 Quarter Credits  
A laboratory course in the unit operations of fluid mechanics which serves to fix in the mind of the student those principles and methods of calculation which are being learned in Unit Operations I. Experience is acquired in techniques of engineering experimentation which are quite different from those encountered in the chemistry laboratory. The writing of reports on the experiments gives practice in this very important phase of technicians training.  
*Prerequisites: MA 130, CH 211*

**CH 225 INSTRUMENTAL AND QUANTITATIVE ANALYSIS I** 4 Quarter Credits

This course emphasizes volumetric and gravimetric analysis. Volumetric analysis is given extensive coverage. Error analysis and rejection of spurious data are required.  
*Prerequisite: CH 131*

CH 226 INSTRUMENTAL AND QUANTITATIVE ANALYSIS II 3 Quarter Credits  
 This course emphasizes chromatography and introduces the elements of chemical instrumentation used for Quantitative Analysis. Physical processes involved in light sources, dispersion, absorption and detection are emphasized.  
*Prerequisites:* CH 131, CH 225

CH 232 ORGANIC CHEMISTRY III 4 Quarter Credits  
 To introduce the student to more sophisticated organic compounds and to involve the student in complex synthesis. The theory of lecture is coupled with pertinent laboratory exercises. Course covers Sulfur Compounds, Carbonic Acid Derivatives, Polymers, Quinones, Amines and Diazo Compounds, substituted Acids, The Claisen Condensation, The Malonic Ester Synthesis, The Michael Addition Reaction, and the Diels-Alder Reaction.  
*Prerequisite:* CH 222

CH 233 UNIT OPERATIONS II 3 Quarter Credits  
 A continuation of Unit Operations I introducing the study of heat transfer. Emphasis is placed on the calculation of heat transfer coefficients and needed surface areas in chemical process equipment. These concepts are then applied to evaporator problems.  
*Prerequisite:* CH 223

CH 234 UNIT OPERATIONS LABORATORY II 2 Quarter Credits  
 A continuation of Unit Operations Laboratory I in which Laboratory investigations are made of thermocouples, thermal conductivity of insulators, heat transfer in 2 pipe and 4 pass heat exchangers and climbing film evaporator.  
*Prerequisite:* CH 223

CH 236 INSTRUMENTAL AND QUANTITATIVE ANALYSIS III 3 Quarter Credits  
 This course aims to give experience in theory and operation of chemical analysis instrumentation, and emphasizes interpretation of results and library research. Independent projects are undertaken to simulate industrial problems.  
*Prerequisite:* CH 226

## Civil

CT 110 CIVIL DRAFTING 4 Quarter Credits  
 This course embodies basic principles of engineering drawing as applied to the field of Civil Technology. Topics such as lettering, basic drafting concepts, and simple drawing problems are followed by exercises in civil applications including building plans, surveying, highway planning and design, structural drawings, etc.

CT 115 CONSTRUCTION FIELD PRACTICE 4 Quarter Credits  
 This course is a broad introduction to the general field of construction with emphasis on methods of economically translating engineering designs into final construction. It includes estimating, quantity take off, earthmoving, planning and management of construction jobs and an introduction to contracts and specifications.

CT 122 CONSTRUCTION COST ESTIMATING 4 Quarter Credits  
 This course gives the student a full understanding of the principles of estimating the total costs of construction projects. The cost estimation of construction equipment, handling and transporting materials, earth work and excavation, highway pavements (concrete and bituminous concrete), structures (reinforced concrete, steel and timber), floor and roof systems, carpentry, plastering, plumbing and electrical wiring are covered.  
*Prerequisite:* CT 115

CT 123 ELEMENTARY SURVEYING 4 Quarter Credits  
 An introduction to the various equipment used in surveying practice. The nomenclature, handling, operation, and function will be discussed in detail along with the methods of neutralization of errors incurred in their use. The laboratory presents the student with the opportunity to make practical application of classroom theory to simple surveying problems such as the measurement of lines and angles, traversing, differential leveling, and locating cultural and topographic features.  
*Prerequisite:* MA 110

CT 131 CONTRACTS AND SPECIFICATIONS 4 Quarter Credits  
 This course introduces the student to the legal and business aspects of the Civil Engineering profession. The major items covered are the role of the contract, specifications, and plans in construction; the relationship between the owner, architect, engineer, the general contractor, and the sub-contractors; the bidding procedure; the duties and responsibilities of the inspector; bonding, insurance, and claim procedure; and other related subjects.  
*Prerequisite:* CT 122

CT 132 ADVANCED SURVEYING 5 Quarter Credits  
 The algebraic and trigonometric solution of open and closed traverses, differential and trigonometric leveling, contours, vertical and horizontal curves, area computations and other related surveying problems. A laboratory term project that makes practical application of the classroom theory is carried on in conjunction with this course.  
*Prerequisites:* CT 123, MA 120

CT 133 STATICS 5 Quarter Credits  
 A study of forces on structures in equilibrium, including forces in two- and three-dimensional structures, methods of sections, and the three-force principle. Also the fundamentals of kinetics.  
*Prerequisites:* PH 111, MA 120

**CT 210 STRENGTH OF MATERIALS** 5 *Quarter Credits*

The underlying principles involved in structural analysis through the analysis of stresses which occur in structures when subjected to various types of loading. Analyses of these stresses are made as they apply to thin-walled cylinders and spheres, riveted and welded joints, beams and columns. Related laboratory work is done in the Materials Testing Laboratory.  
*Prerequisite: CT 133.*

**CT 211 SOILS** 4 *Quarter Credits*

The basic principles of soils and foundation engineering including the following subject areas will be covered in detail: shear strength, bearing capacity, consolidation, slope stability, Darcy's Law and pileings. Investigations will be made, through laboratory testing, of the physical and mechanical properties of soils (sieve analysis, permeability, consolidating density, shear strength, Atterbury limits, etc.).  
*Prerequisite: MA 130.*

**CT 214 ROUTE SURVEYING** 4 *Quarter Credits*

The direct application of surveying concepts to the highway construction industry. The three major types of highway surveys will be covered: preliminary surveys, right-of-way surveys and construction surveys. Field problems making practical application of classroom theory will be carried on in the laboratory in conjunction with this course.  
*Prerequisite: CT 132.*

**CT 215 HIGHWAY PLANNING** 4 *Quarter Credits*

This course covers the initial phase of highway engineering, namely highway planning. The following subjects will be investigated: origin and destination (O & D) studies, land use and its effect on traffic generation and growth, analytical models for forecasting and developing future traffic patterns, methods of financing highway programs and other topics related to the planning of future highway construction.  
*Prerequisite: CT 132.*

**CT 221 CIVIL HYDRAULICS** 4 *Quarter Credits*

This course introduces fluid statics, energy concepts, and motion as background material to the study of flow in closed pipes and open channels. Size of pipes and relationship to capacity and other variables are studied using various design formulas and methods.  
*Prerequisite: CT 133.*

**CT 222 BASIC PROPERTIES OF CONCRETE** 4 *Quarter Credits*

A study of the characteristics of cement, aggregates, admixtures, and water used in concrete mixes; the proper proportioning of these materials; the batching, mixing, placing and curing methods required to produce a finished product of suitable and predictable quality and economy.  
*Prerequisite: CT 211.*

**CT 224 HIGHWAY CONSTRUCTION** 4 *Quarter Credits*

The third phase of highway engineering is highway construction. The subject areas covered are the preparation and function of subgrade, development of adequate sub-base and base courses, and the construction procedures used in the construction of both Portland cement concrete and asphaltic pavements.  
*Prerequisite: CT 235*

**CT 232 PROPERTIES OF ASPHALTIC CONCRETE** 5 *Quarter Credits*

The purpose of this course is to acquaint the student with the use of asphaltic materials in the construction of highway pavements. The elements involved in forming an asphaltic concrete mix are investigated as independent elements and in combination. Methods of proportioning these constituent elements to achieve a serviceable and economical pavement are investigated. Plant mixing and placing operations are discussed in detail. Classroom discussions are supplemented by field trips to central mix plants and highway construction projects.  
*Prerequisite: CT 222*

**CT 233 WATER SUPPLY AND SEWERAGE** 4 *Quarter Credits*

The design and development of municipal water systems, surface and ground; the design and construction of water distributions systems; water quality in respect to public operations; the design and construction of sanitary and storm sewer systems; the characteristics of sewage; stream pollution and its correction; and the treatment and disposal of sewage.  
*Prerequisite: CT 221*

**CT 235 HIGHWAY DESIGN** 5 *Quarter Credits*

The second phase of highway engineering—the design of a highway facility. The design elements of a facility are evaluated as functions of desired capacity and the physical capabilities of the design vehicle. The design elements studies include horizontal and vertical geometry, safe passing and stopping sight distances, intersection capacity, signalization and other related elements of highway facility design.  
*Prerequisites: CT 215, CT 214*

## Data Processing

**DP 111 ACCOUNTING I** 4 *Quarter Credits*

Basic accounting theory is studied to allow the student to become familiar with the various accounting records. The student's ability to classify and analyze transactions is developed.

DP 135 DATABASE SYSTEMS DESIGN

3 Quarter Credits  
Introduce database processing. Present material covering database activities of physical representation, modeling, usage and implementation. Emphasis is upon current database practice.  
Prerequisite: DP 123

DP 136 FORTRAN I

4 Quarter Credits  
A continuation of data processing concepts and computer operations with emphasis in business, general and scientific applications. A review of fundamental algorithms for local and external memories is presented. The Fortran Language is introduced. Laboratory projects using this language are assigned.  
Prerequisite: MA 110 Tech Math I, DP 124 Cobol II

DP 211 INDUSTRIAL SYSTEMS AND PROCEDURES

4 Quarter Credits  
The student studies the overall structure of typical industrial organizations, the major working systems of the firm and the methods used to achieve system goals. The uses of data processing equipment are emphasized. DP 111 suggested.

DP 213 ANALYTICAL AND MANUFACTURING COSTS I

4 Quarter Credits  
Determining methods of accumulating the data necessary to analyze manufacturing processes, to establish the cost of manufacturing a product and to facilitate cost control over the manufacturing process.  
Prerequisite: DP 111

DP 217 ALGORITHMS AND DATA STRUCTURES I

4 Quarter Credits  
A continuation of Data Processing concepts with emphasis on the analysis of fundamental techniques associated with data composition and program development. A contemporary suitable language will be used to implement the instructions described. Previous languages studied may be used for comparison of representation efficiencies.  
Prerequisites: MA 110, DP 124

DP 220 APPLICATIONS

4 Quarter Credits  
The student reviews methods and techniques that industry uses in the various aspects of forming an organization from inception (choosing a product) to final production and sales. The activities involved in organizing and operating a firm are emphasized.  
Prerequisites: DP 227, DP 116

DP 221 NUMERICAL METHODS I

4 Quarter Credits  
Computer applications of elementary linear algebra and matrices. The solution of large systems of simultaneous equations to gain competence with double subscripts. Properties of matrices and matrix arithmetic. Polynomial and least square curve fitting.  
Prerequisites: MA 120, DP 238 or DP 116

DP 113 COMPUTER DATA PROCESSING

3 Quarter Credits  
This course should develop a broad understanding of the overall field of computer data processing, and survey many aspects of the field. Topics such as: computer periodicals and literature, installing management, serving bureaus, quality control, plus specific topics as determined by the instructor which may be applicable to fill gaps in the student's knowledge which evolve when using a new Binary computer. An introduction to BASIC is included.

DP 114 COBOL I

4 Quarter Credits  
The course is designed to introduce the student to computer programming through the use of the COBOL language. It will develop:

- 1) The ability to write efficient COBOL programs
- 2) An understanding of how COBOL is used effectively in commercial application and
- 3) The logical approach necessary to write sophisticated programs.  
Prerequisite: DP 116

DP 116 INTRODUCTION TO PROGRAMMING FORTRAN

4 Quarter Credits  
To enable a beginning student to use the following programmer tools: a) Text editor, b) High-level programming language, c) Operating system commands, d) Knowledge of data-file structures, e) Understanding of structured programming principles.

Upon successful course completion students will be able to program and interact with a computer system. Students will also have received essential and fundamental experience with the structure of programs and data-files. As newer languages are developed and become widely accepted, the programming language used in the course may change.

DP 121 ACCOUNTING II

4 Quarter Credits  
To develop an understanding of extended accounting theories as they apply to the major financial statement classifications and manufacturing operations. Financial statements, cash and investments, income tax, receivable—inventories, fixed assets, liabilities, and manufacturing operations are included.  
Prerequisite: DP 111

DP 123 SOFTWARE DESIGN

3 Quarter Credits  
To instruct the student in the area of program planning and emphasize its importance with respect to the total scope of software generation. Systematic problem analysis will be emphasized.  
Prerequisite: DP 113

DP 124 COBOL II

4 Quarter Credits  
A continuation of DP 114 examining new topics and those already covered in greater detail. Upon completion of DP 124 a thorough understanding of advanced Cobol concepts will have been achieved.  
Prerequisite: DP 114

DP 222 NUMERICAL METHODS II

An examination of several classical methods for the numerical evaluation of certain standard types of mathematical formulas, attention being given to the inaccuracies resulting from the computer evaluation of such expressions in the laboratory. The topics covered will include base conversions, series evaluations, roots of equations, and integration.

*Prerequisites:* DP 221, MA 210, DP 116

DP 238 BASIC

A Beginners' All-purpose symbolic instruction code, is a computer language that requires only an understanding of English. While designed for the novice computer user, latest implementations of BASIC provide experienced programmers with powerful computation and data file manipulation capability. Upon completion of DP 238 a student will be able to specify design, implement and document to moderate complex BASIC programs.

DP 227 RPG PROGRAMMING

An introductory course into the RPG language to teach simple report generation. An explanation of the H, F, I, C and O specifications for elementary report formatting will be explained. Attention will focus on the RPG timing cycle.

*Prerequisite:* DP 116

DP 242 MICROCOMPUTERS

Study in depth a particular microcomputer (uC) system. Emphasis placed upon techniques that apply to uC software and hardware in general.

*Prerequisites:* Knowledge of algebra or a uC machine language

DP 229 SYSTEMS ANALYSIS & DESIGN/  
DATA PROCESSING

This course is meant to be a continuation of the fourth term language offering for the purpose of accomplishing the following objectives:

- Provide sophisticated lab exercises not adequately covered in the previous term.
- Assign the student a term project in some self selected applications area, allowing freedom of language for solutions and requiring the student to apply System Analysis and Design Methods for the solution.
- Introduce new languages to the student as they become available, i.e., PASCAL, C, ADA.

*Prerequisite:* Fourth Term D.P. Language course

## Electrical

ET 010 FUNDAMENTALS OF ELECTRICITY I 4 Quarter Credits

To introduce the student to electricity: the physics of electricity, current and voltage (AC and DC), circuits, components (resistors, capacitors, inductors and transformers) and sources of EMF (generators, batteries). Intended as first electrical course for the industrial electronics certificate program.

ET 011 ELECTRICAL DRAFTING 2 Quarter Credits

This course is an introduction to mechanical and electrical Drafting techniques. The objective of the course is to acquaint the student with the fundamentals of Mechanical and Electrical Drafting.

DP 233 ANALYTICAL AND MANUFACTURING COSTS II 4 Quarter Credits

To investigate and compare various methods of maintaining cost control over the manufacturing process, concentrating on the job order cost system and the process cost system, specifically the operation, strengths and weaknesses of both systems within the standard cost accounting framework.

*Prerequisite:* DP 213

DP 237 ASSEMBLER PROGRAMMING 4 Quarter Credits

An introduction to assemblers assembly language programming and computer organization. The course will not only focus on teaching a specific language but will also examine comparative studies of existing machine language structure. Motivation for compiling versus assembling languages will also be investigated.

*Prerequisite:* Fifth term DP language course such as Systems Analysis & Design DP 229

ET 020 FUNDAMENTALS OF ELECTRICITY II 4 Quarter Credits

A continuation of ET 010 taking the student into the fundamentals of electricity. Topics covered include induced voltages, electromagnetic generators, motors, alternating current, capacitors and inductors, semi-conductor fundamentals, diodes and rectifiers.

*Prerequisites:* ET 010, MA 013

ET 021 ELECTRICAL LAB 2 Quarter Credits

The student will fabricate and test a digital trainer while developing skills in the use of hand and power tools.

ET 030 INTEGRATED ELECTRONICS 4 Quarter Credits

To introduce the student to the theory and application of basic electronic devices with emphasis on diode and transistor models, characteristics and operation in actual circuits with an introduction to amplifiers and other solid state devices. A brief introduction in electron tubes is given.

