

**SUMMARY OF INFORMATION ON EACH COURSE**

|     |  |   |           |     |     |         |     |     |     |     |
|-----|--|---|-----------|-----|-----|---------|-----|-----|-----|-----|
| 1.  | Name of Course   | Biochemistry II   |           |     |     |         |     |     |     |     |
| 2.  | Course Code  | HBC1021   |           |     |     |         |     |     |     |     |
| 3.  | Status of Course<br>[Applies to (cohort) ]   | Specialisation core for B. Sc (Hons) Bioinformatics                       |           |     |     |         |     |     |     |     |
| 4.  | MQF Level/Stage  | Bachelor – MQF Level 6  |           |     |     |         |     |     |     |     |
| 5.  | Version<br>(State the date of the Senate approval –<br>history of previous and current approval date)  | Date of previous version : Jun 2014<br>Date of current version : Apr 2016 |           |     |     |         |     |     |     |     |
| 6.  | Pre-Requisite  | HBC1011 Biochemistry I  |           |     |     |         |     |     |     |     |
| 7.  | Name(s) of academic/teaching staff   | Tan Chai Hong<br>Amelia Kassim<br>Dr Ng Chong Han                         |           |     |     |         |     |     |     |     |
| 8.  | Semester and Year offered  | Trimester 2, Year 1   |           |     |     |         |     |     |     |     |
| 9.  | Objective of the course in the programme :<br>1. To introduce and provide the basic principles of biochemistry.<br>2. To provide basic theoretical knowledge and application of the various components of biochemistry such as bioenergetics, enzymology, metabolism and synthesis of molecules.<br>3. To provide an appreciation of the necessity of biochemical knowledge in various biomedical field. |   |           |     |     |         |     |     |     |     |
| 10. | Justification for including the course in the programme :<br><br>This subject provides fundamental knowledge required for Bioinformatics students to learn the basic component and core principles of various biochemical pathways.  |   |           |     |     |         |     |     |     |     |
| 11. | Course Learning Outcomes :   |   | Domain    |     |     | Level   |     |     |     |     |
|     | LO1 Explain the basic components and core principles of various biochemical pathways   |   | Cognitive |     |     | Level 2 |     |     |     |     |
|     | LO2 Comprehend how and why biochemical pathways are integrated   |   | Cognitive |     |     | Level 2 |     |     |     |     |
|     | LO3 Relate various metabolic disorders to specific biochemical pathway   |   | Cognitive |     |     | Level 3 |     |     |     |     |
| 12. | Mapping of Learning Outcomes to Programme Outcomes :   |   |           |     |     |         |     |     |     |     |
|     | Learning Outcomes  | PO1   | PO2       | PO3 | PO4 | PO5     | PO6 | PO7 | PO8 | PO9 |
|     | LO1  |   | x         |     |     |         |     |     |     |     |
|     | LO2  |   | x         |     |     |         |     |     |     |     |
|     | LO3  |   | x         |     |     |         |     |     |     |     |

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|--|--|-------------------------------|------|------|------|-----|------------|--|--|
|  | LO4  | x                             | x    |      |      |     |            |  |  |
| 13.  | Assessment Methods and Types :   |                               |      |      |      |     |            |  |  |
|  | Method and Type  | Description/Details           |      |      |      |     | Percentage |  |  |
|  | Tests  | Written tests                 |      |      |      |     | 20%        |  |  |
|  | Quizzes  | Written quizzes               |      |      |      |     | 10%        |  |  |
|  | Assignment   | Group presentation and report |      |      |      |     | 10%        |  |  |
|  | Lab  | Lab report                    |      |      |      |     | 10%        |  |  |
|  | Final Exam   | Written final exam            |      |      |      |     | 50%        |  |  |
| 14.  | Mapping of assessment components to learning outcomes (LOs)  |                               |      |      |      |     |            |  |  |
|  | Assessment Components  | %                             | LO1  | LO2  | LO3  | LO4 |            |  |  |
|  | Test   | 20%                           | 25   |      |      |     |            |  |  |
|  | Quizzes  | 10%                           | 12.5 | 16.7 | 14.3 |     |            |  |  |
|  | Assignment   | 10%                           |      |      | 14.3 |     |            |  |  |
|  | Lab  | 10%                           |      |      |      |     | 100        |  |  |
|  | Final Exam   | 50%                           | 62.5 | 83.3 | 71.4 |     |            |  |  |
| 15.  | Total  |                               |      |      |      |     |            |  |  |
|  | Topics   | Mode of Delivery              |      |      |      |     |            |  |  |
|  |  | Lec                           | Tut  | Lab  |      |     |            |  |  |
|  | <b>1. Metabolism: Basic Concepts and design</b> <ul style="list-style-type: none"> <li>Metabolic pathways</li> <li>The chemistry of metabolism</li> <li>Concepts of bioenergetics</li> </ul> |                               | 2    | 1    |      |     |            |  |  |
| <b>2. Glycolysis</b> <ul style="list-style-type: none"> <li>Pathways</li> <li>Regulation</li> <li>Disorders of metabolism</li> </ul> |  | 2                             |      |      |      |     |            |  |  |

