NAVOI STATE UNIVERSITY

O'FBK1106 PLANT PHYSIOLOGY AND BIOCHEMISTRY — COURSE SYLLABUS

Faculty of Natural Sciences and Medicine | Department of Biology | Biotechnology Programme

COURSE PASSPORT & ACADEMIC METADATA

Course Title:	Course Code:
Plant Physiology and Biochemistry	O'FBK1106
Course Type:	**Field of Study:**
Compulsory Course	700000 Engineering, Manufacturing & Construction / 710000 Engineering
Programme:	**Academic Year:**
60710200 Biotechnology	2025–2026
Semester:	**Form of Education:**
6 (VI)	Full-time / Uzbek
ECTS Credits:	**Total Workload:**
6 ECTS Credits	180 Hours (90 Contact Hours [44 Lectures, 46 Labs], 90 Independent Study Hours)
Weekly Contact Hours:	**Assessment:**
6 Hours	Test / Final Examination
Curriculum Code:	**Aligned UN SDGs:**
60710200-1.6	SDG 2 (Zero Hunger); SDG 13 (Climate Action); SDG 15 (Life on Land); SDG 9 (Industry, Innovation & Infrastructure)



1. Course Description & Scope

The course 'Plant Physiology and Biochemistry' (O'FBK1106) provides comprehensive theoretical and practical knowledge on plant cellular structures, metabolic processes, water relations, photosynthesis (light and dark reactions), respiration, mineral nutrition, phytohormones, growth and development regulations, enzymatic activities, stress resistance (cold, heat, drought), and plant defense mechanisms against pathogens and phytophages [cite: 99, 100, 101, 102].

2. Course Aims & Professional Competencies

Course Aim: To equip biotechnology students with foundational knowledge of plant physiological functions, biochemical pathways, cell ultrastructure, metabolic regulation, and environmental adaptation mechanisms [cite: 99].

Professional Competencies:

• Knowledge: Understanding plant cell physiology, photosynthetic carbon assimilation, respiratory pathways, mineral macro- and micro-elements, and hormonal regulation [cite: 100, 101].
• Laboratory & Analytical Skills: Performing plasmolysis/deplasmolysis tests, stomatal movement observation, pigment spectrophotometry, enzyme activity assays (amylase, catalase), and organic compound identification [cite: 101, 102].
• Biotechnology & Stress Adaptation Competence: Evaluating plant stress resistance (cold, heat), total organic composition, and defense responses against phytopathogens for industrial and agricultural biotechnology applications [cite: 101, 102].

3. Prerequisites

• Botany (Anatomy, Morphology, and Systematics of Plants — BOT111) [cite: 99]
• General Biochemistry and Cell Biology [cite: 99]

4. Course Learning Outcomes (CLO)

Code	Learning Outcome Description
CLO 1	Explain plant cell ultrastructure, water exchange mechanisms, photosynthetic light/dark reactions, and cellular respiration pathways [cite: 100, 101, 102].
CLO 2	Perform laboratory diagnostics of plant metabolic status, enzyme activities (catalase, amylase), osmotic pressure, and pigment content [cite: 101, 102].
CLO 3	Evaluate the physiological impacts of environmental stress factors (temperature extremes, drought, pathogens) on plant tissues [cite: 100, 101].

CLO 4	Apply plant physiological and biochemical principles to biotechnology processes, crop enhancement, and stress tolerance improvement [cite: 99, 100, 101].

5. Teaching Technologies & Methods

• Interactive lectures and multimedia metabolic pathway modeling;
• Laboratory experimentation, spectrophotometric assay, and plant tissue analysis [cite: 101, 102];
• Problem-based learning (PBL), case studies, and individual student projects;
• Brainstorming and scientific presentations.

6. Requirements for Earning Course Credits

Students must master theoretical plant physiology and biochemistry concepts, complete all 18 mandatory laboratory sessions, submit independent study tasks, actively participate in coursework, and pass the final test evaluation [cite: 101, 102, 103].

7. Assessment Criteria

• Excellent (90–100% / 5): Comprehensive mastery of plant physiological and biochemical laws; creative problem solving; faultless laboratory execution [cite: 103].
• Good (70–89.9% / 4): Clear understanding of metabolic pathways, water exchange, and photosynthesis; accurate lab performance with minor flaws [cite: 103].
• Satisfactory (60–69.9% / 3): Basic familiarity with core terms; partial completion of lab and independent assignments [cite: 103].
• Unsatisfactory (0–59.9% / 2): Failure to meet course competencies; uncompleted lab tasks; major scientific errors [cite: 103].

8. Recommended Literature & Information Sources

Core Literature:

1. Khojayev, J. Kh. (2004). Plant Physiology [Textbook]. Oqituvchi, Tashkent [cite: 104].
2. Abdullayev, R. A., Asomov, D. K., Beknazarov, B. O., & Safarov, K. S. (2004). Practical Exercises in Plant Physiology [Study Guide]. Universitet, Tashkent [cite: 104].
3. Beknazarov, B. O. (2009). Plant Physiology [Textbook]. National University of Uzbekistan, Tashkent [cite: 104].
4. Sagdiyev, M. T., & Alimova, R. A. (2007). Plant Physiology [Study Guide]. Yangiyol Poligraf-Servis [cite: 104].
5. Taiz, L., & Zeiger, E. (2003 / 2024). Plant Physiology and Development (3rd & 7th eds.). Sinauer Associates / Oxford University Press [cite: 104].

Additional Literature:

6. Mustaqimov, G. D. (1995). Plant Physiology and Basics of Microbiology [Study Guide]. Oqituvchi, Tashkent [cite: 104].
7. Moiseyev, V. A., et al. (1997). Plants of Uzbekistan. Oqituvchi [cite: 104].

Digital Sources:
8. National Library of Uzbekistan: http://www.natlib.uz [cite: 104]
9. ZiyoNET Portal: http://www.ziyonet.uz [cite: 104]
10. MSU Biology Portal: http://bio.msu.ru/study/spescialty/ [cite: 104]

9. UN Sustainable Development Goals (SDG) Alignment

• SDG 2 — Zero Hunger: Aligns by enhancing crop productivity, optimizing mineral nutrition, and developing high-yield resilient plant varieties through biotechnology.
• SDG 13 — Climate Action: Evaluates plant adaptation strategies under thermal and drought stress, carbon dioxide assimilation, and climatic resilience.
• SDG 15 — Life on Land: Focuses on physiological health of flora, plant defense mechanisms against phytopathogens, and biodiversity preservation.
• SDG 9 — Industry, Innovation and Infrastructure: Fosters biotechnological innovations, plant metabolite extraction, and enzyme applications in industrial production.