



**College of Agricultural Engineering Sciences  
Department of Horticulture**

---

**Plant Nutrition  
Unit Guide  
Second Year – Second Semester, 2023 - 2024**

# Course Book

<b>1. Course name</b>	Plant Nutrition
<b>2. Lecturer in charge</b>	Dr Noura Masseh Ellya Kka
<b>3. Department / College</b>	Horticulture / Agricultural Engineering Sciences
<b>4. Contact</b>	Email: <a href="mailto:noura.kka@su.edu.krd">noura.kka@su.edu.krd</a> <a href="mailto:raz.rashad@su.edu.krd">raz.rashad@su.edu.krd</a>
<b>5. Time (in hours) per week</b>	Theory 2 h, Practical 3 h
<b>6. Office hours</b>	I am usually available after class (Sunday 10:30 am – 12:00 pm) or you can arrange an appointment. It is best to email me to set up a meeting time. Please use my direct email address for this purpose.
<b>7. Course code</b>	AgH42
<b>8. Teacher's academic profile</b>	Dr Noura Kka <a href="https://academics.su.edu.krd/noura.kka">https://academics.su.edu.krd/noura.kka</a> Mrs. Raz Kanan Rashad <a href="https://academics.su.edu.krd/raz.rashad">https://academics.su.edu.krd/raz.rashad</a>
<b>9. Keywords</b>	Soil Fertility, Essential Element Content in Plants, Major Essential Plant Elements
<b>10. Course overview:</b>	The basic principles of plant nutrition will span the concepts of soil science. This unit will cover uptake mechanisms of mineral nutrients, their transport and traslocation, mineral nutrition in yield formation, physiological functions of mineral nutrients, diagnosis of nutrient deficiencies and toxicities, genotypic variation in mineral nutrition and soil and plant factors affecting nutrient availability in rhizosphere.
<b>11. Course objective:</b>	This unit has been specifically designed to introduce students to: <ul style="list-style-type: none"> <li>- Basic concepts and principles of plant mineral nutrition that will provide a basis for solving practical nutritional problems in horticultural crops.</li> </ul>
<b>12. Student's obligation</b>	<p><b>Attendance</b> Attendance for this class is mandatory. Attendance will be confirmed with evaluation sheets. Each unexcused absence will result in the lowering of your final grade by one grade.</p> <p><b>Academic Honesty and Integrity</b> Cheating of any kind will not be tolerated. Copying of others' work, use of disallowed material, plagiarism in assignments, or cheating in any other form as defined by the instructor will result in a grade of zero for that assignment. Multiple infractions will result in a grade of 'Fail' for the course.</p> <p><b>Student Conduct</b> Students are expected to respect the rights of others in the class. Cell phones and other electronic equipment should be turned off prior to the beginning of class. Use of these items during class time, or any other unwarranted classroom disruption, will result in your immediate excusal from class for the remainder of the period. You may bring drinks to class. Please finish any meals before class begins. The use of tobacco products during class time is strictly prohibited.</p>
<b>13. Forms of teaching</b>	Lectures (Teaching by presentation), classroom teaching (class discussion), Integrating Technology (electronic mail)

English is the main language for teaching in addition to Arabic and Kurdish.

Google classroom: This course will be enhanced using Google classroom. Students are required to download PowerPoint presentations and other important class material from Google classroom for the course. For Google classroom you only need to login with university account ([example@student.su.edu.krd](mailto:example@student.su.edu.krd)) and password.

Google classroom applications is available in play store.

