

## **COURSE SYLLABUS – BIO 415 Plant Nutrition (Fall 2024)**

**Instructor:** Zaeema Khan (zaeema.khan@sabanciuniv.edu)

**TA:** Ahmet Baki Sahin (ahmet.sahin@sabanciuniv.edu)

**Office & Hours:** FENS G016, Phone 9530. Any time by appointment.

**Lecture Sessions:** Monday, 1:40-3:30 pm; Tuesday, 8:40-9:30 am

**About BIO 415 Plant Nutrition** Last Offered: 2023 Fall

Faculty: Faculty of Engineering and Natural Sciences Subject: Molecular Biology Genetics & Bioengineering (BIO) SU Credit: 3 ECTS

Credit: 6.00 / 5.00 ECTS (for undergraduate & graduate students)

Level of Course: Undergraduate Prerequisites, Graduate with special permission (only for SU students)

### **Content**

Uptake mechanisms of mineral nutrients, their transport in xylem and phloem, mineral nutrition in yield formation, physiological functions of mineral nutrients, relationship between mineral nutrition and plant diseases, diagnosis of nutrient deficiencies and toxicities, genotypic variation in mineral nutrition and soil and plant factors affecting nutrient availability in rhizosphere.

### **Learning Outcomes**

Upon completion of this course students should be able to:

- Characterize and identify leaf deficiency and toxicity symptoms of mineral nutrients in crop plants.
- Describe essential steps of root absorption, shoot transport, leaf remobilization and seed deposition of mineral nutrients.
- Describe critical functions of mineral nutrients in plant growth and stress tolerance.
- Characterize the relationships between mineral nutrition and tolerance to diseases in crop plants.
- Understand how plants modify rhizosphere soil chemically and biologically when exposed to a nutrient deficiency.

**Course Materials** Instructor slides will be the main course material and will be available on SUCourse+ (restricted for redistribution, some parts may be subject to international copyrights). Students who are interested in reading the topics further may find this book helpful (available in SU-IC): Rengel, Zed, Ismail Cakmak, and Philip John White, eds. Marschner's mineral nutrition of plants. Academic Press, 2022. Paperback ISBN: 9780128197738, eBook ISBN: 9780323853521

**Grading Policy (% impact on final grade):**

**Attendance (15%)** – Attendance to lecture sessions will have an impact of 15% on final grade. Missing >15 min of a session will be regarded as absence.

**Term Paper (20%)** – Due date is last day of classes (until 23:59 PM). The term paper must be 2000-2500 (excluding the references) words long including Title, Abstract (200-250 words), Introduction, Discussion, and the References sections. The term paper must provide a comprehensive information on the physiological functions of a selected nutrient. It must also include latest research and results about the selected nutrient by referring to five recent articles published in Q1 journals. The “Term Paper” and “Presentation” topics must be different and selected from any of macro or micronutrients or any specific plant species of Türkiye. The selected nutrient must be declared until Week 7 (mid of term).

**Presentation (20%)** – (see “Student Presentation Rules and Schedule” below)

**Midterms x2 and Final (45%)** – The midterms and final will be held physically in the campus, and will be composed of essay questions, short questions and analytical questions.

**Make-up Policy:** Missing term paper due dates, presentation, or the final exam results in a zero grade for that specific grading item. No scheduled make-ups will be offered for a missed grading item. In case a student misses his/her presentation or the final exam due to an emergency with a valid excuse (e.g. a written proof of doctor’s report, accident report, etc.) the instructor and TA must be informed within the same week. In such a case, a separate exam will be given at a time and date determined by the instructor.

**Policies on Attendance, Classroom Behavior and Cheating:** Attendance to all live lecture sessions is essential for understanding and interpreting the course material and asking questions to the instructor. Attendance to lecture sessions will have an impact of 15% on final grade. Student presentation sessions have a separate attendance policy (see the “Student Presentation Rules and Schedule” below). In case of absence in lecture sessions, it is the student’s responsibility to check the syllabus, retrieve the associated course materials from on-line resources (listed above) and discuss the missed sections with classmates. Students will be responsible for all course slides and any other material presented during lectures (excluding the parts out of context as declared by the instructor). Sabanci University’s regulations on plagiarism and cheating will be strictly enforced on students who help, attempt, or conduct any form of cheating.

Week	*Activity/Chapter
1	1) Remember Basic Properties of Soils, Plant Body and Plant Cell
2	2) Changes in Root Morphology and Physiology under Nutrient Deficiencies and Metal Toxicities
3	3) Synergism and Antagonism between Mineral Nutrients During their Root Uptake and Transport in Plants
4	4) Xylem and Phloem Transport of Nutrients, and Diagnosis and Interpretation of Nutrient Deficiency and Toxicity Symptoms in Plants
5	5) Key things to Know for each Mineral Nutrient

- 6 6) Relationships between Mineral Nutrition and Use of Herbicides (e.g., Glyphosate) in Crop Plants
- 7 7) Key Roles of Potassium in Plant Growth and Yield Formation
- 8 8) Key Roles of Magnesium in Plant Growth and Yield Formation
- 9 9) Key Roles of Phosphorus and Sulfur in Plant Growth
- 10 10) Key Roles of Calcium in Plant Growth
- 11 11) Key Roles of Micronutrients in Plant Growth and Yield Formation12) Major Functions of Zinc in Plant Growth and Yield Formation13) Major Functions of Boron in Plant Growth and Yield Formation14) Major Functions of Nickel in Plant Growth15) Role of Mineral Nutrition in Mitigation of Diseases and Pest Attack16) Role of Seed Nutrient Density in Germination and Seedling Vigor17) Food and Nutrition Security18) Human Nutritional Aspects of Mineral Nutrition of Crop Plants

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**\*\*13**

**\*\*14**

\*subject to change during the semester \*\*weeks of student presentation sessions

### Student Presentation Rules and Schedule

1. Oral presentations will be performed physically in the classroom from the 12th to the 14th week.
  2. During the student presentation sessions (weeks 13-14), full attendance is required (missing >10 min of a session will be regarded as absence). You may miss only one student presentation without a penalty, however if you miss more than one, then your final grade will be reduced by one letter grade (i.e. A to A-). In case a student misses a presentation session due to an emergency with a valid excuse (e.g. a written proof of doctor's report, accident report, etc.) the instructor and TA must be informed within the same week.
  3. Although the course slides and your selected Q1 research articles are the main source to build up your PowerPoint presentation, you are encouraged to research other resources from the IC (<https://www.sabanciuniv.edu/bm/en>) and the internet to design and enrich your presentation.
  4. Your slides (e.g., 10-15 slides) should cover a 20 min ( $\pm 5$  min) presentation. Your last slide must ask a very important/relevant essay question and the corresponding answer. Note that your question-and-answer quality will be used in grading of your presentation, and your question may also appear in the final exam (with or without modifications). Trivial questions that are not relevant, professionally thought, grammatically perfect or do not really teach anything will be disregarded and replaced by the instructor.
  5. Your presentation will be evaluated according to the criteria below (in order of priority), and your presentation grade will have an impact of 20% on your final letter grade as stated in the syllabus published in SUCourse+.
- A comprehensive coverage of the nutrient/plant assigned
  - Use of language, grammar, typeset, units of measurements

- Visual quality of the presentation material (titles, bullets, tables, font size, figures, tables, photos, slide numbers, etc.)
- Time management ( $20 \pm 5$  min)
- Voice modulation, use of body language, eye contact, interactive strategies
- Question & answer quality (last slide!)

6. Presentations must be uploaded to SUcourse+ as a single “.pptx” file before the presentation day.