

APPLIED BIOCHEMISTRY

PLACEMENT: I SEMESTER

THEORY: 2 credits (40 hours) (includes lab hours also)

DESCRIPTION: The course is designed to assist the students to acquire knowledge of the normal biochemical composition and functioning of human body, its alterations in disease conditions and to apply this knowledge in the practice of nursing.

COMPETENCIES: On completion of the course, the students will be able to

1. Describe the metabolism of carbohydrates and its alterations.
2. Explain the metabolism of lipids and its alterations.
3. Explain the metabolism of proteins and amino acids and its alterations.
4. Explain clinical enzymology in various disease conditions.
5. Explain acid base balance, imbalance and its clinical significance.
6. Describe the metabolism of hemoglobin and its clinical significance.
7. Explain different function tests and interpret the findings.
8. Illustrate the immunochemistry

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
I	8 (T)	Describe the metabolism of carbohydrates and its alterations	<p>Carbohydrates Digestion, absorption and metabolism of carbohydrates and related disorders Regulation of blood glucose Diabetes Mellitus – type 1 and type 2, symptoms, complications & management in brief Investigations of Diabetes Mellitus OGTT – Indications, Procedure, Interpretation and types of GTT curve Mini GTT, extended GTT, GCT, IV GTT</p> <p>HbA1c (Only definition)</p> <ul style="list-style-type: none"> • Hypoglycemia – Definition & causes 	<ul style="list-style-type: none"> • Lecture cum Discussion • Explain using charts and slides • Demonstration of laboratory tests 	<ul style="list-style-type: none"> • Essay • Short answer • Very short answer

II	8 (T)	Explain the metabolism of lipids and its alterations	<p>Lipids</p> <p>Fatty acids – Definition, classification Definition & Clinical significance of MUFA & PUFA, Essential fatty acids, Trans fatty acids</p> <p>Digestion, absorption & metabolism of lipids & related disorders</p> <p>Compounds formed from cholesterol</p> <p>Ketone bodies (name, types & significance only)</p> <p style="padding-left: 40px;">Lipoproteins – types & functions (metabolism not required)</p> <p>Lipid profile</p> <ul style="list-style-type: none"> • Atherosclerosis (in brief) 	<ul style="list-style-type: none"> • Lecture cum Discussion • Explain using charts and slides • Demonstration of laboratory tests 	<ul style="list-style-type: none"> • Essay • Short answer • Very short answer
III	9 (T)	Explain the metabolism of amino acids and proteins	<p>Proteins</p> <ul style="list-style-type: none"> • Classification of amino acids based on nutrition, metabolic rate with examples • Digestion, absorption & metabolism of protein & related disorders • Biologically important compounds synthesized from various amino acids (only names) • In born errors of amino acid metabolism <ul style="list-style-type: none"> – only aromatic amino acids (in brief) • Plasma protein – types, function & normal values • Causes of proteinuria, hypoproteinemia, hyper-gamma globinemia • Principle of electrophoresis, normal & abnormal electrophoretic patterns (in brief) 	<ul style="list-style-type: none"> • Lecture cum Discussion • Explain using charts, models and slides 	<ul style="list-style-type: none"> • Essay • Short answer • Very short answer

