Program: Doctor of Philosophy Program in Translational Medicine (International Program)

Degree: Doctor of Philosophy (Translational Medicine)

Study plan

SCHEME 2.1 Students who have completed a master's degree Must complete a thesis of not less than *45* credits and study subjects of not less than *15* credits. The total number of credits is not less than 60 credits.

YEAR	Trimester 1	Credit	Trimester 2	Cradit	Trimester 3	Credit
Year 1	MED51 8001 Concept in Translation Medicine MED51 8002 Basic Science and Clinical Science MED51 8003 Methodology in Translational Medicine MED51 8004 One Health Research Translation I MED51 8005 One Health Research Translation II	1 3 2 1 1	MED51 8XXX Elective subjects MED51 8101 Seminar in Translational Medicine I Comprehensive Examination	4 1 S	MED51 8102 Seminar in Translational Medicine II Qualifying examination	1 S
	Total	**8**	**Total**	**5**	**Total**	**1**
Year 2	MED51 8103 Seminar in Translational Medicine III MED51 8301 Dissertation (SCHEME 2.1) Proposal examination	1 3 S	MED51 8301 Dissertation (SCHEME 2.1)	6	MED51 8301 Dissertation (SCHEME 2.1)	12
	Total	**4**	**Total**	**6**	**Total**	**12**
Year 3	MED51 8301 Dissertation (SCHEME 2.1)	12	MED51 8301 Dissertation (SCHEME 2.1)	9	MED51 8301 Dissertation (SCHEME 2.1)	3
	Total	**12**	**Total**	**9**	**Total**	**3**

MED51 8001 Concept in Translation Medicine 1(1-0-2)
Prerequisite: None

Basic concept of bringing basic science, medical science, medical laboratory science, develop of research and invention into innovation, application for health promotion, prevention, diagnosis, treatment, prognosis, and rehabilitation, knowledge, and innovation transfer to care one health service system

Course Learning Outcomes (CLOs)

1. To update state-of-the-art (Prior art for IP) technology that meet the needs for research (Bench side)
2. Review guidelines for diagnostic, treatment, and prevention (Bedside's gaps): human, animal, and environmental
3. Relate ONE HEALTH idea and community
4. Translation of basic science for human studies (Clinical trials)
5. Translation of new data that can enhance clinical practice or create new health related decision (Policy and/or management)

MED51 8002 Basic Science and Clinical Science 3(2-2-5)
Prerequisite: None

Meaning and important principle of basic science and medical science, cells' structure (tissue), control and homeostasis of human body, reversible of the cells, relationship of basic medical science and clinical science, advance medical science, pathophysiology of the diseases

Course Learning Outcomes (CLOs)

1. Describe about cellular structures, cell function, cell chemistry and biosynthesis
2. Describe about genomes, DNA replication, repair, and recombination, gene expression, internal organization of the cell
3. Describe about tissue base and human body systems, control and maintenance of human body systems, pathophysiology of tissues response to diseases, molecular oncology
4. Appropriately apply molecular biology techniques and techniques in the clinical laboratory to translational medicine

MED51 8003 Methodology in Translational Medicine 2(1-2-3)
Prerequisite: None

Ethical issues in human and animal research, statistical methods in Translational Medicine, methodology, appraisal, generate research question, validity of the data, proposal writing, research design, population and sampling, sample size and sample selection, produce tools and data collection, confidentiality, evaluation, statistical analysis and clinical sign, and academic writing

Course Learning Outcomes (CLOs)
1. Understand principle of ethic in human and animal
2. Describe statistical methods and research methodology in Translational Medicine
3. Properly evaluate appraisal and application, foreground and background question, sources and hierarchy of evidence
4. Correctly analysis data types in statistical methods
5. Apply statistical methods and research methodology to research proposal, research design, study population, sampling, sample size, sample allocation
6. Properly evaluate outcome assessment, test of statistical significance, clinical important, ethic in human and animal, academic writing

