MODULE DESCRIPTION
PRODI S1 FARMASI-JURUSAN KIMIA FMIPA UNIB

S1F-50

TOXICOLOGY (TOKSIKOLOGI)

Module Code: FRS-672	Credit Points (T/P): (2/0)	Semester: 6	Rumpun MK: Pharmacology	Coord of Study Program: Dwi Dominica, S.Farm., Apt., M.Farm	Authorization:
Preparation Date: 00	Last Amandement Date: -		Responsible Person: Reza Pertiwi, S.Farm., Apt., M.Farm. (RP) Agung Giri Samudra, S.Farm., Apt., M.Sc (AGS)		

Intended Learning Outcome (ILO/CP)	**CPL-PRODI :** 1. (STN2)-Upholding human values in carrying out duties based on religion, morals, and ethics; 2. (KU1) Able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise; 3. (KK10) Able to analyze physical, chemical, physico-chemical, and biological parameters, medicinal materials and or medicinal products; 4. (KK13) Able to apply science and technology in pharmaceutical research; 5. (P1) Able to explain the concept of drugs, the human body and the mechanism of action of drugs; 6. (P2) Able to explain the relationship between the structure of active ingredient compounds and their activities; 7. (P3) Able to explain the concept of the journey of drugs in the body
	CP-MK : Able to understand the terms of toxicology science, factors toxicity effect, toxicity test methods, and handling actions in cases of toxicity
Short Desciption	Toxicology courses discuss the introduction of toxicology, factors toxicity effect, intrinsic factors of living beings that toxicity effect, toxic responses to foreign compounds, toxic effect mechanisms, toxic effects of chemical compounds, antidote therapy, toxicology tests, typical and unusual toxicity, risk assessment and evaluation.
Module Content	**Introduction and Introduction of Toxicology**; Definition of toxicology; toxicological principles, the scope of toxicology **Factors toxicity effect**; intrinsic factors, chemical factors, exposure conditions **Intrinsic factors of living beings toxicity effect;** physiological state, state of pathology **Toxic response to foreign compounds;** introduction, mechanism of action, mechanism and response, pharmacological, physiological, and biochemical effects, Developmental toxicology-teratogenesis, Immunotoxicity, Genetic toxicity, and Chemical

	carcinogenesis **The mechanism of toxic effects;** Hepatotoxicity, Carcinogenesis, Kidney damage, Excessive pharmacological effects, and biochemical effects **Toxic effects of chemical compounds**; CCl4, Mercury, Cyanide, Alcohol, Chloroform, Arsenic, Morphine, Paracetamol, Hydrochlortiazide, and Rodamin. **Antidote therapy**; understanding and meaning, therapeutic goals, therapeutic strategies, procedures for implementing therapy **Toxicology tests;** research concept, understanding and feeding, toxicology test system, determinant of toxicity test validity **Typical and non-typical toxicity**; typical and non-typical types of toxicity tests, safety evaluation **Risk assessment**; basic risk assessment, exposure assessment, dose-response assessment, risk characterization, probability, risk evaluation.
Recommended Literatures	**Primary :** 1. Wallig, M. A., Bolon, B., Haschek, W. M., & Rousseaux, C. G. (Eds.). (2017). *Fundamentals of toxicologic pathology*. Academic Press.. 2. Reddy, K. S. (2014). *The essentials of forensic medicine and toxicology*. 33th Ed. The Health Sciences Publisher. New Delhi. 3. Hodgson, E., 2004, *A Textbook of Modern Toxicology*, John Willey & Sons, New Jersey.
Planned use/applicability	**Software :** OS:Windows; Office, Zoom Meeting **Hardware :** PC & LCD Projector
Team Teaching	Reza Pertiwi, S.Farm., Apt., M.Farm. (RP) Agung Giri Samudra, S.Farm., Apt., M.Sc (AGS)
Admission Requirement	Basic Pharmacology (FRS-233 /3 sks) Pharmacology of Infection, Cancer, and Musculoskeletal (FRS-262 /2 sks) Pharmacology of Nervous, Respiratory, and Digestive Systems (FRS-272 /2 sks) Pharmacologi of Endocrine & Cardiovaskular Systems (FRS-392 /2 sks)

Week	Sub-ILO/CP-Module	Indicator(s)	Assessment Types	Teaching Method(s) and Work Load [&Time Estimation]	Module Content [&Literature]	Assessment Percentage (%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)

