COURSE OUTLINE

(1) GENERAL

MD-205 Structure and function of the human body IV

SCHOOL	Medical		
ACADEMIC UNIT	Basic and Clinical Sciences		
LEVEL OF STUDIES	1st Cycle		
COURSE CODE	MD-205	**SEMESTER**	Year 2 / Semester 4 (Spring)
COURSE TITLE	Structure and function of the human body IV		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	20	11
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Core
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Reproduction and Development

Theme 1: The development of the reproductive system in males and females

- Describe the development of the male reproductive organs including the descent of the testes from the posterior abdominal wall into the scrotum.
- Describe the development of the female reproductive organs.
- Discuss how differentiation along male or female lines depends on the presence or absence of masculinising determinants.

Theme 2: The male reproductive system

- Describe and identify the major structural features of the male reproductive organs including the blood supply, lymphatic drainage, and innervation: testes, epididymis, vas deferens, seminal vesicles, prostate gland, bulbourethral glands (Cowper's glands), penis, urethra

- Explain how these organs function in the process of erection and ejaculation.
- Describe the histology of the testes and explain its functional relationship to spermatogenesis and hormone production.
- Describe the process of gametogenesis and discuss the importance of meiosis in reproduction.
- Describe the control of testosterone production and spermatogenesis by the pituitary hormones.
- Explain the male sexual response model of arousal, orgasm, and resolution.

<u>Theme 3: The female reproductive system</u>

- Describe and identify the female reproductive organs including their blood supply, lymphatic drainage, and innervation: ovaries, fallopian tubes, uterus, cervix, vagina, external genitalia (vulva)
- Describe the relationship of the female reproductive organs to the rectum, bladder, and urethra.
- Describe the histology of the ovary and explain its functional relationship to oogenesis and hormone production.
- Explain the female sexual response cycle of arousal, orgasm, and resolution.
- Describe the anatomy and histology of the breast, including the blood supply and lymphatic drainage.
- Describe the physiology of lactation and discuss the importance of breastfeeding.

<u>Theme 4: Puberty and beyond</u>

- Describe the development of the male secondary sex characteristics.
- Describe the development of the female secondary sex characteristics.
- Compare and contrast the events of puberty in males and females, including the hormonal events and the structural changes associated with them.
- Describe the anatomy of the hypothalamus and pituitary gland and explain their role in sexual maturation in males and females during puberty.
- Explain the physiology of the menstrual cycle from menarche to menopause and discuss the effects on other body systems.

<u>Theme 5: Conception and pregnancy</u>

- Describe the process of ovulation, fertilisation, and the early development of the embryo.
- Describe the process of blastocyst implantation and explain the role of trophoblastic enzymes.
- Explain the role of the placenta in hormone production and in exchanges between the maternal and foetal circulation.
- Describe the maternal physiological changes from early pregnancy to parturition.
- Describe the sexual attitudes and behaviours prevalent nowadays among young people.
- Outline the main socio-cultural and economic explanations for teenage pregnancy.
- Discuss the important social concerns that arise with teenage pregnancies at individual and societal levels.

Medical Psychology

- Describe the biological mechanisms underlying sexual differentiation and reproductive behaviour.
- Explain the impact of hormones on sex-specific behaviours.
- Identify and discuss genetic disorders related to reproductive development and behaviour.
- Examine the neuropsychological basis of maternal behaviour.

Medical Ethics

- Outline ethical and legal considerations for counselling and treatment of minors, with respect to consent, confidentiality and determination of best interests

- Describe and practise the guidelines for adolescent patients' sexual and reproductive health care.
- Identify challenges in ethical treatment of transgender children and adolescents.

<u>Theme 6: The neonate</u>

- Outline the physiological changes that occur in the infant at first breath.
- Discuss the neonatal adaptations to extrauterine life.
- Define the physiological parameters in the neonate.

Medical Ethics

- Outline key ethical and legal issues in neonatology
- Describe challenges for clinical practice with reference to the concept of futility and the distinction between treatment and care of premature neonates

<u>Theme 7: Early child development</u>

- Outline the pathways that regulate growth in children and discuss the structure and role of the hypothalamus and pituitary gland in these processes.
- Identify the mechanisms of ossification and bone growth.
- Describe the key developmental milestones up to the age of five.
- Discuss how these milestones can be assessed.

Endocrine system

<u>Theme 1: Introduction to the Endocrine System</u>

- Explain the difference between endocrine and exocrine systems.
- Explain the difference between the three different tissue types that contribute to the endocrine system: endocrine glands, endocrine organs, and endocrine-related tissues and provide examples of the three different tissue types.
- Explain the principal characteristics/attributes of an endocrine gland.
- Based on chemical structure, outline the three classes of hormones secreted by the endocrine system.
- Explain the mechanism of action of hormones and of hormone receptors.
- Explain what is meant by the term 'tropic hormone' and give an example.
- Describe the general mechanism and regulation of hormone secretion, including the principle of negative and positive feedback and feed-forward control.
- Explain the importance of patterns of hormone secretion – e.g., pulsatile, circadian (diurnal), menstrual.
- List the body's major endocrine glands and briefly outline their anatomical location, structure.
- Briefly outline the function of the body's major endocrine glands.