MED51 8004 One Health Research Translation I 1(0-3-2)
Prerequisite: None

Translational research of basic science, medical science, medical laboratory science for solving local health problem (health promotion, prevention, diagnosis, treatment, and management and rehabilitation) in one health platform
Course Learning Outcomes (CLOs)
1. Generate questions used for searching research gap in the local
2. Communicate with the local people effectively
3. Apply basic science, medical science, medical laboratory science for solving local health problem
4. Pinpoint the research question from local surveying

MED51 8005 One Health Research Translation II 1(0-3-2)
Prerequisite: None

Translational research of basic science, medical science, and medical laboratory science for clinical practice (health promotion, prevention, diagnosis, medical intervention, and management and rehabilitation) in one health platform
Course Learning Outcomes (CLOs)
1. Generate questions used for searching research gap in the clinical practice
2. Communicate with the patient or health professional effectively
3. Apply basic science, medical science, medical laboratory science for clinical practice
4. Pinpoint the research question from clinical settings surveying

MED51 8101 Seminar in Translational Medicine I 1(0-3-2)
Prerequisite: None

Seminar on the translational medicine emphasize the information retrieve, appraisal publication.

MED51 8102 Seminar in Translational Medicine II 1(0-3-2)
Prerequisite: None

Seminar on the new knowledge in translational medicine, Information search, Article reading, and research hypothesis.

Course Learning Outcomes (CLOs)

1. Seminar on the translational medicine emphasize the information retrieve, appraisal publication, question creative for research thesis applies advanced knowledge and high technology in Translational Medicine
2. Apply statistical methods and research methodology in research article
3. Identification of main issues and research problem
4. Clarity in results and conclusions
5. Apply Information Technology for data retrieval and visual aids in academic presentation Preparation and appropriate use of visual aids, proper use of English in oral presentation and writing
6. Apply Information Technology for data retrieval and visual aids in academic presentation Preparation and appropriate use of visual aids, proper use of English in oral presentation and writing

MED51 8103 Seminar in Translational Medicine III 1(0-3-2)
Prerequisite: None

Seminar on the translational medicine emphasize the information retrieve, appraisal publication, question creative for research thesis development of oral presentation

Course Learning Outcomes (CLOs)

1. Applying advanced knowledge and high technology and coverage of information
2. Apply statistical methods and research methodology in research article
3. Identification of main issues and research problem
4. Clarity in results and conclusions
5. Appropriate on criticizing of paper and response to questions
6. Apply Information Technology for data retrieval and visual aids in academic presentation
7. Preparation and appropriate use of visual aids, proper use of English in oral presentation and writing.

MED51 8201 Immunology 2(2-0-4)
Prerequisite: None

Immunocytology and molecules of the immune systems, antibody, mediators, cytokines, chemokines, receptors, innate and acquired/adaptive immunity, inflammation, protective immune responses, hypersensitivity

Course Learning Outcomes (CLOs)

1. Describe Immunocytology and molecules of the immune systems
2. Describe difference between innate and acquired/adaptive immunity
3. Define antibody, mediators, cytokines, chemokines, receptors play role in immunity
4. Describe protective immune responses, inflammation, and hypersensitivity

MED51 8202 Comprehensive Laboratory Skills 2(1-2-3)

Prerequisite: None

Advanced laboratory techniques for diagnostic, DNA and RNA extractions from blood and clinical specimens, electrophoresis, polymerase chain reaction, real-time PCR, comprehensive genomic characterization, exploring DNA data based on the World Wide Web, HPLC, MS, next generation sequencing, chromosome study, Immunolabeling, tissue culture, stem cell and derivatives identification

Course Learning Outcomes (CLOs)

1. Understand the principle for DNA and RNA amplification in different kinds of PCR
2. Understand the principle for amplicons separation and do the electrophoresis
3. Know how to retrieve genomics information from human genome project and genomics Thailand
4. Interpret the results from sequencing, chromosome study, and immunolabelling
5. Application of HPLC, MS, and Synchrotron techniques in medical research
6. Choose proper markers for stem cells and differentiated cells identification

MED51 8203 Infectious diseases 2(2-0-4)

Prerequisite: None

Human pathogens, tropical diseases, emerging diseases, epidemiology of infectious diseases, pathogenesis and pathophysiology, clinical manifestations, clinical specimen collection, diagnosis (immune and molecular), treatment, prevention, control, biosafety and biosecurity, related law

