

NECMETTİN ERBAKAN UNIVERSITY FACULTY OF SCIENCE
MOLECULAR BIOLOGY AND GENETICS UNDERGRADUATE PROGRAM
COURSE CONTENTS

1 st Semester

General Biology I

General information about biology, Biological molecules, cell and tissue concepts, Biological nomenclature and classification, metabolism, respiration, photosynthesis, animal tissue, organs and systems, structure, diversity and reproduction of plants, biodiversity.

Resources

General Biology I, II, Keton Gould, Çeviri Editörleri, Prof Dr. A Demirsoy, Prof. Dr. İ Türkan, Palme Publisher, Ankara, 1999.

Biology, Today and Tomorrow, Cecie Starr, Christine A. Evers, Lisa Starr, California USA, 2008.

Biology, 8th Edition, Volume I-II, Eldra Solomon, Linda Berg, Diana Martin, Thompson Corp., USA, 2005.

General Chemistry I

Matter: its properties and measurement, atoms, elements, molecules and mixtures, reactions in aqueous media, gases, thermochemistry, chemical interactions and bonding, reaction kinetic, chemical equilibrium, transient elements, nuclear elements, structure and reactions of organic molecules, gas laws, molecular movement, real gases, thermochemistry: energy, heat and enthalpy, enthalpy of chemical change, reaction temperatures, atomic structure, atomic models, structure of many electron atoms, periodic properties of atoms, chemistry and periodic system, chemical bonds: ionic bonds, covalent bonds, construction of polyatomic species, exceptions to the octet rule, lewis acids and bases, comparison of ionic and covalent bonds, molecules: shape dimension and bond strength: shapes of molecules and ions, load distribution in molecules, Molecules: Shape Dimension and Bond Strength: Forces and Lengths of Bonds, Orbitals and Bond Formation, Liquid and Solid Materials: Intermolecular Forces, Liquid Structure, Solid Structure, Phase Change.

Resources

Petrucci, R.H., Harwood, W.S., Herring, F.G., (8. Baskıdan Çeviri Uyar, T., Aksoy, S.), Palme Publisher, Ankara, 2005.

Chang, R., (4. Baskıdan Çeviri, Uyar, T., Aksoy, S., İnam R.), Palme Yayıncılık, Ankara, 2006.

C.E. Mortimer, Modern Üniversite Kimyası, Çağlayan Kitabevi, 1.Baskı,1999.

E.Erdik, Y.Sarıkaya, Temel Üniversite Kimyası, Cilt:2, 1986.

W.Fine, H.Beal (Çeviri), Üniversite Kimyası, 2.Cilt, Alkim Yayınevi,2000.

W.Atkins, L.Jones (Çeviri), Temel Kimya, Bilim Yayıncılık, 1999.

Mathematics

Real numbers, prime numbers. Exponential and root numbers. Reminiscent of logarithmic expressions, first and second order equations solutions, inequality solutions. To give information about trigonometric expressions with binomial expansion, third order identity, polynomials, probability, permutation combination account.

Resources

Kaya, R., Ünsal, N.: “Matematiğe Giriş”, Anadolu Üniversitesi yayınları

Foreign Language I

Verbs and tenses, be, present simple, present continuous, present simple or continuous, imperative, past simple, present perfect, be going to, will and shall, present continuous for future, have and have got, sentences and questions; nouns, verbs, adjectives, subject, verb object, yes/no questions, wh-questions, whose is this?, short answers.

Resources

New Headway Elementary

Auxiliary Course Books

Work Book, Teacher Book, Basic English Grammar, Longman English Dictionary, Oxford Bookworm Stage 1-2 ve Grpewine Video Book 1

Turkish Language I

Linguistic features, concepts related to the birth of tongues, reflection theory, theory based on interjections, business theory, theory based on music, theory based on gesture and mimism, culture and basic elements, cultural characteristics, language-culture relation, languages in terms of origin, language in construction, The history of Turkish language, the alphabets used by the Turks, the sound characteristics of the Turkish, the sound events, the sound derivation, the sound drop, the syllable, the sound exchange, the sound association, the sound analogy, the morphology, the word types, the sentences and the varieties.

Resources

Üniversite Türk Dili ve Kompozisyon Dersleri, Kemal Yavuz, Kâzım Yetiş, Nejat Birinci, Bayrak Basım Yayım Dağıtım, İstanbul, 1996.

Türk Dili ve Kompozisyon Bilgileri, Zeynep Korkmaz, Yüksek Öğretim Kurulu, Ankara, 1995.

Principles of Atatürk and History of Turkish Revolution I

The developments in the world in the 18th and 19th centuries, efforts to restructure the Ottoman State, When entering the First World War, the Ottoman State, First World War, Mondros Armistice, Amasya and congress period, the national pact, Istanbul's invasion of Sevres process in Turkey, During the War of Independence, eastern politics, the Armenian question, the structure of the Turkish Grand National Assembly, its functioning, national resistance movements, Gazi Mustafa Kemal Pasha and military activities on the western side, the abolition of the sultanate, internal political developments after the War of Independence and the Treaty of Lausanne.

Resources

Türk İnkılabı ve Türkiye Cumhuriyeti Tarihi, M. Keskin, Ufuk Kitabevi, Kayseri, 2001.

Academic Writing

Research and writing techniques, scientific research studies, article, paper, poster, thesis and project writing stages, oral presentation techniques, bibliography rules, use of written and electronic resources and presentation technologies.

Resources

Robert A. Day, Çeviri: Gülay Aşkar Bilimsel Bir Makale Nasıl Yazılır ve yayımlanır, TÜBİTAK 1996

TÜBİTAK Kurumsal İletişim Müdürlüğü, Etkili Sunumlar için El Kitabı, TÜBİTAK YAYINLARI, Ankara; 2013

1 st Semester-Elective Courses

Introduction to University Life

Definition of university and college, Method of access to information resources, City and university, Effective communication skills, YÖK (Council of Higher Education) student

legislation, Human and Society, Historical daily multicultural life, Human rights, Human and environment, What is science? History of science philosophy, Methods in science, Critical view, Urban aesthetics and art.

Resources

Instructor's lecture notes

Academic Turkish I

Features of academic language, academic concepts and terms, structure and analysis of academic texts, applications of preparing academic texts.

Resources

Monippally M.M., Pawar B. S. (2010), Academic Writing A Guide for Management Students And Researchers, New Delhi: Response Books.

Halit Karay (2019), Akademik Türkçe, Pegem Akademi.

2 nd Semester

General Biology II

Cellular types, prokaryotic and eukaryotic cells, mitosis and meiosis divisions, chromosomes, cell organelles, molecular association of cells, biosynthesis of cell components, membranes and organelles, flow of genetic information in cells, cell membrane systems, molecular transport in cells, bioenergy and metabolism, cell cycle and control, cell differentiation, cell death, stem cells, cancer cells, basic principles of cryopreservation of cells, microscopy.