Climate and Health

- Identify environmental exposure pathways through which climate change impacts human health, such as natural disasters, air quality, changes in water quality and quantity, food security and safety, heat stress, and vector-borne diseases
- Evaluate how climate change may interact with other environmental changes, such as land degradation and biodiversity shifts, to affect health

<u>Theme 2: Hypothalamus and Pituitary Gland</u>

- Describe the anatomical location, structure, and function of the hypothalamus.
- Describe the anatomical location, structure and major histologic features of the pituitary gland, including the distinction between the 'anterior' and 'posterior' pituitary.
- Describe the function of the hypothalamus and its role in the regulation of the endocrine system.

- Describe the hormones secreted by the pituitary gland and their principal actions.
- Describe the “hypothalamic-pituitary axis” and briefly outline the synthesis, regulation, storage, secretion, transport, target, mechanism of action, and effect of the key hormones associated with it.

<u>Theme 3: Thyroid and Parathyroid Glands</u>
- Describe the gross anatomy of the thyroid gland and its major histologic features.
- Describe the gross anatomy of the parathyroid glands, their major histologic features, and differentiate between principal and oxyphil cells.
- Relate the histological structure of the thyroid gland to its function.
- Briefly describe thyroid hormone synthesis, storage, secretion, mechanism of action, and regulation/feedback control.
- Briefly describe parathyroid hormone (PTH) synthesis, storage, secretion, mechanism of action, and regulation/feedback control mechanisms, including the role of PTH in calcium and phosphate regulation.

Research Methods and Statistics
- Explain how interviews are useful for explaining the experiences of people with diabetes

<u>Theme 4: Adrenal Glands</u>
- Describe the gross anatomy of the adrenal gland, cortex, and medulla, including the major histologic features.
- Briefly describe the hormones secreted by the adrenal cortex (mineralocorticoids, glucocorticoids, sex hormones) and their synthesis, storage, secretion, mechanism of action, and regulation/feedback control mechanisms.
- Explain the roles of mineralocorticoids in blood pressure regulation, glucocorticoids in homeostatic functions, and sex hormones in male and female adrenarche.
- Describe the hormones secreted by the adrenal medulla and briefly describe their synthesis, storage, secretion, mechanism of action, and regulation/feedback control mechanisms. Outline the role of the adrenal medulla in the body’s response to physiological stress.

<u>Theme 5: Endocrine Pancreas</u>
- Describe the gross anatomy of the endocrine pancreas and the histology of the pancreatic islets.
- Briefly describe pancreatic hormone synthesis, storage, secretion, mechanism of action, and regulation/feedback control mechanisms.

Medical Sociology
- Discuss the social determinants of diabetes.
- Describe the link between social exclusion and diabetes.
- Explain how interviews are useful for understanding the experiences of patients with diabetes.

Medical Ethics
- Address ethical considerations in the care of patients with diabetes and obesity
- Describe key ethical implications of health promotion campaigns targeting obesity
- Describe components of ethic al practice with (and effective counselling of) overweight or obese patients

<u>Theme 6: Imaging Techniques in Endocrinology</u>
- Understand the principles of radioactive decay and radiation physics as applied to imaging techniques in the endocrine system.
- Explain how nuclear medicine scans (e.g., thyroid scans with radioactive iodine) are used to visualize gland function, hormone production, and detect abnormalities in endocrine organs,

such as thyroid nodules and tumors.
- Describe the application of Positron Emission Tomography (PET) scans in studying endocrine glands by tracing metabolic processes using radiolabeled hormones or glucose.

Immune System
Theme 1: Antibody and BCR structure
- Describe the structure of the antibody and differences between monoclonal and polyclonal serum, as well as effector functions of the five classes of antibodies.
- Describe the basic concept of flow cytometry and ELISA and diagnostic applications.

Theme 2: TCR and MHC structure and antigen processing and presentation
- Describe T cell receptor structure and outline the main differences between T cell and B cell receptors.
- Describe the cellular distribution and structure of MHC class I and II molecules and discriminate MHC recognition by CD4 and CD8 T cells.
- Outline the endogenous and exogenous pathways of antigen processing and presentation and cross presentation.
- Explain the mode of inheritance of MHC, the variation MHC variation in a population and its significance.

