



EARLY PROGRAM MILESTONES

This document contains information about the chemical engineering courses offered at USMA prior to the inception of the formal program. The courses include CH362, CH401, and CH402. CH402 was not taught at that time, but was in the planning stages. The program was also planning to offer a summer AIAD for the unit operations lab. CH401 was later re-numbered to CH364 and CH402 is the designation for the current design course.

These plans were changed during the academy curriculum revisions that occurred in 2000. At that time, the first version of the formal major was proposed, initiated in 2002, and had its first graduates in 2005. After this point, the program history is documented in the self-study.

Chemical Engineering Milestones

Spring 1992

Teach initial offering of CH362.
Begin set-up of laboratory rooms, BH315 and BH415.
Prepare list of needed supplies and auxiliary equipment to support ChE labs.

Summer 1992

Prepare for initial offering of CH401.
Plan for CH402 and revisions to CH362.
Complete laboratory set-up of all on-hand equipment.
Develop laboratory experiments.
Finalize laboratory experiments for use with CH401.
Prepare list of projected needs to support the chem engineering lab program.

Fall 1992

Teach initial offering of CH401.
Prepare for initial offering of CH402.
Prepare modifications/revisions for CH362.
Finalize laboratory experiments for use with CH402 and CH362.
Set-up additional experiments as they arrive.
Continue the development of experiments utilizing the equipment on hand.
Prepare possible experiments for use in support of other chemistry electives.
Submit Chemical Engineering Lab course for approval as IAD for credit.
Plan future direction of chemical engineering at USMA.

Spring 1993

Teach initial offering of CH402.
Teach second (revised) offering of CH362.
Prepare initial offering of summer (IAD) Chemical Engineering Lab course.

Summer 1993

Initial offering of summer IAD Chemical Engineering Lab course for credit.
Revise CH362, CH401, and CH402 as needed.
Continued planning.

Chemical Engineering Milestones

Revised December 1992

Spring 1992

Teach initial offering of CH362.

Summer 1992

Prepare for initial offering of CH401.
Plan for CH402 and revisions to CH362.
Develop laboratory experiments.
Finalize laboratory experiments for use with CH401.

Fall 1992

Teach initial offering of CH401.
Prepare for initial offering of CH402.
Prepare modifications/revisions for CH362.

Spring 1993

Teach initial offering of CH402.
Teach second (revised) offering of CH362.
Determine what laboratory experiments can be used with CH402/CH362.
Continue the development of experiments utilizing the equipment on hand.
Prepare list of projected needs to support the chem engineering lab program.
Set-up additional experiments as they arrive.
Plan future direction of chemical engineering at USMA.

Summer 1993

Revise CH362, CH401, and CH402 as needed.
Set-up additional experiments as they arrive.
Upgrade utilities in BH315 and BH415.
Plan lab program for CH401 for Fall 93 and prepare necessary materials.
Prepare possible experiments for use in support of other chemistry electives.
Submit Chemical Engineering Lab course for approval as IAD for credit.
Continued planning.

Fall 1993

Teach CH401 with laboratory program.
Prepare initial offering of summer (IAD) Chemical Engineering Lab course.
Prepare lab programs for CH402 and CH362 for Spring 94.

Spring 1994

Teach CH402 and CH362 with laboratories.
Continue to prepare initial offering of summer (IAD) ChE Lab course.

Summer 1994

Initial offering of summer IAD Chemical Engineering Lab course for credit.

CH362

Mass and Energy Balances

- * Material Balances
- * Energy Balances
- * Selected Topics
 - Distillation
 - Evaporation
 - Sulfur Plant Problem
- * Process Simulation Software/Flowtran

CH401

Chemical Reaction Engineering

- * Kinetics
- * Reactor Design
- * Mass Transfer Operations
 - Absorption
 - Stripping
- * Heat Transfer
 - Selected Topics
- * Simulation Software/Flowtran

CH402

Chemical Engineering Process Design

- * Equipment Oriented Problems
- * Economics
- * Integrated Design Problems
- * Environmental Issues
- * Clean-up and Disposal Considerations
- * Military Applications of Chemical Engineering

Chemical Engineering Laboratory

Support of Chemical Engineering Courses CH401, CH402, and CH362.

IAD (summer enrichment) Course, Chemical Engineering Laboratory.

- 3 to 4 credits.

Support Laboratory Program in chemistry electives or in CH151-152.

Experiments in kinetics and chemical reactors.