Course Learning Outcomes (CLOs)

1. Classify human pathogens, tropical diseases, emerging diseases, epidemiology of infectious diseases
2. Describe pathogenesis and pathophysiology, clinical manifestations

3. Apply diagnosis (immune and molecular), treatment, prevention to infectious diseases
4. Understand control, biosafety and biosecurity, related law
5. Properly evaluate analysis methods for a case study

MED51 8204 Contemporary Parasitology 2(2-0-4)
Prerequisite: None

parasites and vectors, neglected parasites, molecular and biochemical parasitology, parasites immunology, advances in parasitology, applied parasitology, experimental parasitology, parasitology research, drug and vaccination for parasites, innovation for parasites prevention and control

Course Learning Outcomes (CLOs)

1. Describe on parasites and vectors, neglected parasites, molecular and biochemical parasitology, parasites immunology
2. Select appropriate apply in advances in parasitology, applied parasitology, experimental parasitology in parasitology research
3. Apply drug and vaccination for parasites, innovation for parasites prevention and control in Translational Medicine

MED51 8205 Applied Oral Biology 3(2-2-5)
Prerequisite: None

Development structures and functions of oral tissues, oral bacterial ecology in the normal and pathologic condition, Updated dental innovations in applied health care research

Course Learning Outcomes (CLOs)

1. Describe development structures and functions of oral tissues
2. Differentiate oral bacterial ecology in the normal and pathologic condition
3. Apply dental innovations in applied health care research

MED51 8206 Tissue Culture and Molecular Laboratory in Dentistry 3(2-2-5)
Prerequisite: None

Tissue culture techniques for dental research, principle of material, instrument and equipment for analyze

Course Learning Outcomes (CLOs)

1. Describe tissue culture techniques for dental research
2. Describe principle of material, instrument, and equipment for analytical research
3. Apply tissue culture techniques for dental research and Translational Medicine

MED51 8207 Material and Nanotechnology for Translational Medicine 2(1-2-3)
Prerequisite: None

Study of Material and Nanotechnology for Translational Medicine
Course Learning Outcomes (CLOs)
1. Classify types of Nanotechnology
2. Classify types of Material in Nanotechnology
3. Apply material and Nanotechnology for Translational Medicine

MED51 8208 Integrative Immunity and Infection 3(2-2-5)
Prerequisite: Yes

Diversity and biology of human pathogens (bacteria, viruses, fungi), microbial pathogenesis, immune responses and host defense, immunopathology, treatment of infections or diseases, application for research and diagnostics
Course Learning Outcomes (CLOs)
1. Describe diversity and biology of human pathogens (bacteria, viruses, fungi)
2. Compare how immunes responses against difference pathogens
3. Appropriately apply applications for research and diagnosis
4. Discuss the scientific paper for integrated approach to diagnostics and vaccines or therapeutic treatment of infections

MED51 8209 Advance Molecular Biology and Precision Medicine 3(2-2-5)
Prerequisite: No

Molecular technology, DNA replication, genetic recombination, RNA processing and translation, biochemical mechanisms of diseases, experimental design, and data analysis, precision medicine for applying medical laboratory
Course Learning Outcomes (CLOs)
1. Understand basic knowledge of medical molecular biology. DNA replication genetic manipulation transmission of genetic information biochemical mechanisms of disease
2. Understand, create, and apply the knowledge for experimental design and data analysis
3. Apply omics information for health promotion, disease prevention, diagnosis, prognosis, management, and rehabilitation

MED51 8210 Innovative and Technology for Vaccine Design 3(2-2-5)
Prerequisite: Yes

Biologic basis for development and evaluation of new viral, bacteriologic, parasitic, and cancer vaccines antibody, microbial technologies genetic engineering for vaccine antigen, novel adjuvants antigen-carrier systems, vaccine presentation and delivery, phase I and II clinical vaccine trials, Good Clinical Practice (GCP) and vaccine policy in Thailand
Course Learning Outcomes (CLOs)

