

## SYLLABUS:

<b>Date / Revision</b>	23 May 2015 / 02 May 2017 / PP
<b>Faculty</b>	Life Sciences (LS)
<b>Study Programs</b>	Biomedical Engineering (BME), Chemical Engineering (CHE), Food Technology (FTE)

## SUBJECT: Biochemistry

### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Biochemistry</b>
<b>1.02</b>	<b>Semester</b>	3
<b>1.03</b>	<b>Level</b>	1
<b>1.04</b>	<b>SKS</b>	3
<b>1.05</b>	<b>Mandatory / Curriculum</b>	D-02
<b>1.06</b>	<b>Subject Code</b>	BICH
<b>1.07</b>	<b>Subject Code</b>	BME-FTE-CHE-D-LS-117
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, OFSE, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	All Faculty of Life Sciences Students
<b>1.12</b>	<b>Pre-requisite</b>	Chemistry, Chemistry Laboratory, Organic Chemistry, Biology
<b>1.13</b>	<b>Responsible</b>	Dr. Tutun Nugraha
<b>1.14</b>	<b>Revision</b>	15-05-2017/pp

### 2 Description of Subject

Biochemistry is basic knowledge of the molecular structure of the cell, the metabolic significance both enzymatic processes in cellular processes, and complex biochemical reaction cascades and their mediate regulation. Accompanying this, aspects of molecular genetics, state-of-the-art techniques and biochemical working methods, pathological derailments biochemical reactions and the importance immunological components in higher organisms are also discussed during lectures. Accompanying this, students also theroretically learn techniques and methods of these subjects and their significance for the medicine, Pharmacology and Biotechnology.

### 3 Objectives

Biochemistry will further utilize the knowledge that the students already have in the field of chemistry and biology, specifically to the chemistry that is relevant to processes within living organisms including human beings. Biochemistry will become the foundations for further study in the field of Life Sciences relevant to the three study programs in the Faculty of Life Sciences.

### 4 Competency

After having the course, students are expected to:

- know basic concepts of biochemistry to molecular architecture of the cell,
- familiar with the terminology and can both apply to given question in the field
- understand the relationship between structure and function
- understand metabolic importance of enzymatic processes and biochemical reaction cascades and its regulation and to assess their significance in pathological dysfunctions
- understand relationships in biochemical processes to detect deviations and automatically suggested solutions to work on the basis of biochemical mechanisms
- be able to carry out future experimental work and to document the results and interpret the resulting outcome in the relevant field that requires basic knowledge in Biochemistry

### 5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/presentations

### 6 Evaluation

5.1	<b>Absence maximum</b>	25%
5.2	<b>Participation in Discussion</b>	5
5.3	<b>Homework / Classwork/Report</b>	15
5.4	<b>Presentation /Simulation</b>	-
5.5	<b>Daily Quiz</b>	20
5.6	<b>Final Examination</b>	60 Points
	<b>Total</b>	100 Points

## 7 Text Book and Reference

<b>1</b>	<p><b>Main Text Book:</b></p> <ul style="list-style-type: none"> <li>Donald Voet, Judith G. Voet, Charlotte W. Pratt: Fundamentals of Biochemistry, W. H. Freeman, Edition: 4<sup>th</sup>. 2013.</li> </ul> <p><b>Also</b></p> <ul style="list-style-type: none"> <li>D. Nelson, M. Cox: Lehninger Biochemistry, Springer; Edition: 6<sup>th</sup>. 2012.</li> </ul>
<b>2</b>	<p><b>Supplemental Textbooks:</b></p> <ul style="list-style-type: none"> <li>Organic Chemistry, 11th Edition International Student Version T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder, Wiley ISBN: 978-1-118-32379-3</li> <li>Organic Chemistry, L. G. Wade JR, 8th Edition, ISBN-10: 0-321-81139-9, Pearson, 2013</li> <li>Chemistry, 6th Edition, International Student dan Lecture Version James E. Brady, Neil D. Jespersen, Alison Hyslop, John Wiley &amp; Sons</li> </ul>