Resources

Lippincott's Hücre ve Moleküler Biyoloji, Nalini Chandar, Susan Viselli, Çeviri Editörü Betül Yanık, Nobel Kitabevi, Ankara.

General Chemistry II

The states and properties of matter, acid-base and pH concepts, chemical equilibrium, organic compounds and structures (basic knowledge), chemical kinetics and chemical bonds.

Resources

Genel Kimya, R.H. Petrucci, W.S. Harwood , Palme Yayıncılık (8.baskı) Ç.Editörleri:Tahsin Uyar ve Serpil Aksoy

Genel Kimya, Raymond Chang, Palme Yayıncılık (4. Baskı) C.Editörleri:Tahsin Uyar, Serpil Aksoy ve Recai İnam

Biophysics

Energy, vibration and energy, vibration and waves, atomic and molecular structure, spectroscopy, electricity, biological measurement, light, heat and surface properties of lenses and microscopes, mechanical properties of solid and liquids, radioactivity and importance, bioelectrical potentials, electromagnetic fields and the effects of sound, light and heat on living things. Biomechanical and cybernetic properties of living things.

Resources

N.C. Hilyard and H.C. Biggin., “Physics For Applied Biologists”, Edward Arnold Limited, 1978.

Foreign Language II

Modals, can, can't , could, can I, must and mustn't, prepositions; place, time, articles, nouns, pronouns, a, an , the, plural nouns, this, that., countable-uncountable, some, any, no, I and me, my, your, mine, yours, much, many, a lot of, adjectives and adverbs, adjectives, cardinal-ordinal numbers, comparatives, superlatives, adjectives and adverbs, adverbs of frequency, building sentences, and , but, so, both and either...or, neither... nor.

Resources

New Headway Elementary

Work Book, Teacher Book, Basic English Grammar, Longman English Dictionary, Oxford Bookworm Stage 1-2 ve Grpewine Video Book 1

Turkish Language II

Writing rules, practice adjectives, the writing of numbers, compound words, phrases Hendiadyoins, the spelling of foreign words and abbreviations, punctuation, narrative and stylistic features, forms of expression, expression disorders, paragraph structure and properties, paragraph types and characteristics, thought development in paragraph, essay and its elements, written and oral expression.

Resources

Üniversite Türk Dili ve Kompozisyon Dersleri, Kemal Yavuz, Kâzım Yetiş, Nejat Birinci, Bayrak Basım-Yayım-Dağıtım, İstanbul, 1996.

Türk Dili ve Kompozisyon Bilgileri, Zeynep Korkmaz, Yüksek Öğretim Kurulu, Ankara, 1995.

Atatürk's Principles and History of Turkish Revolution II

Ads and republican principles of the Republic, the 1924 constitution of the Republic of Turkey and the common features of the constitution, the first political party and developments, legal revolution, education and culture revolution, nationalism and reformism, social revolutions, Atatürk era economic policies, Atatürk era of Turkish foreign policy, 20. the first half-century in the second world war years Turkey developments in the world, the transition to multiparty era, the world 'in development after the second world war, visual material related to the Ataturk era.

Resources

Türk İnkılabı ve Türkiye Cumhuriyeti Tarihi, M. Keskin, Ufuk Kitabevi, Kayseri, 2001.

Written and visual publications about the subjects.

Carreer Planning

Within the scope of this course, to raise awareness about the dynamics and expectations of business life, to guide students to determine their careers in accordance with their intelligence, personality, knowledge, skills, abilities and competencies, to teach how to benefit from career centers, to introduce different sectors in which they can do internships and work voluntarily or professionally is intended.

Resources:

Kuzgun, Y. (2003). Meslek Rehberliği ve Danışmanlığına Giriş. Ankara: Nobel

Erdoğan, N. (2003). Kariyer Geliştirme. Ankara, Nobel,

Kulaksızoğlu, A. (2005). Ergenlik Psikolojisi. İstanbul

Remzi. Kuzgun, Y. (2003). Meslek Danışmanlığı Kuramlar Uygulamalar. Ankara: Nobel.

Doug Toft, Ed Stupka ,Dave Ellis Doug Toft , Ed Stupka, Stan Lankowitz (2003), Career planning, Third Edition.

2 nd Semester-Elective Course

Social Responsibility

Ethical values, family and care, healthy start to marriage and marriage, gender equality, family communication, health and social responsibility, social responsibility and university, social responsibility and ngos, sample applications in social responsibility 1, sample

applications in social responsibility 11 overview, protection of healthy life, threats to healthy life (dependency), basic first aid-movement style in emergency situations.

Resources

Instructor's lecture notes

Academic Turkish II

Features of academic language and writing; structure and types of academic texts (articles, reports and scientific abstracts, etc.); the formal features of scientific reports and articles.

Resources

Monippally M.M., Pawar B. S. (2010), Academic Writing A Guide for Management Students And Researchers, New Delhi: Response Books.

Halit Karay (2019), Akademik Türkçe, Pegem Akademi.

3 rd Semester

Biochemistry I

Introduction to Biochemistry, Introduction to amino acids and proteins, Peptide bond and structure of proteins, Structural proteins, Structure of hemoglobin and myoglobin, Introduction to carbohydrates, Glycoside bond and glycosides, Disaccharides, polysaccharides and derivative carbohydrates, Introduction to lipids and fatty acids, Triacylglycerols, glycolipids and phospholipids, Sterol, terpene, cholesterol, Lipoproteins, Introduction to vitamins, Fat-soluble vitamins, Water-soluble vitamins, Structure and Classification of Enzymes, Enzyme Kinetics, Hydrolysis with Enzymes, Coenzymes, Glycoproteins and Glycosaminoglycans Structure, Enzyme inhibition, Regulation of enzyme activity, Introduction to mineral metabolism, Calcium and phosphorus metabolism, Iron metabolism, Trace elements, Nucleic acid metabolism.

Resources

Lehninger Principles of Biochemistry, Albert L. Lehninger, David Lee Nelson, Michael M. Cox; W.H. Freeman, New York, 2008.

Biochemistry, Christopher K. Mathews, Kensal E. van Holde, Kevin G. Ahern; 3rd edition, Prentice Hall, New Jersey, 1999

İnsan biyokimyası, Taner ONAT. PALME Yayıncılık.

Tıbbi Biyokimya, Figen GÜRDÖL. Nobel tıp kitabevi.

Molecular Biology I

Molecular biology, molecular structure of DNA, RNA and chromosomes and genes, transcription and translation mechanisms. Introduction and use of laboratory instruments and materials, laboratory setup and cleaning, use of micropipette, electrophoresis and pH meter usage, cloning techniques

Resources

Molecular Biology of the Cell, Bruce Alberts, Alexander Johnson, Julian Lewis and Martin Raff, Garland Science, New York, 2008.

Principles and Techniques of Biochemistry and Molecular Biology, Keith Wilson and John Walker

Instructor's lecture notes

Biostatistics

Introduction to statistical methods for biological data, definition of data, introduction to probability, statistical methods, comparison of groups (variance analysis), linkage analysis (linear regression).