1	1. Able to understand the introduction of toxicology (KK10)(KK13)(P1) (P2)(P3)	• Accuracy in explaining the notion of toxicology • Accuracy of explaining toxicological principles • Accuracy explains the scope of toxicology	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt, **[TM: 1 x (1x50")]**	Introduction: 1. Definition of toxicology 2. Toxicological principles 3. Scope of toxicology **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	5 %
2	2. Able to understand the factors toxicity effect (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains the factors toxicity effect	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt, **[TM: 1 x (1x50")]**	Factors of Toxicity Effects: 1. Intrinsic factors of toxic substances 2. Chemical factors 3. Exposure conditions: Type ofjanan, Path of exposure, Time of exposure, Frequency of exposure, Dosing of exposure **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	5%
3	3. Able to understand the intrinsic factors of living beings that toxicity	• Accuracy explains the intrinsic factors of living beings toxicity effect	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt,	Intrinsic Factors of Creators Toxicity Effects: 1. Physiological state 2. Pathological condition	5%

	effect (KK10)(KK13)(P1) (P2)(P3)			**[TM: 1 x (1x50")]**	**Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	
4	4. Able to understand toxic responses to foreign compounds (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains toxic response to foreign compounds	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt, **[TM: 1 x (1x50")]**	Toxic Response to Foreign Compounds: 1. Live action mechanism: network malfunction 2. Mechanism and response to cellular toxicity 4. Pharmacological, physiological and biochemical effects 5. Teratogenesis 6. Immunotoxicity 7. Genetic toxicity 8. Chemical carcinogenesis **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	5%

5	5. Able to understand the mechanism of toxic effects (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains the mechanism of toxic effects	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt, **[TM: 1 x (1x50")]**	Toxic Effect Mechanism: 1. Hepatototoxicity 2. Carcinogenesis 3. Kidney damage 4. Excessive pharmacological effect 5. Biochemical effects: interaction with specific receptor proteins **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	5%
6,7	6. Able to understand the toxic effects of chemical compounds (KK10)(KK13)(P3)	• Accuracy explains the toxic effects of chemical compounds • Accuracy explains the toxic effects of the drug	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 2x(1x50")]** • Reading text dan ppt, **[TM: 2x(1x50")]** (Assignment 1: Students make a presentation of the mechanisms of chemical compounds and drugs that are widely used by the community so as to cause toxicity)	Toxic Effects of Chemical Compounds: 1. CCl4 2. Mercury 3. Cyanide 4. Alcohol 5. Kloroform 6. Arsen 7. Morphine 8. Paracetamol 9. Hydrochlortiazide 10. Rodamin **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	10%
8	**Midterm Evaluation (Online Exam)**					15%

9	7. Able to understand antidote therapy (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains antidote therapy	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt, **[TM: 1 x (1x50")]**	Antidotum Therapy: 1. Understanding and meaning 2. Therapeutic targets 3. Therapy strategy 4. The grammar of implementation of therapy **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004	7%
10	8. Able to understand toxicology tests (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains toxicology tests	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 1x(1x50")]** • Reading text dan ppt, **[TM: 1 x (1x50")]**	Toxicology Test 1. The concept of research 2. Understanding and meaning 3. Toxicology test system 4. Determination of the validity of toxicological tests **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004)	7%

11,12	9. Able to understand toxicology with typical and non-typical toxicity (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains toxicology with typical toxicity • Accuracy explains toxicology with non-typical toxicity	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 2x(1x50")]** • Reading text dan ppt, **[TM: 2x(1x50")]**	Test Special and Non-Special Toxicity 1. Special and non-special toxicity test type 2. Security evaluation 3. Risk assessment **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004)	6%
13,14, 15	10. Able to understand risk assessment (KK10)(KK13)(P1) (P2)(P3)	• Accuracy explains risk assessment • Accuracy in explaining risk assessment • Accuracy explains risk evaluation	• Review text book/journal	• Lectures, Brain storming, and discussions **[TM: 3x(1x50")]** • Reading text dan ppt, **[TM: 3 x(1x50")]** (Assignment 2: Students make a lecture resume)	Risk Assessment Introductory: 1. Risk assessment policy 2. Spelling assessment: exposure paths and dosages 3. Dosage-response assessment 4. Risk characterization 5. Probability versus determination of risk assessment 6. Evaluation of risks from a mixture of chemicals **Literature** (Wallig et al, 2017) (Reddy, 2014) (Hodgson, 2004)	10%
16	**End of Semester Evaluation (Online Exam)**					20%