- ET 051 DIGITAL ELECTRONICS 4 Quarter Credits  
To provide the student with entry level understanding of digital circuits.  
*Prerequisite: ET 010*
- ET 052 ELECTRONIC LABORATORY 2 Quarter Credits  
To introduce the student to the basic theory and practice of electronic troubleshooting. D.C. power supplies and A.C. amplifiers will be used as examples.  
*Prerequisite: ET 020*
- ET 053 MOTORS AND INDUSTRIAL CONTROLS 4 Quarter Credits  
This course is an introduction to the fundamentals of closed loop automatic control systems. The objective of the course is to acquaint the student with the qualitative aspects of control system sensors, controllers and actuators.
- ET 111 ELECTRICITY I 4 Quarter Credits  
This course is an introduction to the fundamentals of electricity. The objective of the course is to acquaint the student with the concept of engineering units, the nature and analysis of DC electric circuits.
- ET 121 ELECTRICITY II 4 Quarter Credits  
To provide the electrical student with a basic knowledge of A.C. circuit theory. It includes a study of resistance, inductance, capacitance as individual components and also as part of series and parallel circuits. Course will also include a study of magnetism and magnetic circuits.  
*Prerequisites: ET 111, MA 110, PH 111*
- ET 131 ELECTRIC CIRCUITS I 4 Quarter Credits  
To familiarize the student with the various network theorems, applied to AC circuits, basic AC and DC instruments, and the theory and analysis of transformers.  
*Prerequisites: ET 121, MA 120*
- ET 135 INTRODUCTION TO ELECTRONICS\* 4 Quarter Credits  
To present a clear, consistent picture of the internal physical behavior of solid state electronic devices. Conduction in metals and semi-conductors, junction diode characteristics and applications, bipolar transistor characteristics.  
*Prerequisites: PH 121, ET 121, MA 120*
- ET 211 ELECTRIC CIRCUITS II 4 Quarter Credits  
A continuation of Electric Circuits I which will familiarize the student with filter analysis theorems and network applications. Emphasis is placed on linear wave shaping resonance, electrical and band filters, attenuators, filter network design and transmission lines.  
*Prerequisites: ET 131, MA 130*
- \*Equivalent to ET 133, *Electron Physics*

- ET 212 ELECTRONICS I 4 Quarter Credits  
To introduce the student to the theory and application of basic electronic devices with emphasis on transistor models, characteristics and applications; transistor biasing and thermal stabilization.  
*Prerequisites: ET 131, ET 135*
- ET 213 AC/DC MACHINERY 4 Quarter Credits  
A basic introduction to electrical machinery theory and operation. Direct current motors and generators, synchronous and induction machines and single phase motors are covered.  
*Prerequisite: ET 225*
- ET 215 ELECTRICAL MACHINERY 4 Quarter Credits  
To familiarize the student with the theory of operation and the application of direct current motors, generators, alternators, polyphase synchronous and induction machines and single phase motors. To teach the student how to connect and operate motors through laboratory experience.  
*Prerequisite: ET 211*
- ET 221 INTRODUCTION TO MICROCOMPUTERS 4 Quarter Credits  
An introduction to the concepts involved in employing single chip microcomputers as a means to control electrical devices. Emphasis is placed upon learning to program a microprocessor in machine language.  
*Prerequisite: Knowledge of Algebra*  
*Note: Formerly ET 123 Digital Computation*
- ET 222 ELECTRONICS II 4 Quarter Credits  
To analyze and design transistor circuits (low and high frequency) which are used as amplifiers. Also includes feedback amplifiers and field-effect transistors.  
*Prerequisites: ET 212, MA 210, ET 211*
- ET 223 PROJECTS #1 3 Quarter Credits  
The student will design, fabricate and test an electronic circuit while developing skills in the use of hand and power tools.  
*Prerequisites: MA 110, ET 111*
- ET 224 DIGITAL CIRCUITS I 4 Quarter Credits  
Digital Circuits I is a comprehensive study of binary logic gates. The circuits for certain TTL, ECL, MOS and CMOS gates are analyzed. The course also includes the study of codes encoding decoding, number systems and various combinational logic circuits.  
*Prerequisite: ET 135—Introduction to Electronics*

ET 225 ELECTRICITY AND ELECTRONICS 4 Quarter Credits  
To provide a complete basic electricity course covering electrical fundamentals, AC and DC circuits, electromagnetic induction, AC and DC motors and generators, and instruments. Emphasis will be placed on basic theory, experimental procedure, and work habits.

ET 226 ADVANCED APPLIED MATHEMATICS 4 Quarter Credits  
To introduce the student to the expansion and manipulation of functions in series and to the representation of physical system as ordinary differential equations and their solution by various means, Maclaurin, Taylor, Fourier series; first and second order differential equations are covered.  
*Prerequisite: MA 210, ET 211*

ET 230 COMMUNICATIONS 4 Quarter Credits  
An analysis of the sub-systems that comprise r.f. communications system from a systems and circuits viewpoint. Modulation techniques, bandwidth requirements and the propagation and reception of signals will be considered.  
*Prerequisites: ET 222, MA 210*

ET 232 MICROCOMPUTERS 4 Quarter Credits  
To study microcomputer systems. Emphasis is placed upon aspects which utilize the microcomputer as a control device.  
*Prerequisites: ET 236, ET 221*

ET 234 ELECTRONIC CIRCUITS AND APPLICATIONS 4 Quarter Credits  
An opportunity for the student to analyze the application of various electronic devices in the performance of useful functions, such as, power supplies, feedback, operational and large signal amplifiers, oscillator and silicon controlled rectifiers.  
*Prerequisites: ET 222, ET 226*

ET 235 CONTROL SYSTEMS 4 Quarter Credits  
To study the requirements that must be met in order for a closed loop electromechanical system to be stable. To familiarize the student with the type of components that make up a servo-system and to examine their effect on system stability. To show the student the advantages of Laplace transform analysis in dealing with automatic control systems.  
*Prerequisites: ET 226, ET 211, ET 236*

ET 236 DIGITAL CIRCUITS II 4 Quarter Credits  
Digital Circuits II is a continuation of Digital Circuits I with more emphasis on sequential circuits. Flip-Flops, counter and shift registers are studied as well as memories, busses, and analog devices.  
*Prerequisites: ET 212, MA 210, ET 224*

## Fire

FT 111 INTRODUCTION TO FIRE TECHNOLOGY I 3 Quarter Credits

FT 121 INTRODUCTION TO FIRE TECHNOLOGY II 3 Quarter Credits

These introductory courses review the fire problems covering various phases of the fire technology field, including characteristics and behavior of fires, hazardous properties of materials, fire protection equipment, extinguishing agents, and building construction. The NEPA Fire Protection Handbook is used as the text.

FT 131 MUNICIPAL FIRE ADMINISTRATION (FIRE DEPARTMENT ORGANIZATION AND MANAGEMENT) 3 Quarter Credits

This course covers the principles relating to the organization of small, medium and large fire departments including an analysis of fire department needs, building the organization, distribution of fire companies, planning fire stations and related physical facilities, administrative functions, personnel requirements, training, promotions, work schedules, vacation plans and other leaves, evaluation methods and records for State and county fire organizations.

FT 212 BUILDING CONSTRUCTION I 3 Quarter Credits  
This course covers the various types of building construction as they relate to fire problems—frame, woodjoisted masonry, non-combustible, fire resistive. Blueprint reading and free-hand sketching, fire resistance and flame spread ratings are also covered.

FT 213 BUILDING CONSTRUCTION II 3 Quarter Credits  
This course is a continuation of Building Construction I with emphasis on building components. Fire walls and partitions, protection of openings by fire doors and fire windows, heating, air-conditioning and electrical systems, standpipes, building codes and other applicable standards and the use of Sanborn Maps are covered.  
*Prerequisite: FT 212*

FT 415 FIRE PREVENTION & INSPECTION 3 Quarter Credits  
The theory and practice in organizing for fire prevention and inspection, fire prevention campaigns, training inspectors, public relations in inspection work, methods of inspection, coordination with other governmental agencies are covered in this course.

FT 312 FIRE ALARM & COMMUNICATIONS SYSTEMS 3 Quarter Credits  
Fundamentals of municipal, central station, proprietary and local alarm systems, heat, flame and smoke detectors, telephone, teletype and radio systems.  
*Prerequisite: Knowledge of Electricity*

**FT 322**    **INDUSTRIAL PROCESSES & HAZARDS**    3 *Quarter Credits*  
 This course reviews the forming, fabrication, treatment and inspection processes for metals and plastics and their associated fire and explosion hazards. Manufacturing processes included are metal casting, heat treatment, powder metallurgy, combustible metals, cutting and welding, and plastic molding.  
*Prerequisite: PH 111, CH 122*

**FT 332**    **HYDRAULIC TECHNOLOGY**    4 *Quarter Credits*  
 Basic properties of fluids, pressure, forces, center of pressure, interpretation of readings from various kinds of manometers, pressure gages, and hydrostatic devices, fluids in motion, head calculations, pumping problems, friction losses, cavitation, velocity of flow, use of Pitot and Venturi meters, viscosity, discharge from orifice meters.  
*Prerequisite: PH 111*

**FT 413**    **FIRE DEPARTMENT FINANCIAL ADMINISTRATION**    3 *Quarter Credits*  
 Fundamental accounting problems as they relate to the fire service are covered in this course. Budget items and preparation of budgets, justifying budgets, financial statements, cost accounting, taxation, loans, interest, municipal finance, depreciation, reserve funds, accounts and audits are included in this study.

**FT 414**    **LABOR RELATIONS**    3 *Quarter Credits*  
 This course is a study of organized labor and the management community. Included is why workers join unions, the legal framework, union behavior, collective bargaining, wage issues, administration of the agreement, administrative issues under collective bargaining and case histories.

**FT 416**    **FIRE INSURANCE PRINCIPLES**    3 *Quarter Credits*  
 The fundamentals of fire insurance, rating methods, loss records, municipal gradings and underwriters standard grading schedule.

**FT 433**    **WATER SUPPLY AND SPRINKLER SYSTEMS**    4 *Quarter Credits*  
 This course reviews distribution systems, tanks, standpipes, hydrants, NBFU standards and sprinkler systems of various types.  
*Prerequisite: FT 332*

**FT 511**    **LEGAL PROBLEMS IN THE FIRE SERVICE (GENERAL)**    3 *Quarter Credits*  
 This course covers the introduction to the law, civil actions, criminal actions, the judicial system, city's liability for acts of the fire department, right of entry, search and seizures, glossary of legal terms.

**FT 512**    **LEGAL PROBLEMS IN THE FIRE SERVICE (STATE)**

This course covers the study of Connecticut state statutes relating to the fire service. Laws governing the organization and operation of fire departments, liability, forest fire fighting, mutual aid, fire prevention, arson, labor and health laws affecting the fire service, and unemployment compensation.  
*Prerequisite: FT 511*

**FT 518**    **FIRE INVESTIGATION**    3 *Quarter Credits*  
 Determination of causes of accidental and incendiary fires, fire losses and loss records, points of origin, location and preservation of physical evidence, scientific aids to investigation are covered in this course. Motives and methods of fire setting and investigative methods are also covered.  
*Prerequisites: PH 121, CH 122*

**FT 522**    **FIRE DEPARTMENT SPECIFICATIONS AND PURCHASING**    3 *Quarter Credits*  
 This course includes the preparation of specifications for apparatus, hose and minor equipment, fire station specifications, bid procedures, contracts, price structures, discounts, trials, guarantees, quality control and inspection of new equipment.

**FT 534**    **FIRE FIGHTING STRATEGY**    3 *Quarter Credits*  
 This course covers predicting and planning for fires, combined operations, mutual aid, disaster planning, problems in unusual fire operations.  
*Prerequisites: FT 111, FT 121, FT 131*

## Industrial Management

**IM 120**    **INDUSTRIAL SAFETY AND HYGIENE**    3 *Quarter Credits*  
 To acquaint the student with concepts of health and safety, with emphasis on accident and illness prevention and administration. The course also includes an exposure to federal government safety regulations as set forth by the Occupational Safety and Health Act.

**IM 132**    **INDUSTRIAL ORGANIZATION AND MANAGEMENT**    3 *Quarter Credits*  
 To acquaint the person inexperienced in the field of management with the principles and functions of management. Course includes manufacturing systems design and controls, personnel relationship and appraisal of manufacturing results.

**IM 210**    **PERSONNEL MANAGEMENT**    4 *Quarter Credits*  
 To acquaint the student with contemporary theory and practices relating to the management of people as well as the basic personnel processes that are involved in the procurement, motivation and maintenance of these human resources.

**IM 220 CONFERENCE LEADING TECHNIQUES** 3 *Quarter Credits*  
To teach the student how to lead group discussions. The course offers the opportunity to explore the techniques of effective listening and oral communications, conference leading procedures, the leader's responsibilities, the construction and use of the agenda, control and summarization and the use of auxiliary materials. The student is given the opportunity to apply what he has learned by conducting discussions and receiving critiques from the others in the class.

**IM 230 PRODUCTION PLANNING AND CONTROL** 3 *Quarter Credits*  
To explore the process of product conception to shipment. Includes a study of production planning as a part of overall managerial planning with particular regard to the techniques and personnel involved.  
*Prerequisite: IM 132*

**IM 231 JOB INSTRUCTION TRAINING** 3 *Quarter Credits*  
Course is designed to develop a supervisor's ability to instruct employees to all phases of their work. It provides a system of job instruction; a practical system of determining training needs; and the necessary background in teaching methodology to enable the supervisor to handle this important phase of his job. The student is given the opportunity to apply the principles learned by conducting job instruction projects during the course.

**IM 232 PRINCIPLES OF SUPERVISION** 3 *Quarter Credits*  
Emphasis on the human aspects of supervision. The concepts of motivation, moral, and leadership are presented from the point of view that social systems, individuals and organizations are interrelated.  
*Prerequisites: AS 221, AS 232 recommended*

## Manufacturing

**MF 112 MANUFACTURING PROCESSES I** 3 *Quarter Credits*  
Provide laboratory experiences in manufacturing processes involving metal cutting tools, operations, economics, measurements, lubricants, output capabilities of machine tools, and the preparation of process sheets. Lathes, milling machines, grinders and metrology will be covered.

**MF 115 NONDESTRUCTIVE TESTING I** 3 *Quarter Credits*  
The student is introduced to an overview of Non-destructive Testing. Subjects will include metallurgical and design considerations, personal certification, penetrants, magnetic particle, eddy current, ultrasonics, radiography and other unique NDT methods.  
*Prerequisites: High School Geometry and Trigonometry.*

**MF 122 MANUFACTURING PROCESSES II** 3 *Quarter Credits*  
A further development in knowledge and skills of Manufacturing Processes I, to include plastics, powdermetal, bending, forming, blanking, welding, rolling, forging, casting, and in numerical controlled machines. Design and characteristics of forming tools, punches and dies are studied as well as design characteristics affecting production and measuring devices used for inspection and quality control.  
*Prerequisite: MF 112*

**MF 126 NONDESTRUCTIVE TESTING II** 3 *Quarter Credits*  
The purpose of this course is to review the various methods on nondestructive testing, to familiarize the student with ultrasonics; and to introduce radiography.  
*Prerequisite: MF 115*

**MF 212 MATERIALS OF ENGINEERING** 4 *Quarter Credits*  
To acquaint the student with the constitution, properties, and characteristics of engineering materials. Develop working understanding of physical metallurgy skill in metallographic techniques and heat treating, and the use of associated laboratory apparatus.  
*Prerequisites: CH 122, MF 112 desirable.*

**MF 221 CUTTING TOOL PRINCIPLES** 3 *Quarter Credits*  
To familiarize the student with the principles and practices of machining, feeds, cutting speeds, forces, horsepower, lubricants and design on lathes, drills, millers, handtools, etc.  
*Prerequisites: MF 122, DR 123, MA 120*

**MF 222 JIG & FIXTURE DESIGN** 3 *Quarter Credits*  
To give the student a thorough knowledge of principles, practices, tools, and commercial standards of jig and fixture design.  
*Prerequisites: MF 122, DR 123 Technical Drawing II*

**MF 223 FLUID CONTROLS** 4 *Quarter Credits*  
To develop a basic understanding of hydraulic and pneumatic component parts and systems. This is to be further reinforced by the testing of apparatus and the design of systems in the laboratory.  
*Prerequisite: PH 111*

**MF 230 COMPUTER AIDED MFG. (CAM) I** 2 *Quarter Credits*  
To familiarize the student with Computer Assisted preparation of Numerical Control Tapes by using the "Compact II" programming language.  
*Prerequisites: MF 122, DR 123*  
*Note: Former Title: Numerical Control*

**MF 231 DIE DESIGN** 4 *Quarter Credits*  
To acquaint the student with various types of press operations and to develop his ability to design complete blanking or cutoff dies.  
*Prerequisites: DR 123, MT 215*

**MF 232 MOTION, TIME & METHODS** 3 *Quarter Credits*  
To familiarize the student with the principles and methods design (motion study) and work measurement (time study) and the use of process, flow, operation and activity charts.  
*Prerequisite: MF 122*

MF 233 PRINCIPLES OF DIE, JIG & FIXTURE DESIGN 5 Quarter Credits  
To give the student knowledge of principles, practices, tools, and commercial standards of Jig & Fixture Design and Die Design.  
*Prerequisites:* DR 123, MT 215  
*Note:* Replaces MF 231 and MF 222

MF 235 STATISTICAL QUALITY CONTROL 4 Quarter Credits  
To familiarize the student with basic statistical concepts, and application of these concepts to practical manufacturing quality control problems.  
*Prerequisite:* MA 120

MF 236 COMPUTER AIDED MANUFACTURING II 2 Quarter Credits (CAM II)  
To further acquaint the student with computer aided manufacturing through learning letter address programming techniques (machine language), advance "Compact II" source programming language and operation of the series I CNC Bridgeport Vertical Milling, Drilling and Boring Machine Boss 5 system.  
*Prerequisites:* MF 122, DR 123 and MF 230 or permission from instructor

## Mechanical

MT 133 APPLIED MECHANICS 4 Quarter Credits  
To provide a foundation for stress analysis. A study of forces on structures in equilibrium, primarily two-dimensional structures. Also presented are the concepts of centroids, center of gravity, and moment of inertia.  
*Prerequisite:* MA 110, PH 111

MT 211 APPLIED THERMODYNAMICS 4 Quarter Credits  
This is an introductory survey course in thermodynamics. The course objectives are to introduce the student to thermodynamic concepts such as enthalpy, entropy and energy balance equations. Generalized steady flow concepts will also be discussed.  
*Prerequisites:* PH 121, MA 130

MT 213 MECHANISMS 4 Quarter Credits  
To develop the ability to provide mathematical and graphical solutions to problems in machine motion. Included are exercises in centros, velocities, accelerations, cam design, gear theory, gear trains, flexible drives, and miscellaneous mechanisms.  
*Prerequisite:* MT 133

MT 215 STRENGTH OF MATERIALS I 4 Quarter Credits  
A fundamental course in strength of materials to instill knowledge of moments of inertia, torsion, bending, columns, etc., which will be applied in the analysis of various structural configurations which have common engineering applications.  
*Prerequisite:* MT 133

MT 223 COMPUTER AIDED DESIGN I 3 Quarter Credits  
This course is designed to introduce the personal computer as a problem solving tool to the mechanical student. The primary emphasis is upon the "BASIC" language as applied to mechanical technology problems. Topics include but are not limited to (1) the "BASIC" syntax (2) file manipulation (3) trial and error solutions (4) graphical analysis (5) sorting (6) formula manipulation.  
The course includes both lecture and lab with the IBM PC computer.