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
IV	4 (T)	Explain clinical enzymology in various disease conditions	<p>Clinical Enzymology</p> <ul style="list-style-type: none"> • Isoenzymes – Definition & properties • Enzymes of diagnostic importance in • Liver Diseases – ALT, AST, ALP, GGT • Myocardial infarction – CK, cardiac troponins, AST, LDH • Muscle diseases – CK, Aldolase • Bone diseases – ALP • Prostate cancer – PSA, ACP 	<ul style="list-style-type: none"> •Lecture cum Discussion •Explain using charts and slides 	<ul style="list-style-type: none"> •Essay •Short answer •Very short answer
V	3 (T)	Explain acid base balance, imbalance and its clinical significance	<p>Acid base maintenance</p> <p>pH – definition, normal value Regulation of blood pH – blood buffer, respiratory & renal ABG – normal values</p> <ul style="list-style-type: none"> • Acid base disorders – types, definition & causes 	<ul style="list-style-type: none"> • Lecture cum Discussion • Explain using charts and slides 	<ul style="list-style-type: none"> • Short answer • Very short answer
VI	2 (T)	Describe the metabolism of hemoglobin and its clinical significance	<p>Heme catabolism</p> <p>Heme degradation pathway Jaundice – type, causes, urine & blood investigations (van den berg test)</p>	<ul style="list-style-type: none"> • Lecture cum Discussion • Explain using charts and slides 	<ul style="list-style-type: none"> • Short answer • Very short answer

VII	3 (T)	Explain different function tests and interpret the findings	Organ function tests (biochemical parameters & normal values only) Renal Liver Thyroid	<ul style="list-style-type: none"> • Lecture cum Discussion • Visit to Lab • Explain using charts and slides 	<ul style="list-style-type: none"> • Short answer • Very short answer
VIII	3 (T)	Illustrate the immunochemistry	Immunochemistry <ul style="list-style-type: none"> • Structure & functions of immunoglobulin • Investigations & interpretation – ELISA 	<ul style="list-style-type: none"> • Lecture cum Discussion • Explain using charts and slides • Demonstration of laboratory tests 	<ul style="list-style-type: none"> • Short answer • Very short answer

DISTRIBUTION OF TEACHING HOURS

TEACHING STRATEGY:

Total Hours: 40

Theory Hours: 40

STRATEGY		Teaching hours	
Didactic 40Hrs. (2credits)	Lectures	30	40
	Lab Hrs	8	
	Tutorial	2	
Total		40Hrs. (2credits)	

TOPICS & OUTCOMES

Subject	Number of Themes	Number of outcomes
Applied Biochemistry	08	40

DISTRIBUTION OF THEORY HOURS

S. N	Theme	Topics	Teaching hrs.
1	Carbohydrate	Carbohydrate	8
2	Lipid	Lipid	8
3	Protein	Protein	9
4	Clinical Enzymology	Clinical Enzymology	4
5	Acid base maintenance	Acid base maintenance	3
6	Heme catabolism	Heme catabolism	2
7	Organ function tests (biochemical parameters & normal values only)	Organ function tests (biochemical parameters & normal values only)	3
8	Immunochemistry	Immunochemistry	3
TOTAL			40(2credits)

Applied Biochemistry

					Core competencies		Non-core competencies	Total Hours
Theme and total hours allotted	Objectives	Topic	Code No	Competency	Must know	Desirable to know	Nice to know	
I 8(T)	At the end of unit students are able to Knowledge: Understand and digestion ,absorptionand metabolism of carbohydrates. Attitude: In corporate this knowledge in nursing practice.	Carbohydrate	BIOC 135:IISEM1.1	Explain digestion ,absorption and metabolism of carbohydrate	Digestion, absorption and metabolism of carbohydrates and related disorders			2 hour
			BIOC 135:IISEM1.2	Explain regulation of blood glucose	Regulation of blood glucose			1hour
			BIOC 135:IISEM1.3	Describe the diabetes mellitus types, symptoms, complications and manageent	Diabetes Mellitus – type 1 and type 2, symptoms, complications & management in brief			2 hour
			BIOC 135:IISEM1.4	Explain the investigation of diabetes mellitus		Investigations of Diabetes Mellitus		1hour
			BIOC 135:IISEM1.5	Explain indication and procedre and OGGT types of GTT curve Mini GTT, extended GTT, GCT, IV GTT oHbA1c		oOGTT – Indications, Procedure, Interpretation and types of GTT curve Mini GTT, extended GTT, GCT, IV GTT oHbA1c (Only definition)		1hours
			BIOC 135:IISEM1.6	Explain hypoglycemia			Hypoglycemia – Definition & causes	1 an hour

