DESCRIPTION OF COURSE UNIT FOR DOCTORAL STUDIES
AT VILNIUS UNIVERSITY
(Interdisciplinary course)

Scientific Area/eas, Field/ds of Science (codes)	Medical and health sciences (M 000): Medicine (M 001), Dentistry (M 002), Public health (M 004) Natural sciences (N 000): Biology (N 010); Ecology and environmental science (N 012) Social sciences (S 000): Sociology (S 005); Psychology (S 006); Education (S 007)			
Faculty, Institute, Department/Clinic	Faculty of Medicine Institute for Biomedical Sciences Department of Anatomy, Histology and Anthropology			
Course unit title (ECTS credits, hours)	**Human growth and health programming** 10 credits (270 hours)			
Study method	**Lectures**	**Seminars**	**Consultations**	**Self-study**
Number of ECTS credits	1	-	1	8
Method of the assessment (in 10 point system)	Presentation of the report and its evaluation: the report is presented on a target topic that is agreed upon with the coordinating lecturer of the course (the doctoral student must analyze, review, and present the latest scientific publications related to the chosen topic). Report evaluation criteria (minimal passing score – 5 points): a) relevance, novelty and applicability of the material presented to the chosen topic (2 points); b) overall structure and content of the report, clear presentation of the material, rationale, conciseness and specificity (2 points); c) summary, presentation and justification of conclusions (1 point); d) raising problematic questions, presentation of how the reviewed material will be applicability in one's own dissertation (3 points); e) organization of visual aids, ability to participate in discussion, question management, oratory skills (2 points).			

PURPOSE OF THE COURSE UNIT

To provide theoretical and practical knowledge of classical auxology, as well as the latest research-based knowledge of the human growth and maturation patterns, diversity, evaluation, factors, trends, disorders, and links to the general health status, while emphasizing early programming of health and various disease, the importance of perinatal period in the formation of physical, mental and general health of the individual at other periods of ontogenesis. To promote an interdisciplinary, holistic approach to the changes in the body of a growing child, modern methods of auxological research, in

order to solve individual problems of relevant doctoral topics from other fields and areas of science.

THE MAIN TOPICS OF COURSE UNIT

General part. Development and history of auxology research. Modern clinical and applied auxology. Global and Lithuanian schools of auxology. Periods of human ontogenesis, periodization of growth and maturation. Human calendar (chronological), biological, bone age, its criteria. Growth of cells, tissues, organs, systems, body and its parts – growth types, gradients, rate, and peculiarities at different periods of ontogenesis. Endocrinology of growth and maturation. Human growth from an evolutionary viewpoint. Comparative auxology.

Characteristics of human growth and maturation during different periods of ontogenesis: 1. Features of embryo and fetal growth and formation. 2. Growth and maturation in the postnatal period: a) physical and psychomotor development of a newborn and infant, b) physical status of preschool children, c) growth and sexual maturation of school-age children. Characteristics of critical periods of growth and maturation, genetic, epigenetic and other external factors.

Evaluation of growth and maturation, its methodologies. Morphological and functional growth indices. Pubertal growth spurt (PGS). Assessment of sexual maturation. Methods, chronology, dates and diversity of menarche, spermarche, development of secondary sexual characteristics. Criteria, standards, key indices and coefficients of growth and maturation.

Longitudinal and transversal auxological research. Special statistical methods for auxological data. Methods for comparing growth charts and smoothing the empirical data, LMS method, restoration of the *missing data*. Assessment of individual growth and maturation. *C.H.Waddington* growth canalization theory. Saltatory growth. Catch-up growth phenomenon.

Internal and external factors of growth and maturation (general health status, diseases, nutrition, stress, exercise, socio-economic factors) and growth peculiarities. Urbanization, migration and growth. Interpopulational (global) and intrapopulational diversity, differences in growth and maturation, secular trend. Features of growth and maturation of Lithuanian children. Relationships between physical status, puberty and emotional and social maturity. Body image studies and biopsychosocial factors.

Early health programming. Prenatal programming and postnatal health. Prenatal factors and fetal growth, risk of subsequent diseases and behavioral changes: biological factors of mother and father and previous generations, nutrition and other external factors (social, economic), bad habits, stress. The causes and consequences of developmental origins of health and disease, epigenetic epidemiology.

Peculiarities of fetal growth and diseases at the adult age: prenatal and postnatal programming of the neuroendocrine system and metabolic homeostasis, associations with diseases. Obesity, diabetes, metabolic syndrome, cardiovascular disease, oncological diseases – their early programming and identification. Fetal adaptation mechanisms. Programming of appetite control and energy metabolism. "Thrifty" fetal genotype and phenotype. Evolutionary endocrinology. Growth of preterm, low and high birth weight infants and children, health features.