Resources

Biyoistatistik terimler sözlüğü, Mehmet Şahinoğlu, Dokuz Eylül Yayıncılık, 2001, İzmir

Biyoistatistik, Hatiboğlu yayımları: Yükseköğretim dizisi, 1. cilt/Sümbüloğlu Dizisi, Kadir Sümbüloğlu, Vildan Sümbüloğlu, 8. Baskı, 1998

Bioanalytical

Molecular spectroscopy techniques, Magnetic resonance spectroscopy, Principles of separation techniques, Polarity-based methods, Ionic structure and size-based methods, Molecular spectroscopy, Molecular spectroscopy, Molecular resonance spectroscopy, Shaped methods, Potentiometry, conductometry, kurometry, voltammetry, biosensors, The nature of radioactivity, measurement and determination of radioactivity, Biochemical use of isotopes, Intermittent analyzers, continuous analyzers, robotics, General processes based on immune response: antigen-antibody reactions, analytical techniques (precipitation reactions, immunoassay)

Resources

Holme DJ. And Peck H., Analytical Biochemistry, Third Edition, Pearson Education, 1998.

Mikkelsen R.S., Corton E., Bioanalytical Chemistry, John Wiley & Sons, Inc, 2004.

Genetics I

Genetic organization, DNA and RNA structure, genetic structure, cytological basis of inheritance, allele interactions, gene interactions, mutations and polymorphisms, genotype-phenotype relationship, molecular organization of chromosomes and structural differences in chromosomes, DNA repair mechanisms, bacterial and viral genetics, cancer genetics, regulation of cell cycle, genetic probability and statistical analysis

Resources

Genetik Kavramlar, W S. Klug ve M. R. Cummings, Palme Yayıncılık, Ankara 2002.

Genetik, Prof. Dr. Zafer Bahçeci, Öğrenci Kitabevi Yayınları, 2001.

Genetik, Nihat Bozcuk, Palme Yayıncılık, Ankara, 2000.

Moleküler Biyolojide Önemli Notlar, P. C. Turner ve ark., Nobel yayınları, Ankara, 2002.

Professional English I

Improvement of vocabulary in professional subjects, translation exercises, practical speaking, oral and written expression of a known topic on foreign language, research methods, presentation of research reports.

Resources

Instructor's lecture notes, English articles and books related to the field.

History and Philosophy of Science

The birth and development processes of the branches of science, their role and importance in history, the evaluation of science in terms of philosophy, the comparison and evaluation of Science, Philosophy and Scientific Methods, theoretical and practical achievements created by scientific developments.

Resources

BİLİM TARİHİ VE FELSEFESİ, Prof. Dr. Hüseyin Gazi TOPDEMİR ve Prof. Dr. Yavuz UNAT, 2019, PEGEM AKADEMİ

4 th Semester

Biochemistry II

Carbohydrate metabolism, lipid metabolism, protein metabolism, nitrogen metabolism.

Resources

Biyokimya, E. Edip KEHA, Ö. İrfan Küfrevioğlu, Aktif Yayınevi, Erzurum, 2010.

Principles of Biochemistry, Albert L. Lehninger, David L. Nelson, Michael M. Cox, Second Edition, Worth Publishers, New York, 2005.

Molecular Biology II

Structure and organization of DNA and RNA, gene structures in prokaryotes and eukaryotes, control mechanisms of gene expression, molecular biology of recombination, molecular principles of transcription and translation, mutation and DNA repair mechanisms, molecular biology of cancer, apoptosis. DNA isolation, restriction and ligation enzymes, agarose and PAGE electrophoresis, blotting techniques, DNA marker technology, bulk segregant analysis, vectors, cDNA and DNA library generation, DNA sequencing techniques and bioinformatics, transposons, cloning techniques, gene transformations. PCR techniques, staining techniques, Southern analysis, preparation of chemical solutions and preparations.

Resources

Molecular Cell Biology 6th edition, Lodish, Berk, Kaiser, Krieger, Scott, Bretscher, Ploegh, Matsudaira. Çeviri Editörleri Prof. Dr. Hikmet Geçkil, Prof. Dr. Murat Özmen, Prof. Dr. Özfer Yeşilada, Palme Yayıncılık, 2011.

DNA and Biotechnology, Molly Fitzgerald-Hayes, Frieda Reichsman, Third Edition, Academic Press, Elsevier, USA, 2010.

Principles and Techniques of Biochemistry and Molecular Biology, Keith Wilson and John Walker

Instructor's lecture notes

Histology

Texture, concept and classification. Epithelial tissue: Methods used in histology, light microscope working system. Exocrine and endocrine glands: Salivary gland, pancreas, Structure and functions of fatty tissue. Structural features of cartilage tissue, classification and histophysiology. Bones and bone texture: Blood texture: Structure of plasma, classification of blood cells. Lymphoid tissue and organs. Overview of the immune system, Nerve structure: Structure, function and classification of neurons. Neural structure, cerebellum, spinal cord, central and peripheral nervous system: general structure and functions of brain, cerebellum, spinal cord, nucleus, ganglions and peripheral nerves. Respiratory system: Structure and functions of nasal cavities, larynx, trachea, bronchial, bronchiole and alveoli. Digestive system: Structure and functions of oral cavity and pharynx. Glands associated with the

digestive system: Liver, bile duct and pancreas, Excretory system: Structure, function and classification of kidney, nephrons.

Resources

Sema İşısağ Üçüncü, Gürsel Ergen, Hüseyin Arıkan, 2009. Histoloji. EÜ Yayınları, 2. Baskı, Bornova-İzmir

C. Junqueira and Jose Carneiro, 2005, Basic Histology, Text and Atlas, 11th Ed., McGraw-Hill Publishing.

Michael H. Ross, Gordon I. Kaye and Wojciech Paulina, 2003. Histology, A Text and Atlas. Fourth Edition. Williams & Wilkins, Baltimore.

Organic Chemistry

Carbon compounds and chemical bonds, functional groups and functions, aromatic compounds, ethers and alcohols, radical reactions, nucleophilic reactions, carboxylic acids, aldehydes, ketones, aromatic aldehydes and ketones

Resources

Organik Kimya, G.Solomons, Graig Fryhle, C. editörleri G.Okay, Y.Yildirir

Instructor's lecture notes

Genetics II

Genetic mapping, Cytogenetic mapping, Physical mapping; parametric and nonparametric methods. Population genetics; Hardy-Weinberg rules, adaptation, genetic shift, genetic founder effect, Genetic and chromosomal variations, mutations and types of DNA repair. Epigenetics. Cancer genetics; regulation of gene expression and cellular signaling pathways, tumor suppressor genes, oncogenes, uncoded RNAs and microRNAs. Cell cycle control, apoptosis and metastasis mechanisms. Developmental genetics; stem cells, asymmetric mitosis division, differentiation genetics and genetic defects. Neurogenetics; neuronal development, action potential and synapse. Pharmacogenetics; genetic variations and drug resistance. Nutrition genetics; glucose metabolism, insulin signaling pathway, obesity genetics. Behavior genetics. Genetics and Ethics. Genomics and Genetics databases.