II 8(T)	At the end of unit students are able to Knowledge: Understand and explain metabolism of lipids and its alterations Attitude: In corporate this knowledge in nursing practice.	Lipid	BIOC 135:IISEM2.1	Explain about fatty acids	Fattyacids– Definition,classification			1hour
			BIOC 135:IISEM2.2	Explain definition and clinical significance of MUFA & PUFA, Essential fatty acids, Trans fatty acids	Definition & Clinical significance ofMUFA&PUFA,Essentialfattyacids,Transfatty acids			1. hour
			BIOC 135:IISEM2.3	Describe absorption and metabolism of lipids & related disorders	Digestion,absorption& metabolismoflipids& relateddisorders			1 hour
			BIOC 135:IISEM2.4	Explain compounds formed from cholesterol	Compoundsformedfro mcholesterol			1 hour
			BIOC 135:IISEM2.5	Describe ketone bodies	Ketonebodies(name,types&significanceonly)			1 hour
			BIOC 135:IISEM2.6	Explain about lipoprotein		Lipoproteins– types&functions(metabolismnot required)		1hour
			BIOC 135:IISEM2.7	Explain about lipid profile		Lipidprofile		1hour
			BIOC 135:IISEM2.8	Explain about atherosclerosis			Atherosclerosis (in brief)	1 hour
III 9 (T)	At the end of unit students are able to Knowledge: Understand and describe metabolism of amino acids and protein Attitude: Incorporate this knowledge while rendering care to the patients.	Protein	BIOC 135:IISEM3.1	Explain the classification and metabolism of amino acids metabolic rate with examples	Classification of amino acids based onnutrition,metabolicrat ewithexamples			1 hour
			BIOC 135:IISEM3.2	Describe about Digestion and absorption of protein & related disorders	Digestion and absorptionofprotein&related disorders			1 hour
			BIOC 135:IISEM3.3	Explain about metabolism of protein related disorders	metabolismofprotein& related disorders			1 hour
			BIOC 135:IISEM3.4	Describe the Biologically important compounds	Biologically important			1 hour

				synthesized from various amino acid	compounds synthesized from various amino acids (only names)			
			BIOC 135:IISEM3.5	Explain In born errors metabolism of amino acid	Inborn errors of amino acid metabolism			1 hour
			BIOC 135:IISEM3.6	Explain about plasma protein types, function & normal values		<ul style="list-style-type: none"> Plasma protein – types, function & normal values 		1 hour
			BIOC 135:IISEM3.7	Describe the causes of proteinuria, hypoproteinemia,		<ul style="list-style-type: none"> Causes of proteinuria, hypoproteinemia, 		1 hour
			BIOC 135:IISEM3.8	Explain the causes of hyper-gamma globinemia		<ul style="list-style-type: none"> Causes of hyper-gamma globinemia 		1 hour
			BIOC 135:IISEM3.9	Explain the principle, normal & abnormal electrophoretic patterns electrophoresis			Principle of electrophoresis, normal & abnormal electrophoretic patterns (in	1 hour
IV 4(T)	At the end of unit students are able to Knowledge: Understand and describe clinical enzymology in various disease conditions Attitude: Incorporate this knowledge while rendering care to the patients.	Clinical Enzymology	BIOC 135:IISEM4.1	Explain definition & properties isoenzymes	<ul style="list-style-type: none"> Isoenzymes – Definition & properties 			½ hour
			BIOC 135:IISEM4.2	Describe enzymes and liver disease ALT, AST, ALP, GGT	<ul style="list-style-type: none"> Enzymes of diagnostic importance in Liver Diseases – ALT, AST, ALP, GGT 			1 ½ hour
			BIOC 135:IISEM4.3	Explain myocardial infarction CK, cardiac troponins, AST, LDH	Myocardial infarction – CK, cardiac troponins, AST, LDH			½ hour
			BIOC 135:IISEM4.4	Describe muscle CK, Aldolase and bone disease ALP		<ul style="list-style-type: none"> Muscle diseases – CK, Aldolase Bone diseases – 		1 hour

