



Course Specifications

Course Title:	Biochemistry for Nursing
Course Code:	2-5603223
Program:	Bachelors of Nursing
Department:	Nursing Sciences & Research
College:	Nursing
Institution:	Umm Al-Qura University, Abdiyah Campus, Makkah

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A. Course Identification

1. Credit hours:			
2. Course type			
a.	University <input type="checkbox"/>	College <input checked="" type="checkbox"/>	Department <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>	Others <input type="checkbox"/>
3. Level/year at which this course is offered: 2 nd Year, 1 st semester			
4. Pre-requisites for this course (if any):			
Foundation Year Biochemistry Course is Mandatory			
5. Co-requisites for this course (if any):			
Biological studies background			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	98
2	Blended	2	2
3	E-learning	Not Applicable	Not Applicable
4	Distance learning	Not Applicable	Not Applicable
5	Other	Not Applicable	Not Applicable

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	2×15=30
2	Laboratory/Studio	Not Applicable
3	Tutorial	Not Applicable
4	Others (specify)	Not Applicable
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

- To give the students insight into appreciating how understanding of digestion and absorption of the main dietary categories (carbohydrate, lipid, and protein) in the human body and the key metabolic processes occurring in the human body, could contribute to the understanding and explanation of pathological phenomena.
- To make students familiar with the various control and integrating mechanisms of diverse biochemical events in different metabolic processes, and to understand normal and abnormal human metabolism.
- Explain the hormonal, non-hormonal and genetic controls of these major metabolic pathways and correlate the impact of any abnormality to the medical status
- To enable the student to point out the bioenergetics of the concerned metabolic pathways under different physiological circumstances.
- Understand the biochemical basis of diseases, and figure out how to correlate the clinical presentation and complications to biochemical events.

2. Course Main Objective

To understand and create awareness regarding the various biochemical pathways and cycles involved in Carbohydrates, Lipids and Protein metabolism

To understand and elucidate the various clinical metabolic disorders of carbohydrates, lipids and proteins

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Differentiate between carbohydrate, lipid, and protein in the way of their digestion, absorption, and transporting in blood.	1
1.2	Define the key reactions in the metabolic pathways of carbohydrates, lipids, proteins, and their micro-molecules and determine the site of each	5
1.3	Illustrate the steps and regulatory mechanisms of these pathways.	2/3
1.4	Distinguish the various control mechanisms for these pathways, i.e. hormonal, non-hormonal and genetic controls and correlate the impact of any abnormality to the medical status	2/3
1.5	Point out the related metabolic disorders and their clinical prints on biochemical and molecular basis	3
1.6	Describe the components of some regulatory mechanisms for metabolic pathways.	3
1.7	Understand the differing mechanism which the body uses for integration of metabolic pathways	3
1.8	Understanding the adaptation mechanisms for starvation, feeding , exercise....	3
1.9	Understand some basic concepts in clinical biochemistry practice.	4
2	Skills :	
2.1	The ability to understand symptoms of some simple metabolic disorders (inborn errors of metabolism, Glycogen storage disease, Favism.....) with development of the ability to interpret test results for them.	2
2.2	Interpret symptoms, signs and biochemical laboratory findings of some metabolic disorders.	3
2.3	Ability to rationale integrated metabolic pathways	2
2.4	Interpret and differentiate organ and tissue metabolic integrated metabolism in various conditions.	2
2.5	Correlate between different signaling pathways and diverse hormonal effects on metabolic pathways during various physiological situations as: fasting, exercise.....	3
2.6	The student is able to work effectively in a group in lab or during preparation of seminars	3
2.7	The student respects the role of staff and co-staff members regardless of degree or occupation.	2
2.8	Demonstrate professionalism and high ethical standards in all aspects of Medical practice specifically competence, honesty, integrity, compassion, and respect for others, professional	2
3	Values:	
3.1	The ability of students to communicate and work cooperatively together as a team	1
3.2	Apply Biochemistry Knowledge in different clinical Setting	2