MT 225 METAL BONDING 3 Quarter Hours  
Provide class and laboratory experiences in metal bonding applications and techniques. The most commonly used methods of metal bonding, (welding), such as, soldering, brazing, gas welding, plasma arc, MIG, TIG, and shielded arc (stick) will be emphasized.  
*Prerequisite:* MF 212, or MF 220 or permission of instructor

MT 226 MECHANICAL VIBRATIONS 4 Quarter Credits  
This course presents the fundamentals of mechanical vibration theory. Experiments are used to reinforce the fundamentals by covering a comprehensive range of vibration experiments such as, damped and undamped free vibration; forced vibrations, and systems with two and more degrees of freedom.

MT 227 STRENGTH OF MATERIALS II 4 Quarter Credits  
To logically solve advanced problems in mechanical elements using design theory and principles. Assorted problems will stress, materials, kinematics, economy, safety, strength and appearance, as well as proper functioning. Utilizing basic design principles.  
*Prerequisite:* MT 215

MT 231 APPLIED THERMODYNAMICS I 4 Quarter Credits  
This is an introductory survey course in thermodynamics. The course objectives are to introduce the student to thermodynamic concepts such as enthalpy, entropy and energy balance equations. Generalized steady flow concepts will also be discussed.  
*Prerequisites:* PH 121, MA 130

MT 232 FLUID MECHANICS 4 Quarter Credits  
This course is designed to develop a method of approach involved in the study of fluid motion. The philosophy of this course is to develop general relations and to organize experimental observations.  
*Prerequisites:* MA 120, PH 111

MT 235 MACHINE DESIGN 4 Quarter Credits  
To develop the ability to solve problems involving elements, and to learn to transpose these elements, by means of design procedures, into a machine.  
*Prerequisites:* MT 215, MT 227

MT 236 HEAT TRANSFER 4 Quarter Credits  
The course will include one and two dimensional flow, principles of convection, forced convection, heat transfer and will be supplemented by lab experimentation and demonstrations.  
*Prerequisites:* MA 130, PH 121

MT 237 DYNAMICS

An advanced course which investigates kinematic and dynamic problems in rectilinear and rotational systems. Velocities, accelerations, and forces are calculated. Work-energy, and impulse momentum methods are also investigated.

*Prerequisites:* MT 133, MA 210

3 Quarter Credits

MT 239 COMPUTER AIDED DESIGN II

A continuation of CAD I with a primary emphasis upon the personal computer as a problem solving tool for the mechanical student. Topics include but not limited to (1) advanced "BASIC" programming (2) word processing (3) moment of inertia and centroid application (4) structural stress analysis (5) structural vibration analysis (6) helical and spur gear analysis (7) computer aided drafting (8) mechanism application (9) statistical analysis (10) graphical plotting (11) simultaneous equations.

This course includes both lecture and lab with the IBM PC computer.

*Prerequisite:* MT 215, MT 223

3 Quarter Credits

Nuclear

NS 110 ATOMIC PHYSICS

An introduction to modern physics with emphasis on electron and photon characteristics, radiation activity and measurements, hydrogen atom, atomic structure and solid state physics.

*Prerequisites:* MA 110, PH 111 and PH 121 desired

4 Quarter Credits

NS 120 REACTOR PHYSICS

A study of nuclear and nuclear energy with emphasis on fusion, fission, transmutations and radiation detection.

*Prerequisite:* PH 111, PH 121, NS 110, MA 130

3 Quarter Credits

NS 130 REACTOR CHEMISTRY

An introductory study of the physical property changes created in materials as a result of nuclear reaction. Property changes and material contaminations will be studied within interaction of radioactivity with reference to corrosion and toxicity.

*Prerequisite:* Undetermined at time of printing

3 Quarter Credits

NS 210 REACTOR THEORY

An introduction to neutron diffusion theory as applied to nuclear reactors. Conditions for criticality and control of fusion process. Radiation produced and heat generated in a nuclear reactor.

*Prerequisite:* Undetermined at time of printing

3 Quarter Credits

NS 220 NUCLEAR MATERIALS

A study of the physical properties of commonly used materials in reactor systems. Property variations as a result of radiation absorption, high temperatures and time oxidation. Material problems will be studied, such as, Frenkel pairs, fission spike theories, irradiation growth and creep in fuel elements. (2 Hr. Lect.—2 Hrs. Lab Wk.)

*Prerequisite:* MF 212

3 Quarter Credits

NS 221 INTRODUCTION TO NUCLEAR SYSTEMS

A study of the total nuclear system used in powerplants—types, advantages and development will be covered.

*Prerequisite:* Undetermined at time of printing

3 Quarter Credits

NS 222 NUCLEAR RADIATION HEALTH AND SAFETY

Interactions of nuclear radiations with matter and biological systems, theory and practice of radiation—dosimetry as applied to radiation protection will thoroughly be covered.

*Prerequisite:* Undetermined at time of printing

3 Quarter Credits

NS 231 ELEMENTS OF NUCLEAR POWER GENERATION

A study of all the elements involved in Power Generation: Nuclear reactor and controls, steam generation, turbines, efficiency of operation, radiation shielding, prevention maintenance, shut-downs, recharging, etc.

*Prerequisite:* Undetermined at time of printing

3 Quarter Credits

NS 232 NUCLEAR REACTOR SIMULATION

This required course may be given at the University of Lowell, Rensselaer Polytechnic Inst., or at N.E. Utilities. Critical shut-down procedures will be practiced on a reactor system and/or simulator. (1 Hr. Lect.—3 Hrs. Lab Wk.)

*Prerequisite:* Undetermined at time of printing

2 Quarter Credits

ET 239 AUTOMATED PROCESS CONTROL SYSTEMS

This course introduced students to the fundamental automated control system. Sensors, measurement techniques, and signal conditioning will be covered. On-off controllers, programmable controllers, analog and digital systems will be presented to include hardware, software, and interfacing considerations for automated controlling. (2 Hrs. Lect.—2 Hrs. Lab/Wk.)

*Prerequisite:* Undetermined at time of printing

3 Quarter Credits

# Staff

## ADMINISTRATION

RAYMOND T. WODATCH  
B.S., Central Connecticut State College  
M.A.T.M., Fairfield University  
C.A.G.S., Southern Connecticut College  
*Acting President*

JAMES V. ALTIERI, JR.  
B.S., Yale University  
M.S., Central Connecticut State College  
*Acting Dean of Instruction*

LINDA JACOBSEN  
B.A., M.A., Ph.D., Southern Illinois University  
*Dean of Students*

EDWIN RABINOWITZ  
B.S., University of Connecticut  
M.S., Central Connecticut State College  
D.P.E., University of Connecticut  
*Associate Dean*

JAMES E. LEIPER  
B.S., Central Connecticut State College  
*Director of Admissions*

DIANNE MINARDO  
B.A., M.A.T., Sacred Heart University  
*Registrar*

ROBERT A. GRANATO  
B.S., Boston University  
M.S., C.A.G.S., University of Bridgeport  
*Counselor*

WILLIAM F. O'DONNELL  
B.A., University of Connecticut  
M.L.S., University of Rhode Island  
*Librarian*

JOHN F. MATHEWS  
A.S., Norwalk Community College  
B.S., University of Rhode Island  
*Director of Administrative Services*

LEO E. THERRIEN  
B.S., US Naval Academy  
M.B.A., University of New Haven  
*Manager Computer Services*

DONALD R. WELTER  
B.E., Yale University  
M.S., Central Connecticut State College  
*President Emeritus*

## DEPARTMENT CHAIRPERSONS

GARY ADAMS  
B.S., Worcester Polytechnic Institute  
M.A.L.S., Wesleyan University  
*Mathematics and Science*  
*Associate Professor*

GERARD FEENEY  
B.A., M.A., Manhattan College  
*Humanities*  
*Associate Professor*

RICHARD R. SAXTON  
B.S., Worcester Polytechnic Institute  
M.S., Central Connecticut State College  
*Chemical Engineering Technology*  
*Professor*

ARISTEDES K. MANTHOUS  
B.S., Eng., U.S. Coast Guard Academy  
M.S., University of Connecticut  
*Data Processing Technology*  
*Associate Professor*

STANLEY HARASIMOWITZ  
B.S., M.S., University of Connecticut  
*Electrical Engineering Technology*  
*Professor*

PETER J. MOECKEL  
B.S., University of Connecticut  
*Industrial Management Technology*  
*Assistant Professor*

FREDERICK GOULD  
A.S., New Haven College  
B.S., New Haven College  
M.S., Central Connecticut State College  
*Manufacturing Engineering Technology*  
*Associate Professor*

ROBERT J. LANTZ  
B.S.M.E., Purdue University  
M.S., University of Florida  
*Mechanical Engineering Technology*  
*Associate Professor*

TERRENCE L. TINKEL  
B.S., University of Oklahoma  
M.S., Massachusetts Institute of Technology  
*Nuclear Engineering Technology*  
*Assistant Professor*

HERBERT L. ARNOLD, JR.  
B.S., University of Connecticut  
*Architectural and Industrial Drafting*  
*Assistant Professor*

## FACULTY

DONALD E. ALLAN

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M.S., University of Bridgeport

JUDITH BATES

B.S., University of Rhode Island

LAWRENCE BARRELL

B.S., College of the City of New York  
M.A., Columbia University  
Ph.D., New York University  
L.H.D., Dominican College (Honorary)

PAUL F. BUTLER

B.A., University of MA  
M.A., University of Iowa  
Ph.D., Southeastern Louisiana University

WILLIAM F. CHAMBERLAIN

B.S., Bryant College  
M.B.A., Boston University

JUDITH F. DONNELLY

B.S., Tufts University  
M.S., University of Connecticut

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B.M.E., New York University  
M.S., Central Connecticut State College

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B.S., Worcester Polytechnic Institute  
M.S., University of Connecticut  
P.E., Connecticut, Rhode Island

JOSEPH J. ETTL

B.S., Trinity College  
M.S., University of Connecticut

GERALD GAZSO

B.A., Fairfield University  
M.A.L.S., Wesleyan University

ROBERT S. GOLART

B.S., Seton Hall University  
M.A., Connecticut College

RAYMOND W. HASSE

B.S.E.E., Massachusetts Institute of Technology  
M.S., University of Connecticut

EDMUND J. LEMA

A.S., Mitchell College  
B.S., University of Rhode Island  
M.S., Central Connecticut State College

NANCY L. MARCY

B.S., Eastern Connecticut State University  
M.A., University of Texas

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M.S., University of Connecticut

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B.S.M.E., Western New England College  
M.S.C.E., University of Rhode Island  
P.E., Connecticut

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M.S., Trinity College

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B.A., M.A., University of Connecticut

HARRY H. OGDEN

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JOYCE A. PARKER

B.S., Purdue University

RICHARD C. PICARD

B.S.E.E., Lowell Technological Institute  
M.S.E.E., University of Connecticut

NORMAN J. POTTER

B.S.E.E., New Haven College

Associate Professor

Assistant Professor

Professor

Instructor

Assistant Professor

Associate Professor

Assistant Professor

Associate Professor

Assistant Professor

Assistant Professor

Assistant Professor

Associate Professor

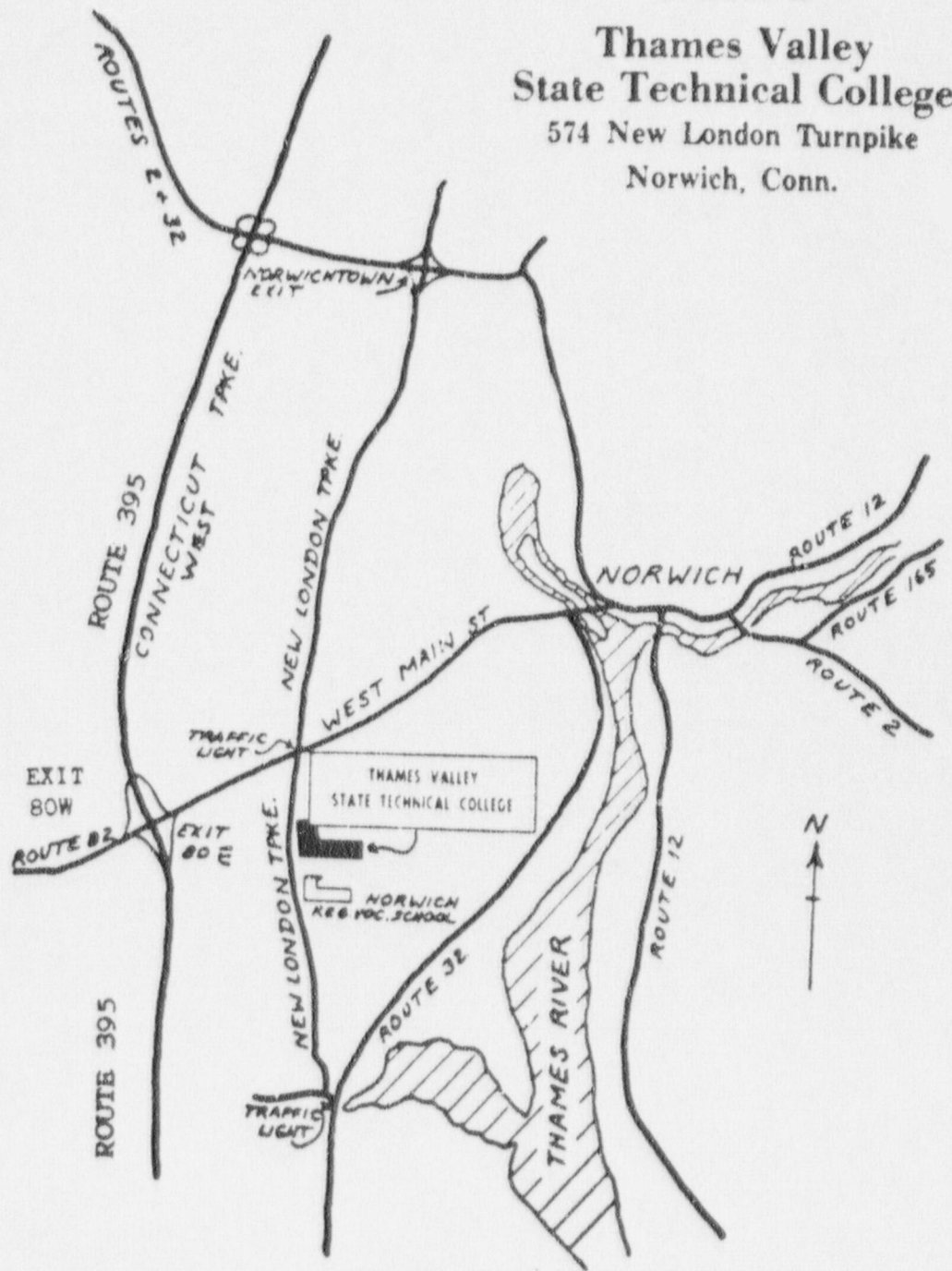
JAMES M. REID B.A., Hofstra University M.S., New York University	Professor	WILBER B. BECKWITH B.S., University of Connecticut	(Electrical)
JAMES A. RHOADES B.S.E.E., Virginia Polytechnic Institute M.S.E.E., Rensselaer Polytechnic Institute	Assistant Professor	JOYCE C. BIRTCHER B.A., Alberta Magnus College M.A., University of Massachusetts	(Mathematics)
JAMES SAVAS B.S., University of Massachusetts M.A., University of Rhode Island	Assistant Professor	DONALD P. BLANCHETTE Providence College	(Manufacturing)
ANDREW SCHAAFSMA B.S., New Haven College M.S., Central Connecticut State College	Assistant Professor	ELIZABETH A. BOSCO B.S., Central Connecticut State College M.S., Central Connecticut State College	(Mathematics)
LINDA M. TREMER B.S., State University of New York M.S., University of Rhode Island M.S., University of Rhode Island	Assistant Professor	PETER D. BOUCHARD B.S., University of Connecticut M.B.A., University of Connecticut	(Data Processing)
TIMOTHY H. WENTZELL B.S.M.E., University of Vermont M.S., Hartford Graduate Center	Assistant Professor	CHARLES D. CALDWELL B.S., University of Connecticut	(Data Processing)
JANET ZITO B.A., Southern Connecticut State College M.A., University of Connecticut	Assistant Professor	ERWIN COHEN B.A., University of Connecticut Ph.D., Northwestern University	(Physics/Chemistry)
ROBERT B. ABBE B.S., Worcester Polytechnic Institute	(Fire)	JAMES DIMITRI B.S., University of Missouri M.S., Lehigh University	(Civil)
ROSEMARY ADAMS B.A., University of Connecticut M.S., Eastern Connecticut State College	(Humanities)	WILLIAM M. J. DOYLE B.A., Providence College M.A.T., Connecticut College	(Mathematics)
LOUIS ALEXANDER B.S., Arkansas Tech University M.S., University of Arkansas	Manufacturer	WILLIAM DUMAS B.A., California State University Long Beach	(Data Processing)
RAJALAKSHMI V. ATREE B.A., University of Bombay M.A., University of Bombay	(Data Processing)	ABRAHAM FISHER B.B.A., Western New England College M.B.A., Western New England College	(Data Processing)
		DAVID GARSIDE JR. Deputy Fire Marshal—Town of Waterford A.S., Thames Valley State Technical College	(Fire)

