CURRICULUM

Course Code	Neame of the course	C	ECTS	Compulsory/Elective
TMED600	Ph.D. Thesis	0	30	Compulsory
TMED699	Ph.D. Qualifying Exam	0	15	Compulsory
TMED698	Seminar	0	5	Compulsory
TMED601	Research Ethics/Medicine and Bioethics	1	5	Compulsory
TMED602	Basic Medical Sciences in Translational Medicine	3	30	Compulsory
TMED603	Clinical Medical Sciences in Translational Medicine	3	30	Compulsory
TMED604	Research Methods in Translational Medicine	3	30	Compulsory
STAT621	Biostatistics	3	20	Compulsory
BIOL651	Essentials of Genetics and Genomics in Medicine	2	10	Compulsory
REQ1	Elective Course	3	30	Elective
REQ2	Elective Course	3	30	Elective

Elective Courses

a. 1st Semester Elective Course Groups

Microbiology Path Courses

TMED605 Medical Bacteriology and Virology

Neuroscience Path Courses

TMED606 Pain

TMED607 Neurodegenerative Disorders

Medical Engineering Path Courses

TMED608 Data Science in Medicine

Chemistry and Pharmacology Path Courses

CHEM609 Chemical Design of Biomaterials

Multidisciplinary Courses

TMED610 Medical Biochemistry and Biochemical Interaction of Biomolecules

TMED611 Health Informatics

BIOL652 Epigenetics and Epigenomics in Human Diseases

BIOL653 Gene Therapy and Genome Editing

b. 2nd Semester Elective Course Groups

Microbiology Path Courses

TMED615 Clinical Microbiology and Infectious Diseases

Neuroscience Path Courses

TMED616 Cognitive Neuroscience

TMED617 Neuroinflammation

Medical Engineering Path Courses

TMED618 Data Mining in Medicine

Chemistry and Pharmacology Path Courses

TMED619 Drug Discovery

Multidisciplinary Courses

TMED612 Biomarker Research

BIOL654 Cancer Biology and Cancer Genomics

BIOL655 Genetics and Personalized Medicine

BIOL656 Systems Medicine

COURSE DESCRIPTIONS

CORE COURSES

STAT621 Biostatistics

- Biostatistics for applications in the fields of clinical research, epidemiology and public health for observational studies and interventional trials
    - Data description, summary statistics, elements of probability, distributions of random variables estimation and confidence intervals, hypothesis testing, analysis of variance, correlation and regression and contingency tables, statistical power, sample size, and study design, p values, and non-parametric tests, analysis of variance, correlation, regression, and statistical power & sample size estimation.
    - Linear and logistic regression models, survival analysis (Kaplan-Meier curves. H
    - Hazard functions, types of censoring, log-rank tests and generalized Wilcoxon tests, Cox regression model)

TMED601 Research Ethics/Medical and Bioethics

- Overview of the major areas of research and clinical biomedical ethics
- Terminology, resources, and major frameworks of ethical analysis
- Practice of informed consent
- Injustice of health care disparities
- Role of ethics committees

TMED602 Basic Medical Sciences in Translational Medicine

- Anatomy of systems
- Biochemistry and physiology in health and disease

BIOL651 Essentials of Genetics and Genomics in Medicine

- Fundamental concepts in molecular biology and genetics
- Application of genetic and genomic information in medicine
- Descriptions of genes, genomes, epigenetics, -omics technologies and their impact in medical research, diagnosis, and treatment

TMED603 Clinical Medical Sciences in Translational Medicine

- Physiopathology of body systems in health and disease
- Epidemiology of diseases
- Diagnostic methods in medicine
- Public health issues, translation research to public
- Treatment methods in medicine

TMED604 Research Methods in Translational Medicine

- The clinical and scientific literature relevant to a clinical and translational medicine discipline
- Synthesize the relevant literature and develop a research proposal and implementation
  - Data treatment, data collection, entry and auditing; provision of experimental tests/tasks
- Research integrity to the design of methodologies
- Knowledge of statistical methods and their appropriate application to a range of scientific data.
- Build a critical narrative containing a strong justification for your aims and hypothesis related to your chosen research topic
- Cellular and molecular technics

ELECTIVE COURSES

TMED605 Medical Bacteriology and Virology

- Bacterial classification, Structure and Replication, Bacterial metabolism, Bacterial Genetics, Mechanism of Bacterial Pathogenesis, Role of bacteria in disease, Laboratory diagnosis of Bacterial diseases, Antibacterial Agents and resistance, Gram positive and negative coccus, Enterobacteriaceae and non-fermentative gram-negative bacteria, Curved and non-enteric bacilli, Mycobacteria, Spore forming and non-spore forming bacilli, Miscellaneous bacterial pathogens
- Viral classification, Viral structure, Viral replication, Mechanism of Viral pathogenesis, Role of viruses in disease, Laboratory Diagnosis of viral disease, Antiviral agents and Infection control, Papillomaviruses, Adenoviruses, Human Herpesviruses, Poxviruses, Parvoviruses, Picornaviruses, Coronaviruses, Paramyxoviruses, Orthomyxoviruses, Hepatitis viruses, Retroviruses