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Metabolism, Overview of metabolic pathways, Bioenergetics and mechanisms of regulation <ul style="list-style-type: none"> ✓ Concept of metabolism, catabolism ✓ Anabolic and catabolic pathways ✓ Important consideration for metabolism of carbohydrates, Protein and Lipid ✓ Overview of metabolic pathways ,energetic and regulation 	2
2	Glycolysis, oxidation of other monosaccharides, Fructose intolerance, galactosemia <ul style="list-style-type: none"> ✓ Digestion & absorption of carbohydrates ✓ Transport of Monosaccharides, ✓ Glucose transporters ✓ Insulin effect on different transporter ✓ Lactose intolerance ✓ Steps and key enzymes for glycolysis (irreversible reactions) <p>Aerobic & Anaerobic glycolysis, Pyruvate and lactate as end products of glycolysis</p>	2
3	Cont'd Glycolysis, oxidation of other monosaccharides, Fructose intolerance, galactosemia <ul style="list-style-type: none"> ✓ Calculation of energy & Inhibitors of glycolysis ✓ Clinical correlation ✓ Lactic acidosis ✓ Regulation of glycolysis, irreversible steps ✓ Comparison of hexokinase and glucokinase ✓ Factors affecting glycolysis ✓ Entry of fructose, galactose & mannose into glycolysis ✓ Clinical correlation : Fructose Lactose intolerance, Fructosuria, Galactosemia 	2
4	Oxidative decarboxylation of Pyruvate, Citric acid cycle <ul style="list-style-type: none"> ✓ Pyruvate Dehydrogenase Complex, Enzymes and coenzymes ✓ Formation of Acetyl CoA, Regulation of Pyruvate Dehydrogenase complex ✓ Fate of Pyruvate ✓ Citric acid cycle, steps & enzymes ✓ Regulatory steps of CAC ✓ Energetic of CAC ✓ Inhibitors of CAC <p>Amphibolic nature of the cycle Anapleorotic reactions of CAC</p>	2
5	Glycogen metabolism and regulation <ul style="list-style-type: none"> ✓ Glycogen synthesis (glycogenesis) ✓ Steps, Key enzyme ✓ Glycogen degradation (Glycogenolysis) ✓ Steps, Key enzyme ✓ Regulation of Glycogen synthesis (glycogenesis) ✓ Regulation of Glycogen degradation (Glycogenolysis) <p>Hormonal and Allosteric regulation of glycogenesis & glycogenolysis</p>	2
6	The respiratory chain and oxidative phosphorylation <ul style="list-style-type: none"> ✓ Electron Transport chain, structure and Organization ✓ Redox potentials and free energy changes ✓ Coupling of oxidative phosphorylation to electron transfer Chemiosmotic theory, ATP synthetase 	2