*ADJUNCT FACULTY—EVENINGS*

CAROLYN D. GATES B.S., Central Connecticut State College M.S., Central Connecticut State College	(Humanities)	STEPHEN E. KICINSKI B.S., Michigan Technological University M.S., Michigan Technological University	(Civil)
REDA GHATTAS B.S., Cairo University M.S., Rutgers University	(Manufacturing)	HENRY KOPIJ B.S., Central Connecticut State College M.A., University of Connecticut	(Mathematics)
JACQUELINE M. GELINAS B.A., Amherst College M.S., Eastern Connecticut State College	(Humanities)	JOHN P. LISTRO B.S., Central Connecticut State University M.S., Central Connecticut State University Ph.D., University of Connecticut	(Data Processing)
BARBARA GILBERT B.A., Fowson State College M.A., University of Connecticut	(Humanities)	PATRICK A. LUVARA B.S.E.E., Carnegie-Mellon University	(Electrical)
JOHN GILBERT B.S., Troy State University	Data Processing	JOHN C. LYON B.S.E.E., Ohio State University M.S., Ohio State University	(Electrical)
ALLAN GLICKSTEIN B.M.E., City College of New York M.S., University of Connecticut	(Mathematics)	BARBARA MAURICE B.S., Central Connecticut State College M.A., University of Connecticut	(Mathematics)
BROR R. HAGLUND B.S., University of Connecticut	(Electrical)	REED B. MILLER B.A., Western New England College M.S., Eastern Connecticut State College	(Mathematics)
DAVID G. HAINES B.S., Boston University M.S., Boston University Ph.D., University of Connecticut	(Fire)	EMILY L. MITCHELL B.A., Vassar College M.A., Connecticut College	(English)
LAWRENCE R. HAYDEN B.S., Worcester Polytechnic Institute	(Data Processing)	DOUGLAS L. MONTIE A.S., Thames Valley State Technical College B.S., Roger Williams College	(Mechanical)
DIANE V. HOLMBERG M.S., University of Connecticut B.A., University of Connecticut	(Chemical)	THOMAS MORIARTY B.A., University of Connecticut M.A., Trinity College	(Economics)
EDWIN J. JUTHA B.A., University of Connecticut	(Fire)	ROBERT J. O'DONOVAN B.S.E., Princeton University M.A.T., Brown University	(Mathematics)
ARNOLD S. KAPLAN B.S., Eastern Connecticut State College M.A., University of Connecticut	(Humanities)	JEFFREY PEARSON B.S.M.E., University of Rhode Island M.S.M.E., University of Rhode Island	(Mechanical)

- THOMAS F. PEPIN  
B.S.A., Bryant College  
*(Data Processing)*
- JOHANNES M. PHILBRICK  
B.A., University of Connecticut  
M.S., Eastern Connecticut State College  
*(Sociology)*
- PETER J. PHILPOT  
B.S.B.A., Bryant College  
*(Data Processing)*
- DOUGLAS B. RELYEA  
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B.S., Eastern Connecticut State College  
*(Industrial Management)*
- ANNE D. RICHMOND  
B.A., Boston University  
M.B.A., University of New Haven  
*(Data Processing)*
- WILLIAM D. SMITH  
B.S., Fairleigh Dickinson University  
*(Industrial Management)*
- WILLIAM H. SMITH  
B.S., Drexel University  
M.Ed., Pennsylvania State University  
*(Data Processing)*
- LARRY H. SOGOLOW  
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M.S., Florida Institute of Technology  
*(Data Processing)*
- ROBERT SOLLENBERGER  
B.A., University of Akron  
M.S., Eastern Connecticut State College  
*(Mathematics)*
- WILLIAM A. STRUZINSKI  
B.A., Holy Cross College  
M.S., Purdue University  
M.S., Rensselaer Polytechnic Institute  
*(Physics)*
- DWIGHT T. TERRANCE  
B.S.B.A., State University of New York—  
Buffalo  
*(Data Processing)*
- GERALD J. THOMPSON  
B.S., Manhattan College  
*(Data Processing)*
- GEORGE VOLKOV JR.  
B.S., University of Connecticut  
M.S., University of Connecticut  
*(Data Processing)*
- LAWRENCE WENZEL  
A.S., Thames Valley State Technical College  
*(Fire)*
- ROGER WILLIAMS  
B.A., Providence College  
M.A.T., Connecticut College  
*(Mathematics)*
- JAMES M. WOODSIDE  
B.S.E.E., University of Maryland  
M.S.E.E., University of Connecticut  
*(Electrical)*
- HOWARD H. YOUNGCLAUS JR.  
B.S., U.S. Merchant Marine Academy  
B.S., University of Michigan  
*(Mechanical)*
- VICTOR C. J. ZIELINSKI  
B.A., Merrimack College  
M.A., Catholic University  
*(Data Processing)*

Location of  
**Thames Valley  
State Technical College**  
574 New London Turnpike  
Norwich, Conn.



NORTHEAST UTILITIES  
THAMES VALLEY STATE TECHNICAL COLLEGE  
NUCLEAR ENGINEERING TECHNOLOGY  
SELECTED SYLLABI

B/S

NUCLEAR ENGINEERING TECHNOLOGY

SELECTED SYLLABI

<u>Course Number</u>	<u>Course Title</u>
ET 213	AC/DC Machinery
ET 225	Electricity and Electronics
ET 239	Automated Process Control
IM 210	Personnel Management
IM 232	Principles of Supervision
MF 115	Non-Destructive Testing
MT 133	Applied Mechanics
MT 231	Applied Thermodynamics I
MT 232	Fluid Mechanics
MT 238	Applied Thermodynamics II
NS 120	Reactor Physics
NS 130	Reactor Chemistry
NS 210	Reactor Theory
NS 220	Nuclear Materials
NS 221	Introduction to Nuclear Systems
NS 222	Nuclear Radiation Health & Safety
NS 231	Topics in Nuclear Operations
NS 232	Nuclear Reactor Simulator

THAMES VALLEY STATE TECHNICAL COLLEGE

SYLLABUS

ET-213

AC/DC MACHINERY

4 CR.

3 Cl., 2 Lab., Hrs./Wk. -- 55 Hrs./QTR.

DESCRIPTION AND COURSE OBJECTIVE: A basic introduction to electrical machinery theory and operation. Direct current motors and generators, synchronous and induction machines and single phase motors are covered.

METHOD: Lectures, demonstrations, and laboratory

TEXT: Electric Circuits and Machines, Lister

A/V AIDS: A laboratory equipped with almost all of the machines studied.

REFERENCE: Electrical Machines, Direct and Alternating Current, Siskind.

PREREQUISITE: Electricity and Electronics, ET-225

COURSE OUTLINE

I.	INTRODUCTION TO MACHINERY TO BE STUDIED. . . . .	1 Hr.
II.	REVIEW OF ELECTROMAGNETIC INDUCTION. . . . .	1 Hr.
III.	DIRECT CURRENT GENERATORS. . . . .	4 Hrs.
IV.	DIRECT CURRENT MOTORS & CONTROLLERS. . . . .	5 Hrs.
V.	REVIEW OF A.C. SINGLE-PHASE CIRCUITS. . . . .	.3 Hrs.
VI.	THREE-PHASE CIRCUITS. . . . .	.3 Hrs.
VII.	ALTERNATING-CURRENT GENERATORS. . . . .	.4 Hrs.
VIII.	POLYPHASE-INDUCTION MOTORS. . . . .	.4 Hrs.
IX.	SYNCHRONOUS MOTORS AND ALTERNATORS. . . . .	.4 Hrs.
X.	SINGLE PHASE MOTORS. . . . .	4 Hrs.
XI.	SINGLE PHASE MOTORS. . . . .	4 Hrs.
	T O T A L	33 Hrs.

LABORATORY EXPERIMENTS

1. D.C. Generator magnetization curve
2. D.C. Generator separately excited characteristic curves
3. Shunt and compound generator characteristics
4. D.C. motor characteristics
5. Induction motor characteristics
6. Synchronous motor and alternator characteristics
7. Single phase motor characteristics

ET-225

ELECTRICITY AND ELECTRONICS

4 CR.

For Chem., Mech., & Mfg.

3 cl., 2 lab., hrs./wk. -- 55 hrs./qtr.

DESCRIPTION AND COURSE OBJECTIVE: To provide a complete basic electricity course covering electrical fundamentals, AC and DC circuits, electromagnetic induction, AC and DC motors and generators, and instruments. Emphasis will be placed on basic theory, experimental procedure, and work habits.

METHOD: Lectures, demonstrations, illustration of equipment, laboratory work quizzes and examinations.

TEXT: Electricity and Electronics, Loper, Ahr, & Clendenning; Delmar

A/V AIDS: Much of the equipment that will be studied.

REFERENCES: Electric Circuits and Machines, Liston; McGraw-Hill  
Electrical and Electronic Engineering Fundamentals, Fitzgerald & Higgenbotham; McGraw-Hill

PREREQUISITES: None

NOTE: Former Title Was Electrical Applications

COURSE OUTLINE

- A. BASIC ELECTRICITY . . . . . 6 hrs.
  - 1. Electro statics
  - 2. Ohm's Law
  - 3. Wire resistance
  - 4. D.C. circuits
- B. POWER AND MAGNETISM . . . . . 6 hrs.
  - 1. Energy & Power
  - 2. Heating & lighting circuits
  - 3. Basic electromagnetism
  - 4. Measuring instruments
- C. ALTERNATING CURRENTS . . . . . 7 hrs.
  - 1. Induction
  - 2. Transformers
  - 3. Capacitance
  - 4. Resonance
- D. ENERGY TRANSFORMATION MACHINES . . . . . 7 hrs.
  - 1. Electromagnetic generators
  - 2. D.C. motors
  - 3. A.C. motors
- E. MISCELLANEOUS . . . . . 7 hrs.
  - 1. Liquids & gases
  - 2. Batteries
  - 3. Other electrical sources

LABORATORY EXPERIMENTS

22 hrs.

- |  |  |
|--|--|
| 1. Ohmmeters & the resistor color code           | 6. Oscilloscope voltage measurements   |
| 2. Connection & reading of ammeters & voltmeters | 7. Oscilloscope frequency measurements |
| 3. Series circuits                               | 8. Transformer characteristics         |
| 4. Parallel circuits                             | 9. Impedance measurements              |
| 5. Watt meters                                   | 10. Phase angle measurement            |

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

ET-239

AUTOMATIC PROCESS CONTROL SYSTEMS

4 CR.

3 Cl. 2 Lab Hr./Wk - 55 Hr./Qt.

DESCRIPTION AND

COURSE OBJECTIVE: An introduction to the fundamentals of closed loop process control systems. To familiarize the student with the type of components that make up typical process control systems and to examine their affect on closed loop system performance.

METHOD: Lecture & Laboratory experiment

TEXT: Intro. Control System Technology/Bateson

REFERENCES: Fund. of Auto. Control/Weyrick

PREREQUISITES: MA-210, PH-111, ET-213

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COURSE OUTLINE

I.	System Components/Transducers . . . . .	8 Hrs.
II.	Laplace Transform . . . . .	6 Hrs.
III.	Controllers . . . . .	5 Hrs.
IV.	Actuators . . . . .	3 Hrs.
V.	Differential Equations . . . . .	5 Hrs.
VI.	Block Diagrams/Steady State Error/Transcient Responce . . . . .	6 Hrs.

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LABORATORY PROJECTS - 22 Hrs.

1. Open vs closed Loop Control.
2. Intro. Operational Amplifier.
3. Integrator
4. First Order System Simulation.
5. Second Order System Simulation.
6. Relay/Home Heating System.
7. DC Motor/Tach characteristics
8. Speed Control System.

IM210

Personnel Management

4 cr.

4cl. 0 lab = 44 hrs./qtr.

COURSE OBJECTIVE: To acquaint the student with contemporary theory and practices relating to the management of people as well as the basic personnel processes that are involved in the procurement, motivation and maintenance of these human resources.

METHOD: Lectures, discussions and case studies.

TEXT: Personnel Management by Chrudden and Sherman. ✓

A/V AIDS: At discretion of Instructor.

REFERENCES: Management of Personnel: Manpower Management and Organizational Behavior by Dunn and Stephens.

PREREQUISITES: NONE

COURSE OUTLINE

- A. The Personnel Management System. . . . . 4 hrs.
  - 1. The Role of Personnel Management
  - 2. The Organization of Work and Jobs
  - 3. The Organization of Personnel
  - 4. The Program for Personnel Management
- B. Staffing the Organization . . . . . 8 hrs.
  - 1. Personnel Recruitment
  - 2. Selection
  - 3. Personnel Assessment
- C. Maximizing Employee Potential. . . . . 8 hrs.
  - 1. Employee Development
  - 2. Management Development
  - 3. Performance Evaluation
  - 4. Motivation and Job Satisfaction
- D. Organizational Behavior . . . . . 8 hrs.
  - 1. Organizational Climate for Work
  - 2. Communication
  - 3. Leadership and Supervision
  - 4. Administering Change
- E. Management=Labor Relations . . . . . 4 hrs.
  - 1. The Union and Personnel Management
  - 2. Union=Management Relations
  - 3. Reducing Labor Relations Problems
- F. Remuneration and Security . . . . . 8 hrs.
  - 1. Wage and Salary Administration
  - 2. Financial Incentives
  - 3. Employee Security
  - 4. Fringe Benefits
- G. Assessment and Research . . . . . 4 hrs.
  - 1. Appraisal and Research
  - 2. Personnel Management in the Future

## SYLLABUS

## PRINCIPLES OF SUPERVISION

IM-232

3 CR.

Formerly as 230

3 Cl. Hr./Wk-33 HR.

DESCRIPTION AND COURSE OBJECTIVE: Emphasis on the human aspects of supervision. The concepts of motivation, moral, and leadership are presented from the point of view that social systems, individuals and organizations are interrelated.

METHOD: Lectures, student participation in typical case studies, and roll-playing.

TEXT: Supervision, A Practical Guide to First Line Mgmt.-Kossen, H. R.

A/V AIDS: As selected by the instructor.

REFERENCES: Personnel Management by Chumfer/Sherman.  
Human Relations at Work by Davis (MC Graw-Hill).  
Human Behavior in Organizations by Sayles and Strauss (Prentice-Hall).

PREREQUISITES: Psychology and Sociology recommended.