Resources

Klug, W.S., Cummings, M.R. and Spencer, C.A. "Genetik Kavramlar" Ç ed. Öner, C ve ark. Palme Yayıncılık, Ankara, 2009.

A Bozcuk, A. Genetic. Palme Publishers, 2000- Tamarın, R. "Principles of Genetics", Third Edition. Wm. C. Brown Publishers, 1991.

Stansfield,W.D., “Theory and Problems of Genetics”, Sc.edit.Schaum’s Outline Series,McGraw-Hill Book Compaany,New York, 1998.

Thompson-Thompson. “Genetics in medicine” (8th edition) Elsevier,2016.

Stratchan, Read. “Human Molecular Genetics 3” Garland Science, 2004.

Tobias, Connor, Ferguson, Smith. “Tıbbi Genetiğin Esasları” Çeviri Ed. U. Özbek, İstanbul Tıp Kitabevi, 2014.

Professional English II

Improvement of vocabulary in professional subjects, translation exercises, practical speaking, oral and written expression of a known topic on foreign language, research methods, presentation of research reports.

Resources

Instructor's lecture notes, English articles and books related to the field.

5 th Semester

Physiology I

Plant growth factors and agricultural application areas, plant growth stimulators and physiological activities, auxins, cytokinins, gibberellins, plant growth inhibitors, photosynthesis precautions, translocation, transpiration, vernalization, dormancy, thermoperiodism, photoperiodism.

Resources

Moleküler Hücre Biyolojisi, H. Lodish, A. Berk, C. Kaiser, M. Krieger, M. Scott, A. Bretcher, H. Ploegh, P. Matsudaira, Çeviri Editörleri, Prof. Dr. Hikmet Geçkil, Prof. Dr. Murat Özmen, Prof. Dr. ÖzferYaşılada, Palme Yayıncılık, Ankara, 2011.

Bitki Fizyolojisi, 3. Baskı, Taiz and Zeiger, Çeviri Editörü Prof. Dr. İsmail Türkan, Palme Yayıncılık, Ankara, 2008.

Stern’s Introductory Plant Biology, 12th edition, James Bidlack, Shelly Jansky, World Color Press, New York, USA, 2011.

Microbiology

Classification of microorganisms, microorganism morphology, bacterial cell structure, protoplast and seperoplast cells, mold and yeast structure, microorganism growth, microbial growth, factors affecting microorganism development, control of microbial growth and

antimicrobial chemotherapy. Dyeing methods and examination of microorganisms by microscope, preparation of food, sterilization methods, inoculation methods, bacterial counting methods, some basic biochemical tests

Resources

Temel Mikrobiyoloji ve Baęışıklık Bilimi, Hakkı Bilgehan, Barış Yayınları Fakülteler Kitabevi, İzmir, 2002.

Temel Mikrobiyoloji, M. Arda, Medisan Yayın Serisi, Ankara, 2000.

Essential Microbiology, Stuart Hogg, (ISBN: 10: 0471497541), John Wiley Ltd., England, 2005.

Genel Mikrobiyoloji Laboratuar Yöntemleri, A. Çotuk, Nobel Yayınları, 2003.

Recombinant DNA Technology

Basic techniques (solutions, agarose gel electrophoresis, Southern, Northern, Western blot), vectors for gene cloning (plasmids, phagemids, cosmids, bacteriophages, Yeast artificial chromosome and bacterial artificial chromosome), gene transfer methods (chemical transformation, electroporation, conjugation) , DNA and RNA modification enzymes (restriction endonucleases, ligases, kinases, phosphatases, polymerases, nucleases), polymerase chain reaction in gene manipulation (special PCR methods, primer designs for cloning), cloning of a gene and specific strategies, recombinant selection, screening and confirmation methods (Sequence analysis, cutting with RE, PCR), protein production with cloned gene (Expression vector types and properties), directed and random mutation techniques, gene cloning and applications in biotechnology and medicine.

Resources

Bernard R. Glick, Cheryl L. Patten, 2019. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Wiley; 5 edition.

Gen Klonlama ve DNA Analizi: Giriş, Çeviri Kurulu: Fevzi Bardakcı - Ali Fazıl Yenidünya - Nazan Yılmaz, 2013, Nobel Akademik Yayıncılık.

Moleküler Hücre Biyolojisi, H. Lodish, A. Berk, C. Kaiser, M. Krieger, M. Scott, A. Bretcher, H. Ploegh, P. Matsudaira, Çeviri Editörleri, Prof. Dr. Hikmet Geçkil, Prof. Dr. Murat Özmen, Prof. Dr. Özfer Yaşılada, Palme Yayıncılık, Ankara, 2011.

Molecular Biology of Cancer

What is Epigenetics? Molecular representation of the relationship between changes in individuals as epigenetic and cancer cases, Discussion of the role of epigenetic factors in the

progression and treatment of cancer, definition of stem cells, hypothesis of stem cells in cancer cases. Niche formation. What is metastasis? Discussing molecular factors by defining the formation and spread of cancer cells, to define the effects of environmental factors on cancer formation and development, discussion of molecular targets of specific factors such as nutritional habits, environmental pollutants

Resources

The Biology of Cancer, Robert E. Weinberg, Garland Science, Taylor&Francis Group, LLC, New York, 2007.

5 th Semester-Elective Courses

Enzyme and Protein Chemistry

Structure and architecture of proteins, protein folding, structure of proteins, structure of protein functions, control and regulation mechanisms of protein functions, key motor proteins, destruction of proteins, techniques for determination of protein functions, structure of enzymes, factors affecting enzyme function, enzyme inhibition, multi enzyme systems, their regulation, coenzymes and their tasks, enzyme immobilization.

Resources

Introduction to Enzyme and Coenzyme Chemistry, Tdh Bugg, Blackwell Science, London, 1997.

Enzyme Technology, Ashok Pandey, Colin Webb, C. Ricardo Soccol, Christian Larroche, Springer Science Business Media, New York, 2006.

Immunology

Introduction to immune system; cells and organs of the immune system, cytokines and chemokines. Natural immunity; Early defense system mechanisms against infections. Immunogen, antigen, tolerogen and haptens. Antigen capture and presentation to lymphocytes. Acquired immune response and antigen recognition. Cell-mediated immune response; T-lymphocyte activation and effector mechanisms. MHC genes and signaling mechanisms. Humoral immune responses; antibody structure, types, B-lymphocyte activation and antibody production. Tissue compatibility and immunological tolerance. Immune responses to tumors and grafts. Congenital and acquired immune deficiencies.

Resources

Abul K. Abbas, Andrew H. Lichtman. “Temel İmmünoloji” Çeviri ed. G. Deniz. İstanbul Medikal Yayıncılık. 2007.

Abul K. Abbas, Andrew H. Lichtman, and Shiv Pillai. “Cellular and Molecular Immunology”.(8th edition), Elsevier, 2015.