Theme 3: BCR and TCR expression and diversity
- Briefly outline the germline organization BCR and TCR genes, the role of RAG1/2 and terminal deoxy-nucleotidyl transferase (TdT) and allelic exclusion.
- Outline the mechanisms involved in the generation of diversity of the immunoglobulin receptors and T cell receptors.
- Describe TRECs (T cell receptor excision circles) and their clinical application.

Theme 4: B Cell Development and Activation
- Describe the major developmental stages of B cell development including mechanisms of central tolerance.
- Compare and contrast T cell-dependent and T-independent B cell response.
- Describe T-dependent B cell activation in a primary focus and in germinal centres.
- Describe somatic hypermutation and how it leads to affinity maturation and antibody class switch recombination.
- Define naive and memory B cells and briefly outline the characteristics of a secondary immune response.
- Describe the characteristics of TI-1 and TI-2 antigens and the B cell response induced by each one of them.
- Explain the ethical principles and cultural competences for working with diverse patients, in terms of age and socioeconomic background. (Cultural Competence integrated with Medical Ethics).
- Discuss and practise the ethical principles and cultural competences for working with diverse patients, such as age and socioeconomic background. (Cultural Competence integrated with Medical Ethics).

AI & Digital Health
- Understand the impact of digital-technology measurements and analysis on diagnosing and monitoring of body systems

Theme 5: T Cell Development and Activation
- Describe the major events in T cell development and the site where they occur in the thymus as well as the role of the selection events.

- Compare and contrast B and T cell development.
- Describe the functions of Treg cells and explain clinical applications of their manipulation.
- Describe the signals required for T cell activation.
- Compare and contrast the role of positive (CD28) and negative (CTLA-4) costimulatory signals in T cell activation.
- State the clinical applications of manipulation of CTLA-4.
- Define clonal anergy.
- Name the different T-helper cell subsets and defining characteristics.
- Explain the ethical principles and cultural competences for working with diverse patients, in terms of age and socioeconomic background. (Cultural Competence integrated with Medical Ethics).
- Discuss and practise the ethical principles and cultural competences for working with diverse patients, such as age and socioeconomic background. (Cultural Competence integrated with Medical Ethics).

AI & Digital Health

- Understand the impact of digital-technology measurements and analysis on diagnosing and monitoring of body systems (reproductive, endocrine)

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Knowledge

- Explain normal human structure and function at the molecular, cellular, tissue, organ and whole-body level from conception to old age.
- Explain the scientific principles underlying common and important disease processes including inflammation, infection, neoplasia and trauma.
- Describe the role of genetics in predicting the risk of disease and in personalised medicine.
- Explain the determinants of normal human behaviour at an individual and societal level.
- Explain how psychological and sociological factors might impact on the risk of disease and the outcome of treatment.
- Describe how individuals adapt to major life changes, including the onset of illness.
- Explain the concept of 'wellness' and describe the importance of promoting lifestyle factors in achieving the best possible health.

(3) SYLLABUS

Reproduction and Development Themes:

- The development of the reproductive system in males and females
- The male reproductive system
- The female reproductive system
- Puberty and beyond
- Conception and pregnancy

- The neonate
- Early child development

Endocrine System Themes:

- Introduction to Endocrine System
- Hypothalamus and Pituitary Gland
- Thyroid and Parathyroid Glands
- Adrenal Glands
- Endocrine Pancreas
- Imaging Techniques in Endocrinology

The Immune System Themes:

- Antibody and BCR structure
- TCR and MHC structure and antigen processing and presentation
- BCR and TCR expression and diversity
- Cell Development and Activation
- T Cell Development and Activation

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching / Χρήση ΤΠΕ* *Communication with students / Επικοινωνία με Φοιτητές*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	• Final exam (80%) • Coursework (20%)

Activity	*Semester Workload*
Lectures/large-group teaching*	61
Tutorials	24
Small group work	24
Laboratories**	12
Directed self-study***	96
Coursework	15
Revision/assessment	45
Total	**277**

(5) ATTACHED BIBLIOGRAPHY

Required Textbooks/Reading:

Authors	Title	Edition	Publisher	Year	ISBN
Arthur F. Dalley, Anne M. R. Agur	Moore's Clinically oriented anatomy	9th Int'l Edition	Wolters Kluwer Health	2024	9781975209544
Sadler, Thomas	Langman's Medical Embryology	15th Edition	Wolters Kluwer	2024	9781975180010
Pawlina, Wojciech	Histology: A Text and Atlas with correlated cell and molecular biology	9th Edition	Wolters Kluwer	2024	9781975181574

Recommended Textbooks/Reading:

Authors	Title	Edition	Publisher	Year	ISBN
Costanzo, Linda	BRS: Physiology	8th Edition	Wolters Kluwer	2023	9781976963467
Halliday, N.L. & Chung, H. M	BRS Gross Anatomy	10th Edition International	Lippincott Williams & Wilkins	2023	9781975181482