COURSE OUTLINE

- I. INTRODUCTION..... 1
- II. MOTIVATING PEOPLE..... 8
  - a) Importance of Motivation
  - b) Human Needs as Motivators
  - c) Adapting Jobs to Human Needs
- III. SOCIAL SYSTEMS RELATED TO SUPERVISION....10
  - a) Formal Organizations
  - b) Informal Groups
  - c) Leadership Qualities
  - d) Discipline and Disciplinary Action
- IV. COMMUNICATION.....12
  - a) Problems
  - b) Approaches to Good Communications
  - c) Outside Forces Affecting Communications
  - d) Instituting Change
- V. COURSE SUMMARY..... 1

SYLLABUS

MF-115

NONDESTRUCTIVE TESTING I

3 CR.

3 Hr./Wk. - 33 HRS.

DESCRIPTION AND COURSE OBJECTIVE: The student is introduced to an overview of Non-destructive Testing. Subjects will include metallurgical and design considerations, personal certification, penetrants, magnetic particle, eddy current, ultrasonics, radiography and other unique NDT methods.

METHOD: Lecture, demonstrations and films.

TEXT: Home Study & Ext. Courses (set of 9 booklets) American Society of Metals & NDT (Materials Engineering Institute).

A/V AIDS: Industrial training, films and cassettes

REFERENCES: Non-destructive Testing Handbook.

PREREQUISITES: High School Geometry and Trigonometry.

COURSE OUTLINES

1. INTRODUCTION . . . . . 2 Hrs.  
a) Purpose & objectives, b) Basic elements required in NDT,  
c) Classification of discontinuities.
2. LIQUID PENETRANT INSPECTION . . . . . 3 Hrs.  
a) Basic principles and methods, b) Interpretation of results,  
c) Advantages and disadvantages, d) Specifications.
3. MAGNETIC PARTICLE INSPECTION . . . . . 6 Hrs.  
a) Basic principles and methods, b) Principles of magnetism,  
c) Magnetic field strengths, d) Application & Interpretation,  
e) Demagnetization, f) Specifications.
4. MATERIAL AND MANUFACTURING DEFECTS . . . . . 3 Hrs.  
a) Discontinuities, (1) Inherent, (2) Primary & secondary  
processing, (3) Service, (4) Weld, b) Severity & Classification,  
c) Interpretation.
5. ULTRASONIC TESTING . . . . . 9 Hrs.  
a) Sound wave types, propagation, & nodes, b) Frequency & velocity,  
c) Field Effects, d) Acoustic impedance, e) Transmission, reflec-  
tion & immersion, f) Applications, g) Transducers, CRT, & other  
equipment use, h) ABC-Scan.
6. EDDY CURRENT TESTINGS . . . . . 1 Hr.
7. RADIOGRAPHY . . . . . 6 Hrs.  
a) X-ray & Gamma radiation, (1) Generation, penetration, sensitivity,  
(2) Equipment & safety, (3) Radioisotopes, (4) Calculation &  
interpretation, (5) Other unique NDT methods, (6) Application.
8. REVIEW AND FINAL EXAMS . . . . . 3 Hrs.

COURSE OBJECTIVE: To acquaint the student with the constitution, properties, and characteristics of engineering materials. Develop working understanding of physical metallurgy skill in metallographic techniques and heat treating, and the use of associated laboratory apparatus.

METHOD: Lectures, demonstrations, special assignments, laboratory equipment.

TEXT: 1) Metallurgy & metallography Engr. - 3rd Ed., Kehl (M.H.)  
2) Material science & metallurgy, 3rd Ed., Pollack (P.H.)

A/V AIDS: Overhead projector, models, films.

REFERENCES: ASM Handbook, Tool Engineers Handbook, ASTM Handbook, Non-destructive Testing Handbook, Machinery Handbook, SPE Handbook, Materials Selector.

PREREQUISITES: Principles of Chemistry, MFG Process I desirable.

NOTE: ME-212 is equivalent to MT-212 and MT-221

#### COURSE OUTLINE

- |       |   |        |
|-------|---|--------|
| I.    | <u>PHYSICAL REQUIREMENTS OF MATERIALS.</u> . . . . .  | 3 Hrs. |
| II.   | <u>ATOMIC ARRANGEMENT:</u> (a) Crystal Structure, (b) Phases. . . . .   | 2 Hrs. |
| III.  | <u>STRUCTURAL IMPERFECTIONS AND ATOM MOVEMENTS:</u> (a) Impure phases,<br>(b) Crystal imperfection, (c) Atom movements. . . . .   | 3 Hrs. |
| IV.   | <u>METALLIC PHASES AND THEIR PROPERTIES:</u> (a) Single-phase metals,<br>(b) Deformation metals, (c) Failure of metals. . . . .   | 6 Hrs. |
| V.    | <u>IRON CARBON ALLOYS:</u> (a) FeC phase diagrams, (b) Austenite,<br>(c) Ferrite, (d) Pearlite, (e) cementite, etc. . . . .   | 2 Hrs. |
| VI.   | <u>REACTION WITHIN SOLID MATERIALS:</u> (a) Eutectoid, (b) Isothermal,<br>(c) Transformation, (d) Metastable phases. . . . .  | 2 Hrs. |
| VII.  | <u>MODIFICATION OF PROPERTIES:</u> (a) Isothermal transformation,<br>(b) Annealing, (c) Stress relieving, (d) Normalizing,<br>(e) Quenching, (f) Tempering, (g) Carburizing, (n) Hardenability. . . . . | 3 Hrs. |
| VIII. | <u>STABILITY OF MATERIALS IN SERVICE ENVIRONMENTS:</u> (a) Corrosion,<br>(b) Oxidation, (c) Radiation damage. . . . .   | 5 Hrs. |
| IX.   | <u>MULTIPLE MATERIALS - EQUILIBRIUM RELATIONSHIPS:</u> (a) Qualitative<br>phase relationship, (b) Quantitative phase relationship. . . . .  | 3 Hrs. |
| X.    | <u>ORGANIC MATERIALS AND THEIR PROPERTIES.</u> . . . . .  | 2 Hrs. |
| XI.   | <u>CERAMIC PHASES AND THEIR PROPERTIES.</u> . . . . .   | 2 Hrs. |

#### LABORATORY EXPERIMENTS

The following experiments will be performed on a variety of ferrous & non-ferrous Metals.

1. METALLOGRAPHIC EXAMINATION - preparations of specimen, mounting, etching, microscopic examination and photographing.
2. MECHANICAL TESTING - Hardness: Rockwell, Brinell, etc; tension, compression, impact ductility.
3. HEAT TREATMENT - Hardening: water, oil & air quench, carburizing, annealing & tempering; hardenability: Jominy End Quench Test.

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

MT-133

APPLIED MECHANICS

4 cr.

4 cl. hrs. -- 44 hrs./qtr.

DESCRIPTION AND COURSE OBJECTIVE: To provide a foundation for force and stress analysis work and to introduce dynamics. A study of forces on structures in equilibrium, including forces in two- and three- dimensional structures. Also presented are the concepts of centroids, center of gravity, and moment of inertia.

METHOD: Lectures, problem sessions, demonstrations, and quizzes.

TEXT: Applied Engineering Mechanics, Jensen/Chenoweth, 3rd edition.

A/V AIDS: Truss units, weights, scales, flexible track unit, moment of inertia, set, rotator.

REFERENCES: Engineering Mechanics, Fairman and Cutshall  
Engineering Mechanics, F.L. Singer  
Engineering Mechanics, Higdon and Stiles

PREREQUISITES: MA-120, PH111

COURSE OUTLINE

A. Basic Principles . . . . .	3 hrs.
B. Coplanar Forces and Couples. . . . .	4 hrs.
C. Equilibrium of Rigid Bodies. . . . .	4 hrs.
D. Analysis of Trusses by Method of Joints. . . . .	3 hrs.
E. Analysis of Trusses by Method of Sections. . . . .	3 hrs.
F. Analysis of Frames . . . . .	3 hrs.
G. Analysis of Machines . . . . .	4 hrs.
H. Friction . . . . .	3 hrs.
I. Center of Gravity and Centroid . . . . .	3 hrs.
J. Distributed Forces . . . . .	2 hrs.
K. Moment of Inertia . . . . .	4 hrs.
L. Noncoplanar Forces and Couples . . . . .	4 hrs.
M. Equilibrium of Rigid Bodies in Three Dimen- sions. . . . .	4 hrs.

APPLIED WORK

Same Topics Listed Above Approximately 2 Hrs. Each

## THAMES VALLEY STATE TECHNICAL COLLEGE

## SYLLABUS

MT-231

APPLIED THERMODYNAMICS I

4 CR.

4 cl., 0 lab., -- 44 hrs./qtr.

DESCRIPTION AND COURSE OBJECTIVES: This is an introductory survey course in thermodynamics. The course objectives are to introduce the student to thermodynamic concepts such as enthalpy, entropy and energy balance equations. Generalized steady flow concepts will also be discussed.

METHOD: Lecture, demonstrations

TEXT: Basic Thermodynamics -- Skrotzki (McGraw-Hill)

A/V AIDS: None

REFERENCES: Thermodynamics -- Faires (McGraw Hill)  
Steam -- (Babcock and Wilcox)

PREREQUISITES: PH-121, MA-130

COURSE OUTLINE

Energy and Work . . . . .	2 hrs.
Heat and Gas Pressure . . . . .	2 hrs.
Perfect Gas Equation . . . . .	4 hrs.
Measuring Energy . . . . .	3 hrs.
Energy Equations of Gases . . . . .	6 hrs.
Carnot Engine . . . . .	4 hrs.
Entropy . . . . .	3 hrs.
Reversed Carnot Cycle . . . . .	2 hrs.
Process Irreversibilities . . . . .	3 hrs.
Basic Engine Cycles . . . . .	3 hrs.
Steady Flow Energy Equation . . . . .	4 hrs.
Vapor and Liquid Properties . . . . .	4 hrs.
Steam Processes . . . . .	4 hrs.
	<u>44 hrs.</u>

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

MT-232

FLUID MECHANICS

4 CR.

3 cl., 2 lab. hrs. wk. -- 55 hrs./qtr.

DESCRIPTION AND COURSE OBJECTIVE: This course is designed to develop a method of approach involved in the study of fluid motion. The philosophy of this course is to develop general relations and to organize experimental observations.

METHOD: Lecture, recitation, demonstrations, and laboratory experimentation.

TEXT: Introduction to Fluid Mechanics, Henke, R.W.

A/V AIDS: Scott Fluids Apparatus, Universal Saybolt Viscometer, Brookfield Viscometer.

COURSE OUTLINE

- |    |  |         |
|----|--|---------|
| A. | FLUID PROPERTIES AND FLUID STATICS . . . . .   | 5 hrs.  |
|    | 1. Fluids, Pressure, Force and Mass, Density, Equation of State for Gases.                           |         |
|    | 2. Pressure, Static Fluid, Manometers, Buoyancy  |         |
| B. | KINEMATICS OF FLUID FLOW . . . . .   | 3 hrs.  |
|    | 1. One-Dimensional Method, Equation of Continuity, Velocity Distribution.                            |         |
| C. | DYNAMIC EQUATION . . . . .   | 5 hrs.  |
|    | 1. Laws of Motion, Dynamic Equation with Friction, Linear Momentum for Steady Flow.                  |         |
| D. | ENERGY EQUATION FOR STEADY FLOW . . . . .  | 6 hrs.  |
|    | 1. Energy Equation, Friction, Enthalpy.  |         |
| E. | VISCOSITY . . . . .  | 2 hrs.  |
|    | 1. Definition, Units, Kinematic Viscosity.   |         |
| F. | DIMENSIONAL ANALYSIS . . . . .   | 3 hrs.  |
|    | 1. Dimensions, Dimensionless Groups.   |         |
| G. | FLOW OF INCOMPRESSIBLE FLUIDS IN PIPES . . . . .   | 5 hrs.  |
|    | 1. Laminar and Turbulent Flow, Energy Relations for Pipe Flow, Smooth and Rough Pipes, Other Losses. |         |
| H. | FORCES ON IMMERSED BODIES . . . . .  | 4 hrs.  |
|    | 1. Fluid Resistance, Drag Coefficients, Skin Friction, Lift.   | 33 hrs. |

LAB EXPERIMENTS

- |    |   |         |
|----|---|---------|
| 1. | Saybolt and Brookfield Viscometers . . . . .      | 6 hrs.  |
| 2. | Venturi Meter . . . . .                           | 2 hrs.  |
| 3. | Orifice Meter . . . . .                           | 2 hrs.  |
| 4. | Pressure Drop in Lines . . . . .                  | 4 hrs.  |
| 5. | Pressure Drop Across Valves . . . . .             | 2 hrs.  |
| 6. | Pressure Drop Around Corners . . . . .            | 2 hrs.  |
| 7. | Friction Factor Versus Reynold's Number . . . . . | 4 hrs.  |
|    |   | 22 hrs. |

THAMES VALLEY STATE TECHNICAL COLLEGE

SYLLABUS

MT-236

HEAT TRANSFER

4 CR.

3 Cl., 2 Lab. Hr./Wk. 55 Hr./Qtr.

DESCRIPTION AND COURSE OBJECTIVE: This course will include one and two dimension flow, principles of convection, conduction, and radiation. Steady state conditions will be investigated. Lectures will be supplemented by lab experiments and demonstrations.

TEXT: Applied Heat Transfer, Todd, Ellis

A/V AIDS:

REFERENCE: Shaums Outline Series

Prerequisites: MA-130, PH-121

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COURSE OUTLINE

I.	STEADY STATE CONDUCTION . . . . .	8 Hrs.
II.	STEADY STATE FREE CONVECTION . . . . .	4 Hrs.
III.	STEADY STATE FORCED CONVECTION . . . . .	5 Hrs.
IV.	BOILING . . . . .	3 Hrs.
V.	CONDENSATION . . . . .	3 Hrs.
VI.	RADIATION . . . . .	5 Hrs.
VII.	OVERALL HEAT TRANSFER AND APPLICATIONS . . . . .	4 Hrs.

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HEAT TRANSFER COURSE OUTLINE

INTRODUCTION CHAPTER #1 . . . . 1 HR.

- nature of head
- principals of dimensions and units
- conduction
- convection
- radiation

CONDUCTIONS CHAPTER #2 . . . . 7 HRS. INCLUDING TEST

- conductivity of material
- thermal conductions
- basic formulas
- conductivity of liquids
- conductivity of solids
- principals of insulation
- building materials and principals
- power line insulation
- R.V. & S.G. insulations
  - Reflective
  - conductive
- conduction paths
  - linear
  - parallel
- contact effects
- two dimensional paths
- extended surfaces
  - rods
  - fins
- heat sources
  - electric coils
  - fuel rods

EXAM - 2 HRS

FREE CONVECTION

- equations for h
- discussion of boundary layer
  - vertical surfaces
  - horizontal surfaces
  - horizontal cylinders
  - vertical cylinders

fluids vs. gases  
enclosed gas spaces (not chimneys)  
quis -  $\frac{1}{2}$  test 1 HR

#### FORCED CONVECTION

boundary layer

effect of flow

laminar

transitional

turbulent

critical

Dimensions parameters

Reynolds

Prandal

Nusselt

Gas flow

laminar

turbulent

fluid flow

laminar

turbulent

mechanical energy losses

s.g. tube flow conditions

use of McAdams ect

stanton number and large temperature difference

configuration effects

surface roughness

values

elbows

use of equivalent length and diameter

flow across cylinder

flow across flat plates

#### BOILING

types of boiling

pool - slow

forced - rapid

bubble formation and cooling

effect of surface temperature

need for pumping in unstable region

- fuel rods
- s.g. tubes
- boiling inside of tubes
- boilers
- non conventional uses
  - freeze drying - vacuum
  - distilling
  - condenser effect
- critical heat flux

#### RADIATION HEAT TRANSFER

- principals of light
  - reflection
  - refraction
  - absorption
- black and gray bodies
- received radiation
  - temperature
  - surface roughness
  - reradiation
- Monochromatic effect
- effect of particles
  - in flame
  - in atmosphere
- solar radiation
  - effect of atmosphere
  - effect of time of day
  - clouds
  - night-time reradiation
  - home heating
    - passive
    - active

#### OVERALL HEAT TRANSFER

- temperature gradiants
- use of U
- boilings
- heat exchangers
- heat pipes
- boilers

discussion of other methods  
temperature gradients  
relaxation method

TEST - 2 HRS  
overall review

## HEAT TRANSFER LAB #1

### PURPOSE:

The purpose of this lab is to understand the operation of flow meters, thermocouples, and heat exchangers.

### METHOD:

Calibrate and verify the operation of the thermocouples and switching systems. Find and record any errors. Calibrate and record flow rates for both flowmeters. Record data and check valve operation.

### RESULTS:

Perform heat balance results should be within 5%. No report required.

## Heat Transfer Lab #2

### PURPOSE:

The purpose of this lab is to determine the film coefficient and rate of heat transfer for a parallel flow heat exchanger. However at this point only a overall heat transfer coefficient will be found, the effect of outside temperature loss fluid flow velocities will be ignored.

