

Module Descriptions “Compulsory BAS”

Module designation	<i>PTK62105 Biochemistry</i>
Semester(s) in which the module is taught	2
Person responsible for the module	1. <i>Dr.Ir. Adrizal, Ms (Coordinator)</i> 2. <i>Prof.Dr.Ir. Maria Endo Mahata, MS</i>
Language	<i>Indonesia and English</i>
Relation to curriculum	<i>Compulsory</i>
Teaching methods	<i>Lecture, lesson (small group discussion), independent assignment.</i>
Workload (incl. contact hours, self-study hours)	<i>(Estimated) Total workload: 90.65 hours</i> <i>Contact hours: 26.65 hours (lecture)</i> <i>Private study including examination preparation, specified in hours: 64.00 hours</i>
Credit points	<i>3.02 ECTS</i>
Required and recommended prerequisites for joining the	-

module	
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Module objectives/intended learning outcomes	<i>ILO 1: Menginternalisasi nilai dasar universitas, kode etik, dan etika ilmiah berdasarkan nilai – nilai Pancasila.</i> <i>PI 2: Able to apply discipline in attendance and completion of assigned tasks.</i> <i>ILO 3: Able to apply animal husbandry science in accordance with developments in the livestock industry and innovative and current scientific activities.</i> <i>PI 2: Mastering technical and management skills in the field of nutrition and feed technology.</i> <i>ILO 4: Able to identify, formulate, provide solutions, and evaluate solutions to problems in the livestock sector.</i> <i>PI: Able to identify problems in the livestock sector.</i> <i>ILO 7: Have an attitude as a lifelong learner and further study in developing a professional career.</i> <i>PI 2: Demonstrate an attitude as a lifelong learner</i> <i>Course Learning Outcomes:</i> <i>1. Students are able to explain the concepts of biochemistry, cells, and membranes.</i> <i>2. Students are able to explain amino acids, peptides, and proteins.</i> <i>3. Students are able to explain about enzymes.</i> <i>4. Students are able to explain the classification and function of carbohydrates, classification and function of lipids.</i> <i>5. Students are able to explain about nucleotides, nucleic acids, DNA, and RNA</i>
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	6. <i>Students are able to explain about bioenergetics</i> 7. <i>Students are able to explain about carbohydrates metabolism</i> 8. <i>Students are able to explain about lipid metabolism</i> 9. <i>Students are able to explain about amino acids and protein metabolism</i> 10. <i>Students are able to explain about photosynthesis</i> 11. <i>Students are able to explain about hormone</i>
Content	<i>The biochemistry course covers: introduction, cells and membranes; amino acids, peptides, and proteins; enzymes; classification and function of carbohydrates; classification and function of lipids; nucleotides, nucleic acids, DNA, and RNA; bioenergetics; carbohydrate metabolism; lipid metabolism; amino acid and protein metabolism; photosynthesis; and hormones.</i>
Examination forms	<i>Individual or group assignment, practical work, mid-term and final exam, intrapersonal skill dimension, interpersonal soft skill attributes, and attitude and value dimension.</i>
Study and examination requirements	1. <i>Individual or Group Assignments: 20%</i> 2. <i>Practical Work: 20%</i> 3. <i>Mid-Term/Final Exam: 30%</i> 4. <i>Intrapersonal Skill Dimension: 10%</i> 5. <i>Interpersonal Soft Skill Attributes: 10%</i> 1. <i>Attitude and Value Dimension: 10%</i>