1. Understand the biologic basis for development and evaluation of new viral, bacteriologic, parasitic, and cancer vaccines
2. Understand technologies genetic engineering for vaccine antigen novel adjuvants antigen-carrier systems, vaccine presentation and delivery, phase I and II clinical vaccine trials, Good Clinical Practice (GCP) and vaccine policy in Thailand

MED51 8211 Development of Diagnostic Methods and Production of Diagnostic Kit 3(2-2-5)
Prerequisite: Yes

Principle, processes and techniques for production and development of diagnostic kit, Element of diagnostic kit, Technology used in diagnostic kit, performance evaluation and quality control of diagnostic kit

Course Learning Outcomes (CLOs)

1. Understand principle, process, and techniques for the development of diagnostic kit
2. Identify the important components in diagnostic kit
3. Update state-of-the-art technologies that can be applied in developing diagnostic kit
4. Tell the steps of performance evaluation

MED51 8212 Technology in Cardiovascular Conditions Care 3(2-2-5)
Prerequisite: None

Fundamental concept of cardiovascular system, cardiovascular disease, anatomy, pathogenesis, pathophysiology of cardiovascular disease, risk factors, health assessment, health promotion, disease prevention, management of common problems in cardiovascular system, innovation thinking in cardiovascular disease research

Course Learning Outcomes (CLOs)

1. Understand fundamental concept of cardiovascular system, cardiovascular disease, anatomy, and pathogenesis
2. Describe pathophysiology of cardiovascular disease, risk factors and health assessment
3. Select proper approach for health promotion, disease prevention, management of common problems in cardiovascular system
4. Apply innovation thinking in cardiovascular disease research

MED51 8213 Technology and Innovation for Gene Therapy 3(2-2-5)

Prerequisite: None

Definition and principle of gene therapy, benefits of gene therapy, types of gene therapy, principle of using viral vector for gene therapy, types of viral vectors can used for gene therapy, principle of using non-viral vectors for gene therapy, disease can be treated by gene therapy, complications of gene therapy

Course Learning Outcomes (CLOs)

1. Understanding of the principles of cell and gene therapy and the contexts in which they are applied
2. Understanding of the methodologies, techniques, tools, and processes employed in cell and gene therapy, the challenges and potential of cell and gene therapies to address inherited conditions and disease

MED51 8214 Musculoskeletal Technology and Innovation 3(2-2-5)

Prerequisite: None

The translation medicine in musculoskeletal system, knowledge about fundamental of musculoskeletal system, application in research and innovation, essential anatomy, cell biology in musculoskeletal system, regenerative medicine and tissue engineering in orthopedics, innovative thinking in musculoskeletal research, current research direction in orthopedics

1. Understand the fundamental of musculoskeletal system, apply the translational medicine in musculoskeletal system
2. Understand the current research direction in orthopedics

MED51 8215 Innovation and Technology for Gastrointestinal System 3(2-2-5)

Prerequisite: None

Classification of gastroenterology diseases, morphology, epidemiology, host-environments-disease interactions, mechanisms of common gastroenterology infections, pathogenesis and pathology, epidemiology, prevention and disease control

Course Learning Outcomes (CLOs)

1. Correctly classify gastroenterology diseases
2. Describe morphology, epidemiology, host-environments-disease interactions, mechanisms of common gastroenterology infections, pathogenesis and pathology, epidemiology
3. Apply gastroenterology in prevention, and disease control

MED51 8216 Concepts for New Drug Development 3(2-2-5)

Prerequisite: None

New active agent discovery, process of new drug development, pharmacological test, toxicity test, formulation development, clinical studies, drug registration, patent drug registration, post-marketing surveillance, development of generic drugs and bioequivalence, pharmaceutical research and development from herbal medicine and local knowledge, pharmaceutical industry in Thailand, national policy

Course Learning Outcomes (CLOs)

1. Understand the pipeline of new active agent discovery until drug registration
2. Understand pharmaceutical research and development from herbal medicine and local knowledge, national policy

MED51 8217 Smart Elderly 3(2-2-5)

