**COURSE SYLLABUS – BIO 308 Plant Physiology**

**(Spring 2021)**

**Instructors:** Prof.Dr. İsmail TÜRKAN ([ismail.turkan@sabanciuniv.edu](mailto:ismail.turkan@sabanciuniv.edu))

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**Office & Hours:** Any time by appointment.

**Lecture Sessions:** Monday 8:40 am-10:30 am, Tuesday 8:40 am-9:30 am

**Zoom Link:** https://zoom.us/j/4829580401?pwd=YXQ0bjNuaWF2YkgwdWhBSFpCVjVtZz09

**Contents**

The aim of this course is to learn the metabolic physiology of plants. It includes relations of water and plant cells, water balance of plants, mineral nutrition, solute transport, photosynthetic light and carbon reactions, translocation in the phloem (sugar transport), respiration and lipid metabolism, assimilation of mineral nutrients.

**Learning Outcomes**

Upon completion of this course students should be able to:

* Learn the main concepts of plant physiology.
* Examine detailed characteristics of plant cells, relations of water and plant cells, water balance, mineral nutrition and solute transport.
* Describe the most important plant metabolism process; photosynthesis: light reactions carbon reactions and its physiological and ecological considerations.
* Characterize translocation in the phloem, respiration and lipid metabolism, assimilation of mineral nutrients, secondary metabolites and plant defense, cell walls structure.
* Understand respiration and lipid metabolism in plants.

**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).

Computer with camera and internet connection. Make sure your battery is charged and you have a smartphone hotspot connection ready as a backup to home internet to be able to participate in-session quizzes without interruption.

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

Attendance (10%) – Attendance to lecture sessions will have an impact of 15% on final grade. Missing >15 min of a session will be regarded as absence.

Midterm on week 6 (25%) – There will be four homework assignments throughout the term with 20% impact on final grade.

Student Presentations on weeks 12 and 13 (25%) – (see “Student Presentation Rules and Schedule” below)

Final Exam (40%) – The final exam will be held online and will be composed of multiple choice, fill in the blanks and short 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 10% 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 from 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.

**WEEKLY SCHEDULE OF COURSE ACTIVITIES & EXAMS**

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| --- | --- |
| **Week** | **\*Activity/Chapter** |
| **1** | Why study plants? Overview of Plant Structure, The Plant Cell, Plasmodesmata |
| **2** | Water and Plant cells: Water in Plant Life, The Structure and Properties of Water |
| **3** | Water Transport Processes Water Balance of Plants: Water Absorption by Roots, Water Transport through the Xylem, Water Movement from Leaf to the Atmosphere |
| **4** | Mineral Nutrition: Essential Nutrients, Deficiencies and Plant Disorders, Treating Nutritional Deficiencies, Soil, Roots and Microbes |
| **5** | Solute Transport: Passive and Active Transport, Transport of Ions Across A Membrane Barrier, Membrane Transport Processes, Membrane Transport Proteins, Ion Transport in Roots |
| **6** | Photosynthesis: The Light Reactions: Photosynthesis in Higher Plants, Organization of the Photosynthetic Apparatus, Organization of Light Absorbing Antenna Systems, Mechanisms of Electron Transport, Proton Transport and ATP Synthesis in the Chloroplast, Repair and Regulation of the Photosynthetic Machinery, Genetics, Assembly and Evolution of Photosynthetic Systems (**Mid-term Exam on 6th week!)** |
| **7** | Photosynthesis: Carbon Reactions: The Calvin Cycle, Regulation of the Calvin Cycle, The C2 Oxidative Photosynthetic Carbon Cycle, CO2 Concentrating Mechanisms I: Algal and Cyanobacterial Pumps, The C4 Carbon Cycle, Crassulacean Acid Metabolism, Synthesis of Starch and Sucrose |
| **8** | Photosynthesis: Physiological and Ecological Considerations: Light, Leaves and Photosynthesis, Photosynthetic Responses to Light by the Intact Leaf, Photosynthetic Responses to Carbon Dioxide, Photosynthetic Responses to Temperature. |
| **9** | Translocation in the Phloem: Pathways of Translocation, Patterns of Translocation: Source to Sink, Materials Translocated in the Phloem: Sucrose, Amino Acids, Hormones, and Some Inorganic Ions, Rates of Movement |
| **10** | The Mechanism of Translocation in the Phloem: The Pressure- Flow Model, Phloem Loading, Phloem Unloading, Photosynthate Allocation and Partitioning |
| **11** | Respiration and Lipid Metabolism: Glycolysis: A Cytosolic and Plastidic Process, The Citric Acid Cycle: A mitochondrial Matrix Process, Electron Transport and ATP Synthesis at the Inner Mitochondrial Membrane, Respiration in Intact Plants and Tissues, Lipid Metabolism |
| **\*\*12 & 13** | Topic group-1: Assimilation of Mineral Nutrients: Nitrate Assimilation, Ammonium Assimilation, Biological Nitrogen Fixation, Sulfur Assimilation, Phosphate Assimilation, Cation Assimilation, Oxygen Assimilation, The Energetics of Nutrient Assimilation  Topic group-2: Secondary Metabolites and Plant Defense: Cutin, Waxes, Suberin, Secondary Metabolites, Terpenes, Phenolic Compounds, Nitrogen Containing Compounds, Plant Defense Against Pathogens  Topic group-3: Cell Walls: Structure, Biogenesis and Expansion  Topic group-4: To be announced… |

**\***subject to change during the semester

**\*\***weeks of student presentation sessions

**Student Presentation Rules and Schedule**

1. Student presentations will be delivered during weeks 12 & 13 during the course hours (see schedule below) on Zoom via the screen share function on a live session. The full session will be recorded to use in grading and as a proof of attendance.

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| **Week of Term** | **Chapters\*** | **Presenting Students (\*\*TBA)**  **(two for each chapter)** | **Date and time** |
| 12 |  |  |  |
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\*subject to change

\*\*to be announced

1. During the student presentation sessions, full time 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.
2. Although your course slides and text book is 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.
3. Students assigned to a chapter are responsible for sharing the chapter content (i.e. sub-topics in a chapter) among themselves.
4. Having learned your presentation chapter and shared the sub-topics with your presentation partner, you should then prepare your slides (e.g. 10-15 slides) that would cover a 25 min (± 5 min) presentation. At the end of your presentation (in your last slide) ask a very important/relevant essay question and give the answer to it. Note that your question may 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 chapter sub-topics assigned
* Use of scientific language, grammar, typeset, units of measurement
* Visual quality of the presentation material (titles, bullets, tables, font size, figures, tables, photos, slide numbers, etc.)
* Time management (25 ± 5 min)
* ~~Voice modulation, use of body language, eye contact, interactive strategies~~

1. Presentations must be uploaded to SUcourse+ as a single “.pptx” file before the presentation day.
2. Some precautions during the student presentation sessions:

* Make sure your camera is working and turned on.
* The instructor will make the presenter a co-host to share his/her screen.
* Make sure the light is coming towards your face and not on your back.
* Have your smartphone hotspot connection ready as a backup to home internet.
* Keep your mic off if not presenting or asking a question to the presenter.