Program Handout for B.Sc. (Hons.) Biochemistry



Department of Biosciences Faculty of Science Integral University, Lucknow



INTEGRAL UNIVERSITY LUCKNOW

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

- Bachelor course in biotechnology offers the synergism of basic concepts of biology, biotechnology, molecular biology, genomics, Recombinant DNA technology, microbiology, biochemistry and bioinformatics with technological applications.
- The main objective of this degree course is to produce graduates with enhanced skills, knowledge and research aptitude to carry out higher studies, entrepreneurship or research and development in the various health, research and industrial areas.
- Develop proficiency in application of current aspects of biotechnology, molecular biology, Recombinant DNA technology, bioinformatics and genomics.
- Students will be able to use state of the art techniques relevant to academia and industry, generic skills and global competencies including knowledge and skills that enable students to undertake further studies in the field of biotechnology, molecular biology, Recombinant DNA technology, genomics, microbiology, biochemistry or any other related field.
- Imparting an education that includes communication skills, the ability to work in a team with leadership quality, devoted to societal problems with an ethical attitude.

PROGRAM OUTCOMES (PO's)

- [PO.1] **Critical Thinking:** Students will demonstrate an understanding of major concepts in all disciplines of basic life sciences, biochemistry and biotechnology. Understand the basic concepts, fundamental principles, the scientific theories related to various biological phenomena, their relevancies in the day-to-day life and their applications.
- [PO.2] Effective Communication- Development of various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.
- [PO.3] **Social Interaction** Development of scientific outlook not only with respect to science subjects but also in all aspects related to life.
- [PO.4] **Effective Citizenship:** Imbibe moral and social values in personal and social life leading to highly cultured and civilized personality.
- [PO.5] Ethics: Follow the ethical principles and responsibilities to serve the society.
- [PO.6] **Environmental Management:** Understand the issues of environmental contexts and sustainable development.
- [PO.7] Self-directed and Lifelong learning- Students will be capable of self-paced and selfdirected learning aimed at personal development and for improving knowledge/skill development

PROGRAM SPECIFIC OUTCOMES (PSO's)

- [PSO.1] To provide in-depth knowledge about core areas of biochemistry.
- [PSO.2] To make students competent in the field of biochemistry and allied areas by providing them hands on experience in basic tools and techniques.
- [PSO.3] To inculcate, facilitate, motivate and promote knowledge and technical skills in core areas of biological sciences including advanced tools and techniques like genomics, proteomics and transcriptomics to young aspirants.
- [PSO.4] To develop graduates with a strong professional ethics and moral duties that will positively affect their profession, community, society and Nation at large.



EVALUATION SCHEME (CBCS) B.Sc. (Hons.) Biochemistry Semester-I

				₽	θ.										Attı	ribu	utes		
				T			TA	Tatal	гог				mployability	ntrepreneurship	kill	ender	nvironment & ustainability	uman values	rofessional hics
			┗	1	Р	UE	IA	Total	ESE				ш	ш	<u></u>	G	ы	Ī	e p
LN104	Essential Professional Communication	Foundation	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	\checkmark	\checkmark			V	\checkmark
MT106	Mathematics	Foundation	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark		\checkmark				
CS109	Concept of Computers	Foundation	3	1	0	25	15	40	60	100	3:1:0	4		\checkmark	\checkmark		\checkmark		\checkmark
CH112	Fundamental of Inorganic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4			\checkmark				
BS112	Fundamentals of Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	\checkmark	\checkmark		\checkmark		
CH113	Chemistry Lab-I	Practical	0	0	6	25	15	40	60	100	0:0:3	3		\checkmark	\checkmark				
BS141	Biochemistry Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3							
	Т	otal								700		26							

Revision effective from 2020-21 batch



		EVALU B.Sc.	ATI (Ho	ON ons. Sem	SCH .) Bi	IEME oche er-II	E (CB misti	CS) ry											
				×											Att	ribu	ites		
Course Code	Course Title	Type of Paper		Periods/Wee				Evaluation Scheme		Max. Marks	Credits	Total Credit	ployability	repreneurship		nder	/ironment & stainability	man values	fessional ics
			L	Т	Ρ	UE	ТА	Total	ESE				Em	Ent	Ski	Gel	En/ sus	Hui	Pro eth
ES115	Fundamentals of Environmental Studies	Foundation	3	1	0	25	15	40	60	100	3:1:0	4					V	\checkmark	
CH114	Fundamental of Organic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	-	V				
BS232	Plant Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4			\checkmark				
BS112	Animal Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4		-	\checkmark				
BS113	Fundamentals of Microbiology	Core	3	1	0	25	15	40	60	100	3:1:0	4		-	\checkmark		\checkmark		
CH115	Chemistry Lab-II	Practical	0	0	6	25	15	40	60	100	0:0:3	3	\checkmark		\checkmark				
BS205	Microbiology lab.	Practical	0	0	6	25	15	40	60	100	0:0:3	3	\checkmark		\checkmark				
	Та	otal								700		26							



EVALUATION SCHEME (CBCS) B.Sc. (Hons.) Biochemistry Semester-III

				¥											Att	ribu	utes		
Course Code	Course Title	Type of Paper		Periods/Wee				Evaluation Scheme		Max. Marks	Credits	Total Credit	ployability	repreneurship	_	nder	/ironment & stainability	nan values	lessional ics
			L	Т	Ρ	UE	ТА	Total	ESE				Em	Ent	Ski	Gel	En/ sus	Hui	Pro eth
CH215	Fundamentals of Physical Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark		\checkmark				
BS202	Biophysical Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	\checkmark					
BS241	Fundamentals of Genetics	Core	3	1	0	25	15	40	60	100	3:1:0	4							
BS242	Introduction to Cell Biology	Core	3	1	0	25	15	40	60	100	3:1:0	4							
BS243	Fundamentals of Bioinformatics	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	\checkmark					
BS244	Physiology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3	\checkmark		\checkmark		V		
BS206	Cell Biology & Genetics Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3	\checkmark						
	То	tal								700		26							

Revision effective from 2020-21 batch



EVALUATION SCHEME (CBCS) B.Sc. (Hons.) Biochemistry Semester-IV

		_		¥											Att	ribu	utes		
Course Code	Course Title	Type of Paper		Periods/Wee				Evaluation Scheme		Max. Marks	Credits	Total Credit	ployability	trepreneurship	_	nder	vironment & stainability	man values	ofessional ics
			L	Т	Ρ	UE	ТА	Total	ESE				Em	Ē	Ski	Ge	En	РП	eth eth
BS251	Enzymes and Hormones	Core	3	1	0	25	15	40	60	100	3:1:0	4			\checkmark				
BS212	Molecular Biology	Core	3	1	0	25	15	40	60	100	3:1:0	4							
BS252	Clinical Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark		\checkmark				
BS253	Fundamentals of Plant Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4							
BS201	Metabolism	Core	3	1	0	25	15	40	60	100	3:1:0	4							
BS255	Enzymology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3			\checkmark				
BS308	Genetic Engineering Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3			\checkmark		\checkmark	ľ	

Total

700 26

Revision effective from 2020-21 batch



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				¥											Att	ribı	ites			
Course Code	Course Title	Type of Paper		Periods/Wee				Evaluation Scheme		Max. Marks	Credits	Total Credit	ployability	trepreneurship	_	nder	vironment & stainability	man values	ofessional ics	
			L	Т	Ρ	UE	TA	Total	ESE				Em	En	Ski	Ge	En' sus	Hu	Prc eth	
BS211	Immunology	Core	3	1	0	25	15	40	60	100	3:1:0	4			\checkmark					
BS341	Nutritional Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4		\checkmark						
BS303	Genetic Engineering	Core	3	1	0	25	15	40	60	100	3:1:0	4					\checkmark			
BS306	Applied Biotechnology	Core	3	1	0	25	15	40	60	100	3:1:0	4				-	· ۱	V		
	Electives: (Any one of the following)	Elective																		
BS305	Genomics, Proteomics & Metabolomics		3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	\checkmark	\checkmark		\checkmark			
BS342	technologies													\checkmark	\checkmark					
BS343	Tissue Culture & Bioinformatics Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3								
BS216	Immunology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3		\checkmark						

Total

700 26



EVALUATION SCHEME (CBCS) B.Sc. (Hons.) Biochemistry Semester-VI

				¥											Att	rib	utes		
Course Code	Course Title	Type of Paper		Periods/Wee				Evaluation Scheme		Max. Marks	Credits	Total Credit	nployability	trepreneurshi	ill velopment	nder	vironment & stainability	man values	ofessional nics
			L	Т	Ρ	UE	TA	Total	ESE				Εn	ы	Sk de	Ge	En Su:	Ĩ	et 5
BS204	IPR & Biosafety	Core	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark	\checkmark				\checkmark	\checkmark
	Elective courses (Any one of the following)																		
BS312	Bionanotechnology	Elective	3	1	0	25	15	40	60	100	3:1:0	4	\checkmark						
BS351	Human Physiology																		
BS352	Seminar Presentation	Practical	0	0	4	25	15	40	60	100	0:0:2	2							
BS315	Project & Training* (3 months)		3 Months	300	0:0:4	4							\checkmark		\checkmark				
BS316	Educational Tour (8-10 days)			100	0:0:2	2									\checkmark			\checkmark	
		Total								700		16							
		* The Evalu	uation s	cher	ne fo	r the	Proj	ect Wo	ork										

	Course Code	Dissertation	Presentation	Viva/Discussion	Total
Project Work	BS315	200	50	50	300

Note: The students of B.Sc. Biotechnology have to undergo the educational/Industrial tour in industry/research institution for practical awareness at the end of 6th semester.



INTEGRAL UNIVERSITY LUCKNOW

				B. Sc	. BIOC	HEMIST	RY 1 st ye	ar/ 1 st s	emester			
1. Name of t	he De	partment	: Bioscienc	es								
2. Course Na	ame		FUNDAMI	ENTALS ()F BIOC	HEMISTR	Y			L	Т	Р
3. Course Co	ode		BS112							3	1	0
4. Type of C	ourse	(use tick	mark)		С	ore ($$)			Foundation	Course ()	Departmen	tal Elective ()
5. Pre-requi	site (i	f any)	10+2 with	Biology	6.]	Frequency	(use tick n	narks)	Even()	Odd ($$)	Either Sem ()	Every Sem ()
7. Total Nun	nber o	of Lecture	es, Tutorial	s, Practica	ls							
Lectures = 3	0				Τι	utorials = 1	0		Practical =	00		
8. COURSE	OBJI	ECTIVES	S: The objec	tive of this	course is	to develop a	an understa	Inding of	basics of bior	nolecules		
9. COURSE	OUT	COMES	(CO):									
After the succ	essfu	l course c	ompletion, l	learners wi	ll develop	following a	attributes:					
COURSE							ATTRIB	UTES				
OUTCOM	3						ATTRID	UILD				
CO1	Тс	understa	nd basic det	ails of carb	ohydrate	molecules a	nd its class	ification				
CO2	Τc	understa	nd basic det	ails of amir	no acid &	protein mol	lecules and	its classif	fication			
CO3	Τc	understa	nd basic det	ails of lipid	molecule	es and its cla	assification					
CO4	Τc	understa	nd basic det	ails of Nuc	leic Acid	molecules a	ind its class	sification				
<u>CO5</u>	To	understa	nd basic det	ails of Vita	min mole	cules and its	s classificat	tion				
10. Unit wise	e deta	iled conte	ent flootung	00		lo of the ur	it. Introd	nation to	Dia malaani	a Carbak	wductor	
Structure clas		tion and r	roperties of	Monosacci	haridas D	lie of the un	and Poly	uction to	bio molecul	veogen n	iyurates	llulose)
Unit_2	sinca	lion and p	f lectures –	08		le of the ur	s, and Fory	acids an	d Proteins	yeogen, pe	eptidogry can, ce	ilulose).
Structure, clas	ssifica	tion and r	roperties of	amino acio	ls. peptide	e bond, prot	eins: prima	rv. secon	dary (α-Helix	beta-ple	ated sheet), terti	ary and
quaternary str	ucture	es. Ramac	handran plo	t. structure	of hemog	lobin and m	voglobin.			, oota pro		
Unit_3	N	mber of	lectures – (8	Ti	le of the ur	nit: Linids					
Structure, func	tion, o	classificat	ion and prop	perties of Fa	atty acids.	, Glycerolip	id, Cholest	erol, Sphi	ngolipid, pho	ospholipid	s, lipoproteins,	
glycoprotein, i	soprei	ne.			•			-	• • •			
Unit-4	Ν	Number o	f lectures =	08	Tit	le of the ur	nit: Nucleio	c acids				
Purines and py	rimid	ines, nucl	eosides, nuc	leotides, po	olynucleot	tides, DNA	types: A D	NA, B DI	NA and Z DN	IA and the	eir function, RN	A types:
mRNA, rRNA	and t	RNA and	their function	on, Forces s	stabilizing	nucleic aci	d structure					
Unit-5 Sources dieter		umber o	function on	Uð d deficiend	u disordo	re of water	(R. C) and	ns fot colubl	o vitemine (A	DEand		
11. CO-PO r	nanni	ng	, runetion an		y uisoide	15 Of water	(D, C) and			, D, L and	и к).	
POS/PSO				201		701		2001	200			5001
COs	PO	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSC	02	PSO3	PSO4
C01	2	1					1	3			3	2
	3	1					1	3			3	2
CO2	3	1					1	3			3	2
	3 2	1					1	2			3	2
C04	3	1					1	3			3	2
R6112	3	1		+			1	2			3	2
D5112	5	1		trong cont	ribution.	2: Average	contribut	ion . 1: L	ow contribut	tion	5	
			2.5					· , · -				
12. Books re	comn	nended:										

- 1. Principles of Biochemistry- AlbertL. Lehninger CBS Publishers & Distributors
- 2. Biochemistry Lubert stryer Freeman International Edition.
- 3. Biochemistry Keshav Trehan Wiley Eastern Publications
- 4. Fundamentals of Bochemistry-J.L.Jain S.Chand and Company