Prerequisite: None

Knowledge about geriatrics care and its application in research and innovation. The topics include principles of primary geriatrics care, health assessment, health promotion and disease prevention in geriatrics, management of common problems in geriatrics, long-term care, home health care, geriatric palliative care, geriatrics rehabilitation and innovation thinking in geriatrics care research

Course Learning Outcomes (CLOs)

1. Understand the knowledge about geriatrics care
2. Understand and apply its application in research and innovation

MED51 8218 Modern Nutrition 3(2-2-5)

Prerequisite: None

Study of food, nutrients, and energy, nutrition in each age, relationship between nutrition and health, mal and over nutrition, nutrition and exercise, nutritional treatment in patients, food consumption for good health, research on nutrition

Course Learning Outcomes (CLOs)

1. Understand the study of food, nutrients, and energy, nutrition in each age, relationship between nutrition and health, mal and over nutrition able to identify and apply food principles to food and nutrition systems
2. Understand and apply research trend on nutrition

MED51 8219 Modern Women Health 3(2-2-5)
Prerequisite: None

Knowledge about fundamental of women health care and its application in research and innovation, menstruation, fertility, menopause, health assessment, health promotion, disease prevention, management of common problems in women health and innovation thinking in women health care research
Course Learning Outcomes (CLOs)
1. Understand the knowledge about fundamental of women health care and its application in research and innovation
2. Understand and apply research trend on women health care

MED51 8220 Palliative Care 3(2-2-5)
Prerequisite: None

Knowledge of palliative care, examine palliative care practice, core concepts related to palliative care, symptom management, evidenced based practice, psychological states, pharmacology, ethical issues, end of life care and interpersonal skills and pastoral care
Course Learning Outcomes (CLOs)
1. Understand the knowledge and core concept of palliative care
2. Understand and manage the knowledge, ethical for end-of-life care

MED51 8221 Translational Health Care 3(2-2-5)
Prerequisite: None

Factors influence on health, association between individual illness, family counseling, community study in multicultural society, community diagnosis, concept and tool of epidemiology, prevention of a specific disease, patient-oriented clinical research, behavioral studies, collaboration between family, community and government, national health research policy
Course Learning Outcomes (CLOs)
1. Understand and apply the factors that influence on health for community study
2. know on national health research policy and apply for community research

MED51 8222 Complementary Medicine 3(2-2-5)
Prerequisite: None

Definition and principle of complementary medicine, benefits of complementary medicine, types and patterns of complementary medicine, principle of traditional Chinese medicine, principle of acupuncture, diseases effectively treated by acupuncture, methods of acupuncture treatment for chronic disease, method for acupuncture treatment for pain relief, contraindication and complications of acupuncture

Course Learning Outcomes (CLOs)

1. Understand the basic of principle of complementary medicine
2. Understand the principle of acupuncture and their benefit for treatment for chronic disease, aware of contraindication and complications of acupuncture

MED51 8223 Geographic Information System Translation Medicine 3(2-2-5)
Prerequisite: None

Principle, theory, practice of geographic information system, remote sensing for disease management and community medicine, spatial database management, data analysis (such as mapping of statistically significant cluster of diseases, and geographic distribution measurement of diseases) and the application of GIS for data presentation and make decision in translation medicine

Course Learning Outcomes (CLOs)

1. Correctly classify data types in geographic information system and remote sensing according to international standards
2. Clearly interpret results of spatial statistical analysis of diseases based on academic ethics
3. Appropriately apply geographic information system in translation medicine
4. Properly evaluate analysis methods for a case study

MED51 8224 Learning Organization and Knowledge Management in Health Systems 3(2-2-5)
Prerequisite: None

Concepts, theories, methods, and instruments for learning culture of the organization and community, learning of team, systematic thinking, knowledge management in health organization and community, applied knowledge in community management, quality development, quality process, quality practice and quality outcomes

Course Learning Outcomes (CLOs)

1. Understand the concepts, theories, methods and instruments for learning culture of the organization and community
2. Apply knowledge in community management

MED51 8225 Startup 1(1-0-2)