Hormones

Chemical structure and classification of cytokines, biosynthesis, physiological effects, chemical structure of jasmonic acid, biosynthesis and biosynthesis, chemical structure of gibberellins, biosynthesis pathway, germination effects, discovery of cytokinins, hormone identification, classification of plant hormones, answers to plant defense at the molecular level, Polyamines as endogenous growth regulators

Resources

Plant Hormones: Biosynthesis, Signal Transduction, Action. Peter J. Davies, Springer, New York, 2004.

Laboratory Quality Assurance

General information about ISO / IEC 17025, ISO 15189 and GLP, laboratory setting conditions and environmental controls, method selection and method validation, measurement uncertainty, instrument calibrations and controls, instrument qualifications, laboratory metrology and traceability, internal quality control program, interlaboratory comparison tests, proficiency tests.

Resources

The Laboratory Quality Assurance System, Thomas A. Ratliff, Wiley Interscience, New Jersey, 2003.

Quality Assurance in Analytical Chemistry Laboratory, D. Bryann Hibbert, Oxford University Press, New York, 2007.

Membrane Biology

The cell membrane is a structure in which very important cellular activities take place, which ensures the exchange of all substances with the cell. Structure and composition of membrane, transport of substance from membrane and structures involved in this process, signaling mechanisms involved in the cell membrane. Membrane structures in bacteria and metabolic activities in bacterial membrane.

Resources

Moleküler Hücre Biyolojisi, H. Lodish, A. Berk, C. Kaiser, M. Krieger, M. Scott, A. Bretcher, H. Ploegh, P. Matsudaira, Çeviri Editörleri, Prof. Dr. Hikmet Geçkil, Prof. Dr. Murat Özmen, Prof. Dr. Özfer Yaşılada, Palme Yayıncılık, Ankara, 2011

William Stillwell, 2013, An Introduction to Biological Membranes: From Bilayers to Rafts. Elsevier Science.

Information Technologies

Basic concepts of information management, conceptual foundations of information management, contemporary management, system approach, informatics; the history of information management, information-managing institutions, information society, information management technologies, human computer interaction

Resources

Bilişim Teknolojileri, Prof. Dr. Hüseyin Uzunboylu

Works of Volunteering (Volunteering Studies)

Volunteering, Ethics, Ethics, Philanthropy, Importance of Volunteering, Individual Social Volunteering Studies, Corporate Volunteering, Institutional Identity, Institutional Image, Economic, Organizational and Social Issues in Corporate Volunteering, Volunteering Issues and Analysis of Successful Volunteering Studies

Resources

TÜRKİYE'DE GÖNÜLLÜLÜK, Deneyimler, Sınırlılıklar ve Yeni Açılımlar; Derleyenler: Emre Erdoğan, Pınar Uyan-Semerci, Nurhan Yentürk, Laden Yurttagüler; İstanbul Bilgi Üniversitesi Yayınları, 2020.

6 th Semester

Physiology II

Introduction to animal physiology, anatomical positions, movement and support systems of the body (skeletal system, control of muscle system, nervous system and body movements) and physiology.

Resources

Moleküler Hücre Biyolojisi, H. Lodish, A. Berk, C. Kaiser, M. Krieger, M. Scott, A. Bretcher, H. Ploegh, P. Matsudaira, Çeviri Editörleri, Prof. Dr. Hikmet Geçkil, Prof. Dr. Murat Özmen, Prof. Dr. Özfer Yaşılada, Palme Yayıncılık, Ankara, 2011.

Molecular Biotechnology

This course focuses on modern and molecular biotechnological approaches rather than traditional approaches. Biotechnology and historical development process, stages of a biotechnological process (downstream, upstream processes), bioreactors and bioprocess types, molecular biological methods used in biotechnology, primary and secondary metabolites, substrates used in biotechnology, host organisms used in the production of biotechnological products, genetically modified organisms (Genetically modified organisms and sample studies for the production of high added value substances), molecular approaches in biofuel production, enzyme and protein technology, primary and secondary metabolite production with biorefinery concept, biosensors, safety, social and ethical considerations, current articles in Molecular Biotechnology.

Resources

Biyoteknoloji (Temel Prensipler ve Uygulama), 1. Baskı, Azmi Telefoncu, Nurdan Kaşıkara Pazarlıoğlu, Birleşik Matbaacılık ISBN. 978-605-125-192-9, Ekim 2010 Bornova.

Bernard R. Glick, Cheryl L. Patten, 2019. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Wiley; 5 edition.

Genetic Engineering

Methods that allow changes to human, animal, and plant genomes (Particle bombardment, microinjection, gene transfer via Agrobacterium, etc.). Gene silencing before and after transcription. Gene silencing methods.

Resources

An Introduction to Genetic Engineering, Dr Desmond S. T. Nicholl

Instrumental Analysis

HPLC and GC applications, optimization in chromatography, validation

Resources

Instrumental Analiz İlkeleri (Principles of Instrumental Analysis, 5th Ed. Çeviri Douglas A. Skoog, F. James Holler, Timothy A. Nieman. Saunders Colle

Instrumental Methods of Analysis (Chemistry), Hobart H. Willard, Lynne L. Merritt Jr., John A. Dean and Frank A. Settle Jr

Critical Thinking

Definition of critical thinking, critical thinking process, critical thinking elements, development of critical thinking, critical reading, writing and discussion skills, importance of critical thinking in decision making process.

Resources

Birsel AYBEK, Eleştirel Düşünme Rehberi, 1. Baskı, Anı Yayıncılık, Ankara, 2012.

Internship

The purpose of the internship is to reinforce the theoretical and applied knowledge gained in undergraduate education, to see the application of this knowledge in working life and to prepare students for the realities and conditions of business life. In this process, students gain 20 working days of experience in the institutions of their choice on the days other than the course and exam periods in the university academic calendar.

6 th Semester -Selective Courses

Biosafety and Bioethics

In transgenic plants, animals and microorganisms, safety, ethical and legal regulations, biosafety protocol, Intellectual property rights-patent system, patent examples, patents of living organisms, global standards, patented ethics, technology protection system, labeling in transgenic products, refuge, cost of biosecurity, identification and monitoring of transgenic crops, benefits of biosecurity, environmental risks of transgenic organisms, risk analysis and regulation for bioethics, environment, human beings and animals in biodiversity, biosecurity in food, effects of transgenic products and foods, toxicological effects of transgenic products, allergic effects, DNA transfer.

Resources

Globalization, Biosecurity, and the Future of the Life Sciences-Institute of Medicine and National Research Council of the National Academies, National Academies press, 2006.

Tom L. Beauchamp, LeRoy Walters, Jeffrey p. Kahn, Mastroianni “Contemporary Issues in Bioethics” Wadsworth Publishing Company, 7th edition, 2007.