B. Sc. BIO	CHEMISTRY	Y 1 st year/ 1 st semeste	r							
1.Name of	the Departmo	ent: Biosciences								
2. Course N	Name	BIOCHEMISTRY	LAB			L		Т	Р	
3. Course (Code	BS141				0		0	6	
4. Type of	Course (use ti	ck mark)	Core (√)		Foundat	ion Course ()	Dep	artment	al Elective()	
5.Pre-requ	usite (if any)	10+2 with Biology	6.Frequency(u	se tick marks)	Even ()	Odd ($$)	Either	Sem()	Every Sem()	
7. TotalNu	mber of Lectu	res, Tutorials, Pract	icals							
	Lecture	s=00	Tu	torials=00			Practic	cal=10		
8. COURS Bimolecular	SE OBJECTI testing.	VES: The objective of	f this course is to	develop the un	derstanding	g of To estimat	e the ba	sic know	ledge of	
9. COURS After the su	E OUTCOM	ES (CO): se completion, learner	rs will develop fo	llowing attribu	tes:					
COURSE ((OUTCOME CO)			ATTR	BUTES					
C	201	Qualitative test for ca	rbohydrates (Mo	lisch test, Bene	dict test, Fe	hling test, Bra	dford ar	nd Iodine	tests)	
C	CO2	Estimation of vitamin	C and Determin	ation of pKa of	glycine					
C	203	Perform spot test for a	amino acids in a	given sample						
C	CO4	Estimate cholesterol i	n a given sample							
C	CO5	Perform DNA and RN	VA estimation in	a given sample						
10. Syllabu	IS	,								
Ex	xp-01	Qualitative test for car	bohydrates (Mol	isch test, Bened	lict test, Fe	hling test, Bar	foed and	l Iodine to	ests)	
Ex	xp-02	Estimation of vitamin	C and Determina	tion of pKa of	glycine					
Ex	xp-03	Perform spot test for a	mino acids in a g	given sample						
E	xp-04	Estimate cholesterol in Perform DNA and RN	a given sample	a given sample						
192	xp-05									
11. СО-РС) mapping									
POS/PSO	PO1	PO2	PO3 PO	D4 PO	5 PC	06 PO7	PSO1	PSO2	PSO3	PSO4
Cos	3	1					3		3	
CO1	3			5	3		3	2	3	
	2	1	,	2			1		2	
CO2	3	I		,	-				5	
CO3	3	1		3	3	5 1				3
CO4	3	1		3 3	3	3 1			1.0	3
BS141	3	1	2	.4 1	2.	4	1.4	0.4	1.8	1.2
		3: Strong con	ntribution, 2: Av	verage contrib	ution , 1: I	low contribut	ion			
12. Books	recommended	1:								

				B.Sc.	. BIOCHEM	ISTRY	Y 1 ye	ar 2 nd s	semest	ter					
1. Name o	of the Do	epartme	nt: Bioscien	ces											
2. Course	Name		PLANT P	HYSIOLOO	GΥ		L		Т			Р			
3. Course	Code		BS232		· · · · ·		3		1			0			
4. Type of	f Course	e (use tic	k mark)		Core (√)	Fo	undation	1 Cours	se ()		Departmen	tal Elective ()		
5. Pre-req any)	luisite (i	if	10+2 with 1	Biology	6. Frequ (use tick	ency	Ev	ven ($$)	C	0dd ()	Eithe	er Sem	Every Sem ()		
7. Total N	umber	of Lectu	res, Tutoria	ls, Practica	ls										
Lectures =	= 30				Tutoria	ls = 10	Prac	tical = 0	0						
8. COURS	SE OBJ	ECTIVI	ES: On comp	oletion of thi	s course, student	s will b	e able t	o develo	p an un	derstand	ling c	of plant water re	elations, nutrition in		
plants, mo	rpholog	y and ph	ysiology of p	plants and pla	ant growth, plan	t hormo	nes and	their re	lation w	vith plan	it gro	wth and develo	pment.		
9. COURS After the su	SE OUI accessfu	COMES	S (CO): completion,	learners wil	l develop follow	ing attri	ibutes:								
COUR OUTCOM	SE E (CO)					A	ATTRI	BUTES							
CO1	L	Students	will have an	understand	ing of movemen	t of wat	er and s	solutes ir	n plants.	, ascent	of sa	p and transpira	tion.		
CO2	2	Have kn	owledge of H	Essential elei	ments, their abso	rption,	transpo	rt and ro	le in pla	ants and	trans	location in phl	oem.		
CO2	,	Know about basics of C assimilation, Photosynthesis, Photorespiration and Nitrogen metabolism specially Biological nitrog fixation Inaculcate basic knowledge about Enzymes and Plant growth regulators. Seed dormancy and germination													
	,	Know about basics of C assimilation, Photosynthesis, Photorespiration and Nitrogen metabolism specially Biological nitroge fixation Inaculcate basic knowledge about Enzymes and Plant growth regulators, Seed dormancy and germination.													
CO4	l I	fixation Inaculcate basic knowledge about Enzymes and Plant growth regulators, Seed dormancy and germination.													
COS		Comprel	hend the resp	onse of plan	it to light, temper	rature a	nd stres	s, specia	lly Pho	to morp	hoge	nesis, Photo pe	riodism and Plant		
0.5	,	moveme	nts												
10. Unit w	vise deta	ailed con	tent												
Unit-1		Numbe	er of lecture	s = 08	Title of t	he unit:	: Plant	-water r	elation	S					
Importan	ce of w	ater, Dif	fusion and w	ater potenti	al, Osmosis, As	cent of	sap,Tra	anspirati	on and	its signi	ifican	ce; Factors aff	ecting transpiration,		
guttation								_		-					
Unit-2	1 .	Numbe	er of lecture	s = 08	Title of t	he unit	:: Mine	eral nutr	rition a	nd tran	sport		11 1		
Essential e Active and j	passive	s, macro transport	and micronu , carriers,	channels a	nd pumps. Trans	nents; A slocation	Absorpt n in phl	ion of m loem,Co	neral si mpositio	alts, Tra on of ph	nspoi	rt of ions acros	s cell membrane,		
Unit-3		Numb	er of lecture	es = 08	Title of t	he unit:	: C and	l N meta	bolism						
Photosyn pathways of	thesis P f Carbor	hotosynt 1 fixation	hetic Pigmen ; Photorespin	ts (Chl a, b) ation. Nitro	; Photo system I gen metabolism	and II, Biologi	Electro cal nitro	n transpo ogen fixa	ort and a ation, N	mechan itrate ar	ism o 1d am	f ATP synthesi monia assimila	s; C3, C4 and CAM ation.		
Unit-4		Numbe	er of lecture	s = 08		he unit	: : Plan	t growt	n regul	ators					
Enzymes	. genera	1 structur	and proper	ties Plant o	rowth regulators	· Discor	Jory on	d physiol	logical	roles of	auvir	s gibberellins	cytokining ABA		
Ethylene R	ole and	applicati	ons in agri-h	orticulture 3	Seed Physiology	· Discov	ancy B	reaking (Of dorn	ancy (Germi	nation	, Cytokinins, ADA,		
Unit-5	ole una	Numbe	er of lecture	s = 08	Title of t	he unit	: Grow	th and I	Develop	ment	Jerrin	inution.			
Plant resp (Discovery) Stress physi	oonse to and stru	light and cture), re	l temperature ed and far rec	e: Photo mor l light respor	phogenesis, Plar nses on photo mo	nt move orphoge	ments, mesis; (Photope: Growth F	riodism Respons	, (SDP, e to tem	LDP,	, Day neutral pl ture, Vernalizat	ants); Phytochrome ion. Introduction to		
11. CO-P	O mapp	ping													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS	01	PSO	2	PSO3	PSO4		
CO1 -		_					1	3				3			
3	,	1			3				1	2		2			
CO2 3	3	1			3		1	3		2		3			
CO3 3	3	1			3		1	1				3			
CO4 ³	3	1			3		1						3		

CO5 3	1			3		1				3					
BS232 3	1			3		1	1.4	0.4	1.8	1.2					
3: Strong contribution, 2: Average contribution , 1: Low contribution															
12. Books rec	3: Strong contribution, 2: Average contribution , 1: Low contribution 12. Books recommended:														
1. Taiz, L., Zei	ger, E.,. Plant	t Physiology	. Sinauer Ass	ociates Inc., U.	S.A. 5th	Editio	n.								
2. Hopkins, W.	G., Huner, N	.P.,. Introduc	ction to Plant	Physiology. Jo	hn Wiley	y & So	ns,								
U.S.A. 4th Edit	ion.														
3 Bajracharya,	D.,. Experim	ents in Plant	Physiology-	A Laboratory N	Manual.	Narosa									
Publishing Hou	ise, New Dell	hi.													
4. Frank B. Sal	isbury, Cleon	W. Ross: Pl	lant Physiolo	gy. Wadsworth	Publish	ing Co	mpany								

BS233	3	1					1			3			
			3: St	rong cont	ribution, 2: Averag	ge contribution , 1	1: Low contri	bution					
12. Books recommended:													
1. Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.													
2. Physiol	2. Physiological basis of Medical practice, West J.B., Best and Taylor.												
3. Introduc	ction to Phy	ysiology by	/ Davidson	H and Seg	gal M.B. Academic	Press.							
7. Sherwo	7. Sherwood L – Human Pysiology: From Cells to Systems, (Wadsworth Publishing, 2000,ISBN: 0534568262)												
8. Tortora	G J Princip	ples of Ana	tomy & Pł	ysiology,	(John Wiley & Sons	s, 1999, ISBN: 04'	71366927)						

B.Sc. BIOCHEMISTRY	7 1 year 2	nd semester											
1. Name of the Departn	ent: Bios	ciences											
2. Course Name	FUN	DAMENTAL	S OF MICR	OBIOLOGY			L			Р			
3. Course Code	BS1	13					3			0			
4. Type of Course (use	ick mark)	С	ore (V)		Foundation	Course()	Dej	partme	ntal El	ective ()		
5. Pre-requisite (if any)	10+2	with Biology	6.	Frequency (use t	ick marks)	Even ($$)	Odd ()	Either	Ev	very Sei	m ()		
7. Total Number of Lec	tures, Tut	torials, Practi	cals				0.0						
Lectures = 30		1	T	utorials = 10		Practical =	00	6					
8. COURSE OBJECTI Classification of microbe	S ; Control	completion of t of Microorgai	this course, stu nisms, Basics	of Recombination	to develop an in Prokaryotes	understandii s, microbial i	ng of Basic nteraction	cs of m with e	1crob10 nvironn	logy, G nent.	eneral		
9. COURSE OUTCOM	IES (CO)	:											
After the successful cour	se comple	etion, learners	will develop f	following attribut	es:								
COURSE OUTCOME (CO)				АТТ	RIBUTES								
CO1 Know	the basics	s of microbiolo	ogy										
CO2 Have	knowledge	e of the genera	l classification	n of microbes									
CO3 under	inderstand basics of Control of Microorganisms												
CO4 study	study bacteriophages and microbes in extreme environments and microbial interactions												
CO5 know	know the basics of recombination in Prokaryotes												
10. Unit wise detailed c	ontent												
Unit-1 Num	ber of lec	ctures = 08	Ti	tle of the unit: Hi	story and clas	sification of	microbio	logy:					
Pasteur's experiments, Nature of the microbial ce	Various for Il surface,	rms of microor gram positive	rganisms (bac and gram neg	eteria, fungi, virus ative bacteria; Gro	es, protozoa, P owth curve.	PLOs); Nutr	itional cla	ssificat	ion of 1	nicroor	ganisms;		
Unit-2 Num	ber of lec	ctures = 08	Ti	tle of the unit: Co	ontrol of Micro	oorganisms:							
Physical agents (Autoclav antibiotics), Radiation Me gall), viral (SARS, TMV),	e, Hot air o thods (UV fungal (re	oven, Laminar ' rays). Pathoge ed rot of sugar	airflow and n enesis of micr cane, dermati	nembrane filter.), o oorganisms: Some tis) and protozoan	chemical agent e common path (malaria).	s (Alcohol, H logenic micro	Halogens a porganism	nd Gas s: Bact	eous a erial (tu	gents, berculo	osis,		
Unit-3 Numb	er of lect	ures = 08	Ti	tle of the unit: M	icrobes in extr	reme enviro	nments ar	nd mici	robial i	nteract	ions:		
The thermophiles, alkalop	hiles, acid	ophiles and sy	mbiosis and a	ntibiosis among m	icrobial popula	ation, N2 fix	ing microł	bes in a	gricultu	re and	forestry.		
Unit-4 Num	ber of lec	ctures = 08	Ti	tle of the unit: Re	combination i	in Prokaryo	tes:						
Transformation, Conjuga	ion and T	ransduction.											
Unit-5 Num	ber of lec	ctures = 08	Ti	tle of the unit: Ba	cteriophage a	nd staining							
Lytic & lysogenic cycle. S	tains and s	staining techni	ques: Principl	es of staining, Typ	bes of stains – s	simple stains.	, structura	l stains	and Dif	ferentia	al stains		
Cos PO1	PO1	PO3	PO4	PO5	POG	τ			DS()	DSO3	DSO/		
	1	rus	FU4	105	3	1	1	1301	F 50 2	1303	3		
$\begin{array}{c c} \hline CO1 & 3 \\ \hline CO2 & 3 \\ \hline \end{array}$	1				3		1				3		
$\begin{array}{c c} CO2 & 3 \\ \hline CO3 & 3 \\ \hline \end{array}$	1				3		1				3		
CO4 3	1				3		1				3		
CO5 3					3		1				3		
BS113 3	1				3		1				3		
	3: Strong contribution. 2: Average contribution . 1: Low contribution												
	1 3 1 3 1 3 1 3 3: Strong contribution, 2: Average contribution , 1: Low contribution 3												

- Introduction to Microbiology, Ingraham, 2ed.
 Brock Biology of Microorganisms, Madigan et al, 9th ed.
 Principles of Microbiology, R.M. Atlas, Wm C. Brown Publisher.
 The Microbial World, Roger Y. Stanier, Prentice Hall
- Howe.C. (1995) Gene Cloning and manioulation, Cambridge University Press, USA
 Lewin, B., Gene VI New York, Oxford University Press.