Reading list	1. <i>Lehninger, A.L. 1994. Fundamentals of Biochemistry. Erlangga Publishers, Jakarta</i> 2. <i>Murray, R.K., D.K. Granner, P.A. Mayes, V.W. Rodwell. 1995. Harper Biochemistry, 22nd Edition, Translated by Dr. Andy Hartono. EGC Medical Book Publishers, Jakarta.</i> 3. <i>Stryer, L. 1996. Biochemistry, 4th Edition. EGC Medical Book Publishers, Jakarta.</i> 4. <i>Bender, D.A., 1985. Amino Acid Metabolism. John Wiley & Sons. Chichester, New York, Brisbane, Toronto, Singapore.17</i> 5. <i>Wirahadikusumah, M., 1985. Biochemistry: Energy, Carbohydrate, and Lipid Metabolism. ITB Publisher, Bandung.</i> 6. <i>Sadikin, H.M., 2002. Biochemistry of Enzymes. Widya Medika Publisher, Jakarta.</i> 7. <i>Mirzah, Nuraini, F. Agustin, Y. Marlida, M. Zain, 2004. Basic Biochemistry Volume I. Course Textbook. Department of Animal Nutrition and Feed. Diploma Program. UNAND Development Project.</i> 8. <i>Ngili, Y., 2009. Biochemistry: Metabolism and Bioenergetics. Graha Ilmu Publisher, Yogyakarta.</i> 9. <i>Rizal, Y., and G. Wu. 2012. Protein and Amino Acid Metabolism. Andalas University Press, Padang.</i>
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	Module Description/Course Syllabi Study Programme : Bachelor of Mathematics Faculty of Animal Science Universitas Andalas
1. Course number and name	
PT 123 Biochemistry	
2. Credits and contact hours/Number of ECTS credits allocated	
4,52 ECTS	
3. Instructors and course coordinator	
Dr.Ir. Adrizal, Ms (Coordinator)	
Prof.Dr.Ir. Maria Endo Mahata, MS	
4. Text book, title, author, and year	
1. Lehninger, A.L. 1994. Fundamentals of Biochemistry. Erlangga Publishers, Jakarta 2. Murray, R.K., D.K. Granner, P.A. Mayes, V.W. Rodwell. 1995. Harper Biochemistry, 22nd Edition, Translated by Dr. Andy Hartono. EGC Medical Book Publishers, Jakarta. 3. Stryer, L. 1996. Biochemistry, 4th Edition. EGC Medical Book Publishers, Jakarta.	
5. Recommended reading and other learning resources/tools	
1. Bender, D.A., 1985. Amino Acid Metabolism. John Wiley & Sons. Chichester, New York, Brisbane, Toronto, Singapore.17 2. Wirahadikusumah, M., 1985. Biochemistry: Energy, Carbohydrate, and Lipid Metabolism. ITB Publisher, Bandung. 3. Sadikin, H.M., 2002. Biochemistry of Enzymes. Widya Medika Publisher, Jakarta. 4. Mirzah, Nuraini, F. Agustin, Y. Marlida, M. Zain, 2004. Basic Biochemistry Volume I. Course Textbook. Department of Animal Nutrition and Feed. Diploma Program. UNAND Development Project. 5. Ngili, Y., 2009. Biochemistry: Metabolism and Bioenergetics. Graha Ilmu Publisher, Yogyakarta. 6. Rizal, Y., and G. Wu. 2012. Protein and Amino Acid Metabolism. Andalas University Press, Padang.	
6. Specific course information	
A. Brief description of the content of the course (catalog description)	

The biochemistry course covers: introduction, cells and membranes; amino acids, peptides, and proteins; enzymes; classification and function of carbohydrates; classification and function of lipids; nucleotides, nucleic acids, DNA, and RNA; bioenergetics; carbohydrate metabolism; lipid metabolism; amino acid and protein metabolism; photosynthesis; and hormones.
<i>B. Prerequisites or co-requisites</i>
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<i>C. Indicate whether a required or elective course in the program</i>
Required
<i>D. Level of course unit (according to EQF: first cycle Bachelor, second cycle Master)</i>
first cycle Bachelor
<i>E. Year of study when the course unit is delivered (if applicable)</i>
2 nd year
<i>F. Semester when the course unit is delivered</i>
Even Semester

<i>G. Mode of delivery (face-to-face, distance learning)</i>
Face-to-face
<i>7. Intended Learning Outcomes</i>
ILO 1: Menginternalisasi nilai dasar universitas, kode etik, dan etika ilmiah berdasarkan nilai – nilai Pancasila. PI 2: Able to apply discipline in attendance and completion of assigned tasks. ILO 3: Able to apply animal husbandry science in accordance with developments in the livestock industry and innovative and current scientific activities. PI 2: Mastering technical and management skills in the field of nutrition and feed technology. ILO 4: Able to identify, formulate, provide solutions, and evaluate solutions to problems in the livestock sector. PI: Able to identify problems in the livestock sector. ILO 7: Have an attitude as a lifelong learner and further study in developing a professional career. PI 2: Demonstrate an attitude as a lifelong learner