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|--|---|---|---|
| <b>3. The Citric Acid Cycle</b> <ul style="list-style-type: none"> <li>• The metabolites involved</li> <li>• Regulation of Citric Acid Cycle</li> <li>• The Glyoxylate Cycle</li> <li>• Disorders of metabolism</li> </ul>   | 1 |   |   |
| <b>4. Electron Transport and Oxidative Phosphorylation</b> <ul style="list-style-type: none"> <li>• The Complexes: I, II, III and IV</li> <li>• The cofactors in Electron Transport</li> <li>• Regulation of oxidative phosphorylation</li> <li>• Disorders of metabolism</li> </ul>   | 2 | 1 | 3 |
| <b>5. Additional Pathways in Carbohydrate Metabolism</b> <ul style="list-style-type: none"> <li>• Glycogen degradation</li> <li>• Glycogen synthesis</li> <li>• Regulation of glycogen metabolism</li> <li>• Gluconeogenesis</li> <li>• Regulation of gluconeogenesis</li> <li>• The Pentose Phosphate Pathway</li> <li>• Disorders of metabolism</li> </ul> | 3 |   |   |
| <b>6. Photosynthesis</b> <ul style="list-style-type: none"> <li>• The Chloroplast</li> <li>• The light capturing pigments</li> <li>• Electron transport in photosynthesis</li> <li>• The dark reaction</li> <li>• The RPP cycle</li> <li>• Additional Carbon-Fixing Pathway</li> <li>• Synthesis of sucrose and starch from RPP metabolites</li> </ul>       | 2 |   | 3 |

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|---|---|---|---|
| <p><b>7. Lipid Metabolism</b></p> <ul style="list-style-type: none"> <li>• Absorption and mobilization of fatty acids</li> <li>• Fatty acid oxidation</li> <li>• Fatty acid synthesis</li> <li>• Fatty acid elongation and desaturation</li> <li>• Regulation of fatty acid oxidation</li> <li>• Synthesis of eicosanoids</li> <li>• Synthesis of sphingolipids</li> <li>• Synthesis of cholesterol</li> <li>• Disorders of metabolism</li> </ul> | 4 | 1 | 3 |
| <p><b>8. Protein Turnover and Amino Acid Metabolism</b></p> <ul style="list-style-type: none"> <li>• Nitrogen cycle and nitrogen fixation</li> <li>• Transamination reactions</li> <li>• Synthesis of nonessential amino acids</li> <li>• Synthesis of essential amino acids</li> <li>• Protein turnover</li> <li>• Amino acid catabolism</li> <li>• Disorders of metabolism</li> </ul>   | 3 |   | 3 |
| <p><b>9. Nucleotide Metabolism</b></p> <ul style="list-style-type: none"> <li>• Synthesis of purine nucleotides</li> <li>• Synthesis of pyrimidine nucleotides</li> <li>• Reduction of ribonucleotides to deoxyribonucleotides</li> <li>• Salvage of purines and pyrimidines</li> <li>• Purine catabolism</li> <li>• Pyrimidine catabolism</li> <li>• Disorders of metabolism</li> </ul>  | 2 | 1 | 3 |
| <p><b>10. Integration of Metabolism</b></p> <ul style="list-style-type: none"> <li>• Principle fuel metabolism by organs</li> <li>• Characteristics of fuel consumption of major organs</li> <li>• Glucose homeostasis</li> <li>• Caloric homeostasis</li> <li>• Hormones and the control of metabolism</li> </ul>  | 4 |   | 3 |
| <p><b>11. Secondary Metabolism</b></p> <ul style="list-style-type: none"> <li>• Role and types of secondary metabolites</li> <li>• Biosynthesis of secondary metabolites</li> </ul>   | 1 |   |   |