						ALP		
			BIOC 135:IISEM4.4	Explain prostate cancer PSA, ACP			Prostatecancer -PSA,ACP	½ hours
V 3 (T)	At the end of unit students are able to Knowledge: Understand and describe acid base balance, imbalance and its clinical significance Attitude: Incorporate this knowledge while rendering care to the patients.	Acid base maintenance	BIOC 135:IISEM5.1	Explain acid base balance pH – definition, normal value	Acidbasemaintenance pH– definition,normalvalue			1 hour
			BIOC 135:IISEM5.2	Explain regulation of blood pH	• Regulation of blood pH			1/2 hour
				Describe about blood buffer, respiratory & renal disorders	blood buffer, respiratory & renal			1/2 hour
			BIOC 135:IISEM5.3	Describe acid base disorders		ABG– normalvalues Acidbasedisorders – types,definition& causes		1 hour
VI 2 (T)	At the end of unit students are able to Knowledge: Understand and describe the metabolism of hemoglobin and its clinical significance Attitude: Incorporate this knowledge while rendering care to the patients.	Heme catabolism	BIOC 135:IISEM6.1	Describe the Heme catabolism Heme degradation pathway	Heme catabolism Heme degradation pathway			1 hour
			BIOC 135:IISEM6.2	Explain abouttype, causes, urine & blood investigations of joundice		Jaundice– type,causes,urine &bloodinvestigati ons(vandenbergte st)		1hour
VII 3 (T)	At the end of unit students are able to Knowledge:	Organ function tests (biochemical	BIOC 135:IISEM7.1	Explain different function tests and interpret the findings of renal	Organ function tests (biochemicalp arameters&n			1 1/2 hour

	Understand and describe different function tests and interpret the findings of renal, liver, Thyroid. Attitude: Incorporate this knowledge while rendering care to the patients.	parameters & normal values only)			ormalvalueso nly) • Renal			
BIOC 135:IISEM7.2			Describe different function tests and interpret the findings of liver d		• Liver		1 hour	
BIOC 135:IISEM7.3			Explain different function tests and interpret the findings of thyroid			Thyroid	½ hour	
VIII 3(T)	At the end of unit students are able to Knowledge: Know the immune chemistry.	Immunochemistry	BIOC 135:IISEM8.1	Explain structure of immunoglobulin	Immunochemistry Structureofimmunoglobulin			1 hour
			BIOC 135:IISEM8.2	Describe the function of immunoglobulin	functionsofimmunoglobulin			1 hour
			BIOC 135:IISEM8.3	Explain the Investigations & interpretation ELISA		Investigations&interpretation–ELISA		1 hour

Lab Hrs (8 Hrs)

No	Comp. no	Competency	Domain	T-L Method	Teaching Hrs
1.	BIOC 135:IISEM1.2	Estimation of blood glucose	K S	Demonstration experiential learning through visual	1 Hour
2.	BIOC 135:IISEM1.5	Procedure and OGGT types of GTT curve Mini GTT, extended GTT, GCT, IV GTT oHbA1c	K S	Demonstration experiential learning through visual	2 hour
3.	BIOC 135:IISEM2.7	Estimation of lipid profile	K S	Demonstration experiential learning through visual	1 hour
4.	BIOC 135:IISEM7.1	Organ function tests (biochemical parameters & normal values only) Renal, Liver, Thyroid	K S	Demonstration experiential learning through visual	3 hour
5.	BIOC 135:IISEM8.3	Investigations & interpretation ELISA	K S	Demonstration experiential learning through visual	1 hour

Modified Tutorials (2 Hours)

