Course Objectives - After completing this course, students will understand the principles and practices of nutrient requirements and management for crop production. Students will also understand the implications of soil fertility management practices on agricultural sustainability and environmental protection.

Summary Notes - This set of notes is only a summary of basic information covered in lectures. Students are expected to participate in lectures, where this material will be discussed and expanded upon. Students are also encouraged to expand and adapt the notes in order to complete and personalize their class notes for effective studying. Cost for the summary notes and the reference material for lab exercises is $10.00.

Recommended Text:
Soil Fertility and Fertilizers: An Introduction to Nutrient Management. 8th Edition (the 7th or 6th editions are also good). 2014. J.L. Havlin, S.L. Tisdale, W.L. Nelson, and J.D. Beaton. Available from U of M Bookstore (a copy of the 7th and 6th editions is on 2 hour reserve in the W.R. Newman Library (WRN))

Other References:
Soil Fertility and Fertilizers (7th, 6th, or 5th editions)
Soil Chemistry (3rd or 2nd Edition). H.L. Bohn, B.L. McNeal, and G.A. O'Connor (2 hour reserve in WRN)
Russell's Soil Conditions and Plant Growth. A. Wild, ed.
The Nature and Properties of Soils. Weil and Brady, eds.

Evaluation and Marking Scheme:
Evaluative feedback will be given to students prior to the voluntary withdrawal deadline. Term tests will be written during regular, 50 minute lecture periods. The final exam will be two-hours in length.

Attendance and participation in the laboratory is compulsory. Weighting of components:

- First midterm exam (Friday, Oct. 10) 15%
- Second midterm exam (Friday, Nov. 14) 15%
- Laboratory (245 Ellis Bldg.)
  - problems 10%
  - oral report on term project 5%
  - written report on term project 10%
  - lab exam 15%
- Final exam 30%

All assignments must be completed satisfactorily by December 3, 2014 to receive a passing and complete grade. Grammar, spelling and composition will be evaluated and considered as part of the grading criteria for tests and assignments. Academic dishonesty will be treated seriously (see the U of M General Calendar for policies on plagiarism, cheating, and impersonations at exams).

Availability of Instructor:
Students with inquiries or suggestions are welcome to “drop in” to the office (Room 307 Ellis Bldg.) at their convenience. However, I frequently have other time commitments that are unpredictable. Therefore, please call or send me an e-mail to set up an appointment.
SOIL 4520 Soil Fertility Course Outline
(Draft - September 2014)

Approx. # lectures

I. Introduction and Review (SFF\textsuperscript{1} Ch 1,2)
1 A. Role of soil fertility for crop production
1 B. Overview of nutrient use, uptake and movement

II. Properties of Soil Solids, Surfaces and Solutions (SFF Ch 2)
3 A. Mineral composition of soil (SC\textsuperscript{2} Ch 5,7)
   1) Primary minerals
   2) Secondary minerals
   3) Other minerals
   4) Effects of soil minerals on soil fertility
1 B. Organic matter in soil (SC Ch 6)
2 C. Surface and solution chemistry
   1) Soil solids, solubility and precipitation (SC Ch 3)
      a) Free ions, solubility products
      b) Soluble complexes, stability constants
   2) Soil surfaces & adsorption (SC Ch 5,8,9)
      a) Inner sphere adsorption of cations
      b) Inner sphere adsorption of anions
      c) Exchangeable adsorption of ions, outer sphere complexes & diffuse ion swarms
   1 3) Effects of pH, acidity and alkalinity (SC Ch 10, SFF Ch 3)
   1 4) Effects of pe, redox, and flooding (SC Ch 4)

III. Soil Fertility and Fertilizers
Nutrient by nutrient discussion of forms and behaviour of nutrients in soil; nutrient uptake, utilization and deficiency symptoms; fertilizer sources, properties and reactions; and fertilization practices for:

6 A. N (SFF Ch 4)
2 B S (SFF Ch 7)
4 C P (SFF Ch 5)
2 D K (SFF Ch 6)
2 E-I. Ca, Mg, Mo, B, Cl (SFF Ch 7,8)
2 J-M. Cu, Zn, Mn, Fe (SFF Ch 8)

IV. Soil Fertility Management - General Issues
1 A. Fertility evaluation, fertilizer recommendations (SFF Ch. 9, 11)
1 B. Soil fertility and agricultural sustainability (SFF Ch. 10,12)
2 C. Soil fertility and environmental issues (SFF Ch. 10,12)

\textsuperscript{1} Soil Fertility and Fertilizers, 8th Edition … the 7th and 6th editions SFF have slight differences in chapter numbers
\textsuperscript{2} Soil Chemistry