8. Course Learning Outcomes *ex. The student will be able to explain the significance of current research about a particular topic.*

Students are able to explain the concepts of biochemistry, cells, and membranes.
 Students are able to explain amino acids, peptides, and proteins.
 Students are able to explain about enzymes.
 Students are able to explain the classification and function of carbohydrates, classification and function of lipids.
 Students are able to explain about nucleotides, nucleic acids, DNA, and RNA
 Students are able to explain about bioenergetics
 Students are able to explain about carbohydrates metabolism
 Students are able to explain about lipid metabolism
 Students are able to explain about amino acids and protein metabolism
 Students are able to explain about photosynthesis
 Students are able to explain about hormone

9. Brief list of topics to be covered

a. Introduction, discussing: (1) Definition of biochemistry, (2) Scope of biochemistry; b. Cells and membranes: (1) Definition of cells, (2) Cell organelles and their functions, (3) Cell membranes, structure, and function, (4) Mechanisms of entry and exit of substances into cells; c. Amino acids, peptides, and proteins: (1) Definition of amino acids, (2) Classification and structure of amino acids, (3) Function of amino acids, (4) Definition and formation of peptides, (5) Definition of proteins, (6) Classification, structure, and properties of proteins, (7) Function of proteins;
 d. Enzymes: (1) Definition and general properties of enzymes, (2) Classification of enzymes 6, (3) Enzyme kinetics, (4) Mechanism of enzyme action, (5) Regulation of enzyme activity; e. Classification and function of carbohydrates: (1) Definition of carbohydrates, (2) Division of carbohydrates and their structure, (3) Function of carbohydrates; f. Classification and function of lipids: (1) Definition of lipids, (2) Classification and function of lipids, (3) Fatty acids and their classification, (4) Role of fatty acids; g. Nucleotides, Nucleic Acids, DNA and RNA: (1) Definition of Nucleotides and nucleic acids, (2) Purine and Pyrimidine Nucleotides, (3) Structure and function of nucleic acids, (4) DNA and RNA; h. Bioenergetics: (1) Introduction, (2) Energy and Energy Interconversion, (3) Isothermal System, (4) Laws of Thermodynamics, (5) Free energy and heat energy, (6) Relationship between changes in free energy, heat energy and entropy in living systems, (7) High energy phosphate compounds, (8) Storage forms of high energy phosphate compounds; i. Carbohydrate Metabolism (1) Glycolysis, (2) Kreb's Cycle, (3) Respiratory Chain, (4) Gluconeogenesis 7, (5) Glycogenesis, (6) Glycogenolysis, (7) HMP Shunt (Pentose Phosphate Pathway), (8) Cori Cycle/Lactate-Alanine Cycle, (8) Abnormal carbohydrate metabolism; J. Lipid Metabolism (1) Fatty acid biosynthesis, (2) Fatty acid degradation, (3) Triglyceride biosynthesis, (4) Lipoprotein metabolism, (5) Ketogenesis and Ketone Body; K. Amino Acid and Protein Metabolism: (1) Amino acid biosynthesis, (2) Amino Acid Degradation, (3) Protein synthesis, (4) Protein catabolism, (5) Urea cycle/Ornithine Cycle; L. Photosynthesis: (1). Definition of photosynthesis, (2) Where photosynthesis takes place, (3) Light reactions and dark reactions, (4) C3 and C4 plants; m. Hormones:

(1). Definition of hormones and how hormones work, (2). Pituitary and hypothalamic hormones, (3). Thyroid hormones, (4) Hormones that regulate calcium metabolism, (5). Adrenal cortex hormones, (6). Adrenal medulla hormones, (7). Gonad hormones, (8). Pancreatic and gastrointestinal tract hormones.
<i>10. Learning and teaching methods</i>
Small group discussion, Directed Learning
face-to-face lectures, independent assignments, and group discussions.
<i>11. Language of instruction</i>
Bahasa Indonesia and English
<i>12. Assessment methods and criteria</i>
Summative Assessment : Individual or Group Assignments: 20% Practical Work: 20% Mid-Term/Final Exam: 30% Intrapersonal Skill Dimension: 10% Interpersonal Soft Skill Attributes: 10% Attitude and Value Dimension: 10% Formative Assessment : -