	<ul style="list-style-type: none"> ✓ Inhibitors of respiratory chain <p>Uncouplers: Dinitrophenol, Valinomycin, Thermogenin (Brown adipose Tissue)</p>	
7	<p>Gluconeogenesis, Cori and Alanine cycle</p> <ul style="list-style-type: none"> ✓ Definition and Importance , ✓ Reactions and irreversibility ✓ Substrates: Glycerol, Lactate, Glucogenic amino acids, Odd chain fatty acids ✓ Hormonal regulation ✓ Reciprocally regulation with glycolysis ✓ Factors affecting gluconeogenesis <p>Cori and alanine cycles</p>	2
8	<p>Pentose phosphate pathway, Favism</p> <ul style="list-style-type: none"> ✓ Two phases of the pathway: oxidative and inter-conversion phase ✓ Significance of PMP shunt in certain tissues ✓ Production of NADPH^+H^+ and ribose-5-Phosphate <p>Glucose-6-phosphate Dehydrogenase deficiency & haemolytic anaemia</p>	2
9	<p>Digestion, absorption, storage and mobilization of fat</p> <ul style="list-style-type: none"> ✓ Digestion of lipid, Lingual & gastric lipase ✓ Pancreatic lipase & formation of micelle ✓ Role of bile salts & bile acids, emulsification of fat ✓ Absorption of lipid from intestinal cells and release as Chylomicron into lymphatic system ✓ Sites & synthesis of TAG: Liver and adipose tissues ✓ Steps & regulation of storage of fat ✓ Lipolysis: Steps & key enzyme <p>Hormone sensitive lipase, regulation of lipolysis</p>	2
10	<p>Fatty acid synthesis, Modification</p> <ul style="list-style-type: none"> ✓ Transport of acetyl CoA from mitochondria into cytoplasm ✓ Fatty acid Synthase Complex ✓ Elongation of fatty acids ✓ Energetic & regulation of fatty acid synthesis ✓ Elongation reaction of palmitic acid ✓ Desaturation of fatty acids <p>Formation and modification of polyunsaturated fatty acids</p>	2
11	<p>Ketone body metabolism , ketoacidosis</p> <ul style="list-style-type: none"> ✓ Ketogenesis, Site and steps ✓ Ketolysis, sites and steps for utilization ✓ Regulation of ketogenesis and ketolysis ✓ Starvation and ketosis <p>Clinical correlation Ketoacidosis</p>	2
12	<p>Oxidation of fatty acids, Refsum's disease</p> <ul style="list-style-type: none"> ✓ Transport of fatty acids into mitochondria ✓ β- Oxidation of fatty acids steps and energetic ✓ Saturated and unsaturated fatty acid oxidation ✓ Oxidation of odd number fatty acids ✓ α- oxidation & ω-oxidation of fatty acids ✓ Clinical correlation ✓ Refsum's disease <p>Genetic deficiencies in Carnitine transport</p>	2
13	<p>Metabolism of special lipids Cholesterol metabolism, control, balance , Bile acids, Atherosclerosis</p> <ul style="list-style-type: none"> ✓ Sources, distribution & balance in tissues 	2

	<ul style="list-style-type: none"> ✓ Overview of steps involved in synthesis of cholesterol ✓ Key enzyme, HMG CoA reductase & regulation ✓ Cholesterol Balance, Factors regulating cholesterol synthesis and degradation ✓ Clinical Aspects: ✓ Hypercholesterolemia: causes & treatment ✓ Atherosclerosis, coronary heart diseases ✓ Cholesterol as precursor of bile salts, Steroid hormones & vitamin D <p>Bile acids and bile salts</p>	
14	<p>Lipoprotein metabolism, Hyperlipoproteinemias</p> <ul style="list-style-type: none"> ✓ Classification and functions of lipoproteins and Apoproteins ✓ Metabolism and degradation of Chylomicrons, VLDL ✓ Metabolism and uptake of LDL ✓ HDL metabolism ✓ Apoproteins, Diseased state 	2
15	<p>Part A: Digestion and absorption of protein, Catabolism of tissue protein, Protein degradation</p> <ul style="list-style-type: none"> ✓ Peptidases: Gastric and Intestinal ✓ Pancreatic peptidases ✓ Amino acid transport across intestinal cells ✓ Essential and nonessential amino acids ✓ Protein turnover in a regular manner, Apoptosis ✓ Nitrogen balance, positive and negative nitrogen balance, causes ✓ Transamination reactions, mechanism of action of transaminases , Pyridoxal phosphate as cofactor ✓ Degradation and transport of tissue protein <p>Part B: Ammonia production and toxicity Urea cycle</p> <ul style="list-style-type: none"> ✓ Transport of ammonia, toxicity ✓ Amino acid oxidase reaction ✓ Ammonia transport to liver and kidney ✓ Intracellular glutamine cycle ✓ Urea cycle: steps and regulation ✓ Transport and excretion of urea ✓ Clinical correlation: ✓ Metabolic disorders of urea synthesis <p>Deficiency of urea cycle enzymes</p>	2
Total		2×15=30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Differentiate between carbohydrate, lipid, and protein in the way of their digestion, absorption, and transporting in blood.	<p>The student will attend:</p> <ol style="list-style-type: none"> 1. Regular 2 hours lectures per week on campus 2. An independent study is encouraged and applied by 	<p>Written Exam (Midterm and Final written exam) of which details are as follow</p> <p>a. At Week 8-10 Mid semester exam: 60 minutes multiple</p>