## 8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	<p><b>The Foundation of Biochemistry:</b></p> <ul style="list-style-type: none"> <li>Cellular Foundations</li> <li>Chemical Foundations</li> <li>Physical Foundations</li> <li>Genetic Foundations</li> <li>Evolutionary Foundations</li> </ul> <p><b>Structure &amp; Catalysis:</b></p> <ul style="list-style-type: none"> <li>Water: hydrogen bonding, ionization, buffering, water as reactant;</li> </ul>	Ch1-2	1 x 3 x 50 min
2	<p><b>Structure &amp; Catalysis:</b></p> <ul style="list-style-type: none"> <li>Amino acids, Peptides and Protein: structure, function, method and application</li> </ul>	Ch4-6	1 x 3 x 50 min
3	<p><b>Structure &amp; Catalysis:</b></p> <ul style="list-style-type: none"> <li>Carbohydrate &amp; Glycobiology: monosaccharides, disaccharides, polysaccharides, glycoconjugates, sugar code, application</li> </ul>	Ch5	1 x 3 x 50 min
4	<p><b>Structure &amp; Catalysis:</b></p> <ul style="list-style-type: none"> <li>Nucleotides and Nucleic Acids: structure, chemistry, functions</li> <li>DNA – Based Information Technologies: genes, methods, genomics and human story</li> </ul>	Ch3	1 x 3 x 50 min
5	<p><b>Structure &amp; Catalysis:</b></p> <ul style="list-style-type: none"> <li>Physiological Activities of Proteins</li> <li>Passive and active transport</li> </ul>	Ch7, 10	1 x 3 x 50 min

6	<b>Structure &amp; Catalysis:</b> <ul style="list-style-type: none"> <li>Lipids: structure, function, application</li> <li>Biological Membranes and Transport: composition &amp; architecture, membrane dynamics, solute transport</li> </ul>	Ch9	1 x 3 x 50 min
7	<b>Structure &amp; Catalysis:</b> <ul style="list-style-type: none"> <li>Enzymes: mechanism, properties, reaction and regulatory</li> <li>Hormones and Biosignaling: structure, function, application</li> </ul>	Ch11-13	1 x 3 x 50 min
8	<b>MIDTERM SEMESTER BREAK</b>		
9	<b>Bioenergetics and Metabolism:</b> <ul style="list-style-type: none"> <li>Bioenergetics and Biochemical Reaction Types</li> <li>Glycolysis, Gluconeogenesis and the Pentose Phosphate Pathways</li> </ul>	Ch13-14	1 x 3 x 50 min
10	<b>Bioenergetics and Metabolism:</b> <ul style="list-style-type: none"> <li>Additional Pathways in Carbohydrate Metabolism</li> <li>The Citric Acid Cycle</li> <li>Photosynthesis</li> </ul>	Ch16-17, 19	1 x 3 x 50 min
11	<b>Bioenergetics and Metabolism:</b> <ul style="list-style-type: none"> <li>Mitochondrial ATP Synthesis</li> <li>Synthesis and Degradation of Lipid</li> <li>Synthesis and Degradation of Amino Acids</li> </ul>	Ch18, 20-21	1 x 3 x 50 min
12	<b>Bioenergetics and Metabolism:</b> <ul style="list-style-type: none"> <li>Nucleotide Synthesis and Degradation</li> <li>Regulation of Fuel Metabolism</li> <li>Nucleid Acid Structure</li> </ul>	Ch22-24	1 x 3 x 50 min
13	<b>Bioenergetics and Metabolism:</b> <ul style="list-style-type: none"> <li>DNA Replication, Repair and Recombination</li> <li>RNA Metabolism</li> </ul>	Ch25-26	1 x 3 x 50 min
14	<b>Information Pathways:</b> <ul style="list-style-type: none"> <li>Protein Synthesis</li> <li>Regulation and Gene Expression: principles, regulation and gene expression in bacteria and eukaryotes</li> </ul>	Ch27-28	1 x 3 x 50 min
15	<b>Review/Evaluation</b>		1 x 3 x 50 min
16, 17	<b>Final Examination</b>		