TMED606 Pain

- Physiology of pain
- Types of pain
- Pain disorders
- Treatment methods in pain
- Research on pain

TMED607 Neurodegenerative Disorders

- Cellular and molecular mechanisms that underlie in neurodegenerative disorders

- Common neurodegenerative disorders' clinical features and its impact on human and public
- Treatment methods in neurodegenerative disorders
- Research on neurodegenerative disorders

TMED608 Data Science in Medicine

- Fundamental concepts of Artificial Intelligence
- Knowledge and skills to translate medical problems to data science problems
- AI technologies in clinical supply chain and medical diagnossis

CHEM609 Chemical Design of Biomaterials

- Understanding the properties, changes, and energetics of molecules and chemical systems, including their identification, separation, characterization, and synthesis for applications in macromolecular chemistry
- Used biomaterials in traditional and regenerative medicine
- New concepts for the future use of biomaterial

TMED610 Medical Biochemistry and Biochemical Interaction of Biomolecules

- Interactions between small molecules, proteins, nucleic acids, lipids and carbohydrates

TMED611 Health Informatics

- Informatics methodology of biomedical and genomic data to formulate knowledge and medical tools
- Biomedical research through the use of computer-based information system.
- Health informatics
    - Advantages and disadvantages of using information technology in healthcare
    - The role of data, information, and knowledge in modern healthcare
    - Finding similarities in patient populations, interpreting biological information to suggest therapy treatments and predict health outcomes

BIOL652 Epigenetics and Epigenomics in Human Diseases

- Epigenetic and epigenomic mechanisms in understanding human disorders
- Understanding of the epigenetic modifications, such as DNA methylation, histone modification, non-coding RNA and their impacts on gene expression and the overall pathophenotypes
- Concepts such as epigenetic approaches in targeting disorders

BIOL653 Gene Therapy and Genome Editing

- To explore the contemporary topics of genome editing and gene therapy
- To introduce the students to molecular techniques which could be applied to human and mammalian genomes for the correction of harmful mutations in human diseases

- Topics covered include contemporary research findings in genome editing for cancers, neurological diseases, infectious diseases and human reproductive purposes
- Ethical, legal and social issues relevant to the field are addressed

TMED615 Clinical Microbiology and Infectious Diseases

- Microbiota and microbiome, sterilization, disinfection and antisepsis
- Infection control in hospital and in community
- Hospital acquired infections
- Microscopy and in vitro culture, molecular diagnosis, serologic tests
- Elements of host protective responses, innate host response
- Antigen specific immune responses, immune responses to infectious agents, antimicrobial vaccines

TMED616 Cognitive Neuroscience

- Cognitive functions of the brain
- Evaluation of cognitive functions
- Cognitive disorders

TMED617 Neuroinflammation

- Inflammation characteristics in the nervous system
- Inflammatory and neuroimmune disorders
- Neuroinflammation in different disorders
- Treatment methods in neuroinflammation
- Research on neuroinflammation
    - Animal models
    - Treatment researches

TMED618 Data Mining in Medicine

- Extract hidden and potentially useful patterns and discover new relationships in the modern medicine databases
- Analyzing the quantitative and qualitative clinical data

TMED619 Drug Discovery

- Introduction to drugs targets and molecular pharmacology
- Introduction to molecular cloning-from DNA to drug discovery
- Pharmacokinetics; pharmacodynamics; drug absorption, distribution, metabolism/elimination
- Drug-drug and drug-disease interactions; preclinical drug development

TMED612 Biomarker Research

- Use of biomarkers in clinical research, principles for biomarkers quantification in analyses.
- Principles of antibody-based analyses, antibody-based analyses
- Design research studies on new predictive, prognostic, diagnostic or pharmacodynamics biomarkers

BIOL654 Cancer Biology and Cancer Genomics

- This course covers the eukaryotic cell cycle in detail.
- Cell differentiation and in particular de-differentiation as well as the molecular and genetic bases of cancers are discussed
- Tumor suppressors and oncogenes are thoroughly investigated
- Recent advances in targeted molecular therapeutic approaches as well as immunotherapy are also detailed. In particular, CAR-T cell therapy is discussed

BIOL655 Genetics and Personalized Medicine

- Genetics, human genome, genome and exome sequencing, pharamcogenetics tests, and the use of personalized medicine in different diseases.
- Topics covered include molecular diagnostic tools used in personalized medicine, importance of variations, genotyping, haplotyping and biomarkers in personalized medicine, basics of pharmacogenetics and personalized medicine focus on several diseases.
- Ethical, legal and social issues relevant to personalized medicine are discussed.

BIOL656 Systems Medicine

- The course is designed to introduce the concept of Systems Medicine to the students.
    - Historical background of Systems Biology is presented.
    - Fundamentals of System Biology and its applications in “Systems Medicine”
    - Students will learn about different topics including interactomes, protein-protein interactions, data sources, network formation and visualization