A. THE CURRICULUM DETAILS OF THE DOCTORAL PROGRAM IN PHARMACEUTICAL SCIENCES REGULAR TRACK 2022/2023

1. COURSES(12 credits)

Compulsory courses

No.	Field of Study	Course Name	Course code	credits
1.	General	Research Methodology for PhD	FAS3220101	2
2.	General	Scientific writing	FAS3220102	2

Elective courses; Dissertation supporting courses

No.	Field of Study	Course Name	Course code	credits
1.	Pharmaceutics and Pharmaceutical Technology	Pharmaceutics and Pharmaceutical Technology I	FAS3220103	2
2.	Pharmaceutics and Pharmaceutical Technology	Pharmaceutics and Pharmaceutical Technology II	FAS3220104	2
3.	Pharmaceutical Biology	Pharmaceutical Biology	FAS3220105	2
4.	Pharmaceutical Biology	Advanced Natural Product Pharmaceuticals	FAS3220106	2
5.	Macromolecular Engineering	Pharmaceutical Bioinformatics	FAS3220107	2
6.	Macromolecular Engineering	Methods in Molecular Biology	FAS3220108	2
7.	Pharmaceutical Chemistry Analysis	Pharmaceutical Analysis	FAS3220109	2
8.	Medicinal Chemistry	Structure Elucidation	FAS3220110	2
9.	Medicinal Chemistry	Cheminformatics and Molecular Modeling	FAS3220111	2
10.	Medicinal Chemistry	Organic Chemistry Synthesis and Green Chemistry	FAS3220112	2
11.	Pharmacology and Toxicology	Pharmacology and Toxicology I	FAS3220113	2
12.	Pharmacology and Toxicology	Pharmacology and Toxicology II	FAS3220114	2
13.	Pharmacology and Toxicology	Experimental Pharmacology and Toxicology	FAS3220115	2
14.	Clinical Pharmacy	Clinical Trial	FAS3220116	2
15.	Clinical Pharmacy	Pharmacovigilance	FAS3220117	2

No.	Field of Study	Course Name	Course code	credits
16.	Clinical Pharmacy	Geriatric Care	FAS3220118	2
17.	Clinical Pharmacy	Advanced Pharmacoeconomy	FAS3220119	2
18.	Clinical Pharmacy	Intervention Model in Clinical Pharmacy	FAS3220120	2
19.	Community Pharmacy	Community Pharmacy	FAS3220121	2
20.	Pharmaceutical Management	Pharmaceutical Management I	FAS3220122	2
21.	Pharmaceutical Management	Pharmaceutical Management II	FAS3220123	2
22.	According to Dissertation Topic	Other courses provided in other PhD program in or outside of UGM.	The course code and credits are adjusted to the applicable curriculum.	
23.	According to Dissertation Topic	Capita Selecta in Pharmaceutical Science	FAS3220124	2

2. DISSERTATION (34 credits)

No.	Course Name	Description	Course code	credits
1.	Research Proposal and Comprehensive Basic Skills	Proposal writing based on basic comprehensive skills	FAS3220201	4
2.	Dissertation Research Progress I	Monitoring and evaluation of dissertation research progress	FAS3220202	1
3.	Dissertation Research Progress II	Monitoring and evaluation of dissertation research progress	FAS3220301	2
4.	Dissertation Research Progress III	Monitoring and evaluation of dissertation research progress	FAS3220401	2
5.	Dissertation Research Progress IV	Monitoring and evaluation of dissertation research progress	FAS3220501	2
6.	Presentation of Dissertation Result	Presentation of Dissertation Result	FAS3220502	4
7.	Dissertation Eligibility	Assessment of Dissertation Script eligibility	FAS3220601	4
8.	Dissertation Examination	Dissertation Examination	FAS3220602	15

B. THE CURRICULUM DETAILS OF THE DOCTORAL PROGRAM INPHARMACEUTICAL SCIENCES RESEARCH TRACK 2022/2023

1. COURSES(6 CREDITS)

Compulsory courses

No.	Field of Study	Course Name	Course code	credits
1.	General	Research Methodology for PhD	FAS3220101	2
2.	General	Scientific writing	FAS3220102	2

Elective Course

No.	Field of Study	Course Name	Course code	credits
1.	According to Dissertation Topic	Other courses provided in regular track, and in other PhD program in or outside of UGM.	The course code and credits adjust to the applicable curriculum.	