### METHOD:

By determining the length and area of a heat transfer surface measure temperature differences. Assume fluid sectional temperature differences do not exist and entrance effects are minimal. As a way of proof vary flow rates and determine film coefficients for different flows and plot this data. In addition assume heat flow to the atmosphere is minimal.

### RESULTS:

Plot flow vs temperature change and determine surface coefficient. Discuss linearity of this result. Explain possible sources of error and list ways to improve your results.

## HEAT TRANSFER LAB #3

### PURPOSE:

The purpose of this lab is to calculate and verify the film coefficient for changing flow rates in a parallel flow heat exchanger. The verification of this film coefficient will be done in a similar manner to the procedure used in lab #2.

### METHOD:

By determining the length and area of a heat transfer surface measure temperature differences. Assume fluid sectional temperatures differences do not exist and entrance effects are minimal. Vary flow rate for laminas, transition, critical and turbulent flow. Calculate and verify film coefficient for each condition. Assume heat flow to the atmosphere is minimal but calculate and show in your report.

### RESULTS:

Calculate and plot film coefficient vs flow and compare to test valves. Explain possible sources of error and list ways to improve your results.

## HEAT TRANSFER LAB #4

### PURPOSE:

The purpose of this lab is to determine total heat transfer rates for a tube in tube heat exchanger for counter flow. In this lab all losses should be considered including losses to the atmosphere.

### METHOD:

By determining the length and area of the heat transfer surface both inside and outside determine heat flows both experimentally and analytically. Assume fluid cross sectional differences do not exist and entrance effects are minimal use turbulent flow only. Calculate and verify film coefficients for each condition.

### Results:

Calculate film coefficients for water to water and tube to air and compare to test values. Explain sources of error.



NS 110  
ATOMIC PHYSICS  
COURSE TOPICAL OUTLINE

- TEXTS
- A. Introduction to Atomic & Nuclear Physics, (4th Edition)  
by O. Oldenberg & W. Holloday  
Chapters 1-9, 11, 13, 14
- B. "Technical Physics", (2nd Edition), by F. Bueche  
Chapters 24, 30

CLASS HOURS	TOPICS	PAGES	PROBLEMS	SPECIAL ASSIGNMENT
1 Hr.	<u>ATOMIC HYPOTHESIS (A: Chapter 1)</u>			
	1.2 Avogadro's Hypothesis	3,4	1.1	Demonstration on Electrolysis of Water ( $\frac{1}{2}$ hr.)
	1.4 Atomic & Molecular Weights	4,5	1.3	
	1.5 A new unit of Mass	5,6	1.5	
2 Hrs.	<u>GASES (A: Chapter 2)</u>			
	2.1 Empirical Gas Laws	9,10	2.1,.2	Viscosity of a Gas ( $\frac{1}{2}$ Hr)
	2.2 Kinetic Theory of Gases	10,11	2.8	
	2.4 Specific Heats of Gases	13-15	2.12	
	2.6 Mean free Path	16,17		
	2.7 Estimates of Masses and Sizes of Molecules	17,18		
4 Hrs.	<u>ELECTROSTATICS (B: Chapter 24)</u>			
	24.1 Two Kinds of Charges	500-501	(1)	Demonstration of Static Charges ( $\frac{1}{2}$ Hr)
	24.6 Coulombs Laws	504-506	3,4	
	24.7 Superposition of Forces	506	7	
	24.8 The Electric Field	506-508	12	Gold Leaf
	24.9 Electric Field Intensity	508-509	10,16	<u>Electrometers</u>
	24.12 Batteries & Potential Dif.	512-514	18	Demonstration of
	24.13 Electric Potential Energy	514	24	Charges on Battery Plates ( $\frac{1}{2}$ hr)
TEST NO. 1	CHAPTERS 1, 2, 24	(1 HR.)		
3 Hrs.	<u>CHARGE/MASS RATIOS OF ELECTRONS AND IONS (A: Chapter 4)</u>			
	4.1 Faraday's Law of Electrolysis	37,38		Demonstration e/m Vacuum Tube & Hemholtz Coil (2 Hrs)
	4.2 e/m of Cathode-rays	39-47	4.1,.3	
	4.3 e/m of Positive-ray	55-58	4.7,.8 4.15	
1 Hr.	<u>DETERMINATION OF CHARGE ON THE ELECTRON (A: Chapter 5)</u>			
	5.2 Masses of Atoms & Molecules	63-64	5.1 5.2	Milikens Oil Drop Experiment
	5.3 Electron Volt	64	5.4,.5	
2 Hr.	<u>NUCLEAR ATOMS (A: Chapter 7)</u>			
	7.1 Discovery of Nuclear Atom	83-86	7.1,.2	Films (1 Hr)
	7.2 Charge of Nucleus	87	7.3	
	7.3 Size of Nucleus	87-88	7.4	
2 Hrs.	<u>RELATIVITY (A: Chapter 3)</u>			
	3.1 Newtonian Relativity	23-24	3.1,.2,	Michelson Morely Experiment
	3.2 Einstein Relativity & Equivalence of Mass & Energy	26-35	.3	

2 Hrs.	<u>PHOTOELECTRIC EFFECT (A: Chapter 6)</u>			
	6.1 Experimental Facts	69-73	6.1,.3,	Demonstration of Photoelectric Effect (1 Hr)
	6.2 Conflicts with Classical Theory	73-74	.7	
	6.3 Quantum Theory	74-76		
<hr/>				
TEST NO. 2	CHAPTERS 3, 4, 5, 6, 7 (1 HR.)			
5 Hrs.	<u>BOHR'S THEORY (A: Chapter 8)</u>			
	8.1 Spectrum of the Hydrogen Atom	91-93		Demonstration Crook's Tubes
	8.2 Conflict with E.M. Theory	94		
	8.3 Gravitational Motion	94-96	8.3,.4,	Spectrums of Gases (1 Hr)
	8.4 Bohr	96-99	.5	
	8.5 Conclusions	98-103		
	8.6 Applications to He <sup>+</sup>	103-106	8.6,.7	Electromagnetic Spectrum
	8.7 Further Developments	106-108		
3 Hrs.	<u>OTHER ATOMIC SPECTRA (A: Chapter 9)</u>			
	9.1 Energy Level Diagrams	111-114		Diagrams of Energy Levels
	9.2 Quantum Numbers	114		
	9.3 Electron Spin	114-115		(1 Hr)
	9.4 Zeeman Effect	116-118		
	9.5 Two Electron Systems	118-119	9.2,.3	
	9.6 Nuclear Spin	119		
	9.8 Displacement Lows	121		
	9.9 Energy of Ionization	122		Lasers Joint with Chapter 11
	9.10 Metastable States	122-123		
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TEST NO. 3	CHAPTERS 8, 9 (1 HR.)			
2 Hrs.	<u>FUNDAMENTAL PROCESSES (A: Chapter 11)</u>			
	11.1 Excitation by Electron Impact	131-134	11.2,.3,	Lab Demonstration Absorption & Mercury Excitation (1 Hr)
	11.2 Electric Discharge Thru Gases	134-139	.4	
	11.4 Absorption Spectra	140-145		
	<u>X-RAYS (A: Chapter 13)</u>			
	13.1 Properties	167-178	13.1,.4,	Bremsstrahlung Radiation & Maxwell Moseley Diagrams & Shell Theory
	13.2 X-Ray Spectra	180-193	.7	
	13.3 Compton Effect	193-197	.15,.16	
3 Hrs.	<u>WAVE MECHANICS (A: Chapter 14)</u>			
	14.1 Diffraction of Electrons	201-204	14.1,.2,	Uncertainty Principle & Limitations of Measurement and Prediction
	14.2 DeBroglie Waves	204-207	.3,.4	
	14.3 Schrodinger Equation	207-209		
	14.5 Conclusions from Schrodinger Equations	210-214		
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TEST NO. 4	CHAPTERS 11, 13, 14 (1 Hr.)			

THAMES VALLEY STATE TECHNICAL COLLEGE  
Syllabus

NS 120

REACTOR PHYSICS

3 CR

3 Cl. Hr./Wk. - 33 Qtr. Hr.

COURSE DESCRIPTION: This course is an introduction to basic concepts associated with Nuclear Reactor Physics. Topics covered include nuclear energy and forces, radioactivity, nuclear reactions, fission, fusion, nuclear reactor types, and radiation detection.

METHOD: Lecture, Homework, Quizzes, Examinations

TEXT: Basic Nuclear Engineering, Foster and Wright, 4th Edition

A/V AIDS: Chalkboard, Chart of Nuclides (Chart), General Electric Co.

REFERENCES: Chart of Nuclides (Booklet), General Electric Co.

PREREQUISITES: PH 111 Physics (Mechanics), PH 121 Physics (Heat, Sound, Light),  
NS 110 Atomic Physics, MA 130 Calculus 1 (may be taken concurrently)

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COURSE OUTLINE

<u>PART I</u>	<u>INTRODUCTION</u> . . . . .	6 Hrs
<u>PART II</u>	<u>NUCLEAR ENERGY AND FORCES</u> . . . . .	4 Hrs
	1. Binding Energy	
	2. Nuclear Stability	
<u>PART III</u>	<u>RADIOACTIVITY.</u> . . . . .	3 Hrs
	1. Decay Process	
	2. Decay Rate and Half-life	
<u>PART IV</u>	<u>NUCLEAR REACTIONS</u> . . . . .	10 Hrs
	1. Types of Radiation and Interactions	
	2. Cross Section	
	3. Flux and Interaction Rate	
	4. Slowing Down of Neutrons	
<u>PART V</u>	<u>NUCLEAR FISSION AND FUSION</u> . . . . .	4 Hrs
	1. Mechanism	
	2. Products	
<u>PART VI</u>	<u>NUCLEAR REACTOR TYPES</u> . . . . .	1 Hrs
	1. Homogeneous/Heterogeneous	
	2. Power Reactors	
<u>PART VII</u>	<u>RADIATION DETECTION</u> . . . . .	5 Hrs
	1. Ionization in an Electric Field	
	2. Types of Detectors	

September 4, 1984

TOPICAL REVIEW  
of  
PHYSICS FUNDAMENTALS  
for  
NS 120 REACTOR PHYSICS

<u>TOPICS</u>	<u>SUGGESTED REVIEW</u>
<u>SYSTEMS OF UNITS</u>	
Metric	A: 4.3
SI System	A: 4.6
British	A: 4.7
<u>NEWTON'S LAWS</u>	
First Law	A: 4.1
Third Law	A: 4.2
Second Law	A: 4.4
<u>WORK &amp; ENERGY</u>	
Work	A: 7.1; 7.2
Energy	A: 7.5; 7.7; 7.8
Conservation of Energy	A: 7.9
<u>MOMENTUM</u>	
Linear Momentum	A: 9.2
Conservation of Lin. Momentum	A: 9.3
Collisions in Two Dimensions	A: 9.4
Perfectly Elastic Collisions	A: 9.5

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A. Text for PH 111 Physics (Mechanics), Technical Physics, 2nd  
Bueche

TOPICAL REVIEW  
of  
ATOMIC PHYSICS FUNDAMENTALS  
for  
NS 120 REACTOR PHYSICS

<u>TOPICS</u>	<u>SUGGESTED REVIEW</u>
 <u>ELECTROSTATICS</u>	
Two Kinds of Charges	A: 24.1
Charges within Atoms	A: 24.2
Unit of Charge	A: 24.3
Coulomb's Law	A: 24.6
 <u>ELECTROMAGNETIC WAVES</u>	
Speed & Nature of E/M Waves	A: 30.3
Photoelectric Effect	A: 30.7
BOHR Atomic Theory	A: 30.9; B: p.35
X-Rays	A: 30.13; B: p.40
Debroglie Waves	A: 30.13; B: p.40
Absorption of E/M Waves	A: 30.14
 <u>ATOMIC STRUCTURE</u>	
Atomic Nucleus	A: 32.1
Protons	
Neutrons	
Atomic Number	A: 32.3
Atomic Mass	A: 32.3
Isotopes	A: 32.3; B: p.28
Isotones	B: p.29
Isobars	B: p.29
Isomers	B: p.53
Symbols for Isotopes	A: 32.4; B: p.28
 <u>MASS-ENERGY RELATION</u>	
	A: 32.7

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A. Text for PH 111 PHYSICS (Mechanics), Technical Physics, 2nd  
Bueche

B. Text for NS 120 REACTOR PHYSICS, Basic Nuclear Engineering,  
4th, Foster & Wright

NS 120 REACTOR PHYSICS  
Course Topical Outline

## TOPICS

INTRODUCTION	READING	HOURS
Physics in Nuclear Power Plants		1
Nuclear Fission Reactor (Basic)		
Core (Fuel)		
Moderator		
Control Rods		
Coolant		
Containment		
Physics Fundamentals (Review)		3
Atomic Physics Fundamentals (Review)		2
<b>NUCLEAR ENERGY &amp; FORCES</b>		<b>3</b>
Mass Defect	A: 32.5	
Mass Energy Relation	A: 32.7	
Binding Energy	A: 32.8; B: p.31	
Binding Energy per Nucleon	A: 32.8; B: p.31	
Fusion v. Fission	B: p.32	
Nuclear Stability		
Electrostatic Forces		
Nuclear Forces		
Neutron-Proton Ratio		
EXAM NO. 1 (September 25) . . . . .		1
<b>RADIOACTIVITY</b>	A: 32.9; B: p.46	<b>3</b>
Decay Process	B: p.46	
Alpha	B: p.48	
Beta	B: p.49	
Electron Capture	B: p.51	
X-Ray		
Proton Decay	B: p.53	
Neutron Emission	B: p.53	
Isomeric Transition	B: p.53	
Gamma		
Internal Conversion	B: p.53	
Decay Rate	A: 32.11; B: p:55	
Decay Constant	A: 32.11; B: p:55	
Halflife	A: 32.11; B: p.55	
Radioactive Series	A: 32.12	
Chart of Nuclides		
Activity of Radioactive Substances	A: 32.13; B: p.55	
<b>NUCLEAR REACTIONS (INTERACTIONS OF RADIATION WITH MATTER)</b>		<b>9</b>
Compound Nucleus	B: p.67	
Tunneling	B: p.67	
Scattering	B: p.72	
Elastic	B: p.72	
Inelastic	B: p.72	
Radiative Capture	B: p.72	
Charged Particle Interactions (Alpha, Beta, Proton)	B: p.110; B; p.114	

(Continued)

TOPICS (Nuclear Reactions . . . Continued)	READING	HOURS
Ionization		
Absorption		
Bremsstrahlung Radiation	B: p.40, p.115	
Cerenkov Radiation		
Gamma Interactions	B: p.118	
Photoelectric Effect	B: p.118	
Compton Effect	B: p.118	
Pair Production	B: p.118	
Gamma Attenuation	B: p.118	
Linear Abs. Coef.	B: p.118	
Halfthickness	B: p.120	
Neutron Interactions	B: p.195	
Neutron Energy (Velocity)		
Fast		
Epithermal (Resonance)		
Slow (Thermal)		
Interaction Probability (Cross Section)	B: p.195	
Types of Interactions & Cross Section		
Scattering	B: p.195	
Elastic	B: p.195	
Inelastic	B: p.196	
Absorption	B: p.196	
Radioactive Capture	B: p.196	
Capture with Particle Emission	B: p.196	
Fission	B: p.196	
Attenuation of a Neutron Beam	B: p.197	
Mean Free Path	B: p.198	
Total Cross Section	B: p.199	
Cross Section Variation (with Neutron energy)	B: p.200, p.207	
Doppler Effect		
Neutron Flux	B: p.208	
Interaction Rate	B: p.208	
Slowing Down of Neutrons (Moderation)	B: p.226	
Logarithmic Energy Decrement	B: p.232	
Slowing Down Power (Macro)	B: p.235	
Moderating Ratio	B: p.235	
EXAM NO. 2 (October 29) . . . . .		1
NUCLEAR FISSION	A: 32.17; B: p.4, 74	4
Fissile Material		
Fission Mechanism (Liquid Drop Model)	A: p.74	
Critical Mass	A: 32.18	
Critical Energy	A: 32.18	
Fission Cross Section		
Fission Neutrons	B: p.74	
Prompt		
Delayed		
Fission Gamma		
Fission Fragments	B: p.75	
Fission Energy Distribution	B: p.76	
Fertile Material	B: p.77	
Post Shutdown Heat Release		
Post Shutdown Radioactivity		
NUCLEAR FUSION	A: 32.20; B: p.78	

TOPIC	READING	HOURS
<b>NUCLEAR REACTOR TYPES</b>		1
Homogeneous		
Heterogeneous		
Breeder/Converter		
Experimental		
Power Reactor		
Pressurized Water		
Boiling Water		
<b>RADIATION DETECTION</b>		3
Ionization in an Elec. Field	A: 24.9; 30.10; B; p.121	
Types of Detectors		
Electrostatic Dosimeters	B: p.121	
Ion Chambers	B: p.123	
Proportional Counters	B: p.124	
Geiger-Muller Counters	B: p.126	
Scintillation Counters	B: p.128	
Neutron Detectors	B: p.131	
Fission Chambers	B: p.132	
Fast Neutron Detectors	B: p.133	
Thermoluminescent Dosimeters	B: p.137	
Photographic Emulsions		
REVIEW-EXAM NO. 3 (November 20) . . . . .		2

- A. Text for PH 111 Physics (Mechanics), Technical Physics, 2nd, Bueche
- B. Text for NS 120 Reactor Physics, Basic Nuclear Engineering, 4th, Foster & Wright

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

NS 130

REACTOR CHEMISTRY

3 CR

3 Cl. Hr./Wk. - 33 Qtr. Hr.

COURSE DESCRIPTION: This course is an introduction to basic concepts associated with Nuclear Reactor Chemistry. Topics covered include principles of corrosion, corrosion mechanisms, corrosion control practices and important nuclear chemistry reactions.