Prerequisite: No

Startup subject provides the basic knowledge of entrepreneurship which consists of the definition of startup and SME, business model canvas for startup, the basic knowledge of finance and accounting for startup, the basic knowledge of marketing, the basic knowledge of human resource management, the concept of pitching for investment from venture capitals

Course Learning Outcomes (CLOs)

1. Understand the definition of “startup” and “SME”
2. Know business model canvas for startup
3. Learn about finance and accounting for startup
4. Understand the basic knowledge of human resource management, the concept of pitching for investment from venture capitals

MED51 8226 Intellectual property 1(1-0-2)

Prerequisite: No

Understand meaning of intellectual property, rights, and process of patent registration, dealing with accusations or abused about the rights

Course Learning Outcomes (CLOs)

1. Understand the meaning of intellectual property and right
2. Know about the process of patent registration
3. Deal with accusations or abused regarding the right

MED51 8227 Stem Cell Technology and Regenerative Medicine 2(1-2-3)

Prerequisite: Yes

Study of stem cell and derived cells and the application of these cells in Regenerative Medicine

Course Learning Outcomes (CLOs)

1. Understand the meaning of stem cells and their specific markers
2. Know the properties of multipotent stem cells and pluripotent stem cells
3. Apply the markers for stem cells and derived cells identification

4. Learn how the stem cells therapy can be used in regenerative medicine

MED51 8228 Bioinformatics and Big Data Management 2(1-2-3)
Prerequisite: Yes

Functional genomics, biological databases (genome, transcriptome, proteome, metabolome), data retrieval and analysis of DNA and protein sequences, primers and probes design, structural genomics, comparative genomics, microbiome and metagenomics, phylogenetic analysis, system biology, genome-wide-associate study, microarrays analysis, next generation sequencing data analysis, pharmacogenomics, AI and deep learning, big data management

Course Learning Outcomes (CLOs)
1. Correctly classify data types and data retrieval in Bioinformatics
2. Appropriately apply of DNA and protein sequences analysis
3. Apply Bioinformatics in primers and probes design, structural genomics, comparative genomics, microbiome and metagenomics, phylogenetic analysis, system biology, genome-wide-associate study, microarrays analysis, next generation sequencing data analysis, pharmacogenomics
4. Understand AI and deep learning, big data management in Translational Medicine research

MED51 8229 Pharmacogenomics 2(1-2-3)
Prerequisite: Yes

Study pharmacogenomics for future drug development

Course Learning Outcomes (CLOs)
1. Understand principle of pharmacogenomics
2. Describe benefits of pharmacogenomics and research solutions
3. Describe applications of therapeutic approaches and drug development
4. Create research proposal in Translational Medicine by using applications of pharmacogenomics

MED51 8230 Writing Skills for Doctoral Students 1(0-3-2)
Prerequisite: None

Additional of scientific writing skills for communication and publication at least moderate level

Course Learning Outcomes (CLOs)
1. Communicate with written from effectively
2. Write a manuscript with complete components

3. Critique other's scientific writing

MED51 8301 Dissertation (SCHEME 2.1) 45 Credits

Prerequisite: None

Research work on translational medicine problems under advice by research advisor leading to the preparation of a doctoral thesis (Curriculum on course training and research work)

Course Learning Outcomes (CLOs)

1. Strictly follow research ethical approach
2. Conduct research proposal, hypothesis, research methodology and statistical analysis, clarity in results and conclusions
3. Apply knowledge and technology or innovation in research problem of Translational Medicine or related fields
4. Prepare and appropriate use of visual aids in academic presentation, proper use of English in oral presentation and writing in international standard

MED51 8302 Dissertation (SCHEME 2.2) 60 Credits

Prerequisite: None

Research work on translational medicine problems under advice by research advisor leading to the preparation of a doctoral thesis (Curriculum on course training and research work)

Course Learning Outcomes (CLOs)

1. Strictly follow research ethical approach
2. Conduct research proposal, hypothesis, research methodology and statistical analysis, clarity in results and conclusions
3. Apply knowledge and technology or innovation in research problem of Translational Medicine or related fields
4. Prepare and appropriate use of visual aids in academic presentation, proper use of English in oral presentation and writing in international standard

as of January 2024