Distillation.

Original plan grew out of study done by Mike Delleo (1983).

Visit to several ChE Depts.

Literature Search.

Recommendation to go with a number of package units from companies such as Technovate or TecQuipment.

Delleo Report led to the Chemical Engineering Lab Package.

ChE Lab Package has been in the system since 1984 and has evolved to the following experiments:

- *1. Dynamic Behavior of Stirred Tanks.
- *2. Heat Conduction Unit.
- *3. Concentric Tube Heat Exchanger.
- *4. Free and Forced Convective Heat Transfer Unit.
- *5. Mass Transfer and Diffusion Coefficients.
- +6. Liquid Phase Chemical Reactor.
- #7. Gas Absorption Column.
- #8. Evaporation Unit.
- #9. Tubular Reactor.
- #10. Cooling Tower.
- #11. Distillation Unit.
- #12. Liquid-Liquid Extraction Unit.

* On-Hand (arrived late 1991 or early 1992)

+ Expected in June 1992

Projected Fall of 1992

Bartlett Hall Renovations provided two classroom sized Laboratory Rooms.

Chemical Engineering Laboratory Rooms Projected Layout

The attached sketches are the projected arrangement of the two chemical engineering lab rooms, 315 and 415 Bartlett Hall.

The location of the primary experimental packages are shown by circled numbers. Specific experiments (with room number shown) are numbered as follows:

- | | | |
|-----|---|-------|
| 1. | Dynamic Behavior of Stirred Tanks | (415) |
| 2. | Heat Conduction Unit | (315) |
| 3. | Concetric Tube Heat Exchanger | (315) |
| 4. | Free and Forced Convection Heat Transfer Unit | (315) |
| 5. | Mass Transfer and Diffusion Coefficients | (315) |
| 6. | Liquid Phase Chemical Reactor | (415) |
| 7. | Gas Absorption Column | (415) |
| 8. | Evaporation Unit | (415) |
| 9. | Tubular Reactor | (415) |
| 10. | Cooling Tower | (315) |
| 11. | Distillation Unit | (315) |
| 12. | Liquid-Liquid Extraction Unit | (415) |

Utility needs are also shown on the sketches. On-hand or on-order furniture is shown and identified as follows:

WS = work station

Lab Table = lab table on wheels

IC = instrument cart (on-hand)

MSC = mobile storage unit (drawers, cabinet, work top area)

Cart = laboratory cart

TV = television stand

SD = student desk

Sink = Projected Deep Sink Locations, sinks not on-hand or on-order.

LIST OF OMA ITEMS IN SUPPORT OF CHEMICAL ENGINEERING LAB:

From Fisher 91/92 Catalog or equivalent:

page	quantity	item/model	catalog number	unit price	total price
p. 36	2	Balance, BB3000	01-913-421	1050.00	2100.00
p. 48	2	Balance, GT4100	01-919-93	1750.00	3500.00
p. 58	3	Three Beam Balance, 711-T	02-020-711T	112.46	337.38
p. 58	3	Weight Set	01-913-309	24.10	72.30
p. 63	1	Platform Scale	02-117	936.00	936.00
p. 239	2	Fisher Instrument Cart	11-925-107	989.00	1978.00
p. 241	4	Heavy-Duty Cart	11-926	250.00	1000.00
p. 1348	1	Safety Cabinet/Flammable Liq	17-156D	550.00	550.00
p. 996	1	Lab Ladder, 4 Step	11-930-4	239.00	239.00
p. 996	1	Lab Ladder, 3 Step	11-930-3	176.00	176.00
p. 1557	12	Stopwatch	14-649-7	29.95	359.40
p. 890	2	Lab Work Tables, Standing Height, 60 or 72 x 30			

Fire Extinguishers, as needed to meet requirements for new lab rooms (depending on what comes with the constructions).

Safety Equipment not included with construction, as needed.

From Cole-Parmer 1989-1990 Catalog or equivalent:

p. 829	1	Refractometer	N-02940-02	2550.00	2550.00
p. 508	1	Solution Analyzer	N-05800-05	995.00	995.00
p. 508	1	Function Verifier	N-05800-07	255.00	255.00
p. 508	2	Conductivity Cell, Dip	N-01481-62	90.00	180.00
p. 508	2	Conductivity Cell, Flow	N-01481-63	100.00	200.00
p. 168	1	Digital Conductivity Meter	N-01481-60	330.00	330.00
p. 878	1	Digital Tachometer	N-08202-20	394.00	394.00

Misc. Cabinets if the construction does not include adequate storage units.