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		<p>asking the student to write an essay about certain topics related to the lectures (twice per course semester).</p> <p><u>Teaching plan</u></p> <p>a. Introductory lecture gives an overview of the content and significance of the course and of its relationship to students' existing knowledge</p> <p>b. Each subsequent lecture begins with a general outline that will be followed by a detailed explaining of each heading to link the particular content of the presentation to the general overview</p> <p>c. Tutorials review the content of each lecture and clarify any issue that has not been understood.</p> <p>d. Individual tasks are prepared by students to ensure the independent study that requires the use of library reference material and web sites to identify information required to complete tasks.</p>	<p>choice test (60 MCQs) on studied topics with results carrying 30 % of final assessment.</p> <p>Exam Site: On Campus / On site</p> <p>b. Activities (I, II, III) evaluation carrying 30 % of final assessment</p> <p>c. Final year exam. 120 minutes multiple choice test (80 MCQs) on studied topics 40 % of total marks with results completing to 100% total marks</p> <p>Exam Site: At Week 16 On site /On campus as per instructions</p>
1.2	Define the key reactions in the metabolic pathways of carbohydrates, lipids, proteins, and their micro-molecules and determine the site of each	a + b + c + d as prescribed above	a + b + c as prescribed above
1.3	Illustrate the steps and regulatory mechanisms of these pathways.	a + b + c + d as prescribed above	a + b + c as prescribed above

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.4	Distinguish the various control mechanisms for these pathways, i.e. hormonal, non-hormonal and genetic controls and correlate the impact of any abnormality to the medical status	a + b + c + d as prescribed above	a + b + c as prescribed above
1.5	Point out the related metabolic disorders and their clinical prints on biochemical and molecular basis	a + b + c + d as prescribed above	a + b + c as prescribed above
1.6	Describe the components of some regulatory mechanisms for metabolic pathways.	a + b + c + d as prescribed above	a + b + c as prescribed above
1.7	Understand the differing mechanism which the body uses for integration of metabolic pathways	a + b + c + d as prescribed above	a + b + c as prescribed above
1.8	Understanding the adaptation mechanisms for starvation, feeding, exercise...	a + b + c + d as prescribed above	a + b + c as prescribed above
1.9	Understand some basic concepts in clinical biochemistry practice.	a + b + c + d as prescribed above	a + b + c as prescribed above
2.0	Skills		
2.1	The ability to understand symptoms of some simple metabolic disorders (inborn errors of metabolism, Glycogen storage disease, Favism) with development of the ability to interpret test results for them.	a. Explanations and examples given in lectures with participation of students in group discussion with staff members b. Assignment tasks include some open ended tasks designed to apply predictive, analytical and problem solving skills. Practiced under supervision in tutorials and laboratory tasks.	a. Problem solving questions carrying 20% of mark on each exam and for Quiz questions given at the end of each topic b. Group and individual assignments require application of analytical tools in problem solving tasks
2.2	Interpret symptoms, signs and biochemical laboratory findings of some metabolic disorders.	a+ b + c as prescribed above	a+ b as prescribed above
2.3	Ability to rationale integrated metabolic pathways	a+ b + c as prescribed above	a+ b as prescribed above
2.4	Interpret and differentiate organ and tissue metabolic integrated metabolism in various conditions.	a+ b + c as prescribed above	a+ b as prescribed above
2.5	Correlate between different signaling pathways and diverse hormonal effects on metabolic pathways during various physiological situations as: fasting, exercise.....	a+ b + c as prescribed above	a+ b as prescribed above
2.6	The student is able to work effectively in a group in lab or during preparation of seminars	One group assignment in which part of assessment is based on individuals contribution to the group task.	Same as prescribed above

