NAVOI STATE UNIVERSITY

SGE11208 CYTOLOGY, HISTOLOGY & EMBRIOLOGY — COURSE SYLLABUS

Faculty of Natural Sciences & Medicine | Department of Biology | Program: 60510100 Biology

COURSE PASSPORT & ACADEMIC METADATA Course

Title: Cytology, Histology and Embryology (SGE11208)
Field of Study: 100000 Education / Natural Sciences
Program: 60510100 Biology
Academic Year: 2026–2027
Semesters: 1 & 2
Form of Education: Full-time
Language of Instruction: Uzbek
Total Workload: 240 Hours (60 Contact Hours, 120 Independent Study, Laboratory Modules) |
Assessment: Examination
Aligned UN SDGs: SDG 15 (Life on Land), SDG 4 (Quality Education)





1. Course Description & Microscopic Biology

This comprehensive course explores the microscopic architecture of living systems across three integrated disciplines: Cytology (cell biology, organelles, cell division), Histology (tissue types, matrix, histogenesis), and Embryology (gametogenesis, fertilization, cleavage, gastrulation, organogenesis).

In alignment with SDG 15 (Life on Land) and SDG 4 (Quality Education), the curriculum equips biology students with advanced microscopy skills, microtome slide preparation, and histological diagnostic competencies.

2. Course Aims & Intended Competencies

Course Aim: To foster scientific mastery in cellular physiology, tissue differentiation, embryonic development stages, and histological slide identification.

- Cytological Competency: Master prokaryotic vs. eukaryotic cell ultrastructure, biological membranes, organelle function (mitochondria, ER, Golgi, lysosomes, centrosomes), nuclear chromatin, mitosis, and meiosis.
- Embryological Competency: Analyze spermatogenesis, oogenesis, fertilization mechanisms, zygote cleavage patterns, gastrulation, germ layer formation, and neurulation.
- Histological Competency: Classify primary animal tissues (epithelial, connective, muscular, nervous, blood/lymph), hemopoiesis, and tissue regeneration.
- Laboratory Skills: Prepare temporary and permanent histological slides, operate light/fluorescence microscopes, and diagnose tissue biopsies.

3. Prerequisites

Prerequisites: Botany (BOT11210), Human Anatomy (OAN1204), General Chemistry.

4. Course Structure & Workload Allocation

Semester / Module	Contact Hours Breakdown	Workload Distribution
Semester 1: Cytology & Embryology	20 hrs Lecture / 20 hrs Lab	60 Hours Contact
Semester 2: General & Special Histology	20 hrs Lecture / 20 hrs Lab	60 Hours Contact
Independent Research & Slide Prep	120 Hours	Self-Directed Work
Total Workload (Full Course)	240 Hours Total	8 ECTS Credits

5. Detailed Course Curriculum Outline

5.1 Lecture Syllabus Outline

• **L1: History of Cytology & Cell Theory:** Evolution of cell theory, microscopic techniques (light, electron, fluorescence), and cytological research methods.

• **L2: Prokaryotic vs. Eukaryotic Cell Ultrastructure:** Comparative cell morphology, cytoplasm matrix, cell wall, and cellular evolution.

• **L3: Biological Membranes & Plasmalemma:** Fluid mosaic model, membrane transport, endocytosis, exocytosis, and cell surface receptors.

• **L4: Organelles of Protein Synthesis & Energy:** Endoplasmic reticulum, Golgi apparatus, mitochondria, plastids, and lysosomal systems.

• **L5: Cytoskeleton, Centrosome & Cellular Inclusions:** Microtubules, microfilaments, centrosome dynamics, trophic and secretory inclusions.

• **L6: Nucleus, Chromatin & Chromosome Architecture:** Nuclear envelope, nucleolus, karyoplasm, chromatin compaction, and karyotype analysis.

• **L7: Cell Division — Mitosis, Meiosis & Cell Cycle:** Interphase, mitotic stages, meiotic recombination, amitos, and cell cycle regulation.

• **L8: Gametogenesis, Fertilization & Early Embryology:** Spermatogenesis, oogenesis, acrosome reaction, fertilization, cleavage types, and gastrulation.

• **L9: Blood, Lymph & Hemopoiesis:** Blood plasma, erythrocytes, leukocytes, platelets, embryonic and post-embryonic hemopoiesis.

• **L10: Connective, Epithelial, Muscular & Nervous Tissues:** Histogenesis, structural classification, extracellular matrix, synapsology, and tissue regeneration.

5.2 Practical & Laboratory Outline

- Microscope setup, calibration, and histological slide preparation techniques.
- Microscopic comparison of plant and animal cell structures.
- Observing mitotic figures in onion root tip slides (Allium cepa).
- Meiosis and gametogenesis slide examination (spermatogenesis and oogenesis).
- Embryological stage identification: Zygote, blastula, gastrula, and neurula in amphibian/bird models.
- Histological analysis of epithelial tissues: Simple, stratified, squamous, and glandular epithelia.
- Connective tissue examination: Bone cross-sections, cartilage, and loose connective tissue.
- Muscular tissue diagnostics: Skeletal, cardiac, and smooth muscle micro-slides.
- Nervous tissue examination: Multipolar neurons, myelinated/unmyelinated nerve fibers, and synapses.

5.3 Independent Study (Mustaqil Ta'lim) Topics

- Developing a 100-question test bank covering Cytology, Histology, and Embryology.
- Building 3D physical/digital cell organelle models for educational demonstrations.
- Creating interactive 3D video animations illustrating embryonic development stages.
- Creating clinical case studies and video demonstrations on histological tissue diagnostics.

6. Recommended Literature & Information Sources

- Jumaxtayev Q.R. et al. Cytology, Histology, Embryology (Textbook). Tashkent: O'zkitobsavdo, 2021.
- Qodirov E. Histology (Textbook). Tashkent: Fan va Texnologiya, 2012.
- Toshmanov N., Madatov R. Developmental Biology. Tashkent, 2022.
- Abdulov I.A., Halbekova H.U. Cell Biology. Tashkent, 2020.