#### 14. Assessment scheme

Theory	Percentage of Overall Mark
10 x pre-quizzes	5%
<b>First midterm test</b> Covers topics (Week 1 to Week 4). Feb 19 ,2024	5%
<b>Second midterm test</b> Covers topics up (Week 5 to Week 8). April 1, 2024	5%
<b>Optional midterm test</b> <b>April 29, 2024</b>	
<b>Practical</b>	
10 x quizzes	5%
Activity	5%
Report	5%
<b>First midterm test</b> Feb 15,2024	10%
<b>Second midterm test</b> Mar 28, 2024	10%
<b>Final exam</b>	
Theory (Week 1 – Week 12)	50%
<b>TOTAL</b>	<b>100%</b>

#### 15. Student learning outcome:

Students will be able to learn about:

1. Assess strengths and weaknesses of different fertilizer types, sources, and application methods
2. Classify nutrients as essential, beneficial, and non-essential for plant growth.
3. Create fertilizer schedules for different horticultural production systems
4. Apply a nutrient management plan for a horticultural crop

#### 16. Course Reading List and References:

Lecture notes, class notes provided or recommended by the lecturers will be sufficient for the course.

- Although there are prescribed text books, the students can refer to the following books.
  - 1- Naeem, M., Ansari, A.A. and Gill, S.S. eds., 2017. Essential plant nutrients: uptake, use efficiency, and management. Cham: Springer International Publishing.
  - 2- Barker, A.V. and Pilbeam, D.J. eds., 2015. Handbook of plant nutrition. CRC press.
  - 3- Jones Jr, J.B., 2012. Plant nutrition and soil fertility manual. CRC press.
  - 4- Mengel, K. and Kirkby, E.A., 2012. Principles of plant nutrition. Springer Science & Business Media.
  - 5- Sonneveld, C, Voogt W, 2009. Plant Nutrition of Greenhouse Crops. Springer Science & Business Media.
  - 6- Lisa Urry, Michael Cain, Steven Wasserman, Peter Minorsky, Rebecca Orr, 2020. Campbell Biology Pearson Education, Science - 1488 pages

17. The Topics:		Lecturer's name	
<b>Unit weekly activities</b>			
<b>Theory</b>			
Week	Class topics	Assessment tasks	Date
	<b>Soil contains a living, complex ecosystem p. 806</b>		
1	Soil contains a living, complex ecosystem; Soil Texture		Jan 22,2024
2	Topsoil Composition; Inorganic Components ; Organic Components	Post-quiz W1	Jan 29,2024
3	Soil Conservation and Sustainable Agriculture; Irrigation; Fertilization	Post-quiz W2	Feb 5,2024
4	Adjusting Soil pH; Controlling Erosion; Phytoremediation	Post-quiz W3	Feb 12,2024
5	<b>First midterm exam</b>	Post-quiz W4	Feb19,2024
	<b>Plant roots absorb many types of essential elements from the soil p. 809</b>		
6	Essential Elements; Hydroponic Culture	Post-quiz W5	Feb 26,2024
7	Symptoms of Mineral Deficiency; Global Climate Change and Food Quality	Post-quiz W6	Mar 4,2024
	<b>Plant nutrition often involves relationships with other organisms</b>		
8	Bacteria and Plant Nutrition; Rhizobacteria	Post-quiz W7	Mar 11,2024
9	Bacteria in the Nitrogen Cycle; Bacteria and Nitrogen Fixation <span style="color: red;">Newroz</span>	Post-quiz W8	Mar 25,2024
10	<b>Second midterm exam</b>		Apr 1,2024
11	Nitrogen Fixation and Agriculture; Fungi and Plant Nutrition	Post-quiz W9	Apr 8,2024
12	Types of Mycorrhizae; Agricultural and Ecological Importance of Mycorrhizae; Epiphytes, Parasitic Plants, and Carnivorous Plants	Post-quiz W10	Apr 15,2024
13	Review	Post-quiz W11	Apr 22,2024
14	<b>Optional midterm exam</b>		Apr 29,2024
15	<b>Final Exam</b>		May 4,2023
<b>Practice</b>			