2. DISSERTATION (40 credits)

No.	Course Name	Description	Course code	credits
1.	Comprehensive Proposal and Basic Skills	Proposal writing based on basic comprehensive skills	FAS3220201	4
2.	Seminar of Dissertation Research Progress I	Seminar of dissertation research progress	FAS3220203	1
3.	Seminar of Dissertation Research Progress II	Seminar of dissertation research progress	FAS3220302	2
4.	Seminar of Dissertation Research Progress III	Seminar of dissertation research progress	FAS3220402	2
5.	Seminar of Dissertation Research Progress IV	Seminar of dissertation research progress	FAS3220503	2
6.	Publication of Dissertation Result	Presentation of Dissertation Result	FAS3220504	6
7.	Result Presentation of Dissertation Research	Presentation of Dissertation result	FAS3220505	4
8.	Dissertation Eligibility	Assessment of Dissertation script eligibility	FAS3220603	4
9.	Dissertation Examination	Dissertation Examination	FAS3220604	15

C. COURSES SYLLABI

Courses name	Courses syllabi
Research Metodology for PhD	This course discusses various research methodologies at the doctoral level, both for scientific pharmacy research and clinical and community pharmacy research.
Scientific writing	This course discusses basic concepts and trains the application of concepts related to grammar, selection of trusted references, electronic citation systems, making abstracts and body parts of manuscripts that are effective and efficient, to produce good quality scientific writings, especially in writing research proposals (with a focus on dissertation research) as well as manuscripts for publication of research results in international journals. The output of this course is a dissertation proposal and a draft of a narrative review publication.
Pharmaceutics and Pharmaceutical Technology I	This course discusses and motivates students to conduct research in the fields of pharmaceutical chemistry, stability and biopharmaceuticals of drugs and drug preparation products which includes the structure and physicochemical character of medicinal ingredients and drug additives, character and aspects of the study of biopharmaceuticals of drugs and drug preparation products and classification. biopharmaceuticals, degradation and stability of drugs and drug products as well as drug release kinetics from various dosage forms.
Pharmaceutics and Pharmaceutical Technology II	This course discusses preformulation studies to design liquid, semisolid and solid dosage forms, formulation and production of liquid, semisolid and solid dosage forms as well as quality attributes and quality control of liquid, semisolid and solid dosage forms. In addition, discussions related to the technology and formulation of pharmaceutical preparations related to the research interests to be carried out were also held.
Pharmaceutical Biology	This course discusses cell biology and applications in supporting biotechnology, microbiological systems and their applications for virus-based bioassays, plant cell and tissue systems, mammal cell and tissue systems for vaccine and antibody activity, introduction of biosynthetic pathways for biological systems, bioengineering of metabolite synthesis, optimization of physical and chemical metabolite production chemical, bioreactor design for metabolite production, downstream processing and capita selecta related to biological systems for its application in the pharmaceutical and health world.
Advance Natural Product Pharmaceuticals	This course discusses the diversity of metabolite structures in terms of biosynthesis, enzymatic reactions (oxidation, reduction, acetylation, etc.) of primary and secondary metabolites related to aspects of biological activity. Development of methods for isolating compounds from natural materials, including basic solutions related to the stability of compounds from natural materials; application of identification method techniques on the basis of the characteristics of compounds of natural materials, and experimental techniques of

Courses name	Courses syllabi
	structure elucidation of compounds of natural materials related to the complexity of compounds. Strategy of procurement and selection of raw materials, development of herbal products (new and development); herbal production technology. Strategy and application of the concept of herbal standardization and quality control to produce products with good quality consistency.
Pharmaceutical Bioinformatics	This course aims to provide knowledge about bioinformatics that can be applied to solve pharmaceutical problems. This course focuses on understanding and using software which contains an introduction to pharmaceutical bioinformatics, biological and chemical databases, theories and methods for experimental data analysis, experimental design, drug candidate prediction, and proteochemistry.
Methods in Molecular Biology	This course focuses on the application of molecular biology techniques in the discovery and development for drugs and other pharmaceutical products. This course discusses the necessary steps for each method related to the topic, starting from preparation, procedures, analysis, up to important factors that need to be considered. The topics covered in this course including cloning techniques; isolation, purification, and analysis of nucleic acids and proteins (e.g. gel electrophoresis, polymerase chain reaction, immunochromatography); transfection in mammalian cultured cells; protein methods (e.g. immunoprecipitation, Western blot, protein staining), and cell-based assays. Advanced techniques such as flow cytometry, microarray, and sequencing are also discussed in this course.
Pharmaceutical Analysis	This course discusses aspects related to pharmaceutical analysis, starting with the development of analytical methods, various analytical methods used for pharmaceutical analysis and ending with data processing and presentation of pharmaceutical analysis results. The topics covered include: Sample preparation in different matrix (pharmaceutical preparations, biological fluids from plants and animal) including solid phase extraction, spectrometric methods (UV/VIS, Infrared, Mass), Chromatographic-based techniques (HPLC, TLC/HPTLC, GC, Electrophoresis), Analytical Method Validation, Quality assurances of chemical analysis, and the application of statistics and chemometrics in pharmaceutical analysis.
Structure Elucidation	This course discusses the identification and determination of the structure of organic compounds using UV, IR, NMR, and MS spectroscopic methods.
Cheminformatics dan Molecular Modeling	This course discusses the concepts, principles, and applications of cheminformatics and molecular modeling in the pharmaceutical field, particularly in the design of drug molecules and/or tracking of mechanisms of action. The cheminformatics tools (PubChem, CHEMBL, ZINC, Drug Central, etc.) are used to mine information on the structure of compounds (drugs) along with their physicochemical properties and biological activities. Molecular