METHOD: Lecture, Homework, Quizzes, Examinations

TEXT: (None)

A/V AIDS: Chalkboard, Chart of Nuclides (Chart), General Electric Co; Periodic Chart of Elements

REFERENCES: Chart of Nuclides (Booklet), General Electric Co.

PREREQUISITES: Principles of Chemistry, CH122  
Calculus I, MA-130, (may be taken concurrently)

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COURSE OUTLINE

PART I INTRODUCTION . . . . . 8 Hrs

PART II CORROSION. . . . . 19 Hrs

1. Principles of Electrochemistry
2. Corrosion Mechanisms
3. Types of Damage
4. Factors Affecting Corrosion Rate & Potential
5. Corrosion Control Practices

PART III NUCLEAR REACTIONS. . . . . 6 Hrs

1. Activation Products
2. Fission Products and Fuel Element Integrity
3. Chemical Shim

September 4, 1984

TOPICAL REVIEW  
OF  
CHEMISTRY FUNDAMENTALS  
FOR  
NS 130 REACTOR CHEMISTRY

TOPICS	SUGGESTED REVIEW
Measurement	C: 1.3
Conversion Factors	C: 1.5
Unit Cancellation Method	
Classification of Matter	C: 1.6
Elements	
Compounds	
Mixtures	
Solutions	
States of Matter	C: 1.6
Conservation of Mass	C: 1.6
Laws of Constant & Multiple Proportions	C: 2.2
Dalton's Atomic Theory	C: 2.3
Atomic and Formula (Molecular) Weight	C: 2.4
Mole	C: 2.5
Gram Atomic Weight	
Gram Formula (Molecular) Weight	
Equivalent Weight	
Gram Equivalent Weight (Equivalents)	
Balancing Chemical Equations	C: 2.7
Composition (Synthesis)	
Decomposition	
Single Replacement	
Energy Associated With Chemical Reactions	C: 2.8
Exothermic	
Endothermic	
Stoichiometry Problems	C: 3 (ALL)
Periodic Table	C: 5.2
Periods	
Groups	
Electron Affinity	C: 5.5
Cations	C: 5.4
Anions	C: 5.5
Valence	C: 6.1
Chemical Bonds	
Ionic	C: 6.2
Covalent	C: 6.3
Polar	C: 6.7
Metallic	
Ideal Gases	
Boyles' Law	C: 8.3
Charles' Law	C: 8.4
Combined Law	C: 8.5
STP (Not the Old Additive)	C: 8.5
Ideal Gas Law	C: 8.7
Molar Volume	C: 8.7

## TOPICS (continued)

## SUGGESTED REVIEW

Avagadro's Principle	C: 8.6
Dalton's Law of Partial Pressure	C: 8.8
Real Gases (Deviations From Ideal)	C: 8.11
Electrolytes	C:10.3
Concentration	C:10.5
Molarity	C:10.5
Normality	C:10.5
Percent Solution	
Percent Concentration	C:10.5
Equilibrium Constants	C:10.5
Lechatelier's Principle	C:11.2; 11.3
Acids, Bases, Salts	C:11.4
Equilibrium Constant for Water	C:12.1; 12.2
PH	C:12.5
POH	C:12.6
Neutralization Reactions	C:12.7

C. Text For CH122, Principles of Chemistry, Fundamentals of Chemistry,  
Kostiner & Rea

September 4, 1984

NS 130  
 REACTOR CHEMISTRY  
 COURSE TOPICAL OUTLINE

TOPICS	READING	HOURS
<u>INTRODUCTION</u>		
Chemistry in Nuclear Power Plants		8
Chemistry Fundamentals (Review)		
Important Chemical Species		
Elements		
Radicals		
Isotopic Symbol Notation		
<u>CORROSION</u>		
Principles of Electrochemistry		8
Oxidation-Reduction (Redox) Equations	A: 13.2	
Balancing Redox Equations	A: 13.3	
EXAM NO. 1 (October 1) . . . . .		1
Electrochemical Cells		1
Galvanic (Voltaic)	A: 13.4	
Electrolytic	A: 13.5	
Electrode Potentials		2
Standard Potentials		
EMF Series		
Galvanic Series		
Faraday's Law	A: 13.8	
Polarization		2
Polarization Diagrams		
Pourbaix Diagrams		
Corrosion Mechanisms		2
Electrochemical Corrosion		
Erosion-Corrosion		
Stress Corrosion		
Hydrogen Embrittlement		
Types of Damage		2
General (Uniform) Attack		
Mechanical		
Fretting		
Cavitation		
Cracking		
Intergranular		
Stress Corrosion		
Chloride (Halogen)		
Caustic (Embrittlement)		
Hydrogen		
Pitting		
Crevice (Concent Ration Cell)		
Parting (Selective Leaching)		
Exfoliation		
EXAM NO. 2 . . . . .		1

## TOPICS

## READING

Page 2

HOURS

## (CORROSION . . .Continued)

Factors Affecting Corrosion Rate & Potential	2
Time	
Temperature	
Stress	
Concentration	
Electrode Area	
Impurities & Alloying	
PH	
Aeration (Oxygen)	
Flow Velocity	
Passive Films	
Inhibitors	
Radiation	
Scale and Sludge	
Corrosion Control Practices	3
Water Chemistry Control	
PH	
Oxygen and Gas	
Conductivity	
Solids	
System and Component Design	
Protective Films and Coatings	
Anodic and Cathodic Protection	

## NUCLEAR REACTIONS

4

Hydrogen-Oxygen & Water in a Radiation Field	
Activation Products in Nuclear Power Plants	
Source and Decay Chain	
Importance	
Crud and Crud Bursts	
Fission Products and Fuel Element Integrity	
Important Isotopes	
Source and Decay Chain	
Zirconium-Water Reaction	
Total Gas Control	
Chemical Shim (Boron)	
Nuclear Reaction	
Chemical Reaction	
Tritium Production	
Nitrogen Reaction	

REVIEW/EXAM NO. 3 (November 20, 21). . . . . 2

C. Text for CH122, Principles of Chemistry, Fundamentals of Chemistry,  
Kostiner & Rea

THAMES VALLEY STATE TECHNICAL COLLEGE  
Syllabus

NS 210

REACTOR THEORY

4 CR  
4 Cl. Hr./Wk. - 44 Qtr. Hr.

COURSE DESCRIPTION: This is an introduction to basic concepts associated with nuclear reactor theory. Topics covered include neutron moderation, steady state reactor, time dependent reactor, and reactor heat removal.

METHOD: Lecture, Homework, Quizzes, Examinations

TEXT: Basic Nuclear Engineering, Foster & Wright, 4th Edition

A/V AIDS: Chalkboard, Chart of Nuclides (Chart), General Electric Co.

REFERENCES: Chart of Nuclides (Booklet), General Electric Co.

PREREQUISITES: NS 120 Reactor Physics  
MA 210 Calculus II (May be taken concurrently)  
MT 236 Heat Transfer (Not mandatory, but highly desirable)

COURSE OUTLINE

- PART I SLOWING DOWN OF NEUTRONS (Moderation) . . . 4 Hrs
1. Energy Loss in a Collision
  2. Logarithmic Energy Decrement
  3. Transport Mean Free Path
- PART II STEADY STATE REACTOR . . . . . 20 Hrs
1. Neutron Balance
  2. Infinite Systems
  3. Finite Systems
  4. Single Group Diffusion Theory
- PART III TRANSIENT (TIME DEPENDENT) REACTOR . . . 10 Hrs
1. Neutron Lifetime
  2. Deviations from Criticality
  3. Delayed Neutrons
  4. Reactivity Change Mechanisms
  5. Reactivity Control Methods
- PART IV REACTOR HEAT REMOVAL . . . . . 10 Hrs
1. Heat Flow by Conduction
  2. Heat Flow to Coolants
  3. Temperature Distribution in Fuel Elements
  4. Departure from Nucleate Boiling

TOPICS	READING	PROBLEMS
I. NEUTRON SLOWING DOWN (Moderation) [12/4] Energy Loss in a Collision Scattering Angle Logarithmic Energy Decrement Lethargy Number of Collisions to Thermalize Macroscopic Slowing Down Power Moderating Ratio Transport Mean Free Path	<hr/> ↑ A: 232-239 B: 97-99 ↓ <hr/>	
II. STEADY STATE REACTOR Neutron Balance [12/7] Critical Subcritical Supercritical Infinite Systems [12/12] Infinite Multiplication Factor Four Factor Formula Fast Fission Factor Resonance Escape Probability Thermal Utilization Factor Reproduction Factor Homogeneous Heterogeneous Finite Systems [12/14] Effective Multiplication Factor Nonleakage Probability Neutron Current Density [12/19] Isotropy Anisotropy Single Group Diffusion Theory [12/19] Thermal Diffusion Length Buckling Nonleakage Probability Criticality Calculations [1/3]	<hr/> ↑ A: 243-253 B: 100-102; 103 ↓ <hr/> ↑ A: 253-257 B: 102-107 ↓ <hr/> ↑ A: 257-261 B: 107-113 ↓ <hr/>	
<u>EXAMINATION NO. 1 [January 4, 1985]</u> Bare Reactors Infinite Slab Parrallelepiped Spherical Cylindrical Critical Size/Mass Reflected Reactor Reflector Savings Other Criticality Calculation Methods [1/18] Two Group Diffusion Theory Slowing Down Length Fermi Age Migration Area Multigroup Diffusion Theory Transport Theory Monte Carlo	<hr/> ↑ A: 261-282 B: 107-113 ↓ <hr/> ↑ A: 282-287 ↓ <hr/> ↑ A: 295 B: 113-124 <hr/>	

## III. TIME DEPENDENT (TRANSIENT) REACTOR

Neutron Lifetime [1/24]  
 Slowing Down Time  
 Thermal Lifetime  
 Deviations from Criticality [1/24]  
 Excess Multiplication Factor  
 Reactivity  
 Units of Reactivity  
 Period (Folding Time)  
 Delayed Neutrons [1/25]  
 Average Neutron Lifetime  
 Effect of Delayed Neutrons  
 Diffusion Equation for a Transient Reactor [1/29]  
 Inhour Equation  
 Prompt Critical Condition  
 Excess Multiplication Factor  
 Subcritical Multiplication

## EXAMINATION NO. 2 [January 31, 1985]

Reactivity Change Mechanisms [2/1]  
 Fuel  
 Temperature  
 Motion  
 Moderator  
 Temperature  
 Density  
 Void  
 Fission Product Accumulation  
 Fission Product Poisoning (After Shutdown)  
 Fuel Depletion  
 Conversion  
 Reactivity Control Methods [2/8]  
 Production  
 Absorption  
 Control Rods  
 Effectiveness/Worth  
 Material  
 Insertions  
 Scram  
 Burnable Poisons  
 Soluble Poisons  
 Chemical Shim  
 Leakage  
 Inherent Stability  
 Power Distribution  
 Hot Channel Factor (Peaking)  
 Nuclear Hot Channel Factors  
 Engineering Hot Channel Factors

A: 299-301



A: 301-302

B: 129-137



A: 303-306

B: 129-137



A: 306-312

B: 137-139



A: 312-318

B: 139-144



A: 318-326



A: 326-328

B: 144-146



A: 328-330

B: 173-179

B: 185-192



A: 400-411

B: 179-185



A: 411-416

A: 420-423

A: 425-427

B: 185-190

## IV. REACTOR HEAT REMOVAL

Heat Flow by Conduction [2/13]  
 Heat Transfer to Coolants [2/15]  
 Convective  
 Boiling  
 Temperature Distribution in Fuel Elements [2/20]  
 Temperature Distribution in a Cooling Channel [2/21]  
 Departure from Nucleate Boiling (DNB) [2/26]  
 Burnout (Boiling Crisis)  
 Superheat  
 Heat Generation in Reflectors/Shields

EXAMINATION NO. 3 [March 1, 1985]

TEXTS:

- A. Basic Nuclear Engineering, 4th, Foster & Wright
- B. Nuclear Energy Technology, Knief

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

NS-220

Nuclear Materials

4 CR.

3 Cl., 2 Lab. Hrs./Wk. -- 55 Hrs./QTR.

COURSE DESCRIPTION: This course is an introduction to principles of mechanics of materials with applications to nuclear power. The effects of material irradiation encountered in nuclear power plants is also discussed.

METHOD: Lecture, homework, quizzes, examinations, laboratory projects.

TEXT: (1) Mechanics of Materials by Beer & Johnston (1981)  
(2) Basic Nuclear Engineering by Foster & Wright (4th Ed.)

A/V AIDS: Chalkboard

REFERENCES: ASTM Series

PREREQUISITES: MT-133 Applied Mechanics, NS-130 Reactor Chemistry, MF-212 Materials of Engineering, MA-130 Calculus I

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COURSE LECTURE SUMMARY

- I. MECHANICS OF MATERIALS. . . . . . 16 Hrs.  
A. Stress-strain      F. Creep  
B. Torsion            G. Pressure vessel strength/  
C. Bending                      combined stresses  
D. Buckling            H. Weld strength  
E. Fatigue
- II. BASIS FOR SELECTION OF TYPICAL NUCLEAR POWER  
PLANT MATERIALS. . . . . . 5 Hrs.  
A. Reactor Systems  
B. Nuclear Systems  
C. Steam Plant Systems
- III. EFFECTS OF MATERIAL IRRADIATION. . . . . . 9 Hrs.  
A. Crystal structure of metal  
B. Radiation damage mechanisms  
C. Temperature and mobility effects  
D. Radiation effects on material properties  
E. Other related radiation effects
- IV. EXAMINATIONS. . . . . . 3 Hrs.

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COURSE LABORATORY SUMMARY . . . . . 22 Hrs.

1. Laboratory introduction
2. Strain gage (installation & use)
3. Fatigue Testing (commence long term testing)
4. Corrosion Testing (Commence long term testing)
5. Tension-compression (uniaxial, bending, torsion)
6. Brittle fracture impact testing
7. Stress concentration testing
8. Thermal stress-strain testing
9. Fatigue testing (complete)
10. Corrosion testing (complete)
11. Seminar

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

NS-222

NUCLEAR RADIATION HEALTH and SAFETY

4 CR.

3 Cl., 2 Lab Hrs/wk.--- 55 Hrs/Qtr.

COURSE DESCRIPTION: This course is an introduction to basic concepts associated with Nuclear Physics and Nuclear Radiation Health and Safety. Topics covered include nuclear structure, radioactivity, interaction of radiation with matter, shielding, radiation measurement, exposure and biological effects.

METHOD: Lecture, Homework, Quizzes, Examinations, Laboratory projects.

TEXT: Radiotracer Methodology in the Biological Environmental, and Physical Sciences, (1975) By C.H. Wang, David L. Willis, and Walter D. Loveland.

A/V AIDS: Chalkboard, overhead projector.

REFERENCE: Chart of Nuclides (booklet), 13th Ed GE (required)

PREREQUISITES: CH122 Principles of Chemistry  
NS110 Atomic Physics  
MA130 Calculus I (may be taken concurrently)

COURSE LECTURE SUMMARY

I. <u>ATOMIC and NUCLEAR STRUCTURE</u> .....	1.5 Hrs.
II. <u>RADIOACTIVE DECAY and RADIATION</u> .....	3.0 Hrs.
III. <u>INTERACTION of RADIATION WITH MATTER</u> .....	4.5 Hrs.
IV. <u>RADIATION DETECTORS and MEASUREMENT</u> .....	10.5 Hrs.
V. <u>DOSE and EXPOSURE</u> .....	3.0 Hrs.
VI. <u>WASTE DISPOSAL</u> .....	1.5 Hrs.
VII. <u>BIOLOGICAL EFFECTS of RADIATION</u> .....	3.0 Hrs.
VIII <u>REGULATIONS</u> .....	3.0 Hrs.
IV. <u>EXAMS</u> .....	3.0 Hrs.

COURSE LABORATORY SUMMARY

- I. NATURAL BACKGROUND RADIATION
- II. CHART of NUCLIDES
- III SHIELDING
- IV. PORTABLE DETECTORS
- V. COUNTING SYSTEMS and COUNTING
- VI. AIR SAMPLING
- VII EXPOSURE and DOSE
- VIII NUCLEAR STATISTICS
- IX. NEUTRON FLUX

THAMES VALLEY STATE TECHNICAL COLLEGE  
Syllabus

NS 231                      Topics in Nuclear Operations                      3 CR

COURSE DESCRIPTION: This course will familiarize students with the issues and problems encountered in the actual operation of a commercial nuclear power plant. Normally scheduled during the last term of the program, it will synthesize and relate concepts covered in previous courses. Topics listed below are typical examples. Actual topics covered may vary with each term.