B. Sc. BIC	OCHEMIS	TRY 1 st y	ear/ 2 nd sen	iester											
1.Name of	f the Depa	rtment: Bi	osciences												
2.Course	Name	MIC	ROBIOLO	GY LAB		L		Т				Р			
3.Course	Code	BS2)5			0		0				6			
4.Type of	Course (u	se tick ma	rk)	Core($$)	F	oundati	on Course ()		Depart	mental	Electiv	ve()			
5.Pre-req	uisite (if a	ny) 10+2	with Biolog	gy 6.Frequency tick marks	y(use Ev	ven (√)	Odd ()	Either Sem ())		EveryS	Sem()			
7.TotalNu	ımberofLe	ctures,Tu	torials,Prac	ticals											
	Lect	tures=00			Tutorials	=00			Pra	ctical=1	10				
8. COUR Instrumen liquefactio bacteria, I	RSE OBJE its used to on, Cleanin Isolation an	ECTIVES: o study and ng and steri nd purificat	After com d work or lization of g ion and esti	pletion of the microbes, Sta glassware, Medi mation of DNA	course, a aining Tec a preparati and RNA	student hniques, on and Is	will be able Enzyme as solation of ba	to develop the say and Bioch cteria and fung	e unders nemical i from va	tanding tests–st trious se	; of ba arch h ources,	sic microbiology, ydrolysis, gelatin Growth curve of			
After the su	iccessful co	ourse comp): oletion, lear	ners will develo	op followin	g attribu	tes:								
COURSE	OUTCON	AE	,		15	0	ATTRIBUT	FS							
(CO)	Daval						Auto alauto. Ile			t T				
(C O 1	centrif	ntrifuge and Staining Techniques as Simple, Negative staining, Gram staining, Endospore staining, fungal staining.												
C	C O2	Have l of prol	Iave knowledge of enzyme assay and Biochemical tests–starch hydrolysis, gelatin liquefaction. the cellular organization f prokaryotic and eukaryotic cells												
(CO3	Under isolatio	nderstand processes involved in culturing of microbes as Cleaning and sterilization of glassware, media preparation, olation of bacteria and fungi from soil/ air/water/ other sources												
(C O 4	Under	stand the gr	owth pattern of	bacteria										
(C O 5	Have o	lear unders	tanding of proce	esses invol	ved in Is	olation and p	urification and	estimatio	on of Dl	NA and	RNA			
10.Syllabu	us														
Ε	xp-01	Isolatio	on and purif	ication of genor	nic DNA.	Estimatio	on of DNA an	d RNA							
E	2xp-02	Enzym	e assay (on	e example)											
E	xp-03	Bioche	mical tests-	starch hydrolys	is, gelatin	liquefact	ion.								
E	xp-04	Cleanii	ng and steri	ization of glass	ware.										
Е	xp-05	Study (of instrume	its: Compound	microscope	e, Autocl	ave, Hot air c	ven, pH meter,	, Lamina	r airflov	v and c	entrifuge			
E	xp-06	Media	preparation	: Nutrients agar,	, Nutrient l	oroth and	LB.								
E	xp-07	Stainin	g Techniqu	es: Simple, Neg	ative stain	ing, Grar	n staining, Er	dospore stainin	ng, funga	l staini	ng.				
E		Isolatio	on of bacter	a and fungi from	m soil/ air/	water – d	lilution and p	our plate metho	ods						
E		Study of	of <i>Rhizobiu</i>	n from root nod	lules of leg	umes									
Е		Growth	n curve of b	acteria											
11. СО-РО	- mapping														
COs	PO1	PO2	PO3	PO4	PO5		PO6	PO7	PSO1	PSO2	PSO3	PSO4			
CO1	3	3	1				3		3	2		3			
CO2	3	3	1				3		3	2		3			

CO3	3	3	1			3		3	2	3
CO4	3	3	1			3		3	2	3
CO5	3	3	1	2		3		3	2	3
BS205	3	3	1	0.4		3		3	2	3
			3: Stro	ng contributio	n. 2: Average	contribution . 1: I	ow contribut	ion		

				B.Sc.	BIOCHEMI	STRY I	l year 3 rd	¹ seme	ster					
1. Name	e of the	Department:	Bioscien	ces			-							
2. Cour	se Nam	e BIOPH	IYSICA	L	L	Г	[Р				
3. Cour	se Cod	e BS202			3	1				0				
4. Type	of Cou	rse (use tick n	nark)		Core $()$		Foundatio)		Departme	ental Elect	ive ()		
5. Pre-r	equisit	e 10+2 w	ith Biolo	gy (6. Frequency (u	se tick	Even ()	Odd	(√) E	ither Sem ()) E	very Sem	n ()	
7. Total	Numb	er of Lectures	, Tutoria	ls, Practic	cals									
Lecture	es = 30				Tutorials = 10		Practical	= 00						
8. COU applicati radioact	RSE O ions, Bo ivity in	BJECTIVES eer's law and biological stud	: On com Lamberts lies, GM	pletion of law , chro counters a	this course, stu omatography, Bo nd Scintillation c	dents will eer's law a counting	be able to and Lambe	o develogerts law,	p an u GM c	inderstanding counters and	g of: Princ Scintillati	viple, wor on, Impo	rking and ortance of	
9. COU	RSE O	UTCOMES (CO):	-		•								
After the	succes	sful course co	mpletion,	learners v	will develop follo	owing attr	ibutes:							
COUF OUTCO	RSE OME					ATT	RIBUTES							
СО	1	Concept of el of spectropho	ectromag tometer a	netic radia nd AAS	tion, absorption	spectrum,	Beer's law	and La	mberts	s law, Princi	ple, workir	ng and ap	plications	
CO	2	Concepts of c	hromatog	graphy and	l concept of parti	ition coeff	icient							
CO	3	Principle, me	thodology	/ and appli	ication of various	s chromate	ographic te	chnique	s					
CO	4	Centrifugatio	n and Ele	ctrophores	sis-Principles and	d applicati	ons							
CO	5	Importance of radioactivity in biological studies, GM counters and Scintillation counting.												
10. Unit	t wise d	etailed conten	t											
Unit-1		Number of le	ectures =	08]	Fitle of the unit :	: Basics of	f Biophysic	es, Chen	nical ł	oonding				
Ionic bo	ond, cov	alent bond, hy	drogen b	ond and pe	eptide bond, Van	der-Waals	s forces, Pri	inciples	of the	rmodynamic	s.			
Unit-2		Number of le	ectures =	08	Fitle of the unit :	: Analytic	al techniqu	ues:						
Spectro	photom	etry and colori	metry, Sp	pectroscop	ic techniques: U	V visible s	spectroscop	y, NMR	R, IR, 1	Fluorescence	e and			
Atomic	absorp	tion spectrosco	py, X-ray	v crystallog	graphy.									
Unit-3		Number of le	ectures =	08]	Fitle of the unit :	: Chroma	tography							
Paper, t	hin-lay	er, column, HP	LC, GLC	and mole	cular sieving									
Unit-4		Number of le	ectures =	08]	Fitle of the unit :	: Centrifu	gation:							
Principl	les, type	es, instrumenta	tion and a	application	s. Electrophores	is: Princip	les and app	olication	s (PA	GE and Agai	rose gel ele	ctrophor	esis).	
Unit-5		Number of le	ectures =	08]	Fitle of the unit :	: - Radioa	ctivity							
Types,	their im	portance in bio	ological s	tudies, mea	asure of radioact	ivity, GM	counters a	nd Scint	illatio	n counting.				
11. CO-	PO map	ping												
COs	PO1	PO2	PO3	PO4	PO5	PO	6	PO7		PSO1	PSO2	PSO4	PSO4	
CO1	3	3	1			3				3	2		3	
CO2	3	3	1			3				3	2		3	
CO3	3	3	3 1 3 3 3 3											
CO4	3	3	1			3				3	2		3	
CO5	3	3	1	2		3				3	2		3	

BS202	3	3	1	0.4	.4 3 3 3 2 3											
			3: Sti	ong contri	bution, 2: Av	erage contribution	, 1: Low contri	bution			<u>. </u>					
12. Boo	12. Books recommended:															
1. Narayanan, P (2000) Essentials of Biophysics, New Age Int. Pub. New Delhi.																
2. Bliss, (C.J.K (196	57) Statistics	in Biolog	gy, Vol. I c	Graw Hill, Ne	w York.										
3. Campb	ell R.C (1	974) Statisti	cs for Bio	ologists, Ca	mbridge Univ	. Press, Cambridge.										
4. Daniel	(1999) Bi	ostatistics (3	Red Editio	n) Panima l	Publishing Con	rporation.										
5. Swardl	aw, A.C (1985) Practi	cal Statis	tics for Exp	erimental Biol	logists, John Wiley	and Sons, Inc. N	Y								
6. Khan (. Swardlaw, A.C (1985) Practical Statistics for Experimental Biologists, John Wiley and Sons, Inc. NY 5. Khan (1999) Fundamentals of Biostatistics Publishing Corporation															
7. Roy R.	N. (1999)	A Text Boo	k of Biop	hysics New	Central Book	k Agency.										

B.Sc. BI	OCHEMI	STRY II year	3 rd semest	er									
1. Name	of the Dep	partment: Bio	sciences										
2. Cours	e Name	INTR	ODUCTI	ON TO CEL	L BIOLOGY		L		Т		P		
3. Cours	e Code	BS24	2		a (1)		3		1		0	0	
4. Type o	of Course	(use tick mark	<u>s)</u>		$\frac{\text{Core}(\vee)}{(\nabla \nabla $	Fo	undation Co	ourse ()		Departmen	ntal Elective	e ()	
5. Pre-re	equisite (if	10+2	with Biolo	gy	6. Frequency (us	se	Even ()	$\operatorname{Odd}()$	Either Sen	n (Every Sem	()	
7. Total	Number o	of Lectures, Tu	itorials, Pi	racticals				0					
Lectures	= 30		11.1	6.4.1	Tutorials = 10		ractical = 0	0	. 10	11.3.4 1		C.	
8. COUR Microtub	ules, micr	ofilaments, cell	e objective lular organ	of this course ization of pro	karyotic and euka	unders	canding of Cy cells signal tr	vtoskele ansduct	ion, second	ll Membra lary messer	ne, structure ngers.	of	
9. COUR	RSE OUT successful	COMES (CO) l course comple	: etion, learr	iers will deve	lop following attr	ibutes:							
COUI OUTCOM	RSE ⁄IE (CO)				A	ATTRI	BUTES						
CO	01	Develop an un	derstandin	g of the Cyto	skeleton, Microtul	bules, n	nicrofilamen	ts and C	ell Membr	ane			
CO	02	Distinguish be	tween the	cellular organ	ization of prokary	votic an	d eukaryotic	cells					
CO	03	Would have de	eeper unde	rstanding of c	ell at structural ar	nd funct	ional level.						
CO)4	Would have be	road knowl	edge on the r	nolecular interacti	ion betw	veen cells.						
CO)5	Would demon	strate a cle	ar understand	ing of the signal t	ransduc	tion, second	ary mes	sengers.				
10. Unit	wise detai	ed content											
Unit-1		Number of lectures = 08 Title of the unit: Introduction and tools of cell biology:											
Prokaryo	tic (archae	a and eubacter	ia) and euk	aryotic cells	(animal and plant	cells), l	Light micros	copy, pl	nase contra	st microsco	opy Fluoresc	ence	
microscop	by, confoc	al microscopy,	electron m	icroscopy.									
Unit-2	1	Number of le	ctures = 08	3	Title of the unit:	Intrac	ellular orga	nizatio	n El il		6 1 1 1	1	
Cell Me	strane a	nd Permeabilit	ty: Chemic	cal component	its and organizat	101 OF	biological r	nembra	nes, Fluid	Mosaic N	10del and m		
transport.	Structure	and functions of	organette	es, nucleus, E	R, Golgi, Lysoson	ne, mu	chondria, ch	·	sts and perc	oxisomes. A	Zenweger sy	narome.	
Unit-3	and organ	Number of lect	ures = 08	Intermediate	filement proteins	. Cytos	keleton prot	eins an	d protein t	argeting	ization		
Organiza	tion and m	nzation of actin	is and flog	alla Concont	of protoin torgeti	, MICIC	nuouies. asse	anory a		ulai organ	ization.		
Unit-4		Number of le	ta and mag		Title of the unit:	Cell w	all. extrace	lular m	atrix and	cell signal	ing		
Prokaryo	otic and eu	karyotic cell w	all, cell ma	atrix proteins.	Cell-matrix intera	actions	and cell-cell	interact	tions. Adhe	rence junc	tions, tight j	unctions,	
gap juncti	ons, desm	osomes, hemid	esmosome	s, focal adhes	ions and plasmod	esmata.	Basics of sig	gnal tra	nsduction,	Role of cA	MP, G-prote	eins and	
inositol pl	hosphates	in signal transd	luction.		-			-			-		
Unit-5		Number of le	ctures = 08	3	Title of the unit:	: Cell c	ycle						
Cell deat brief outlir	th and cell ne.	renewal: Euka	ryotic cell	cycle, restrict	ion point, and che	eckpoin	ts. Cell divis	ion: Mi	tosis and M	leiosis. Ap	optosis and 1	necrosis -	
11. CO-	PO mapp	ing											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7		PSO1	PSO2	PSO3	PSO4	
CO1	3	1					1	1					
CO2	3	1					1	1					
$CO\overline{3}$	3	1					1	1					
CO4	3	1					1	1		2			
CO5	3	1	1 1 1 .										
BS242	3	1					1	1		0.4			
	L		I I										

3: Strong contribution, 2: Average contribution, 1: Low contribution

12. Books recommended:

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0- 87893300-6.

2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J., W.H. Freeman & Company (New York), ISBN:13:9781-4641-0981-2 / ISBN:10: 1-4641-0981-8.

3. Molecular Biology of the Cell (2008) 5th ed., Alberts, B., Johnson, A., Lewis, J., and Enlarge, M., Garland Science (Princeton), ISBN:0-8153-1619-4 / ISBN:0-8153-1620-8.

4. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.

5. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

			ليتع										
B.Sc. BIOCH	HEMIS	STRY 2 nd y	year 3 rd semes	ster									
1. Name of the	he Dep	artment:	Biosciences										
2. Course Na	nme	FU	JNDAMENT.	ALS OF BIO	INFORMA	TICS		L		Т	Р		
3. Course Co	ode	:	BS243					3		1	0		
4. Type of C	ourse ((use tick m	ark)		Core (\checkmark)		Found	lation	Course ()	Depa	rtmental Elec	tive ()	
5. Pre-requise any)	site (if	10	+2 with Biolo	gy	6. Frequenc tick marks)	y (use	Even	0	Odd ($$)	Either Sem ()	Every Ser	m ()	
7. Total Nun	iber of	f Lectures,	Tutorials, Pr	acticals									
Lectures = 3	0				Tutorials =	10	Pract	ical = (00				
8. COURSE	OBJE	CTIVES:	The objective	of this course	is to develop	the unders	standing	g of ba	sic practica	l techniques o	f bioinformati	cs.	
biological dat	tabase	and will be	able to apply	these methods	s to research	problems.							
9. COURSE	OUT	COMES (O	C O):										
After the succ	essful	course con	npletion, learr	ers will devel	lop following	g attributes.	:						
COURSE OUTCOME (CO)					ATTR	IBUTE	S					
CO1	Fo pi	ormulate a rotein sequ	nd justify appr ence data.	opriate choice	es in technolo	ogy, strateg	y, and a	analysi	s for a rang	e of projects i	nvolving DNA	A, RNA, or	
CO2	D re	Develop pipelines of analysis tools to analyze real-world biological data sets, and show familiarity with the syntax and options required to generate meaningful interpretations.											
CO3	A sŗ	Analyze an analytical approach for efficiency, robustness and correctness and explain the importance of these to non-specialist colleagues.											
CO4	E	xplain com	mon methods	and application	ons for analy	sis of gene	or prote	ein exp	ression.				
CO5	U	se data vis	ualization soft	ware to effect	ively commu	inicate resu	lts.						
10. Unit wise	e detail	led content	t										
Unit-1]	Number of	f lectures = 08	3	Title of the	unit: Intro	duction	n to Bi	oinformati	ics Genesis			
Definition ar	nd need	l of Bioinfo	ormatics, Brief	history of bio	ological datal	oases, Inter	nationa	l nucle	otide datab	ases (e.g., Ge	n Bank, Europ	bean	
Molecular Bi	ology I	Laboratory	(EMBL), I	Bio informatio	on and DNA	Data Banl	k of Jap	oan (D	DBJ) Cente	er), Internatio	nal Nucleotide	e Sequence	
Database Coll	aborati	ion (INSDO	C).										
Unit-2]	Number of	f lectures = 08	8	Title of the	unit: Prote	ein Data	abases	Introduct	ion to structu	iral elements	of proteins	
Classification	n of pro	otein datab	ases (e.g., prir	nary, seconda	ry, and comp	osite datab	ases), E	Brief ov	verview of 1	ExPASy (Exp	ert Protein An	alysis	
System) bioin	format	ics resourc	e portal, Prote	in 3D structur	al databases	(e.g., RCSI	B-PDB	(Resea	rch Collab	oratory for St	ructural Bioinf	formatics	
Protein Data H	Bank),	and MMD	B (Molecular l	Modeling Data	abase) of NC	BI).							
Unit-3	N	umber of	lectures = 08		Title of the	unit: Biolo	gical F	ile For	mats and	Literatures D	atabases		
Brief overviev	v of bio	ological see	quence and 3D	structure file	formats (e.g	GenBank	d GenPe	ept. EN	1BL. FAST	A. PIR. and F	PDB), NCBI's	literature	
databases (e.g	PubN	Med. PubM	led Central. Pu	bChem Proje	ct (e.g., PubC	Chem Com	bound.	Substa	nce and Bio	bassav databas	ses). and OMI	M (Online	
Mendelien Inh	neritano	ce in Man)	database		(18)		[, .						
Unit-4	1	Number of	f lectures – OS	2	Title of the	unit• Data	hase Si	milari	ty Searchi	ng and Phylo	genetics		
Requirements	of data	abase searc	hing BLAST	(Basic Local	Alignment S	earch Tool) algorit	thm St	atistical sig	nificance and	variants of B	LAST	
FASTA algori	ithm ar	nd its statis	tical significar	ce Comparis	on of BLAS	Γ and $F\Delta S'$	$\Gamma \Delta Bri$	ef Ove	rview of pl	vogenetic and			
Unit-5		Number of	f lectures – 08		Title of the	unit. Com	nuter A	ided I	Drug Desig	n	ury 515		
Introduction to	n drug	discovery	drugs derived	from natural	products exi	sting drugs		urce fo	r new drug	discovery sc	reening for ne	w drug	
leads modern	ration	al annroach	to drug desig	n docking an	d virtual scre	ening arags	ef overv	view of	online data	abases of Liga	ands and Drug	e arag	
	nannin		r to and acong	ii, uooning ali		ening. Dire		10 10 01	Sinne add		and und Drug		
11.00101	паррш	5											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	I	PO7	PSO1	PSO2	PSO3	PSO4	
CO1	3	1				2			1	3			

CO2	3	1				2		1	3	
CO3	3	1				2		1	3	
	3	1				2		1		
CO4									3	
CO5	3	1				3		1	3	2
	5	1				5		1		
	3	1								
BS243						2		1	3	0.4
			3: Stron	g contribution	n, 2: Averag	e contributio	n , 1: Low	contributio	n	
12. Books re	comm	ended:								
1. Protein Bio	informa	atics: From	Sequence to F	Function, Acad	lemic Press,	2011, ISBN 01	123884241	, 978012388	34244.	

 Essential Bioinformatics, Cambridge University Press, 2006, ISBN 113945062X, 9781139450621
 Kerns EH, Di L. Drug-Like Properties: Concepts, Structure Design and Methods: from ADME to Toxicity Optimization, Academic Press, Oxford, 2008

B.Sc. BIO	CHEMISTR	Y 2 nd yea	r 3 rd seme	ster											
1.Name of	the Departr	nent: Bios	ciences						-						
2.Course	Name	PHYS	IOLOGY	LAB COU	JRSE			L	Т		Р				
3.Course	Code	BS244						0	0		6				
4.Type of	Course (use	tick mark	()	Core (√)			Foundati	on Course ()	Depart	tmental l	Elective()				
5.Pre-requ	uisite (if any)	Biolog	yith y	6.Freque	ency(use tick mar	ks) E	Even ()	Odd ($$)	Either Sei	m() E	very Sem()				
7.TotalNu	mberofLect	ires,Tutoi	rials, Prac	ticals											
8 COUL	Lecture SE OBJEC	es=00 TIVES, 7	The object	ive of this	Tutorials=00	alon th	o undorst	anding of the	Practical=	=10	ions of the				
biological	systems	11 (1.5. 1	ine object	Ive of this	s course is to dev	ciop in	e understa	and ing of the	physiologi	cai funct	ions of the				
9. COUR	SE OUTCO	MES (CO)):												
After the su	iccessful cou	rse compl	etion, lear	ners will d	evelop following a	ttribute	s:								
COURSE (OUTCOME CO)					ATTR	IBUTES								
(CO1 Determination of osmotic potential of plant cell sap by plasmolytic method.														
(CO2To study the effect of two environmental factors (light and wind) on transpiration.CO3To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.														
(CO3 To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.														
	<u>204</u> 205	Estima	Estimation of hemoglobin.												
10 Syllaby	CO5 Measurement of blood pressure														
10.5ynabt	15 vn_01	Determ	nination of	osmotic p	otential of plant ce	ll can hi	z plasmoly	utic method							
E	xp-01	To stud	ly the effe	ct of two e	nvironmental facto	rs (ligh	t and wind	the method. (1) on transpirat	tion by exci	sed twig.					
E	xp-03	To stud	ly the effe	ct of light i	intensity and bicar	oonate c	oncentrat	ion on O2 evol	lution in pho	otosynthe	esis.				
F	xn-04	Estima	tion of hae	moglobin											
E	xp-05	Measu	rement of	blood press	sure										
11. CO-P	0 mapping			1											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4				
CO1	3	3	1			2	3	1							
CO2	3	3	1			2	3	1							
CO3	2	2	1			2	2	1							
	3	3	1			2	3	1							
CO4	3	3	1			2	3	1							
CO5	3	3	1			3	3	1		2					
BS244	3 3	\$	1			2	3	1		0.4					
	· · · ·	3:	Strong co	ntribution	, 2: Average cont	ribution	n , 1: Low	contribution	· · · ·						
12. Books	recommend	ed:													

B. Sc. BIO	CHEMIS	STRY	Z 2 nd	year/ 3 ^r	^d semest	ær										
1.Name of	the Depa	rtme	nt: I	Bioscien	ces											
2. Course I	Name		CI	ELL BIC	DLOGY	& GENET	FICS LAB			L	Т		Р			
3. Course	Code		BS	206						0	0		6			
4. Type of	Course (u	ıse tic	ek m	ark)		Core $()$)		Found	ation Course	e () Departm	enta	l Elective()			
5.Pre-requ	uisite (if	any)	10-	+2 with	Biology	6.Freque	ency(use t	tick mark	s) Even	() Odd ($$) Either Sem	()	EverySem()			
7.TotalNu	mberofLo	ecture	es,Ti	utorials,	Practica	ıls										
		ctures	5=00			6 (1)	Tutoria	ls=00	1	(Practical=1)	1 111 (11)			
8. COUKS	SE OBJE		v ES: nide	: The of	bjective	Of this co veast Cell	division	develop t	he unders	tanding of us	studies Chron	er ar	id calibration,			
chromoson	nes. Karvo	otvne	anal	vsis – wi	ith the he	elp of slide	s and how	to make B	lood smea	r – differentia	l staining and B	licca	l smear – Barr			
bodies.		, ., p .		<i>j</i> ⁰¹⁰		-ip of shoe	5 und 110 m		1000							
9. COURS	E OUTCO	OME	S (C	:O):												
After the su	ccessful o	course	e cor	mpletion	, learner	s will deve	lop followi	ing attribu	tes:							
COURSE								ATT	RIBUTES	5						
(<u>20)</u> 201		Com	nprehend the use of Micrometer and calibration, measurement of cells.												
				e knowledge and can evaluate Cell division: Mitosis and meiosis												
(202		Have	re knowledge and can evaluate Cell division: Mitosis and meiosis												
(203	4	Anal	yze Chro	omosome	es.										
	CO4]	Have	e knowle	dge of ty	pes of chro	omosomes	as polyten	e chromos	omes						
0	205]	Mak	e and ana	alyze Blo	ood smear -	– differenti	al staining	, Buccal si	near – Barr bo	odies					
10.Syllabu	IS															
E	xp-01	l	Jse c	of Microi	neter an	d calibratio	on, measure	ement of or	nion epide	rmal cells and	yeast.					
E	xp-02	C	Cell	division:	Mitotic	and meioti	c studies in	i grasshopp	per testes,	onion root tips	s and flower bud					
E	xp-03	C	Chro	mosome	s: Mount	ting of poly	tene chron	nosomes								
E	xp-04	E	Bucc	al smear	– Barr b	odies										
—	xp-05	ŀ	Kary	otype and	alysis – v	with the he	lp of slides									
E	xp-06	S	Study	y of poly	tene chro	omosomes	by slides									
E2 11 CO PO	xp-07	E	51000	a smear -	- antere	ntial stainir	1g									
		DO	2	DO3	DO4	PO5	D O6	PO7	DSO1	DSO2	DSO3					
	3	3	2	1	FU4	105	FUU	3	3	1	1505		1504			
CO1 CO2	3	3		1				3	3	1		-				
CO3	3	3		$\begin{array}{c c c c c c c c c c c c c c c c c c c $												
CO4	3	3		1 3 3 1 3												
CO5	3	3														
BS206	3	3		1				3	3 1				1			
		1	I	3: Stro	ng conti	ribution, 2	: Average	contributi	on , 1: Lo	w contributio)n					