Week	Class topics	Assessment tasks	Date
1	Diagnostic plant symptoms of essential plant nutrient element insufficiencies P 28-31		Jan 11,2023
2	How to Be a Diagnostician P 37-41	Post-quiz W1	Jan 18,2023
3	Soil Testing P119-125	Post-quiz W2	Jan 25,2023
4	Plant Analysis and Tissue Testing 127-131	Post-quiz W3	Feb 1,2023
5	<b>First midterm exam</b>		Feb 8,2023
6	Plant Tissue Handling, Preparation, and Analysis 131-133]	Post-quiz W4	Feb15,2023
7	Methods of Interpretation 134-138	Post-quiz W5	Feb 22,2023
8	Fertilizer Placement methods P173-176	Post-quiz W6	Mar 1,2023
9	Placement and timing of fertilizer application	Post-quiz W7	Mar 8,2023
10	<b>Second midterm exam</b>		Mar 15,2023
11	Calculating fertilizer requirements	Post-quiz W8	Mar 29,2023
12	Fertilizer schedule for open field agriculture	Post-quiz W9	Apr 5,2023
13	Fertilizer schedule for hydroponic	Post-quiz W10	Apr 12,2023
14	The Nutrient Solution 198-203	Post-quiz W11	Apr 19,2023
15	<b>Final Exam</b>		

Class content may change slightly and classes may overlap

## 19. Examinations:

### Questions and Answers template

- A soil sample taken from a farmer's field was analyzed and the following data were obtained

Soil texture Clay loam

Soil pH (1:1.2.5 soil: water) 5.8

Total nitrogen 0.15%

Available nitrogen 15 kg N/ha

Available phosphorus 40 kg P/ha

Available potassium 1000 kg K/ha

Base saturation 80%

Micronutrients All above critical level

The farmer's production target is 3 tons of maize grain per hectare. Available information suggests that: (i) maize crop in the area remove 40 kg K, 16 kg P and 37 kg K per ton of grain produced. (ii) the crop utilizes 40% of the available nutrients in the soil. From the given information, determine the number of 50 kg bags

of fertilizer (indicating their respective ratios of N: P: K) which are to be applied to supplement soil nutrients in order to achieve the target yield. The available fertilizers are 20:5:5, 20:20:0, 20:0:0 and 0:0:50 (N: P: K)

➤ **Why the flowing nutrients are needed for plant growth?**

**Nitrogen (N)**

- Responsible for rapid foliage growth and green color
- Easily leaches from soil
- Mobile in plant, moving to new growth.

**Phosphorus (P)**

- Promotes root formation and growth
- Affects quality of seed, fruit, and flower production
- Increased disease resistance
- Does not leach from soil readily
- Mobile in plant, moving to new growth.

**Calcium (Ca)**

- Moderately leachable
- Limited mobility in plant
- Essential for growth of shoot and root tips.

➤ **What are the deficiency symptoms of N, P and Ca**

**Nitrogen (N)**

- Reduced growth
- Light-green to yellow foliage (chlorosis)
- Reds and purples may intensify with some plants
- Reduced lateral breaks
- Symptoms appear first on older growth

**Phosphorus (P)**

- Reduced growth
- Leaves dark-green; purple or red color in older leaves, especially on the underside of the leaf along the veins
- Leaf shape may be distorted
- Thin stems
- Limited root growth

**Calcium (Ca)**

- Inhibition of bud growth
- Roots can turn black and rot
- Young leaves are scalloped and abnormally green
- Leaf tips may stick together
- Cupping of maturing leaves
- Blossom end rot of many fruits
- Pits on root vegetables; stem structure is weak
- Premature shedding of fruit and buds

**20. Extra notes:**

Please feel free to come and talk to me to get helpful feedback on your progress, or if you are struggling in any way.

This course book provides you with the key information about Plant biotechnology.

For the best chance of success, you should read it very carefully and refer to it frequently throughout the semester.

**21. Peer review**

Standard guidelines were followed and it is clear.

- There are sufficient topics and examples.
- References are relevant, recent and available.