Cell and Tissue Culture

Cell culture laboratory and equipment. Working principles in aseptic conditions and laboratory safety. Sterilization methods. Culture containers, culture media, incubators and other consumables used. Primary culture, immortal culture and cell lines. Primary culture preparation techniques, cell passaging, freezing and thawing protocols. Cell counting, primary cell, lineage cell, stem cell identification and imaging methods. Gene transfer techniques; transfection and transduction. Cell proliferation, toxicity, apoptosis and migration techniques, Induced pluripotent stem cells and organoid culture. Cell separation; Ficoll, MACS and FACS methods. Somatic Embryogenesis, Protoplast Culture and somatic Hybridization, Haploid plant production, Disease control, Secondary metabolite production, Micropropagation and rapid propagation of plants, Germplasm preservation, Embryo culture, Somaclonal variation.

Resources

Cheryl D. Helgason, Cindy L. Miller. "Basic Cell Culture Protocols". Springer protocols. 2005.

Cell Culture Techniques, Michael Aschner, Cristina Suñol, Anna Bal-Price, Humana Press, 2011, USA

Bitki Biyoteknolojisi, Babaoğlu, B. Gürel, E., Özcan, S, S.Ü. vakfı yayımları, ISBN 975-6652-03-9, 2001.

Animal Cell Culture Methods, Jennie P. Mather (Editor), David Barnes (Editor)

Biomaterials

Classification, structure and basic properties of materials; Identification and classification of biomaterials; Methods used in synthesis and characterization of biomaterials; Use of biomaterials in tissue engineering applications; Nanobiomaterials and their applications in medical field.

Resources

Park, J., & Lakes, R. S. (2007). *Biomaterials: an introduction*. Springer Science & Business Media.

Lanza, R., Langer, R., & Vacanti, J. P. (Eds.), *Principles of tissue engineering*, Academic press, 2011.

Ashby, M.F., Ferreira P.J., Schodek, D.L., *Nanomaterials, nanotechnologies and design: An introduction for engineers and Architects*, Butterworth-Heinemann, 2009.

Greco, R.S., Prinz, F.B., Smith, R.L., *Nanoscale Technology in Biological Systems*, CRC Press, 2005.

Monoclonal Antibodies

The structure of the antibodies, advantages / disadvantages of monoclonal antibodies, history, immunization of experimental animals, myeloma cultures, lymphocyte isolation from spleen and lymph nodes, cell fusion, HAT selection, cloning techniques, in vivo and in vitro antibody production, identification of monoclonal antibodies, large scale production, human monoclonal antibodies, problems and solutions.

Resources

Monoclonal Antibodies: A Practical Approach, Oxfordpress, Shepherd, P., Dean, C., 2000.

Monoclonal Antibodies: Preparation and use of Monoclonal Antibodies and Engineered Antibody Derivatives, Zola, H., BiosScientific Pub., 2000.

Microbial Genetics

Genetic structures of microorganisms (bacteria, fungi, viruses, etc.), gene expression systems and genetic processes in these organisms (general recombination, site-specific recombination etc.). Microorganisms use in researching biotechnology and genetic engineering.

Resources

Microbial Genetics, Stanley Maloy

Molecular Genetics of Bacteria, Third Edition (Snyder, Molecular Genetics of Bacteria)

Applied Cytology Lesson

Cell types in the female genital organ and their properties, multilayered epithelium and its properties, menopause and benign cellular changes, gynecological infectious agents and cellular changes, early and late cancers of the cervix uterine

Resources

Cotran R.S., Kumar V., Robbins S.L. Pathologic Bases of Disease. 4th edition, 1989.

Koss L.G., Diagnostic Cytology and its Histopathologic Bases, Lippincott Williams& Wilkins, 2006.

7 th Semester

Proteomics and Genomics

Genomic and proteomic concepts, nucleolus proteomics, microarrays and proteomics, ribozymes, phosphorylation and protein functions, identification of proteins with MS, protein-

protein interactions, algorithm and mass spectrometry, protein fragmentation techniques, analytic protein and peptide separations, proteomic mapping methods

Resources

Genomics: Essential Methods, Mike Starkey, Ramnath Elaswarapu, Wiley-Blackwell, 2011, UK.

Introduction to Genomics, Arthur Lesk, Oxford University Press, 2007, USA.

Genetic Diseases and Diagnosis

Ovulation, Zygote formation, Morula, Blastocyst and Preimplantation period. Implantation stage and embryonal development. Organogenesis, morphogenesis and fetal development. Congenital malformations. Chromosomal and genetic defects. Genotype, phenotype and pedigree drawing. Penetrance and expressivity variability. Numerical and structural chromosomal anomalies and related diseases; Down, Patau, Edwards, Cat cry, Cat eye syndromes, Chronic Myeloid Leukemia. Mendelian inheritance and diseases; Familial hypercholesterolemia, Cystic fibrosis, hemoglobinopathies (beta-thalassemia), X inactivation, Lyon hypothesis, Rett syndrome, Hemophilia A and B. Non-mendelian inheritance and diseases; anticipation (Fragile X syndrome), mosaicism, chimerism, genomic imprinting, uniparental disomy; Angelman and Prader-Willi syndromes, Beckwith-Wiedemann syndrome. Sexual development disorders; Turner, Klinefelter, XYY syndromes, hermaphrodite. Mitochondrial diseases and maternal inheritance. Genetic diagnostic methods. Case presentations and discussions.

Resources

Thompson-Thompson. "Genetics in medicine" (8th edition) Elsevier, 2016.

Strachan, Read. "Human Molecular Genetics 3" Garland Science, 2004.

Tobias, Connor, Ferguson, Smith. "Tıbbi Genetiğin Esasları" Çeviri Ed. U. Özbek, İstanbul Tıp Kitabevi, 2014.

Molecular Biology and Genetics Practises I

These courses, Molecular Biology and Genetics Practises I and II are given in the fall and spring semesters. Within the scope of the courses, it is aimed that our students make practises at laboratory about the research areas of our faculty members and also gain experiences before their graduation by applying scientific research techniques under the supervision of our faculty members. Molecular Biology and Genetic Practises I course includes Biochemical and genetic calculations I, Protein determination and quantification methods, Enzyme activity

determination, Proteomic applications, Quantitative mycotoxin determination by ELISA method, Gene amplification by real-time PCR, Western blot and analysis, Natural diversity analysis populations Gene and protein databases, DNA vectors and technical visits in transgenic plant production.

Resources

Instructor's lecture notes

Entrepreneurship Culture

Entrepreneurship concept and scope, Historical development and basic dimensions of entrepreneurship, Entrepreneurial thinkers' appointments and management and management, Entrepreneurial passion, The formation of entrepreneurship culture and motivation factors, The types, characteristics and basic functions of entrepreneurship, The obstacles and constraints in entrepreneurship, Entrepreneurs' process of establishing business processes, Women entrepreneurship, Theoretical basis of the location of SMEs and entrepreneurial culture in Turkey, Entrepreneurship problems and solutions in Turkey, Giving information about the future issues of entrepreneurship.

