NAVOI STATE UNIVERSITY

FZ160 PLANT PHYSIOLOGY — COURSE SYLLABUS

Faculty of Natural Sciences - 60510100 Biology

COURSE PASSPORT & ACADEMIC METADATA

Course Title: Plant Physiology (FZ160)
Course Type: Mandatory (Compulsory)
Field of Study: 100000
Program: 60510100 Biology
Academic Year: 2026–2027
Form of Education: Full-time
Language of Instruction: Uzbek
Total Workload: 180 Hours
Credits: 6 ECTS
Assessment: Examination
Aligned UN SDGs: SDG 15 (Life on Land), SDG 13 (Climate Action), SDG 2 (Zero Hunger / Sustainable Agriculture)



1. Course Description & SDG Integration

The Plant Physiology course explores physiological, biochemical, and metabolic processes occurring in plant organisms. It covers water relations, photosynthesis, respiration, mineral nutrition, growth regulators, stress physiology, and plant defense mechanisms against pathogens and photophages.

In alignment with SDG 15 (Life on Land), SDG 13 (Climate Action), and SDG 2 (Zero Hunger), the course focuses on understanding plant adaptations under regional desert environmental conditions, water deficit, and thermal stress, fostering sustainable agricultural practices and ecological resilience in Uzbekistan.

2. Course Aims & Learning Outcomes

Course Aim: To provide comprehensive scientific knowledge regarding plant physiological mechanisms, metabolic pathways, energy transformation, and environmental adaptations.

- Knowledge: Understand physiological concepts, water transport, photosynthetic dark/light reactions, respiration, and mineral assimilation.
- Skills: Analyze physiological responses of native flora and agricultural crops to environmental stressors (drought, salinity, high temperature).
- Practical Competency: Conduct laboratory experiments on plant cell water potential, pigment extraction, stomatal regulation, and photosynthetic rates.
- SDG Competencies: Apply physiological principles to design climate-resilient crop management strategies (SDG 13, SDG 15).

3. Prerequisites

Prerequisites: Botany (BOT111 / BOT11210), Organic & Biological Chemistry, Plant Morphology and Anatomy.

4. Course Structure & Workload Allocation

Activity Type	Hours (Sem 1)	Hours (Sem 2)	Total Hours
Lectures	30	30	60 Hours
Laboratory Classes	30	30	60 Hours
Independent Study	30	30	60 Hours
Total Workload	90 Hours	90 Hours	180 Hours (6 ECTS)

5. Detailed Course Curriculum Outline

5.1 Lecture Syllabus Outline

• **L1: Introduction to Plant Physiology:** Scope, history, and methods of plant physiology. Plant cell physiology and protoplasm properties.

• **L2: Water Relations in Plants:** Water potential, osmosis, root pressure, transpiration mechanisms, and water stress adaptations (SDG 15).

• **L3: Photosynthesis & Solar Energy Conversion:** Pigment systems, light reactions, Calvin cycle, C3/C4/CAM metabolic pathways.

• **L4: Plant Respiration & Bioenergetics:** Glycolysis, Krebs cycle, electron transport chain, alternative respiration in stress adaptation.

• **L5: Mineral Nutrition & Ion Assimilation:** Essential elements, membrane transport mechanisms, nitrogen and sulfur metabolism.

• **L6: Plant Growth & Development Regulators:** Phytohormones (auxins, gibberellins, cytokinins, ABA, ethylene) and photomorphogenesis.

• **L7: Stress Physiology & Defense Mechanisms:** Physiological response to drought, salinity, thermal extremes, photophages, and pathogens (SDG 13).

5.2 Practical & Laboratory Outline

- Determination of plant cell water potential and osmotic pressure.
- Quantitative extraction and spectrophotometric analysis of photosynthetic pigments (chlorophyll a, b, carotenoids).
- Measurement of stomatal conductance and transpiration rates under water deficit conditions.
- Assessment of peroxidase and catalase enzyme activity under abiotic stress conditions.
- Analysis of plant mineral nutrition deficiency symptoms.

5.3 Independent Study (Mustaqil Ta'lim) Topics

- Literature review on drought and salinity resilience mechanisms in Zarafshan valley crops.
- Essay on phytohormonal regulation of crop yield under changing climate conditions.
- Preparation of laboratory report portfolios and diagnostic test items.

6. Recommended Literature & Information Sources

- Taiz L., Zeiger E., Møller I., Murphy A. Plant Physiology and Development. 7th Edition, Sinauer Associates, 2024.
- Tursinbayeva G.S. et al. Plant Physiology. Textbook, Tashkent, 2020.
- Powo Science (Kew Gardens) & Plantarium Databases.