

# COURSE SYLLABUS – BIO 415 Plant Nutrition

## (Fall 2022)

**Instructors:** Ismail Cakmak ([cakmak@sabanciuniv.edu](mailto:cakmak@sabanciuniv.edu)) & Levent Ozturk ([lozturk@sabanciuniv.edu](mailto:lozturk@sabanciuniv.edu))

**TA:** Büge İrem Sunar ([bugesunar@sabanciuniv.edu](mailto:bugesunar@sabanciuniv.edu))

**Office & Hours:** 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: 2021 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 students admitted in the 2013-14 Academic Year or following years)

Level of Course: Undergraduate

Prerequisites (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): Marschner's mineral nutrition of higher plants. Horst Marschner; Petra Marschner, 2011, Academic Press eBook ISBN: 9780123849069, Hardcover ISBN: 9780123849052

### 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 (25%)** – 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 the same and selected from any of macro or micronutrients. The selected nutrient must be declared until Week 7 (mid of term) using the spreadsheet in the following link:

[https://docs.google.com/document/d/1Efskc9IFB1IxAT1P\\_18GTf6UV4G5TBtEYqqLDYh528c/edit?usp=sharing](https://docs.google.com/document/d/1Efskc9IFB1IxAT1P_18GTf6UV4G5TBtEYqqLDYh528c/edit?usp=sharing)

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

**Final Exam (40%)** – The final exam will be held physical in the campus, and will be composed of essay questions.

### Make-up Policy:

Missing homework 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 on-line 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).

Sabancı University's regulations on plagiarism and cheating will be strictly enforced on students who help, attempt, or conduct any form of cheating.

## WEEKLY SCHEDULE OF COURSE ACTIVITIES, ASSIGNMENTS & EXAMS

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 Formation  12) Major Functions of Zinc in Plant Growth and Yield Formation  13) Major Functions of Boron in Plant Growth and Yield Formation  14) Major Functions of Nickel in Plant Growth 15) Role of Mineral Nutrition in Mitigation of Diseases and Pest Attack 16) Role of Seed Nutrient Density in Germination and Seedling Vigor 17) Food and Nutrition Security 18) Human Nutritional Aspects of Mineral Nutrition of Crop Plants
<b>**12</b>	
<b>**13</b>	
<b>**14</b>	

\*subject to change during the semester

\*\*weeks of student presentation sessions

## Student Presentation Rules and Schedule

- Students will be presenting physically in class during weeks 12 through 14 during the course hours (see schedule below).

Week of Term	Nutrients	Row no.	Presenting Student*	Date and time
12	Nitrogen	1	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Potassium	2	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Calcium	3	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Magnesium	4	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Phosphorus	5	Aaaaaaaaa Bbbbbbbb Ccccccc	
13	Sulphur	6	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Chlorine	7	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Boron	8	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Iron	9	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Manganese	10	Aaaaaaaaa Bbbbbbbb Ccccccc	
14	Zinc	11	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Copper	12	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Nickel	13	Aaaaaaaaa Bbbbbbbb Ccccccc	
	Molybdenum	14	Aaaaaaaaa Bbbbbbbb Ccccccc	

\*to be announced

2. During the student presentation sessions (weeks 12-14), 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 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.