Resources

Instructor's lecture notes

7 th Semester-Elective Courses

Plant Stress Physiology

Water Scarcity and Drought, Heat Stress and Heat Odor, Cold and Freezing Temperatures, Salinity Stress, Stress Physiology of Plants under Oxygen Deficiency Conditions

Resources

Taiz L., Zeiger E. "Plant Physiology", Sinauer Press, 2006.

Smith A.M., Coupland G., Dolan L., Harberd N., Jones J., Martin C., Sablowski R., Amey A. "Plant Biology", First Edition, Garland Science, Taylor&Francis Group, LLC, New York, 2010

Genetically Modified Organisms

Genetically modified organisms (GMOs) history and description, Model organisms, The way GMOs are developed and obtained, Reasons for using GMOs Classification of GMOs, Production and dissemination of GMOs, Genetically modified microbial, mammalian and

plant organisms, The use of GMOs in research, environment, industry and agricultural production, Potential risks of GMOs, The national and international regulations on the production and trade of GMOs, GMOs and biosafety, moral and social problems, GMOs and food safety.

Resources

Safety of Genetically Engineered Foods, National Academic Press, New York, 2004.

Transgenic Plant Technologies

Transgenic plant production and their use; Drought and extreme floods, climate change due to global warming, it has shown rapid development in recent years as a powerful tool for the fight against harmful insects and growing plants resistant to diseases and various stress factors. In addition to the basic plant biology and plant genetics, this course will contribute to students for their knowledge about fundamentals of plant biotechnology and applications. In this course, students will have theoretical knowledge and new perspectives about the following subjects: sowing and cultivation of biotech crops, design and construction of vectors for the production of recombinant DNA, Genes related to transgenic plant production and their characteristics, Marker genes and promoters, transgenic plant production, analysis of transgenic plants, GMO legislation in our country and in the world (genetically modified organism) for the biosecurity, field experiments with transgenic plants, risk perception about transgenic plants and the future status of transgenic plants.

Resources

Plant Biotechnology and Genetics: Principles Techniques and Applications. Editor: C. Neil Steward, Wiley Yayıncılık 2008.

Bitki Biyoteknolojisi II Genetik Mühendisliği ve Uygulamaları Editör: Sebahattin Özcan, Ekrem Gürel, Mehmet Babaoğlu SU Vakfı Yayınları

Bitki Biyoteknolojisi ve Genetik; ilkeler teknikler ve uygulamalar, Çeviri Ed: H.A. Öktem ve M. Yücel, Nobel yayıncılık, 2012.

Industrial Microbiology

Microorganisms and their products used in industry, strategies and techniques used in the isolation of these microorganisms, primary and secondary metabolites, pilot-scale and industrial scale fermentation techniques, growth methods in closed and open systems and ways of obtaining industrial products, laboratory activities to increase productivity of

producer organism, methods of storage of organisms, general grouping of products (antibiotics, vitamins, alcoholic beverages, biopolymers, proteins and enzymes).

Resources

Industrial Microbiology: An Introduction, Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton, Blackwell Science, London, 2001.

Immunogenetics

MHC genes and their role in autoimmune and infectious diseases. HLA typing. Immunoglobulin structures and genetics. Tissue alignment and transplantation immunology. T and B cell clones. Tumor cells and tumor immunology. Hypersensitivity diseases and classification; autoimmune, reactions against microbes and environmental antigens. Opsonization and phagocytosis mechanisms. Immune complex mediated diseases and pathogenesis; Serum disease, Arthus reaction. Diseases caused by T-lymphocytes; Th1 and Th17. Delayed type hypersensitivity. Major mechanisms underlying rheumatoid arthritis, multiple sclerosis, type 1 diabetes, psoriasis and other autoimmune diseases. Contact sensitivity and eczema. Therapeutic approaches in immunological diseases; anti-inflammatory agents, antibody and cell depletion, anti-cytokine treatments, migration inhibiting agents, intravenous IgG, T-reg based treatments; Ex: Type 1 Diabetes. Allergy; b cell activation and IgE-dependent, T-helper cell-dependent, granulocyte-dependent allergies. Production of cytokines and mediators. Degranulation mechanism. Primary and secondary immunodeficiency diseases and immunogenetic mechanisms.

Resources

Frank T. Christiansen, Brian D. Tait. "Immunogenetics Methods and Applications in Clinical Practice". Humana Press, 2012.

Immunogenetics of Autoimmune Disease (Medical Intelligence Unit) Jorge R. Oksenberg, David Brassat.

David Male, Johathan Brostoff, David B Roth. "Immunology" 7. Baskı çeviri: Turgut İzmir, Palme yayıncılık, Ankara, 2008.

Temel İmmunoloji, Yıldız Cancioğlu, İstanbul Medikal Yayıncılık, İstanbul, 2007.

Experimental Animals and Applications

Biological characteristics of experimental animals (mouse, rat, guinea pig, rabbit). Annual usage amounts in the world, in which areas are experimental animals used ?, systematic characteristics, reproductive characteristics, physiological characteristics, anatomical

characteristics, behavioral characteristics, special production techniques, physiological characteristics, anatomical characteristics, behavioral characteristics, special production techniques, physical and chemical parameters required by experimental animals, care, feeding, breeding and diseases of all experimental animals (mice, rats, guinea pigs, hamsters, rabbits and cats). Ethical rules for experimental animals. Handling/restraint techniques of experimental animals. Sex separation. Animal and cage marking. Gavage. Anesthesia. Vaginal smear technique. Injection (iv, im, ip, sc). Blood collection methods. Catheter placement. Femoral artery and vein. Removal of organs. Perfusion. Euthanasia.

Resources

İde T, Laboratuvar hayvanları biliminin temel ilkeleri, Ankara, Medipress Yayıncılık, 2003.

Poyraz Ö, Laboratuvar hayvanları bilimi, Ankara, Kardelen ofset baskısı, 2000.

Yeğen BÇ, Gören MZ, Biyomedikal arařtırmalarda deney hayvanı "temel bilgiler ve etik ilkeler", İstanbul, Yüce yayıncılık, 2005.

Başaran A, Deney hayvanları; laboratuvar teknikleri, nisan kitabevi yayınları Dr. Nail Odabaşođlu, Prof. Dr. Ataman Güre, Yard. Doç.Dr. Eşref Yeğın, Yard. Doç.Dr. Galip Akın: Laboratuvar hayvanları I, Van 1988.

Pharmacology

Basic information, drug forms and routes of administration, pharmacokinetic and pharmacodynamic events related to drugs, migration and absorption phenomena of drugs from biological membranes, place of application, drug distribution, biotransformation of drugs, drug overdose, dose concentration-effect relationships.

Resources

Lippincott Farmakoloji, HowlanMycek, Çevirmen: Filiz Onat, Zafer Gören, Atila Karaalp, Nobel Tıp Kitabevi, 2008.

8 th Semester

Bioinformatics

Biological databases, bioinformatics tools and approaches, flow of information between DNA-RNA and protein, comparison of sequences, phylogenetic tree establishment, calculation of distances between species, evaluation of microarray data, genomic and proteomic approaches.