			B.	<mark>Sc. BIO</mark>	CHEMIST	RY II g	year 4 ^{rt}	^h semeste	r				
1. Name of	the Depa	artment: Bio	sciences										
2. Course N	lame	Enzyı	nes & Hormo	ones			L		Т	Р			
3. Course C	Code	BS251	1				3		1	0			
4. Type of	Course (ı	ise tick marl	x)		Core ($$)		Fou	Indation	Depa	artmental E	lective ()		
5. Pre-requ	isite (if	10+2	with Biology		6. Frequency (use	Even (Odd ()	Either Sem ()	Eve	ery Sem ()	
any) 7 Total Nu	mbor of	Loctures Tu	torials Proof	icole	tick marks))	v v			-		
7. Total Nu	30	Lectures, ru	1011415, 1140	icais	Tutorials – 1(Practic	al – 00					
8 COUPSI	JU F OB IE(TIVES. The	objective of t	his course	$\frac{1}{1}$ $\frac{1}$, no undo	retonding	$a_1 - b_2$	conts of onzumo	and hormon	00 0070/00	20	
kinetics.		211 V E.S. 1110			is to develop u		Istanung	g of the con	cepts of enzyme		cs chizyn	ic .	
9. COURSI	E OUTC	OMES (CO)	:										
After the suc	ccessful c	ourse comple	etion, learners	will deve	lop following a	ttribut	es:						
COUR	SE					۸ТТ	PRINTI	FS					
OUTCOM	E (CO)					AII		20					
CO1	H	Hormones: cla	assification, st	ructural fe	atures & function	ons in l	Plants: au	ixins, gibbei	ellins,				
CO2	ł	Hormones and	their function	ns secreted	l by endocrine g	glands							
CO3	(General prope	rties and mod	es of actio	ns of enzymes.								
CO4	F	Activation ene	ergy and thern	nodynamic	cs of enzyme ac	tion.							
CO5	0	Classification	of proteases v	vith their r	nechanism of a	ction.							
10. Unit wis	se detaile	ed content	content										
Unit-1		Number of l	Image: Number of lectures = 08 Title of the unit: General properties and modes of actions of enzymes										
Criteria of	purity of	enzymes Spe	cific activity. l	Enzyme ui	nits-Katal and I	U. Che	emical nat	ture of enzy	mes. Protein nat	ure of enzyn	nes and N	lon	
protein enzy	mes- Rib	ozymes and I	ONAzymes .A	ctivation e	energy and therr	nodyna	amics of e	enzyme acti	on. Classificatio	on of protease	es with th	eir	
mechanism o	of action							_					
Unit-2		Number of	ectures = 08		Title of the un	it: Enz	zyme Kin	netics	x 11				
Enzyme Ki	netics, Bi	riggs-Haldane	e steady state a	approach,	methods for the	detern	nination of	of Km and V	max normalized	d initial rate	equation	and	
normalized o	curves. Ei	nzyme inhibit	ion and activa	tion, Effec	et of enzymes co	oncenti	ration, pH	and tempe	rature on kinetic	s of enzyme	reactions	S.	
Unit-3	I	Number of le	ctures = 08		Title of the un	it: Vit	amins						
Structure, s	ource, bi	ochemical rol	e and deficien	cy disease	e: Fat soluble vit	tamins	A, D & V	Water solub	le vitamin – B1,	B2, niacin,	pyridoxin	ie,	
Tolic acid, B	12 and C												
Unit-4		Number of l	lectures = 08		Title of the un	it: Pla	nt Horm	ones					
classificatio	on, struct	ural features &	& functions in	Plants: au	ixins, gibberellin	ns, cyto	okinins, e	thylene, and	l abscisic acid				
Unit-5		Number of l	lectures = 08		Title of the un	it: Ani	imal Hor	mones					
Hormones an	nd their f	unctions secre	eted by endocr	ine glands	s: Hypothalamu	s, pitui	tary gland	d- anterior p	ituitary and pos	terior pituita	ry; thyroi	d	
gland; adren	al gland;	Pancreas; goi	nads.										
11. CO-PO) mappin	g											
COs	PO1	PO2	PO3	PO4	PO5	P	06	PO7	PSO1	PSO2	PSO3	PSO4	
CO1	3	1						1		2	2		
CO2	3	1						1		3		3	
CO3	3	1						1		3			
CO4	3	1						1		3			
CO5	3	1		2	3			1		3		1	

BS251	3	1		0.4	1.8		1		3	0.4	0.8
			3: Strong	contributio	on, 2: Average	contribution ,	1: Low con	tribution	•		L
13. Books	recomm	ended:									
1) Lehning	er, AL "P	rinciples of	Biochemistry".								
2) Lubert S	tryer "Bic	chemistry"									
3) Voet & V	Voet "Bio	chemistry".									
4) Shuler "	Bioproces	s Engineeri	ing".								
5) Alan Fe	rsht "Enz	yme Structi	ure and Mechani	sm".							
6) David S.	Sigman,	Paul S. Sig	man "The Enzyr	nes: Mecha	nisms of Catal	ysis".					
7) Palmer	'Enzymes	s" Dixon &	Webb "Enzyme	s.							
8) Vander's	Human I	Physiology	(2008) 11th ed.,	Widmaier,	E.P., Raff, H.	and Strang, K.T	. McGraw H	Hill International	Publications	, ISBN: 9	978-0-
07-128366-	3.					-					

9) Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc. ISBN: 978-81-317-2610-5.

B.Sc. BI	OCHEM	ISTRY	<mark>ll year</mark> 4	l ^{rth} semester										
1. Name	of the D	epartme	nt: Bios	ciences										
2. Cours	se Name		MOI	LECULAR I	BIOLOG	Y	L	1			Т	Р		
3. Cours	se Code		BS21	2			3				1	0		
4. Type	of Cours	e (use tic	k mark	.)		Core ($$)		Found	lation	De	partmental Ele	ctive ()	
5. Pre-re	equisite (if any)	10+2	with Biolog	y	6. Freque marks)	ency (use	e tick	Even (√	Odd ()	Either Sem ()	Every S	5em ()	
7. Total	Number	of Lectu	res, Tu	torials, Prac	ticals									
Lecture	s = 30					Tutorial	s = 10		Practica	= 00				
 8. COUI split gen Lap oper 9. COUI 	RSE OBJ e, DNA r con and in RSE OUT	ECTIVI eplication Eukaryo	ES: The n and Tr otes by T S (CO):	objective of anscription, ' Trp operon.	this cour Franslatio	se is to dev on, Post tra	velop the	understan and trans	nding of Co criptional	oncept of nechanis	f gene, pseu sm, Gene ex	do gene, cryptic pression in prok	gene and aryotes using	
Ajter ine	successfi	u course	comple	tion, learner	s will ae	velop jollo	wing alli	idules:						
OUTCO	ME (CO)					A	ATTRIBU	UTES					
C	01	Concep	t of gen	e, pseudo gei	ne, crypti	c gene and	split gei	ne						
C	D2 DNA replication and regulation in prokaryotes and eukaryotes D3 Transcription in prokaryotes and eukaryotes. Translation in prokaryotes and eukaryotes.													
С	03	Transcription in prokaryotes and eukaryotes, Translation in prokaryotes and eukaryotes Post translation and transcriptional mechanism.												
C	04	Post translation and transcriptional mechanism.												
C	O5 Gene expression in prokaryotes using Lap operon and in Eukaryotes by Trp operon.													
10. Unit	wise det	ailed con	tent											
Unit-1		Numb	oer of le	ctures = 08		Title of th	ne unit: (<mark>Central I</mark>	Dogma of 1	Molecula	ar Biology			
Organiz	ation of C	Genetic N	faterial:	split genes, o	overlappi	ng genes; j	pseudo g	enes, cryp	ptic genes,	Insertion	n elements a	nd transposons.	Gene	
organizat	ion and e	xpression	n in Mite	ochondria and	d Chloro	plast			lication					
Drokary	otic and I	- Numi	c Enz	$\frac{ctures = 08}{vmes and pro}$	toins inv	olved in re	nlication	DNA Kep Theta m	odel and F	Colling c	ircle model			
Unit 3		Numbe	$\mathbf{r} = \mathbf{L} \mathbf{n} \mathbf{z}$	turos = 08		Title of th	pileation	Francari		connig e	freie moder.			
Transcri	intion in r	rokarvot	es and F	Fukarvotes: N	lechanis	m Promote	ers and R	NA poly	merase tra	nscriptio	n factors P	ost-transcription	al	
modificat	tions of e	ukarvotic	mRNA	Jukaryotes. I	lechanis	in, i tomot	cis and i	uni poly	merase, tre	insemptio	ni ideitois, i	ost transcription	ai	
Unit-4		Numb	per of le	$\frac{1}{\text{ctures}} = 08$		Title of th	ne unit: (Genetic c	ode					
Properti	es and W	obble hy	pothesis	. Translation	: Mechar	nism of trar	nslation i	n Prokary	votes and E	ukaryote	es, Post-tran	slational modifie	cations of	
proteins.														
Unit-5		Numb	oer of le	ctures = 08		Title of th	ne unit:]	Regulatio	on of Gene	express	ion:			
Regulati	on of Ger	ne expres	sion in H	Prokaryotes:	Operon c	oncept (La	c), Regu	lation of	Gene expre	ession in	Eukaryotes	transcriptional	activation,	
galactose	metaboli	sm in yea	ast											
11. CO-	PO mapp	oing												
Cos	PO1	PO2	PO3	PO4	PO	95	PO6	PO7	PSC)1	PSO2	PSO3	PSO4	
CO1	3	1						1	2		2			
CO2	CO2 3 1 2 1 3 3													
CO3	3	1		2				1	3					
CO4	CO4 3 1 3													
CO5	CO5 3 1 3 1													
BS212	5	1		0.4	1						0.4	0.8		
10 0				5: Strong co	ontributi	ion, 2: Ave	erage con	ntributio	n, I: Low	contrib	ution			
12. Book	ks recom	mended:												

- 1. Howe.C. (1995) Gene Cloning and manioulation, Cambridge University Press, USA
- 2. Lewin, B., Gene VI New York, Oxford University Press.
- 3. Sambrooket al (2000) Molecular cloning Volumes I, II, & III Cold spring Harbor Laboratory Press, New York, USA
- 4. Walker J.M. and Gingold, E.B. (1983) Molecular Biology & Biotechnogy (Indian Edition) Royal Society of Cemistry U.K
- 5. Karp.G (2002) Cell & Molecular Biology, 3rd Edition, John Wiley & Sons; INC.

B.Sc. BIO	CHEMIST	RY ll year	4 ^{rth} semeste	r									
1. Name of	f the Depai	rtment: Bio	sciences										
2. Course	Name	CLI	NICAL BIC	CHEMIS	STRY		L		Т	Р			
3. Course	Code	BS2	52				3		1	0			
4. Type of	Course (us	se tick mar	k)		Core ($$)	Fou	ndation Cou	ırse ()	Depart	mental Elec	ctive ()		
5. Pre-req	uisite (if ar	ny) 10+2	2 with Biolog	gy	6. Frequency (tick marks)	(use Even	(1)	Odd ()	Either Sem ()	Every S	Sem ()		
7. Total N	umber of L	lectures, Tu	itorials, Pra	cticals									
Lectures =	= 30				Tutorials = 1() Practi	cal = 00						
8. COURS	SE OBJEC	TIVES: The	e objective of	f this cour	se is to develop	the understan	ding of basic	concepts	s of clinical bio	chemistry, T	Го		
understand	l disorder re	lated with b	io molecules	metabolis	sm.								
9. COURS	SE OUTCO	MES (CO)	:										
After the su	iccessful co	ourse compl	etion, learne	rs will dev	elop following	attributes:							
COUI OUTCOM	RSE IE (CO)					ATTRIB	U TES						
CO)1	Anticoagula	ant preservat	ives for bl	ood and urine. 7	Fransport of s	pecimens.						
CO	02	Compositio Bleeding tii	n and their for me, Prothrom	unctions, A	Anemia:- classif RBC count, WI	fications, erytl BC count,	nrocyte indic	es. Blood	l coagulation s	ystem, Clotti	ing time,		
CO	3	Oral glucos	e tolerance to	est in norn	hal and diabetic	condition.							
CO	94	Cholesterol	: Factors affe	ecting bloc	od cholesterol le	evel. Dyslipop	roteinemia, a	atheroscel	lorosis, risk fac	ctor and fatty	v liver.		
CO	CO5 Metabolism of bilirubin, jaundice - types, differential diagnosis. Liver function test – Icteric index, Vandenberg test, plasma protein changes.												
10. Unit w	vise detailed	l content							-				
Unit-1		Number of	$\frac{1}{1}$ lectures = 0	8	Title of the un	it: Basic con	epts of Clin	ical Bioc	hemistry:				
A Brief re	eview of uni	ts and abbre	eviations used	1 in expres	sing concentrat	ions and stand	lard solution	s. Specin	ten collection a	and processing	ng		
(Blood, uri	ne, feces). A	Anticoagular	nt preservativ	es for blo	od and urine. Tr	ransport of spe	ecimens.						
Unit-2		Number of	lectures = 0	8	Title of the un	it: Hematolo	gy: Blood		<u> </u>				
Compositi Prothrombi Thalassemi	ion and thei in time, RB0 a.	r functions, C count, WI	Anemia:- cla 3C count, Pla	assification atelet coun	t, Differential c	ount, determi	l coagulation nation of Hb	system, 0 , PCV and	d ESR. Hemog	Bleeding tim lobinopathie	le, es,		
Unit-3	Ν	Number of l	ectures = 08		Title of the un	it: Carbohyd	rate metabo	olism					
Regulation	n of blood s	ugar, Glyco	suria-types o	of Glycosu	ria. Oral glucos	e tolerance te	st in normal	and diabe	tic condition.				
Diabetes r	nellitus and	Diabetic in	sipidus - hyp	oglycemia	a, hyperglycemi	a. Ketonuria,	ketosis.						
Unit-4		Number of	lectures = 0	8	Title of the un	it: Lipid met	abolism						
Lipid and	lipoprotein	s: Classifica	tions, compo	sition, mo	de of action. Ch	nolesterol: Fac	ctors affectin	g blood c	holesterol leve	1.			
Dyslipopro	teinemia, a	theroscleros	sis, risk facto	or and fat	ty liver. Involv	ement of enz	ymes in dia	gnostics	of heart diseas	se including	aspartate		
transaminas	se. isoenzvr	e. isoenzymes of creatine kinase and lactate dehydrogenase and troponin.											
Unit-5	, , , , , , , , , , , , , , , , , , ,	Number of	lectures = 0	8	Title of the un	it: Liver fund	tion test M	letabolis	m of bilirubin	, jaundice			
Types, dif	ferential dia	agnosis. Liv	er function te	est - Icteri	c index, Vanden	berg test, pla	sma protein o	hanges. l	Renal function	test: Clearar	nce test-		
Urea. Creat	tinine. Int	ilin. Para- a	minohippurid	e acid (PA	H) test. Concer	ntration and d	ilution test.	Enzymol	ogy: Clinical s	ignificance	of SGOT.		
SGPT ALL	P ACP CP	K and LDH							56 5 7. emiliar s	-8			
11. CO-P	\mathbf{O} mapping												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4		
CO1	3	1					1	2	2				

CO2								3		3			
002	3	1					1						
CO3								3					
000	3	1					1						
CO4								3					
004	3	1					1						
~~ -								3		1			
C05	3	1		2			1						
D G 252								3	0.4	0.8			
BS252	BS252 3 1 0.4 0.3												
	3: Strong contribution, 2: Average contribution , 1: Low contribution												
12. Book	12. Books recommended:												
1. Medical Biochemistry by MN Chatterjee, Rana Shinde, 8 edition, 2013, Jaypee publications.													
2. Textbook of Medical Laboratory Technology by Praful B. Godkar and Darshan P. Godkar th													
3. Medical	Laboratory	Technology	by Ramnik s	sood. 5 Editio	n. 1999. Javı	bee publishers							

Medical Laboratory Technology by Ramnik sood, 5 Edition, 1999, Jaypee publishers.
 Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. JohnWiley-Liss Inc. Publication.

5. Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi.

B.Sc. BI	OCHEMI	STRY 2 ⁿ	^d year 4 ^{rth}	semester									
1. Name	of the Dep	partment	: Bioscien	ces									
2. Cours	e Name	F	UNDAME	NTALS OF I	PLANT B	IOCHEMIS	TRY	L		Т	Р		
3. Cours	e Code	B	S253					3		1	0		
4. Type	of Course	(use tick	mark)		Core	(√)		Foundat	ion	Departmer	tal Elective ()		
5. Pre-re any)	equisite (if	10	0+2 with B	iology	6. Fre marks	quency (use 5)	tick	Odd () Either	: Sem ()	Every Sem ()		
7. Total	Number o	f Lecture	es, Tutoria	ls, Practicals									
Lectures	s = 30				Tutor	rials = 10		Practical =	00				
8. COUL	RSE OBJE	ECTIVES	S: The obje	ctive of this c	ourse is to	develop the	understandin	g of carbon a	assimilation, r	espiration a	nd nitrogen		
	SIN, terpeno RSF OUT	COMES	$(\mathbf{CO}) \cdot \mathbf{Aft}$	or the success	ful course	class, biologi	learners wi	s of terpenoid	ls. Concept of lowing attrib		ns.		
		COMES	(00). Aji	er me success	juicourse	completion,		ii aevelop joi		uics.			
OUTCO	ME (CO)					А	TTRIBUTI	ES					
C	01	Overvie	w of glyco	lysis, Alterna	tive reaction	ons of glycoly	ysis, Fate of	pyruvate, Re	gulation of				
C	02	Plant gr	owth regul	ators – salicy	ic acid, po	lyamines, bra	assinosteroid	ls.					
C	03	Classifi	cation of te	erpenoids and	representa	tive example	s from each	class, biologi	cal				
C	04	Concept	t of phytoa	lexins.									
C	05	Plant ho	ormones an	d their effect	on plant gr	owth and dev	velopment						
10. Unit	wise detai	led conte	ent	aa 00	T:41	£ 4h a)	~ • ~					
Photosyn	thesis and	and Carbon assimilation: Structure of PSI and PSII complexes, Light reaction, Cyclic and non cyclic Photophosphorylation,											
Calvin cy	cle and rec	l regulation; C4 cycle and Crassulacean acid metabolism (CAM), Photorespiration.											
Unit-2	cic and reg	Number of lectures = 08 Title of the unit: Respiration											
Respirati	on: Overvi	iew of gly	colysis, A	Iternative reac	tions of gl	ycolysis, Fate	e of pyruvate	e, Regulation	of plant glyco	olysis, TCA	cycle, oxidative		
phosphor	ylation and	l electron	transport s	ystem.	0.			, C	1 01		•		
Unit-3		Number	of lecture	s = 08	Title o	of the unit: N	Nitrogen me	tabolism					
Nitrogen Nitrate as	metabolis ssimilation	m: Biolog	gical Nitrog and Nitrite	gen fixation by reductase.	free livin	g and in sym	biotic associ	ation, structu	re and function	on of enzy m	e Nitrogenase.		
Unit-4		Numbe	r of lectur	es = 08	Title o	of the unit: C	Cell wall & r	lant hormo	nes				
Cell wall	structure a	and plant	growth Re	gulation: Con	ponents ai	nd structure of	of plant cell	wall. Plant ho	ormones and t	heir effect o	on plant growth		
and devel	opment, R	egulation	of plant m	orphogenetic	processes l	by light. Plan	nt growth reg	ulators – sali	cylic acid, po	lyamines, b	rassinosteroids.		
Unit-5	1 /	Numbe	r of lectur	es = 08	Title o	of the unit: S	econdary m	etabolites	J /1	,			
Secondar	ry metabol	ites: Repr	esentatives	alkaloid grou	p and their	r amino acid	precursors, f	function of al	kaloids, Exan	nples of ma	jor phenolic		
groups; si	imple phen	ylpropan	oids, flavoi	noids, tannins	and lignin	, biological r	ole of plant j	phenolics, Cl	assification of	f terpenoids	and		
representa	ative exam	ples from	each class	, biological fu	nctions of	terpenoids. C	Concept of p	hytoalexins					
11. CO-l	PO mappi	ng											
COs	PO1	D1 PO2 PO3 PO4 PO5 PO6 PO7 PS01 PS02 PS03 PS04											
CO1	3	3 1 1 2 2											
CO2	3	3 1 1 3 3											
CO3	3	1	2				1		3				
CO4	CO4 3 1 1 3												
CO5	COS 3 1 1 3 1												
BS253	3	1	0.4				1		3	0.4	0.8		
			3: St	trong contrib	ution, 2: A	verage cont	tribution , 1	: Low contri	bution -	1			

12. Books recommend	led:
1. Taiz, L., Zeiger, E.,. P	lant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Hune	r, N.P.,. Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3 Bajracharya, D.,. Expe	riments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Frank B. Salisbury, C	leon W. Ross: Plant Physiology. Wadsworth Publishing Company

B. Sc. BI	. Sc. BIOCHEMISTRY 2 nd year/ 4 th semester Name of the Department: Biosciencess														
1. Name	of the D	epartment	: Bioscien	cess											
2. Course Nam	e Ie	МЕТАВО	LISM				L			Т	ŀ				
3. Course Code	e e	BS201					3			1	0				
4. Type o	of Cours	e (use tick	mark)		Core	e(√)		Four	ndatio	on Course	() Depa	rtmental Elective ()			
5. Pre-								Ev				Every			
requisite	(if	10+2 with 1	Biology		6. Fre	equency (use ti	ck marks)	en	Oc	$\operatorname{Id}(\sqrt{)}$	Either Sem	() Sem ()			
any) 7 Totol N	Jumbor	of Looturo	a Tutoria	la Dreaticala				()							
7. Total I	= 30	of Lecture	s, 1 utoria	us, Fracticais	Tuto	rials = 10		Prac	tical =	= 00					
8 COUR	<u>= 50</u> SE OBJ	IECTIVES	• The obje	ective of this co	ourse is to a	levelop the und	erstanding	of char	acteri	stics of Er	zvmes enz	vme inhibition and			
kinetics, c	carbohy	lrate metabo	olism, sign	ificance of gly	colysis and	d ETC, untreate	d diabetes,	lipid n	netabo	lism and p	production c	f ketone bodies,			
protein m	etabolis	m, role of u	rea cycle a	and errors of p	rotein meta	bolism, biosynt	hesis and d	legrada	tion o	f purine ai	ıd pyrimidir	ie			
9. COURS After the si	SE OUT uccessfu	COMES (C al course co	CO): mpletion,	learners will d	levelop fol	lowing attribute	es:								
COU	COURSE ATTRIBUTES														
OUTCOM	ATTRIBUTES CO1 Understand the characteristic of Enzymes, enzyme inhibition and kinetics														
CO	1	Understand	d the chara	acteristic of En	zymes, enz	yme inhibition	and kinetic	cs							
CO	2	Know the	basics of c	arbohydrate m	etabolism,	significance of	glycolysis	and ET	ГC, un	treated dia	ibetes				
<u> </u>	3	Know the	basics of L	Lipid metabolis	sm and pro	duction of ketor	e bodies			1:					
	5	Know the basics of Protein metabolism, role of urea cycle and errors of protein metabolism Know the biosynthesis and degradation of purine and pyrimidine													
10 Unit .	uico dot	Know the biosynthesis and degradation of purine and pyrimidine													
IU. UIII	wise uet	Number	ni of lecture	r = 08	Title	of the unit: En	zvmes								
Classificat	tion pro	perties and	factors inf	luencing enzy	me activity	coenzymes pr	osthetic gr	oun and	d co-f	actors Lo	ck & kev hv	pothesis induced fit			
hypothesis	s, Enzyn	ne kinetics:	Michaelis	Menten equat	ion, Linewe	eaver-Burk plot	, Enzyme i	nhibitic	on, Al	losteric en	zymes.	potnesis, induced in			
Unit-2		Number	of lecture	s = 08	Title	of the unit: Ca	rbohydrat	e meta	bolisı	n					
Glycolysis	s, TCA c	ycle, Electr	on Transp	ort Chain and	Oxidative j	phosphorylation	, Gluconeo	ogenesi	s and	Glycogen	metabolism				
Unit-3		Number o	f lectures	= 08	Title	of the unit: lipi	d metabol	ism							
Degradatio	on of fat	ty acids: 🗌	oxidation;	Ketone bodie	s, acidosis,	ketosis, cholest	erol synthe	esis.							
Unit-4		Number	of lecture	s = 08	Title	of the unit: pro	tein meta	bolism							
Urea Cycl	e, transp	ort of amm	onia, dean	nination and tr	ansaminati	on reactions. In	oorn errors	of prot	tein m	etabolism					
Unit-5	1	Number	of lecture	s = 08	Title	of the unit: Nu	cleic acid	metabo	olism						
11. CO-PC) mappi	ng	thesis and	degradation.											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS	01	PSO2	PSO3	PSO4			
CO1	3	1					2	í	3						
CO2	3	1				+ +	2		3	+					
CO3	3	1				+ +	2		3						
CO4	3	1				+ +	2		3	+	1				
C05	3	1	2			+ +	2			+	3	2			
BS201	3	1	0.4				2	2	.4	+	0.8	0.4			
			3.9	Strong contri	bution. 2.	Average contri	- bution . 1•		ontri	bution					
13. Book	s recom	mended:	0.1	on ong contra		- eruge contri	~ 4000 9 10	1011 0	SHUI	- anon					
TO: DOOM	s recom														

- 1.. Principles of Biochemistry- AlbertL. Lehninger CBS Publishers & Distributors
- Biochemistry Lubert stryer Freeman International Edition.
 Biochemistry Keshav Trehan Wiley Eastern Publications
- 4. Fundamentals of Biochemistry-J.L.Jain S.Chand and Company
- 5. Biochemistry- Prasaranga, Bangalore University
 6. Fundamental of Biochemistry Dr.A.C.Deb
- 7. Textbook of Organic Chemistry (A Modern Approach)
- 8. The Biochemistry of Nucleic acid Tenth Edition-Roger L.P.Adams, John T. Knowler and David P.Leader, Chapman and Hall Publications

B.Sc. BIC	B.Sc. BIOCHEMISTRY 2 nd year 4 ^{rth} semester 1.Name of the Department: Biosciences														
1.Name o	f the Depa	artment	Bioscience	es											
2.Course	Name		ENZYMO	DLOGY LA	AB			L		Т	Р				
3.Course	Code		BS255					0		0	6				
4.Type of	Course (use tick	mark)	С	ore(√)		Foundatio	on Course ()	De	partmenta	al Elective()				
5.Pre-req	uisite (if a	any)	10+2 with Biology	6.1 ma	Frequency(us arks)	e tick	Even (√)	Odd ()	Either	Sem ()	Every Sem()				
7.TotalNu	ımberofL	ectures,	Tutorials,P	racticals											
	Le	ectures=	00		Tut	orials=00			Pract	ical=10					
8. COURS	SE OBJE	CTIVES	: The objec	tive of this	course is to de	evelop the	understanding	g of the conce	pts of enz	zyme dynar	nics.				
9. COUR	SE OUTC	COMES	(CO):												
After the s	uccessful	course c	ompletion,	learners wi	ll develop foll	owing attr	ibutes:								
COURSE	OUTCO	ME						n							
(CO)					А	TTRIBUTES)							
(C O 1	Kn	ow how to i	solate enzy	me and deterr	nine enzyı	ne activity.								
	C O2	Kn	ow how to s	study the ef	fect of pH and	l temperati	ure on the enz	yme activity.							
(CO3	Kn	ow how to s	study the ef	fect of varying	g substrate	and inhibitor	concentratior	on the er	nzyme activ	vity				
	CO4	Know how to detect Amino acids by Paper chromatography and TLC. Know how to perform Poly Acrylamide Gel Electrophoresis (PAGE).													
	CO5	Know how to perform Poly Acrylamide Gel Electrophoresis (PAGE).													
10.Syllab	us	S													
E	2xp-01	Am	ino acid det	ections (Pa	per chromatog	graphy/ TI	<u>.C).</u>								
Ē	xp-02	Stu	dv of the eff	fect of pH of	on the enzyme	activity.	activity								
F		Stu	dy of the eff	fect of vary	ing substrate of	concentrati	on on the enz	yme activity a	and deterr	nination of	Km and				
F		Stu	dy of the eff	fect of temp	berature on the	e enzyme a	ctivity.	· ·							
F	- <u>r</u>	Stu	dy of the eff	fect of inhib	oitors on the e	nzyme act	ivity.								
F		Pol	y Acrylamic	le Gel Elec	trophoresis Te	echnique									
11. CO-F	O mappi	ng													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO1	PSO2	PSO3	PSO4				
CO1	3	3	1				3	3							
CO2								3							
02	3	3	1				3								
CO3					2		2	3							
	3	3	1		2		3								
CO4	3	3	1				3	3		1					
CO5	CO5 3 3 1 3 2														
BS255	3	3	1		0.4		3	2.4		0.8	0.4				
			3: Stron	g contribu	tion, 2: Avera	age contri	bution , 1: Lo	w contributi	on						
12. Books	recomm	ended:													