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|     |  |                     |                                       |           |
|-----|--|---------------------|---------------------------------------|-----------|
|     | <b>Total</b>   | <b>26</b>           | <b>4</b>                              | <b>18</b> |
| 16. | <b>Laboratory</b>  |                     |                                       |           |
|     | Lab 1: Metabolic Pathway Databases and Tools – Carbohydrate Metabolism<br>Lab 2: Investigating Factors Affecting the Rate of Photosynthesis<br>Lab 3: Lipid Metabolism: Extraction of lipid<br>Lab 4: Blood Glucose, Triglycerides and Cholesterol Measurements<br>Lab 5: Computational analysis of amino acid synthesis and degradation pathways using BioCyc database<br>Lab 6: Purine and Pyrimidine Metabolism Disorders |                     |                                       |           |
| 17. | Total Student Learning Time (SLT)  | Face to Face (Hour) | Total Guided and Independent Learning |           |
|     | Lecture  | 26                  | 26                                    |           |
|     | Tutorials  | 4                   | 4                                     |           |
|     | Laboratory/Practical   | 18                  | 9                                     |           |
|     | Presentation   | -                   | -                                     |           |
|     | Assignment   | -                   | 10                                    |           |
|     | Mid Term Test  | 1                   | 3                                     |           |
|     | Final Exam   | 2                   | 15                                    |           |
|     | Quizzes  | 2 times             | 2                                     |           |
|     | Sub Total  | 51                  | 69                                    |           |
|     | Total SLT  | <b>120</b>          |                                       |           |
| 18. | Credit value   | <b>3</b>            |                                       |           |
| 19. | <b>Reading Materials</b>   |                     |                                       |           |
|     | <b>Textbook</b>  |                     |                                       |           |
|     | Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. "Biochemistry". 7th Edition. WH Freeman, New York, 2012.   |                     |                                       |           |
|     | <b>Reference Material (including 'Statutes' for Law)</b>   |                     |                                       |           |
|     | Moran, Horton, Scrimgeour, and Perry "Principles of Biochemistry," 5th Edition. Pearson, 2012.   |                     |                                       |           |
|     |  |                     |                                       |           |
|     |  |                     |                                       |           |
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Appendix (to be compiled when submitting the complete syllabus for the programme) :

1. Mission and Vision of the University and Faculty
2. Programme Objectives or Programme Educational Objectives
3. Programme Outcomes (POs)
4. Mapping of POs to the 8 MQF domain
5. Summary of the Bloom's Taxonomy's Domain Coverage in all the Los in the format below :

| Subject | Learning Outcomes<br>(please state the learning outcomes) | Bloom's Taxonomy Domain |           |             |
|---------|---|-------------------------|-----------|-------------|
|         |   | Affective               | Cognitive | Psychomotor |
| ABC1234 | Learning Outcome 1  |                         |           |             |
|         | Learning Outcome 2  |                         |           |             |
|         | Learning Outcome 3  |                         |           |             |
|         | Learning Outcome 4  |                         |           |             |
| DEF5678 | Learning Outcome 1  |                         |           |             |
|         | Learning Outcome 2  |                         |           |             |
|         | Learning Outcome 3  |                         |           |             |
|         | Learning Outcome 4  |                         |           |             |

6. Summary of LO to PO measurement
7. Measurement and Tabulation of result for LO achievement
8. Measurement Tabulation of result for PO achievement