Lab Stools.

Other items Dave Loehle might think of that he feels we will need.

THESE ITEMS ORDERED IN FY 91 AND
ARE ON-HAND.

CHEMICAL ENGINEERING LABORATORY FURNITURE REQUIRED

(Less any additional sinks)

ITEM	Quantity	Suggested Vender and Model	Estimated Cost each	Cost total
Table, Laboratory, Wood, with Drawers, Solid Epoxy Resin Top (30"W x 72"L), with Locking Casters, Height between 30" and 34".	3	Fisher Scientific (p. 890), Contempra, Model No. 98-D8624X	1544.00	4632.00
Mobile Storage Cabinet, Wood, Four Drawers and Cupboard, Solid Work Top (36"W x 24"D), Locking Casters.	2	Frey Scientific (p. 327) Cat. No. 17382	622.90	1245.80
Lab Ladder, 4 Step	1	Fisher (p. 996) Cat. No. 11-930-4	239.00	239.00
Chair, Rotary, Drafting	12	GSA 7110-00-194-1611	53.30	639.60
PC Workstations, Mobile, Compact, Slide-out Keyboard Shelf, Approx. Overall Dimensions: 27.5"Wx20"Dx30"H.	4	Nationwide Office Supply, (p. 92) Model SF-DEPO-AO	239.00	956.00
PC Workstation, Slide Out Keyboard and Utility Shelves, Approx. Overall Dimensions: 39"Wx23"Dx32"H.	1	Nationwide Office Supply, (p. 91) Model MF-WS0305	466.00	466.00
		Total		\$ 8,178.40

ITEMS ON ORDER FY 92.

CH362

Mass and Energy Balances

- * Material Balances
- * Energy Balances
- * Selected Topics
 - Distillation
 - Evaporation
 - Sulfur Plant Problem
- * Process Simulation Software/Flowtran

CH401

Chemical Reaction Engineering

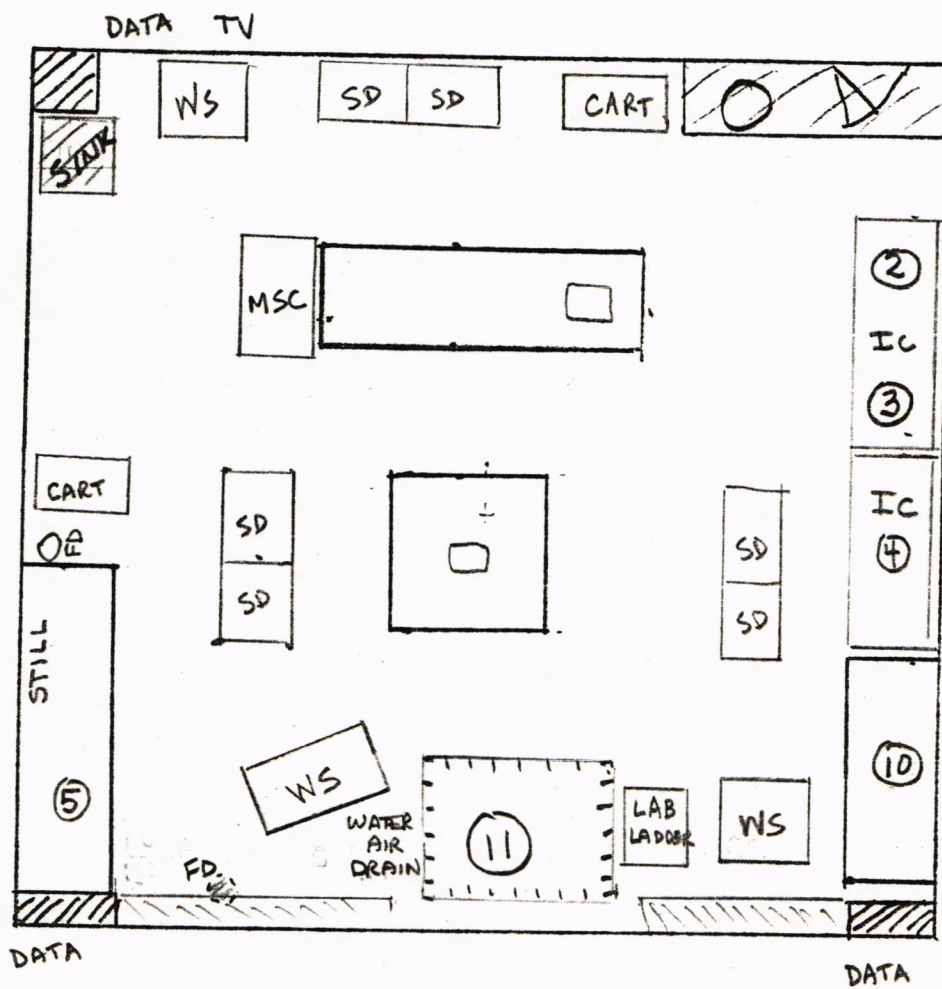
- * Kinetics
- * Reactor Design
- * Mass Transfer Operations
 - Absorption
 - Stripping
- * Heat Transfer
 - Selected Topics
- * Simulation Software/Flowtran