B.Sc. BIC	CHEM	ISTRY	2 nd year 4 ^{rt}	^h semest	er							
1.Name o	f the De	partme	ent: Bioscieno	es								
2.Course	Name		GENETIC	ENGIN	EERING LA	В			L		Т	Р
3.Course	Code		BS308						0		0	6
4.Type of	Course	(use ti	ck mark)		$\mathbf{Core}(\sqrt{)}$			Foundat	ion Course ()	De	epartmen	tal Elective()
5.Pre-req	uisite (if	any)	10+2 with 1	Biology	6.Frequency(use tick m	arks)	Even (√)	Odd ()	Either	r Sem ()	Every Sem()
7.TotalNu	umberof	Lectur	es,Tutorials,	Practica	ls							
0.001	L	ecture:	s=00		T	utorials=0	0	1 . 1		Pract	tical=10	
8. COL	RSE OI	SJECT	IVES: The o	bjective	of this course i	s to develop	p the u	nderstand	ing of genetic	engineer	rıng.	
9. COUR After the s	SE OUI uccessfu	COM l cours	ES (CO): e completion	, learner,	s will develop j	following a	ttribut	es:				
COURSE (OUTC (CO)	OME					ATT	RIBUTES	5			
	C O 1		Isolate genon	nic DNA	from bacteria,	plant and a	nimal	tissues				
(CO2		Isolate plasm	id DNA	(E. coli)							
	C O 3		Perform rest	riction d	igestion of DN	A						
	C O 4		Perform Ag	arose Ge	l Electrophores	sis						
	C O 5		Understand	basics of	PCR							
10.Syllabus												
Exp-01 solation of genomic DNA from bacteria, plant and animal tissue												
E	2xp-02]	solation of pl	asmid D	NA (E. coli)							
E	Exp-03		Restriction di	gestion o	f DNA							
E	Exp-04		Agarose Gel	Electrop	horesis							
E	Exp-05]	monstratio	n of PCR								
11. CO-F	O mapp	oing										
COs	PO1	PO2	PO3	PO4	PO5	PO6	Р	07	PSO1 PS	02	PSO3	PSO4
CO1	3	3					3			3		
CO2	3	3				2	3			3		
CO3	3	3					3			3		
CO4	3	3					3			3		1
CO5	3	3		2			3					3
BS308	3	3		0.4		0.4	3		2	.4		0.8
			3: Stro	ng contr	ibution, 2: Av	erage cont	ributi	on , 1: Lo	w contributio	n		
12. Books	recomn	nended	:									

				B. Sc. H	BIOCHE	MISTRY	⁷ 3 rd year	r/ 5 th	semester	r				
1. Name o	of the Dep	oartment	: Bioscien	ces										
2. Course	Name]		LOGY	L		Т			Р				
3. Course	Code]	BS211		3		1			0				
4. Type of	f Course	(use tick	mark)		Core ($$)	Founda Cours	ation se ()		Departm	ental Electi	ve ()		
5. Pre-req	quisite (if	any)	10+2 with	Biology	6. Freque tick marl	ency (use ks)	Even	(√)	Odd () E	Either Sem () E	very Sem ()		
7. Total N	lumber o	f Lecture	es, Tutoria	ls, Practic	als									
Lectures :	= 30				Tutorial	s = 10	Practica	al = 00)					
8. COURS Responses 9. COURS After the su	SE OBJE s, antigens SE OUTC uccessful	CCTIVES s and anti COMES (course c	S: The obje bodies, his CO): ompletion,	ctive of this tocompatib <i>learners</i> w	s course is ility, vaccin <i>ill develop</i>	to develop nes and Im <i>following</i>	the underst munization <i>attributes:</i>	tanding	g of basics	of Immunol	ogy, types of	⁷ Immune		
COUR OUTCOM	RSE IE (CO)						ATTRIB	UTES						
CO	1	Know the	history an	d scope of]	lmmunolog	gy.								
CO	2 a	Understar and the ce	d the type and orga	s of Immun ins of immi	ity: Passive	e, Active, I ses and thei	nnate and A r functions	Acquire , B & '	ed immuni T cells.	ty, Humoral	and Cell Me	diated Immunity		
CO	3 t 1	Have basic knowledge of Antigens as haptens, epitopes and Factors influencing immunogenicity, and Antibodies structure, types, production and functions of immunoglobulins, Clonal selection theory and Antigen Antibody reactions as Precipitation, Immunoelectrophoresis, Haem-agglutination, RIA and ELISA. Comprehend Histocompatibility, structure of MHC class I, II & III antigens and their mode of antigen presentation,												
CO	4 ¹	Comprehend Histocompatibility, structure of MHC class I, II & III antigens and their mode of antigen presentation, MHC restriction Complement system: Components, Classical and alternate pathways of complement activation, Hypersensitivity, Autoimmunity												
CO	5	Understar Vaccines,	d Passive Peptide ar	and Active d DNA Va	immunizat ccines.	ion, Types	of Vaccine	es: Inac	ctivated, A	ttenuated, Re	ecombinant a	and Subunit		
10. Unit w	vise detai	led conte	ent											
Unit-1		Number	of lecture	es = 08	Title of th	ne unit: Ba	sics of Im	munol	ogy					
History an Immunity.	nd scope o	of Immun	ology, Typ	es of Immu	nity: Passi	ve, Active,	Innate and	Acqui	ired immui	nity, Humora	and Cell M	lediated		
Unit-2		Number	of lecture	es = 08	Title of th	<mark>ie unit: Im</mark>	mune Res	ponses	S					
Cell and or	gans of in	nmune re	sponses ar	d their fun	ctions, B &	: T cells								
Unit-3	1	Number	of lectures	= 08	Title of th	ne unit: Ar	itigens and	Antibo	odies					
Antigens: immunogl and ELISA	haptens, e lobulins C A.	epitopes a Clonal sele	and Factors ection theo	s influencin ry. Antigen	g immunog Antibody	genicity, An reaction: P	ntibodies: S recipitation	Structu 1, Imm	re, types, p unoelectro	production ar phoresis, Ha	nd functions em-agglutin	of ation, RIA		
Unit-4		Number	of lecture	es = 08	Title of th	ne unit: Hi	stocompat	ibility						
structure of Classical a	of MHC c	lass I, II a ate pathy	& III antigo	ens and their	r mode of a	antigen pre	sentation, I	MHC r	estriction;	Complemen	t system: Co	mponents,		
Unit-5		Number of lectures = 08 Title of the unit: Vaccines and Immunization												
Passive an	d Active	immuniz	ation. Type	es of Vacci	nes: Inactiv	ated. Atter	uated. Rec	ombin	ant and Su	bUnit Vacci	nes. Pentide	and DNA		
Vaccines.			, r , p											
11. СО-РО	mapping	g												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	I	PSO1	PSO2	PSO3	PSO4		
CO1	3	1			2		3			3				
CO2	3	1			2		3			3				
CO3	3	1			2	2	3			3				

CO4	3	1		2		3	2	3	1
CO5	3	1	2	2		3			3
BS211	3	1	0.4	2	0.4	3	0.4	2.4	0.8
			3: Strong cont	ribution, 2:	Average	contributio	on , 1: Low contri	ibution	
12 Dealer		andadı							

13. Books recommended:

1. William, E. Paul (1989) Fundamental Immunology, 2nd Edition Raven Press, New York.

2. William, R. Clark (1991) the Experimental Foundations of Modern Immunology (4th Edition) John Wiley and Sons, New York.

3. Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company

4. Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins

5. Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).

6. Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-LissInc.

B.Sc. BIOCHEMI	STRY II	ll year 5	TH semes	ter								
1. Name of the Dep	partmen	nt: Biosc	iences									
2. Course Name	N	UTRITI	IONAL I	BIOCHEM	ISTRY	(L		Т	Р	
3. Course Code	BS	5341						3		1	0	
4. Type of Course	(use ticl	k mark)			Core	(√)		Fou	ndation	De	epartmental Elective ()	
5. Pre-requisite (if any)	1	0+2 wit	h Biolog	у	6. Fre marks	equency (us s)	se tick	Eve n ()	Odd ($$)	Either Sem ()	Every Sem ()	
7. Total Number o	f Lectur	res, Tuto	orials, P	racticals								
Lectures = 30					Tuto	rials = 10		Pract	ical = 00			
8. COURSE OBJ	ECTIVI utritional	ES: The l values	objectiv of foods tion in in	e of this co , dietary rec	ourse is quireme	to developents of carb	p the unders ohydrates, 1	standing ipids, p	g of the ba proteins and	sic concep the factor	ts of nutritional biochemistry s responsible for malnutrition	
9 COURSE OUT	COMES				iuns.							
After the successful	course	completi	ion. lear	ners will de	velop fo	ollowing at	tributes:					
COURSE OUTCOME (CO)		T	,		15	0	ATTRIBU	TES				
CO1	Concept	t of nutri	tion, ene	rgy measure	ements,	BMR, SD	A, RNI and	RDA				
CO2	Classific	cation, F	unctions	, Bioavailab	ility an	d deficienc	y of Mineral	ls and v	itamins			
C03	Distribu	tion, cor	npositio	n and function	ons of f	luid in hun	nan body					
C04	Classific	cation. co	ompositi	on, food sou	irces, fi	unctions of	carbohvdrat	es, prot	eins, fats a	nd oils		
C05	Introduc	tion to v	various cl	linical diagn	ostic te	ests		, I				
10 Unit wise detai	iled content											
Unit-1	Numb	er of lec	tures = (08	Title (of the unit:	Nutrition a	and ene	rgy metab	olism		
Food as a source of	nutrient	ts, functi	on of foo	ods, definitio	on of nu	utrition, nut	rients, adequ	uate, op	timum and	l good nutri	tion, malnutrition. Unit of	
energy measuremen	ts of foo	d stuffs	by Bomb	o colorimete	r, calor	ific value a	nd RQ of fo	od stuff	fs. Basic m	etabolic rat	e (BMR), its measurements	
and influencing fact	ors, SDA	A of food	d. Recom	nmended Nu	trient I	ntakes (RN	I) and Record	mmend	ed Dietary	Allowance	s for different age groups.	
Unit-2	Numb	er of lec	tures = (08	Title of	of the unit:	Minerals a	nd Vita	amins:			
Minerals Classificat	ion: Mac	cronutrie	ents and l	Micronutrie	nts, Fur	nctions, sou	rces, Bioava	ailabilit	y, and defi	ciency of m	ninerals. Vitamins -	
Classification, Bioa	vailabilit	ty, sourc	es, funct	ions and def	iciency	: Fat solub	le vitamins,	Water s	soluble vita	mins and f	ew members of B-complex.	
Unit-3	Number	r of lectu	ures = 08	8	Title of	of the unit:	Water met	abolisr	n 			
Distribution & con	npositior	n of fluid	l in huma	an body, EC	F, ICF,	, Functions	of water, flu	ud bala	nce disorde	er of water	metabolism, Homeostasis.	
Unit-4	Numb	er of lec	tures =	08	Title of	of the unit:	Carbohyd	rates:				
Classification, comp	position,	food sou	urces, fui	nctions, stor	age in l	body. Fat a	nd Oils: Con	npositic	on, saturate	d unsaturat	ed fatty acids, classification	
food sources, function	ons of fa	ts. Prote	eins: Con	nposition, so	ources,	essential, n	on essential	amino	acids, sour	ce of protei	ns, functions, protein	
deficiency.	Number of lectures - 08 Title of the unit: Biochemical test											
: Introduction to live	ver function test. Liver function test LFT profile. Glucose tolerance test, renal function test, Evaluation of filtration barrier.											
Total Protein Albun	nin/Glob	ulin Rati	io (A-G	Ratio).		,				,	,	
				,								
11 CO-PO manni	nσ											
Cos PO1 P	02 F	203	PO4	PO5	PO6	PO7	PSO1	PSO ₂	PSC)3	PSO4	
CO1 3 1						1	3		150			
CO2							3					
CO3 3 1						1	3					
CO4 3 1						1	3		1			
CO5 3 1						1			3		2	

BS341	3	1					1	2.4		0.8	0.4				
				3: Stron	g contribu	tion, 2:	Average c	ontribution	, 1: Lo	w contribution					
12.Bo	12.Book recommended														
1. Tom	. Tom Brody: Nutritional Biochemistry (Second Edition), Academic Press.														
2. David	2. David A. Bender: Nutritional Biochemistry of the Vitamins, Second Edition, University College London, Cambridge University Press.														
3. Harp	3. Harper's Illustrated Biochemistry, 29th edition, Mc Graw Hill Education, Lange.														
4. Denise R. Ferrier, Richard A. Harvey, Biochemistry (Lippincott Illustrated Reviews Series), 6th edition. Wolters Kluwer/Lipincott, Williams															
and Wil	kins.														