Courses name	Courses syllabi
	modeling methods (docking, pharmacophore modeling, QSAR, protein modeling, etc.) are used to study drug-target interactions and predict their biological activity.
Organic Chemistry Synthesis and Green Chemistry	This course discusses diversity-oriented synthesis (DOS) and target-oriented synthesis (TOS) approaches, principles and applications of retrosynthetic analysis to design organic compound synthesis pathways through functional group conversion reactions and bond formation between carbon and heteroatoms in acyclic, cyclic and aromatic structures, as well as the application of green chemistry in the synthesis of organic compounds.
Pharmacology and Toxicology I	This course discusses the theories and research methods of pharmacology and toxicology which includes qualitative pharmacokinetics and pharmacology of drugs that affect the central nervous system, autonomic nervous system, immune system, and autacoids, as well as examples of experimental pharmacology, and discussion of the research interest.
Pharmacology and Toxicology II	This course discusses quantitative pharmacokinetics, drug metabolism and pharmacogenetics, experimental pharmacology of drug metabolism and drug transport and polymorphisms, toxicokinetics, drug pharmacology on the endocrine system, experimental pharmacology of drugs on the endocrine system, chemotherapy, molecular mechanisms of toxic compounds, and discussion of the research interest.
Experimental Pharmacology and Toxicology	This course studies the application and development of various experimental models for research, discovery and development of drugs in the digestive system, respiratory system, endocrine system, cardiovascular system, reproductive system, immune system, and cancer, antimicrobial, antibiotic, antiviral, immunological and anti-inflammatory. non-immunology through the application and development of experimental pharmacology-toxicology designs in vitro, in vivo, in silico etc. adapted to the research topic of the student's dissertation.
Clinical Trial	This course explains the concept of clinical trials, good clinical practice, and the preparation of clinical trial protocols. In addition, the concept and implementation of the bioavailability test (BA/BE) between drug products was also presented.
Pharmacovigilance	This course explains the concept and role of pharmacovigilance in drug safety detection, implementation of pharmacovigilance in the world, reporting and analysis of adverse events/ESO causality, the role of health workers in pharmacovigilance, and discussion of case reports of ESO in various organ systems.
Geriatric Care	This course explains the concept of geriatric care comprehensively and research in the geriatric field including physiological decline in elderly patients, drug use in elderly patients, nutritional needs in elderly patients, oral dental health, psychology in geriatric patients, the role of pharmacists in the geriatric care team, geriatric research.

Courses name	Courses syllabi
Intervention Model in Clinical Pharmacy	This course describes various pharmacoeconomic analyzes; measurement of effectiveness and patient-reported outcomes; decision analysis models and sensitivity analysis; Pharmacoeconomic applications in drug selection and disease management.
Community Pharmacy	This course discusses the activities of pharmacists in a community pharmacy setting with a focus on the ability of pharmacists to develop patient-oriented pharmaceutical services, including disease management, therapy management, preventive health screening, immunization, specialty compounding, patient education, and other pharmacy service activities.
Pharmaceutical Management I	This course discusses and motivates students to conduct research in the field of pharmaceutical management, especially those related to the role of intangible assets for companies, supporting management: finance and administration, human resource management, organizational management, information systems and strategic management.
Pharmaceutical Management II	This course discusses and motivates students to conduct research in the field of pharmaceutical management, especially those related to the roles of drug policy, regulation, drug management and rational drug use.
Capita Selecta in Pharmaceutical Science	This course contains material to support the dissertation which is coordinated by the promoter team according to the student's dissertation topic.