CH402

Chemical Engineering Process Design

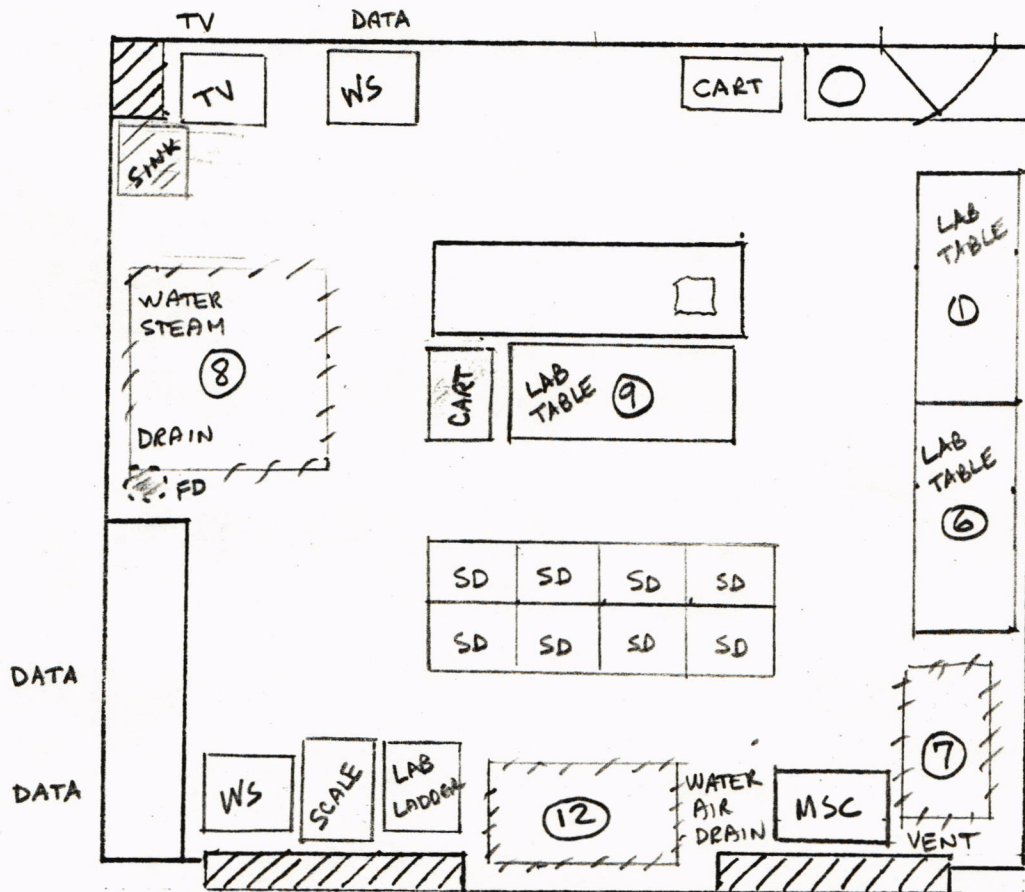
- * Equipment Oriented Problems
- * Economics
- * Integrated Design Problems
- * Environmental Issues
- * Clean-up and Disposal Considerations
- * Military Applications of Chemical Engineering

42-381	50 SHEETS	5 SQUARE
42-382	100 SHEETS	5 SQUARE
42-389	200 SHEETS	5 SQUARE



415

42 381 50 SHEETS 5 SQUARE
42 382 100 SHEETS 5 SQUARE
42 383 200 SHEETS 5 SQUARE
NATIONAL



CEILING 10'