Models of experimental animals, their use for the studies of the peculiarities of human diseases during periods of ontogenesis. Early programming of immunity, relations with infectious and allergic diseases. Links between microorganisms, microbiome and early

development of immunity. Early programming of response to the pain. Perinatal factors of behavioral and mental health. Future directions: prenatal and postnatal modulation (change) of the genetic program. Genetic imprinting and epigenetic programming of fetal development.

RECOMMENDED LITERATURE SOURCES

1. Cameron N., Schell L.M., 2021. Human Growth and Development. Elsevier, 3rd edition, 2021: *https://www.elsevier.com/books/human-growth-and-development/cameron/978-0-12-822652-0*

2. Cheung Y.B (ed.), 2020. Statistical Analysis of Human Growth and Development. Chapman and Hall/CRC, 2020: *https://scholar.google.lt/scholar?q=Cheung+Y.B+(ed.).+Statistical+Analysis+of+Human+Growth+and+Development.+Chapman+and+Hall/CRC,+2020.&hl=en&as_sdt=0&as_vis=1&oi=scholart*

3. Gluckman P., Beedle A., Buklijas T., Low F., Hanson M., 2016. Principles of Evolutionary medicine. OUP Oxford; 2nd edition, 2016: *https://oxford.universitypressscholarship.com/view/10.1093/acprof:oso/9780199663927.001.0001/acprof-9780199663927*

4. Patel M.S., Nielsen J.H., 2017. Fetal and Early Postnatal Programming and its Influence on Adult Health. CRC Press, 2017: *https://www.routledge.com/Fetal-and-Early-Postnatal-Programming-and-its-Influence-on-Adult-Health/Patel-Nielsen/p/book/9780367657895*

5. Richardson S.S., 2021. The Maternal Imprint: The Contested Science of Maternal-Fetal Effects. The University of Chicago Press, 2021: *https://www.amazon.com/Maternal-Imprint-Contested-Science-Maternal-Fetal/dp/022654480X*

6. Sigelman C.K., Rider E.A., 2021. Life-Span Human Development Cengage Learning, 10th edition, 2021: *https://books.google.lt/books?id=XUooEAAAQBAJ&hl=lt&source=gbs_book_other_versions*

7. Solomon P. Wasser and Milana Frenkel-Morgenstern, 2021. New Horizons in Evolution. Academic Press, 2021: *https://www.sciencedirect.com/book/9780323907521/new-horizons-in-evolution#book-description*

ONLINE:

8. Aguila M.B., Ornellas F., Mandarim-de-Lacerda C.A., 2021. Nutritional Research and Fetal Programming: Parental Nutrition Influences the Structure and Function of the Organs: *http://www.intjmorphol.com/wp-content/uploads/2020/12/art_48_391.pdf*

9. Costa J.T. et al., 2022. Programming of Vascular Dysfunction by Maternal Stress: Immune System Implications: *https://www.frontiersin.org/articles/10.3389/fphys.2022.787617/full*

10. Crispi F., Miranda J., Gratacós E., 2018. Long-term cardiovascular consequences of fetal growth restriction: biology, clinical implications, and opportunities for prevention of adult disease: *https://www.sciencedirect.com/science/article/abs/pii/S0002937817324870?casa_token=IjcfSg41_2wAAAAA:CVf0ukk37GIkK30sneQo4wGwcdQcjUnnWUSfND77yLqnAQUrvouNJa9QFrdX7GLpyf8UyVkMlEE*

11. Journal of Developmental Origins of Health and Disease, 2009-2022: *https://www.cambridge.org/core/journals/journal-of-developmental-origins-of-health-and-disease*

12. Koos B.J., Gornbein J.A., 2021. Early pregnancy metabolites predict gestational diabetes mellitus: implications for fetal programming: *https://www.sciencedirect.com/science/article/abs/pii/S0002937820308243*

13. Öztürk H.N.O., Türker R.F., 2021. Fetal programming: could intrauterin life affect health status in adulthood? *https://pubmed.ncbi.nlm.nih.gov/34670066/*

14. Schoonejans, J.M., Ozanne, S.E., 2021. Developmental programming by maternal obesity: Lessons from animal models: *https://onlinelibrary.wiley.com/doi/full/10.1111/dme.14694?casa_token=jYvuTZxcKJgAAAAA%3A2xAY7G3hZefGUbJXHudRd07wgpbIO0WZTF9PfIUA8hlqPh-dAFm0tEbVkWhzMEqTTtJkaOrp11CJXAQ*

15. World Health Organization (WHO) Child growth standards: *https://www.who.int/tools/child-growth-standards*

CONSULTING LECTURERS

1. Coordinating lecturer: Janina Tutkuvienė (Prof. dr. HP)

2. Renata Šimkūnaitė - Rizgelienė (Prof. dr.)

3. Eglė Marija Jakimavičienė (Assoc. prof. dr.)

APPROVED:

By Council of Doctoral School of Medicine and Health Sciences at Vilnius University 15th of June, 2022

Chairperson of the Board: Prof. Janina Tutkuvienė