Resources

Bioinformatics, Andrzej Polanski, Marek Kimmel, Springer, 2007.

Genetic Breeding

Genetic and Cultural Characters, Environmental Conditions in Plant Breeding, Practical Rehabilitation Methods of Self and Foreign Fertilized Horticultural Plants, General Rehabilitation Techniques, Hybridization Rehabilitation, Mutation Rehabilitation, Strengthening Rehabilitation, Rehabilitation Rehabilitation, Selection Breeding, Tissue Cultures, Seed Certification. Genetic Progression, Genetic Advancement, Performance Test, Family Selection, Selection by Brothers, Progeny Control, Selection by Pedigriy, Selection for Multiple Features, Genetic Environment Interaction, Genotype Interference Interference, Genetic Interference Interference, , Relative Breeding and Hybridization, Breeding Plans and Developments.

Resources

Bitki Genetiği ve Islahı, Hasan Baydar, Süleyman Demirel Üniversitesi Yayınları, 2007.

Molecular Biology & Genetics Practices II

These courses, Molecular Biology and Genetics Practises I and II are given in the fall and spring semesters. Within the scope of the courses, it is aimed that our students make practises at labrotary about the research areas of our faculty members and also gain experiences before their graduation by applying scientific research techniques under the supervision of our faculty members. Molecular Biology and Genetic Practices II course includes Biochemical and Genetic Calculations II, DNA isolation from tissue or cell, Plasmid DNA isolation, DNA cutting with restriction endonucleases, Software used in gene engineering, DNA fingerprint analysis, reverse transcription of viral RNA samples, real-time PCR and technical visit.

Resources

Instructor's lecture notes

8 th Semester Elective Courses

Gene Control Mechanisms

Gene regulation in living organisms is a very important part of metabolism. In which condition and which genes to express, is the key to efficient and effective use of energy and substrate for the organism. Gene control mechanisms in prokaryotes; Gene structure, DNA

binding proteins, negative control of transcription, repression and induction mechanism, positive control of transcription, operons and regulators, global regulation mechanisms, lac and trp operons, stringent-restricted response, alternative sigma factors, quorum detection, two-component regulatory systems, regulation of lytic and lysogenic cycles in lambda phage, Gene control mechanisms in eukaryotes; Comparison of eukaryotic and prokaryotic gene regulation mechanisms, chromosome organization, methylation and acetylation, control of transcription in eukaryotes, post-transcriptional control, alternative splicing, RNA silencing, translation control.

Resources

Jun Ma, 2007. Gene Expression and Regulation, Springer.

Gary H. Perdew, John P. Vanden, Jeffrey M. Peters, 2006. Regulation of Gene Expression: Molecular Mechanisms, Humana Press.

Cell Signalling

Intracellular signal transduction mechanisms include the functional properties of different types of receptors and signaling pathways involved in intracellular signaling (G proteins, effector enzymes, ion channels, intracellular calcium, phospholipases and eicosanoids, protein kinases, protein phosphorylation etc.) (apoptosis, regulation of cell cycle, gene transcription etc.), Basic elements of signaling: extracellular message and its receptors, G protein-bound receptors and their effectors, Receptor tyrosine kinases and Ras, MAPK, JNK and p38 signaling pathways, PI3K / AKT signaling pathways, association and differentiation between signal pathways, apoptotic pathway associated with death receptors, mitochondrial apoptosis

Resources

J. Hancock, Cell Signalling, Oxford University Press, 2005.

Apoptosis, Cell Signaling, and Human Diseases : Molecular Mechanisms, Volume 2 by Rakesh Srivastava (Mar 2007)

Biochemistry of Signal Transduction and Regulation by Gerhard Krauss (Author) - Nov 14, 2003

Ernst J. M. Helmreich: The Biochemistry of Cell Signalling, Oxford University Press, (First edition) September 2001.

Dianne Watters and Martin Lavin: Signalling pathways in Apoptosis, Harwood Academic Publishers, (First edition) Amsterdam 1999.

Stem Cell Biology

General Characteristics of Stem Cells, Embryonic and Adult Stem Cells. Molecular biology of stem cells. Hematopoietic stem cells and their relationship with microenvironment. Clinical application areas of hematopoietic stem cells. Cancer stem cells and biology. Cancer stem cells in targeted therapy. Mesenchymal stem cells and their use in regenerative medicine. The role of mesenchymal stem cells in immunomodulation. Induced pluripotent stem cells, their properties and application areas. Induced stem cell based hematopoiesis and novel approaches. Stem cells and ethics.

Resources

Alp Can. "Kök Hücre". Nobel kitabevi. 2013.

Rob Burgess. "Stem Cells. A short course". Wiley-Blackwell yayınevi. 2016.

Virology

Morphology, chemical structure and classification of viruses, DNA and RNA virus families, production of viruses, virus-host cell associations, infection mechanisms, viral virulence

Resources

Introduction to Modern virology, N. Dimmock, A. Easton ve K. Leppard, John Wiley and sons, 2006.

Virology: Principles and Applications, J. Carter ve V. Saunders, Wiley, 2007.

Basic Virology, E.K. Wagner, J. Hewlett, D.C. Bloom, ve D. Camerini, Wiley-Blackwell, 2007.

Secondary Metabolites

Functions of secondary metabolites in organism. Classification of secondary metabolites. Production of secondary metabolites and their usage in pharmacy and industry.

Resources

The Ecology of Plant Secondary Metabolites: From Genes to Global Processes , Glenn R. Iason, Marcel Dicke and Susan E. Hartley

Plant Secondary Metabolites (Methods in Molecular Biology), Harinder P.S. Makkar

Secondary-Metabolite Biosynthesis and Metabolism (Environmental Science Research), Richard J. Petroski and Susan P. McCormick

Synthetic Biology

Synthetic Biology definition and historical development process, gene, genome structure and organization, data banks and genome projects, classical gene cloning strategies, synthetic

biology approach to gene generation, comparison of classical gene cloning and synthetic biology approach, synthetic gene fragments and gene samples, software used in synthetic biology, synthetic biology and biofuel production, synthetic biology and valuable chemical production, synthetic biology and pharmaceutical production, synthetic proteins, synthetic life forms, risks, threats and ethics.

Resources

Gen Klonlama ve DNA Analizi: Giriş, Çeviri Kurulu: Fevzi Bardakcı- Ali Fazıl Yenidünya - Nazan Yılmaz, 2013, Nobel Akademik Yayıncılık.

Jamie A. Davies, 2018. Synthetic Biology: A Very Short Introduction. Oxford University Press.

Bernard R. Glick, Cheryl L. Patten, 2019. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Wiley; 5 edition.

Embriology

History of plant embryology, flower, mikrosporangium, male gametophyte, megasporangium, female gametophyte, fertilization, endosperm and types, embryo, poliembryony, seed, equality dispute.

Resources

Ünal, M.. Bitki (Angiosperm) embriyolojisi. Marmara Üniversitesi Fen Edebiyat Fak. Yayın No: 11, İstanbul, 2004.