METHOD: Lectures, field trips, reports.

TEXT: Handouts by instructor(s), references.

A/V AIDS Chalkboard, slides, overhead, transparencies, films.

PRE-REQUISITES: Familiarity with nuclear theory, radioactivity, chemistry, materials, thermodynamics, fluid flow and plant systems.

TOPICS

1. Environmental Issues
2. Fuel Management
3. Turbine-Generator Theory & Problems
4. Component Failure and Analysis
5. Steam Generator Related Problems
6. Emergency Plan
7. Plant Licensing & Construction Process
8. Quality Assurance Program
9. Outage Management
10. Power Distribution Systems

THAMES VALLEY STATE TECHNICAL COLLEGE  
Syllabus

NS 221 Introduction To Nuclear Systems . . . . . 3 CR.

COURSE DESCRIPTION: This course is an introduction to the major component systems of a commercial nuclear power plant. Designed for the student with no prior knowledge of engineering principles, it adheres to a systemic approach to operations and explains the underlying theoretical principles. The course focuses on pressurized water reactor (PWR) plant design but discusses briefly the similarities and differences of a boiling water reactor (BWR).

METHOD: Lecture, Homework, Quizzes, Examinations

TEXT: An Introduction To Nuclear Systems, Prepared by Northeast Utilities, Nuclear Training Department

A/V Aids: Chalkboard, Slides, Overhead Transparencies

PREREQUISITES: None

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COURSE OUTLINE

PART I	<u>INTRODUCTION</u> . . . . .	3 Hours
PART II	<u>PRIMARY SYSTEMS</u> . . . . .	16 Hours
PART III	<u>SECONDARY SYSTEMS</u> . . . . .	6 Hours
PART IV	<u>INSTRUMENTATION AND CONTROL</u> . . . . .	5 Hours
PART V	<u>BOILING WATER REACTORS</u> . . . . .	3 Hours

NS 221  
Introduction To Nuclear Systems  
Course Topical Outline

<u>TOPICS</u>	<u>READING</u>
I. INTRODUCTION Nuclear Engineering Fundamentals	Chapter 1
II. PRIMARY SYSTEMS Reactor Coolant System Chemical and Volume Control System Shutdown Cooling System Engineered Safety Features Emergency Core Cooling Systems Containment	Chapter 2 Chapter 3 Chapter 4 Chapter 5 Chapter 6 Chapter 7
<u>EXAMINATION NO. 1</u> Cooling Water Systems Radioactive Waste Systems	Chapter 8 Chapter 9
III. SECONDARY SYSTEMS Main Steam System Feed and Condensate System Turbine Generator Electrical Distribution System <u>EXAMINATION NO. 2</u>	Chapter 10 Chapter 11 Chapter 12 Chapter 13
IV. INTRODUCTION TO INSTRUMENTATION AND CONTROLS Nuclear Instrumentation Rod Control and Position Indication Reactor Protection System	Chapter 14 Chapter 15 Chapter 16 Chapter 17
V. BOILING WATER REACTORS	Chapter 18
<u>FINAL EXAM</u>	

THAMES VALLEY STATE TECHNICAL COLLEGE  
SYLLABUS

NS 232

PO-3

NUCLEAR REACTOR SIMULATOR

2 CR.

1 Cl., 3 Lab Hrs/wk--- 44 Hrs/Otr.

COURSE DESCRIPTION: This course, utilizing a reactor plant concepts simulator, will introduce the student to basic power plant overall operation. Topics covered include primary and secondary systems, control and protective systems, plant startup and plant operation.

METHOD: Lecture, Homework, Quizzes, Examinations, Laboratory sessions.

TEXT: Nuclear Reactor Simulator Course, (1986) Nuclear Training, Combustion Engineering, Inc.

A/V AIDS: Chalkboard, Transparencies, Overhead and 35 mm Slide Projectors.

REFERENCE:

PREREQUISITES:

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COURSE LECTURE SUMMARY

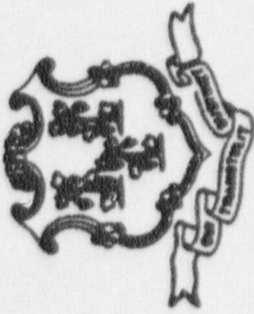
1.	<u>PRIMARY SYSTEMS OVERVIEW</u> .....	1.5 Hrs.
2.	<u>SECONDARY SYSTEMS OVERVIEW</u> .....	1.5 Hrs.
3.	<u>CONTROL SYSTEMS</u> .....	1.0 Hrs.
4.	<u>CONTROL ELEMENT DRIVE MECHANISM CONTROL SYSTEM</u> .....	0.5 Hrs.
5.	<u>NUCLEAR INSTRUMENTATION</u> .....	0.5 Hrs.
6.	<u>PLANT PROTECTION SYSTEMS</u> .....	1.0 Hrs.
7.	<u>GENERAL REACTOR OPERATING CHARACTERISTICS</u> .....	1.0 Hrs.
8.	<u>ESTIMATED CRITICAL POSITION CALCULATION</u> .....	1.0 Hrs.
9.	<u>PLANT STARTUP</u> .....	1.0 Hrs.

COURSE LABORATORY SUMMARY

1. INTRODUCTION TO THE CONCEPTS SIMULATOR
2. UP POWER AND DOWN POWER MANEUVER
3. DEMONSTRATION OF CONTROL SYSTEMS
4. DEMONSTRATION OF REACTOR PROTECTION OPERATION
5. ECP STARTUP
6. PLANT STARTUP
7. OPERATING EXAM

NUCLEAR TRAINING  
COMBUSTION ENGINEERING, INC.

STATE OF CONNECTICUT  
DEPARTMENT OF EDUCATION



**Vocational Improvement Practices  
Merit Award**

EDWIN RABINOWITZ

NUCLEAR ENGINEERING TECHNOLOGY

THAMES VALLEY STATE TECHNICAL COLLEGE

CHIEF EXECUTIVE: GEORGE D. HARRIS

B/9

*George D. Harris*  
Commissioner of Education

9-24-86  
Date

*Angela Feltus*  
Associate Commissioner

## **Nuclear Engineering Technology**

District/Agency: Thames Valley State Technical College

Chief Executive: George D. Harris

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### **Descriptors:**

Education and Business Collaboration, Technical Education.

### **Target Audience:**

High School graduates or GED diploma holders interested in working in the nuclear power industry.

### **Major Objectives:**

To fulfill the need for health physics, reactor engineering, and nuclear power plant maintenance technicians; to prepare students for careers as reactor operators; to increase the available number of qualified nuclear power industry personnel.

### **Overview:**

Nuclear Engineering Technology was implemented in 1983, in response to the need for degreed nuclear plant operators. Conducted at Thames Valley State Technical College, this two-year Associate Degree program, is 100 percent subsidized by Northeast Utilities. Most of the students are screened and supplied by Northeast Utilities. The program, proven to be a model in the East and throughout the country, consists of both lecture and laboratory components taught by staff at the college and highly specialized instructors from Northeast Utilities. Each class consists of 20 to 25 students.

### **Indicators of Success:**

All 23 program completers are currently employed by Northeast Utilities. The successful completion rate for students in the course has been nearly 100 percent. Northeast Utilities, for its efforts and accomplishments in student recruiting, has received many Affirmative Action Awards in connection with the program.

### **Resources Needed:**

A qualified technical staff, adequate laboratory resources and the cooperation, both financially and academically, of the nuclear power industry. First year costs, based on 25 students, are estimated to be \$200,000. Costs increased during the second year when two student groups were in session. Personnel - \$100,000; Facilities - \$40,000; Materials - \$10,000; Equipment - \$50,000.

### **Contact**

Edwin Rabinowitz  
Associate Dean/Program Administrator  
Thames Valley State Technical College  
574 New London Turnpike  
Norwich, CT 06360

### **Telephone:**

203-886-0177

### Thames Valley State Technical College

Thames Valley State Technical College is a two year technical institution affiliated with the state of Connecticut's system of higher education. The college occupies a two story complex housing classrooms, gymnasium, library, and well-equipped laboratories for physics, chemistry, computers, electricity and electronics, engineering design, materials testing, metallurgy, manufacturing and other technology courses. Thames Valley State Technical College is located at 574 New London Turnpike in Norwich, Connecticut. It is readily accessible from Route 2 and the Connecticut Turnpike.

## WHAT ABOUT FINANCIAL AID?

### Northeast Utilities Scholarship:

Many participants in the program are eligible for a special Nuclear Engineering Technologies scholarship from NU. This scholarship consists of:

- full tuition
- books
- \$400 per month for general expenses

### Summer Employment:

Participants in the program are given preferential treatment for summer employment in NU power generating facilities when appropriate positions are available.

## HOW TO FIND OUT MORE...

For more information, simply fill out the attached card and mail it to Northeast Utilities, or write:

TVSTC Program  
Nuclear Training Department  
Northeast Utilities  
P.O. Box 270  
Hartford, Connecticut 06141-0270

## BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO 4003 HARTFORD, CT

POSTAGE WILL BE PAID BY ADDRESSEE

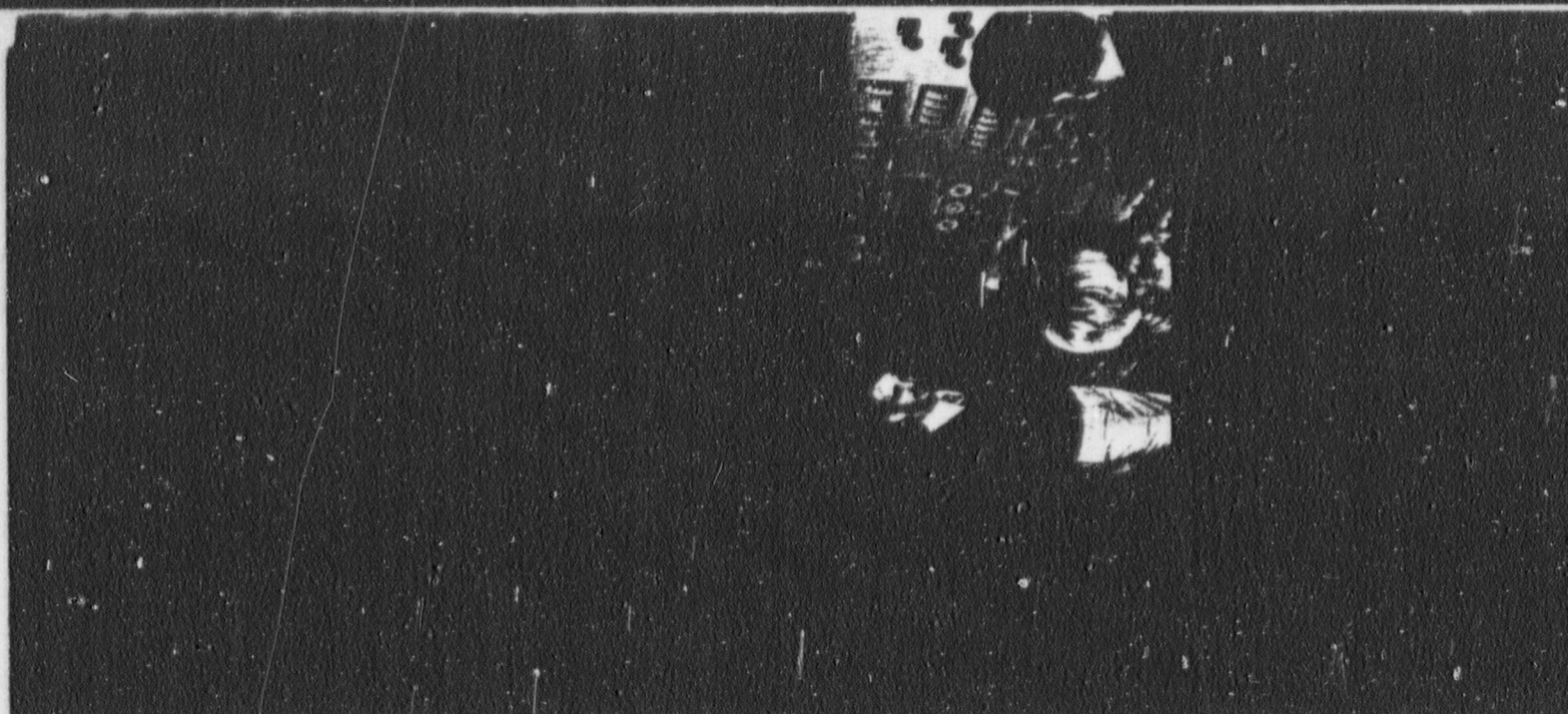
Nuclear Training Department  
Northeast Utilities  
P.O. Box 270  
Hartford, Connecticut 06141-0270

NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

### NORTHEAST UTILITIES



THE CONNECTICUT LIGHT AND POWER COMPANY  
WESTERN MASSACHUSETTS ELECTRIC COMPANY  
NEW YORK WATER POWER COMPANY  
NORTHEAST UTILITIES SERVICE COMPANY  
NORTHEAST NUCLEAR ENERGY COMPANY



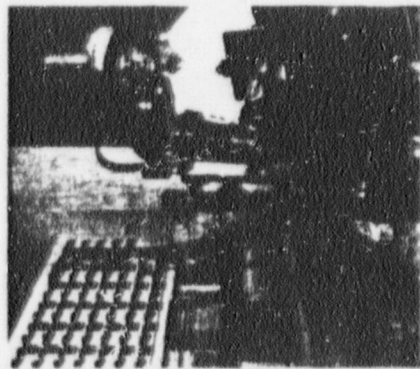
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**A**s the U.S. relies more and more on safe and efficient nuclear technology to meet our growing energy needs, qualified technicians and operators become ever more important members of the nuclear engineering and operations team.

Nuclear technology is more than just a job... it's a career, with excitement, challenge, and the opportunity for growth.

That's why Thames

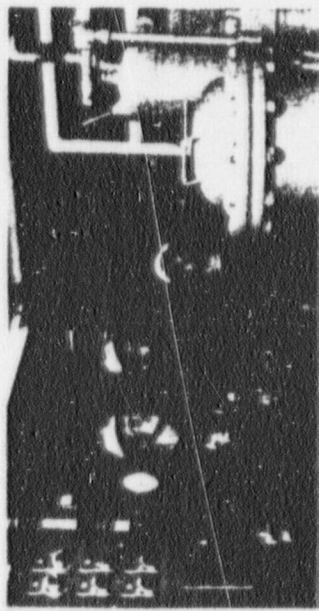
Valley State Technical College, in cooperation with nuclear engineers at Northeast Utilities, created the Nuclear Engineering Technology Program. The two year program offers an Associate of Science degree. As a graduate of the program, you'll be qualified to work in a variety of entry level technical positions in the nuclear power industry, and you'll have a chance at entry level positions at Northeast Utilities when they are available.



## CAN YOU MEET THE QUALIFICATIONS?

To be admitted into the Nuclear Engineering Technology Program at Thames Valley State Technical College, you must:

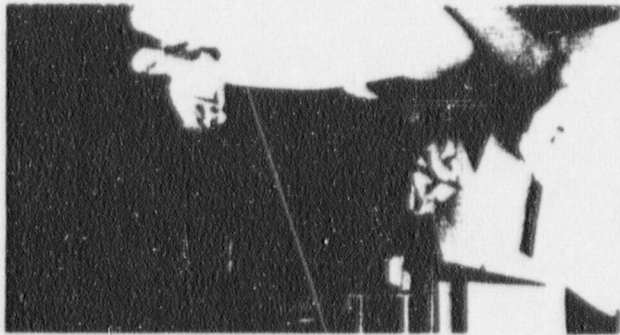
- Be a high school or vocational/technical school graduate (State or Federal equivalency acceptable)
- Have taken a minimum of two years of algebra
- Have taken a related lab science such as physics, chemistry, or computer science
- Have taken four units of English



## WHAT WILL YOU STUDY?

Coursework is given through a quarterly program, with five courses each quarter.

Every student is given a firm foundation in technical subjects such as mathematics, physics, chemistry, programming and human relations. In addition, using classroom, laboratory and simulator instruction, students are trained in the theories behind the actual operation of nuclear power generating stations—including



reactor physics, reactor chemistry and reactor theory, nuclear materials, and nuclear systems. By graduation time, every participant will have had the chance to explore a multitude of career paths on the technical side of the industry, including radiation health and safety, nuclear power generation and automated process control systems.

**Information Form**  
 Yes, please send me more information about the Nuclear Engineering Technology program at Thames Valley State Technical College.

Name \_\_\_\_\_

Home address \_\_\_\_\_

Phone number \_\_\_\_\_

School \_\_\_\_\_

Years of school completed \_\_\_\_\_