No	Comp. no	TOPIC	Domain	T-L Method	Teaching Hrs
6.	BIOC 135:IISEM3.3	Metabolism of protein	K	Tutorials	1 Hour
7.	BIOC 135:IISEM8.2	Function of immunoglobulin	K	Tutorials	1 hour

Theory

Continuous Assessment: 10Marks

Sr. No	Assignments	Percentage of Attendance required	Allotted marks	Total Marks for attendance
1	Attendance	95-100%	2	2 marks
		90-94%	1.5	
		85-89%	1	
		80-84%	0.5	
		<80%	0	
		Number of assignments required	Marks	Total Marks allotted
2.i	Written Assignment	2	1X10	10
ii	Written assignment		1X10	10
3.i	Seminar/Individual presentation	2	1x6	6
ii	Microteaching		1x6	6
4	Group work/Work/Report	1	1x6	6
Total				30/3=10Marks

Formative Assessment

1. Sessional Examinations: Theory: I

Name of the Institute: SRMM College of Nursing

Name of Examination: Second Semester/ B.Sc. Nursing Program

Semester II/Sessional I: Applied Biochemistry

BIOC135: II -SEM/Primary/2021-2025

	Must to Know (MK)	Desirable to know (DK)	Nice to know (NK)	Marks=30
Essay/Situation type (2) 1/2	(2) Level-I-1 Level-II-1			10Mx1=10M

Short(3) 2/3	(2) Level I-1 Level II-1	(1) Level I-1		5Mx2=10M
Very Short (4) 3/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level-I-1	2Mx3=6M
MCQ (4) 4/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level-1	1Mx4=4M
About 60:30:10 (MK:DK:NK) Level of Learning 80:20				Total =30

2. Sessional Examinations: Theory: II

Name of the Institute: SRMM College of Nursing

Name of Examination: Second Semester/ B.Sc. Nursing Program

Semester II/Sessional II: Applied Biochemistry

BIOC135: II -SEM/Primary/2021-2025

	Must to Know (MK)	Desirable to know (DK)	Nice to know (NK)	Marks=25
SHORT (4) 3/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level I-1	5Mx3=15M
VERY SHORT (4) 3/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level-I-1	2Mx3=6M
MCQ (4) 4/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level-1	1Mx4=4M
About 60:30:10 (MK:DK:NK) Level of Learning 80:20				Total =25

Calculation of Internal Assessment (IA): Theory

- Total marks of two sessional examinations along with continuous assessment
 $30\text{marks} \times 2 = 60/4 = 15$
- $10 + 15 = 25$ Marks
- Minimum required - 50 %

3. Summative Assessment

a. Theory:

Name of the Institute: SRMM College of Nursing

Name of Examination: Second Semester/ B.Sc. Nursing Program

Semester II/University Exam: Applied Biochemistry

BIOC135: II -SEM/Primary/2021-2025

	Must to Know (MK)	Desirable to know (DK)	Nice to know (NK)	Marks=25
SHORT (4) 3/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level I-1	5Mx3=15M
VERY SHORT (4) 3/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level-I-1	2Mx3=6M
MCQ (4) 4/4	(2) Level I-1 Level II-1	(1) Level I-1	(1) Level-1	1Mx4=4M
About 60:30:10 (MK:DK:NK) Level of Learning 80:20				Total =25

Books recommended:

TEXT BOOKS:

- Biochemistry for B.Sc. Nursing Students (PB) Harbans Lal
- Textbook of Biochemistry & Biophysics for Nurses
- Ananthanaryan and Paniker's Textbook of Microbiology- 10th edition
- E. Duncan Robert, Biochemical values in Clinical Medicine
- Chandlish J.K .Lecture notes on Biochemistry
- Klein S Israel , Human Biochemistry

REFERENCE BOOKS:

- V Harold, Practical chemical Biochemistry.
- Pankaja Kale, Essentials of Biochemistry.
- Jacob Anthikod, Biochemistry for Nurses.