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.7	The student respects the role of staff and co-staff members regardless of degree or occupation.	Individual assignments requiring investigation using internet and library resources as a means of developing self study skills. + a	Same as prescribed above
2.8	Demonstrate professionalism and high ethical standards in all aspects of Medical practice specifically competence, honesty, integrity, compassion, and respect for others, professional	Role play exercise on controversial issue relevant to the course based on a case study, with discussion in tutorial of appropriate responses and consequences to individuals involved. + a	Same as prescribed above
3.0	Values		
3.1	The ability of students to communicate and work cooperatively together as a team	Implemented as follow: Provide guided practice monitor performance and provide feedback after each step. Inform the students about clinical metabolic disorders and how it can be assessed.	Clinical practice training through the semester using previous medical case histories
3.2	Apply Biochemistry Knowledge in different clinical Setting	Same as prescribed above	Same as prescribed above

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Semester Midterm exam 60 minutes multiple choice test (60 MCQs) on studied topics. On site / On campus	8-10	30 % of overall assessment.
2	Activities Evaluation	Throughout semester	30 %
3	Final year exam. 120 minutes multiple choice test (80 MCQs) on studied topics On site / on Campus	16	40 %

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Faculty must arrange specific discussion hours so as the students can discuss freely concerned subject topics with tutors besides classroom learning environment

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1. <i>Text book of Biochemistry with Clinical Correlations</i> Fifth Ed, Devlin TM (2012) Ed. Wiley -Liss New York 2. <i>Principles of Biochemistry</i> , A.L. Lehninger. D.L. Nelson and M.M. Cox, (2010) Worth Publication s. New York
Essential References Materials	1. <i>Instant Notes Biochemistry</i> , 2 nd Ed(2005) by B.D. Hames & N.M. Hooper Publishers :Springer-Verlag New York Inc., 175 Fifth Avenue, New York, NY 10010-7858, in association with BIOS Scientific Publishers Ltd ISBN 1 85996 142 8 2. <i>Marks' Basic Medical Biochemistry: A Clinical Approach</i> , 2 nd Edition (2005) By A. D Marks, CM Smith and Lieberman M. Williams & Wilkins- London. 3. <i>Lippincott's Reviews of Biochemistry</i> , 3 rd edition (2005) by Champe PC, Harvey RA, Ferrier DR, Lippincott William & Wilkins London,
Electronic Materials	http://www.kumc.edu/biochemistry/resource.html http://www.medlib.iupui.edu/ref/biochem.htm http://www.ag.unr.edu/shintani/bch400-600/Chapter%20notes%20current.htm http://www.medicaleducationonline.org/component/option,com_docman/task,cat_view/gid,101/Itemid,37/ http://bcs.whfreeman.com/thelifewire/content/chp00/00020.html http://science.nhmccd.edu/biol/ap1int.htm http://www.johnkyrk.com/index.html http://science.nhmccd.edu/biol/biolint.htm
Other Learning Materials	Reference web links and recommended books are sufficient for through understanding of students

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none">Lecture Theatre: provided by the Faculty (2 theaters).Small group Lab classes: in the Department Lab (30 students). Laboratory: laboratory facilities to perform the required experiments are available in the department.
Technology Resources (AV, data show, Smart Board, software, etc.)	Desk Top computers are available in the student library.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Not Applicable

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Evaluation Course Survey.	Students	Checklist format
Annual Evaluation by Course Coordinator.	Course coordinator & teaching staff Dr. Adil Jamal (For male students)- <i>Course Coordinator</i> Dr. Mohamed M Nour Eldein (For male students) Dr. Hala F. M. Kamel (For female students) Dr Heba Almoudi (For female students)	Revising content of the course & methods of teaching.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	