B.Sc. BIOCHEMISTRY III year 5 th semester															
1. Name	of the De	partment:	Bioscier	nces											
2. Cours	se Name	G	ENETIC	ENGINEER	ING				L	Р					
3. Cours	se Code	BS	5303						3	0					
4. Type	of Course	(use tick)	mark)		Co	ore (\vee)		Foundatio	on Course	Department	al Elective ()				
5. Pre-r	equisite (if	f 10	+2 with 1	Biology	6. 1	Frequency (use ti	ck marks)	Even ()	Odd $()$	Every	Sem ()				
7. Total	Number o	of Lecture	s, Tutori	als, Practical	5										
Lecture	s = 30				Tu	utorials = 10		Practical =	00						
8. COU	RSE OBJI	ECTIVES	: The obj	ective of this c	course is	to develop the unc	lerstanding of	f DNA manipu	ilative enzy	ymes and Gene c	loning				
vectors,	Screening	and selection	on of rec of $r_{-}DN/$	ombinants, 1e	cnniques	s used as Polymera	ise chain reac	tion (PCR), Si	ite directed	mutagenesis (SI	JM), Nucleic				
9. COU	RSE OUT	COMES ($\frac{O(1-D(1))}{CO}$	A teeninques											
After the	successful	course co	mpletion	, learners wil	l develop	following attribu	tes:								
COU	IRSE														
OUTCO	ME (CO)					AI	IRIBUTES								
C	01	Get proper vectors.	knowled	lge about the I	DNA mar	nipulative enzyme	s: Restriction	enzymes and	DNA ligas	es, and Gene clo	ning				
C	02	gain knowledge about In vitro construction of recombinant DNA molecules, passenger and vector DNA, and Transformation													
С	03	earn about screening and selection of recombinant host cells, Gene Libraries, cloning techniques, Expression of cloned DNA													
	, ,	Learn about the basics of Electrophoresis techniques, Polymerase chain reaction (PCR), Site directed mutagenesis (SDM),													
C	04	Nucleic acid sequencing:Blotting techniques.													
		Nucleic acid sequencing:Blotting techniques. Have knowledge of Application of r-DNA technique in human health, Production of Insulin, Production of recombinant													
C	CO5 Have knowledge of Application of r-DNA technique in human health, Production of Insulin, Production of recombinant vaccines: Hepatitis B, Production of human growth hormone.														
10 Unit	vaccines: Hepatitis B, Production of human growth hormone.														
Unit-1	10. Unit wise detailed content Unit-1 Number of lectures = 08 Title of the unit: DNA manipulative enzymes														
Restrict	Restriction enzymes and DNA ligases, Gene cloning vectors: Plasmids, Bacteriophage and Chimeric plasmids.														
	-							-							
Unit-2		Number	of lectur	es = 08		tle of the unit: In	vitro constru	iction of reco	mbinant D	NA molecules					
Transform	construction	DNA by	libiliant L	mathods	s (рыкэ:	52, puc 19), isolai	lon of passen	ger and vector	r DNA, cre	auon of r-DNA,					
Transform	nation of r	-DNA by (inethous.	T1		• •	1							
Unit-3	1	Number o	f lecture	$\mathbf{s} = 08$	Tit.	le of the unit: Sci	eening and s	selection of re	combinan	t host cells					
Immuno E acli	biogical sci	eening and	1 colony	nybridization,	Gene Li	braries: Genomic	DNA and CDI	NA cloning teo	chniques, E	expression of clo	ned DNA in				
E. con.															
Unit-4		Number	of lectur	es = 08	Tit	le of the unit: Te	chniques: Ele	ectrophoretic	technique	es,					
Polyme	rase chain	reaction (P	CR), Site	e directed muta	agenesis	(SDM), Nucleic a	cid sequencin	ig: Sanger's m	ethod, Blo	tting techniques:	Southern,				
Western	and Northe	ern blot.	<u> </u>	0.0											
Unit-5	one of r D	Number	of lectur	res = 08	Tit	le of the unit: Ap	plication	nhinant vasair	age Hanati	tic P. Droduction	of human				
arowth h	ormona		que in nu	inan nearth, F	ouuciioi	n or msunn, riodu			ies. riepau	us B, Floduction	of numan				
	PO manni	na													
	$\begin{array}{c c c c c c c c c c c c c c c c c c c $														
	3	102	105	104	105	100	2	3	1502	1505	1504				
COI	3	1					2	2	1	2					
CO2	3						2	5	1	2					
	3	1					2	1		2					
CO3	5						-	-		-					
	3	1					2	2		1					
CO4	5	1					-	-		*					

CO5	3	1	2	2	2	2	2		1					
BS303	3	1	0.4	0.4	0.4	2	2.2	0.2	1.2					
	3: Strong contribution, 2: Average contribution, 1: Low contribution													
12. Books recommended:														
1. Glick, B.R & Padternak J.J (1994) Molecular Biotechnology, Principles and Applications of Recombinant DNA, American Society for														
Microbiology, Washington D.C														
2. Christopler H. (1995) Gene cloning and Manipulating, Cambridge University Press														
3 Nichol	1 DST(19)	94) An In	troduction of Gene	tic Engineering	g Cambridge U	niversity Pre	\$\$							

3. Nicholl, D.S.T (1994) An Introduction of Genetic Engineering, Cambridge University Press.
4. Old. R.W. and Primrose, S.B. (186) Principles of Gene manipulation, An introduction to genetic engineering (3rd Edition) Black well Scientific Publications

B. Sc. BIOCHEMISTRY 3 rd year/ 5 th semester															
1. Nam	e of the	e Departr	nent: Bio	sciences											
2. Cour	se Nar	ne	APPI	LIED BIO	FECHNO	LOGY			L		Т	Р			
3. Cour	se Coc	le	BS 3	06					3		1	0			
4. Type	of Co	urse (use	tick marl	x)		Core ((√)	Fo	undation Co	ourse ()	De	partmental Elective ()			
5. Pre-	requisi	te (if any)) 10+2	with Biolo	gy	6. Freq tick ma	luency (uso arks)	e I	Even () O	dd ($$)	Either Sem	Every Sem ()			
7. Tota	l Numl	ber of Leo	ctures, Tu	itorials, Pi	racticals										
Lecture	es = 30					Tutori	ials = 10	P	ractical = 0	0					
8. COU	IRSE (OBJECT	VES: Th	e objective	of this cou	irse is to r	nake stude	nts fami	liar with prin	nciple, r	nethodology	and application of Drug and			
target 1	dentifi	cation, ta	rget value	lation, Bio	oprospectin	g and co	nservation:	: impor	information	odiversit	y, General	theory of free radical and			
	ants, S		$\frac{200 \text{ IPR}}{500000000000000000000000000000000000$	Requireme	ent of a pate	entable no	verty and L	Jetanea,	information	on pater	nting biologi	ical products and blodiversity			
After the	e succe	ssful cou	rse compl	etion, learr	iers will de	velop folla	owing attri	butes:							
COI OUTCO	COURSE ATTRIBUTES DUTCOME (CO) Get proper knowledge about Genomics and Proteomics and gene expression.														
C	CO1Get proper knowledge about Genomics and Proteomics and gene expression.CO2Gain knowledge about Drug Discovery and Designing: Drug and target identification, target validation														
C	CO2Gain knowledge about Drug Discovery and Designing: Drug and target identification, target validationCO3Learn about Bioprospecting and conservation: importance of biodiversity														
C	CO3Learn about Bioprospecting and conservation: importance of biodiversityCO4Learn about the basics of Free Radical Biology: General theory of free radical and antioxidants														
C	CO4 Learn about the basics of Free Radical Biology: General theory of free radical and antioxidants Have knowledge of Significance of IPR: Requirement of a patentable povelty and Detailed information on patenting biological														
C	CO5 Have knowledge of Significance of IPR; Requirement of a patentable novelty and Detailed, information on patenting biological products and biodiversity.														
U	cos products and biodiversity.														
10. Uni	10. Unit wise detailed content														
Unit-1 Number of lectures = 08 Title of the unit: Genomics and Proteomics															
Introduc	Introduction to genomics, Genome annotation, Human genome project and its application, Introduction to Proteomics: Protein expression and its														
analysis	mitotatetion to genomics, cenomic annotation, runnan genomic project and its appreation, introduction to Proteomics. Protein expression and its inalysis														
Drug on	Unit-2 Number of lectures = 08 Title of the unit: Drug Discovery and Designing Drug and target identification_target validation_Molecular docking studies and its Insilco tools e.g. Autodock_GOLD Output														
Unit 3	u targe	Num	ation, targ	$\frac{1}{1000} - 08$	n, worceu		the unit. I	Riopros	neo tools c.g	consoru	otion				
Importa	nce of t	hiodiversi	ty biodive	1000000000000000000000000000000000000	matics data	hases in h	viological n	naterials	Internation:	al effort	and issues	of sustainability			
Unit 4		Nun	bor of lo	$\frac{1}{2}$		Title of	f the unit.	Erec De	dical Dialog		5 4114 155465	or sustainaointy			
General	theory	of free ra	dical and	ctures = oc antiovidant	• Eree radi	cal mediat	ted damage	rree Ka	s proteins a	sy nd DNA	· Natural an	tiovidants and their			
applicati	ions			antioxidant	.s. 1400 1401		icu uamage	to npiù	s, proteins a		, ivaturar an	noxidants and then			
Unit-5		Nun	ber of le	ctures = 08	3	Title of	f the unit:	IPR and	l Patenting						
Significa	ance of	IPR; Req	uirement	of a patenta	able novelty	y; Issues re	elated to IP	R protec	ction of softv	ware and	database; II	PR protection of life forms;			
Internati	onal co	onvention	in IPR; O	btaining pa	tent; Inven	tion step a	nd prior ar	t and sta	te of art proc	cedure; I	Detailed info	ormation on patenting			
	al prod	ucts and t	olodiversit	y.											
		pping DO2	DO2			006	DO7		DSO2	DCO2		BSO4			
COs		PO2	POS	PO4	PU5	200	PU/ 1	PSUI	PS02	PS05		PS04			
	3 3	1						2	1		2				
CO2	3				1	2	2) 1	1		2				
CO3	3 2	1			1	3	3 3	1			ے 				
C04	3	1			3	2	2	2			1	<u> </u>			
CO5	3	1			0.8	- 1	2.2	2.2	0.2		1.2	0.4			
D9200				2. 54	a oontrik	tion 2. A			n 1. T		ition				
10 D	1	7		5: Stron	g contribu	uon, 2: A	verage con	itributio	, 1: LOW (contribu	ILION				
12. Boo	ks reco	ommende	ed:												

- 1. Environmental Studies by Benny Joseph, Tata McGraw Hill, 2005.
- 2. Environmental Studies by Dr. D.L. Manjunath, Pearson Education, 2006.
- 3. Principles of Environmental Science and Engineering by P. Venugopal Rao, Prentice Hall of India.
- 4. Environmental Science and Engineering by Meenakshi, Prentice Hall of India.
- 5. O'Reilly, "Developing Bioinformatics Computer Skills".
- 6. Griffiths JF, "An Introduction to Generic Analysis".
- 7. Hunter L, "Artificial Intelligence & Molecular Biology".

B. Sc. B	IOCHE	MISTR	Y 3 rd year	r/ 5 th semeste	r									
1. Nam	e of the	Departn	nent: Bios	ciences										
2. Cour	se Nam	e	Genor	nics, Proteon	nics & Mo	etabolomics		L		Т	Р			
3. Cour	se Code	1	BS 30	5				3		1	0			
4. Type	of Cou	rse (use t	tick mark)		Core ()	F	oundation	Course ()	Depa	rtmental E	lective (√)		
5. Pre-r	equisite	(if any)	10+2 v	with Biology		6. Frequenc tick marks)	y (use	Even()	Odd ($$)	ither Sem ()	Eve	ery Sem ()		
7. Total	Numbe	er of Lec	tures, Tu	torials, Pract	icals									
Lecture	s = 30					Tutorials =	10	Practical =	00					
8. COU	RSE OI	BJECTI	VES: The	course has be	en design	ed to make st	udents awa	are of Genor	me sequer	icing, genome	databases, C	Genome analysis,		
Proteom	ics and	Metabol	omics											
9. COUL	SE OU	ful cour	LS (CO): se comple	tion. learners	will deve	lon following	attributes	:						
COI	IRSE	,	se compre					•						
OUTCO	ME (CO))					ATTR	IBUTES						
C	01	Get kn	owledge o	of Genome se	quencing	and Sequenci	ng technol	ogy.						
C	02	Gain k	nowledge	about Major	genome d	atabases, Ger	nome analy	sis and Con	nparative	genomics Fund	ctional geno	mics		
C	03	Learn	about basi	c proteomics	technolog	sy.								
C	04	Learn	about the	basics of Tech	nnologies	used in metal	oolomics							
C	CO5 Have knowledge of Applications of genomics and proteomics in various fields of life													
10. Unit	10. Unit wise detailed content													
Interview Number of lectures = 08 Title of the unit: Genome sequencing														
Sanger segenome	Sanger sequencing, Pyrosequencing, Illumina/Solexa, SOLiD System. Pros and cons of sequencing Maxam-Gilbert sequencing, Whole shotgun zenome sequencing													
genome sequencing Visite of the unit: Structural and functional genomics														
Classical Compara	ways o tive gen	f genome omics Fi	e analysis, unctional g	large fragmer genomics: DN	nt genomi A chips a	c libraries; Ph and their use i	nysical map n transcrip	oping of gen tome analys	iomes; sec is; Mutan	juence assemb ts and RNAi ii	ly and anno functional	tation; genomics		
Unit-3		Numb	er of lectu	ures = 08		Title of the u	nit: Prote	omics						
Introduc	tion to b	asic prot	eomics tec	chnology; Bio	informatio	cs in proteom	ics; Proteo	me analysis	. Proteom	ics classification	on. Yeast-tw	vo-hybrid		
system, o	DNA m	icroarray	ys 1D-SDS	S-PAGE, 2D-	SDS PAC	GE. Detection	and quant	itation of pr	oteins in g	gels. Pros and	cons of varie	ous staining		
methods	Basics o	f mass sp	bectrometr	y. MALDI TO	OFF and E	ESI, and their	application	n in proteon	nics, Tand	em MS/MS sp	ectrometry,	Peptide		
Unit-4	ng by ta	Num	ber of lec	tures – 08	ty purfice	Title of the	in TAF tag unit: Meta	bolomics						
Technolo	ogies in	metabolo	mics. Rol	e of Spectros	copy, Elec	trophoretic a	nd Chroma	tographic te	chniques	in metabolic p	rofiling Nut	rigenomics		
Unit-5	8	Num	ber of lec	tures = 08	1,,	Title of the	unit: Appl	ications	1		8	8		
Applicat	ions of g	genomics	and prote	omics in agrie	culture, hu	ıman health a	nd industry	/						
11. CO-F	O map	ping												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSC	D2 PSO	3	PSO4		
CO1	3	1					1	3		3				
CO2	3	1					1			3				
CO3	3	1					1	3		3				
CO4	3	1					1			3				
CO5	3	1					1	1		3				
BS305	3	1					1	1.4		3				
	I			3: Strong co	ontributio	on, 2: Averag	ge contribu	ition , 1: Lo	ow contri	bution	I			
12. Boo	ks recor	nmende	d:											
 O'Re Griff 	illy, "De iths JF, '	eveloping 'An Intro	g Bioinfor oduction to	matics Comp Genetic Ana	ıter Skills Iysis".	·"								

3. Hunter L, "Artificial Intelligence & Molecular Biology".

- 4. Gene Cloning and DNA Analysis: An Introduction, 6th Edition by T. A. Brown
- 5. Genomics and Proteomics: Functional and Computational Aspects by Suhai and Sándors,
- 6. Genomics and Proteomics: Principles, Technologies, and Applications by Devarajan Thangadurai and Jeyabalan Sangeetha
- 7. Genomics, Proteomics and Bioinformatics by Ira Milosevic and Nuno Raimundo
- 8. The Handbook of Metabolomics by Fan, Teresa Whei-Mei, Lane, Andrew N, Higashi, Richard M
- 9. The Handbook of Metabonomics and Metabolomics by John C. Lindon, Jeremy K. Nicholson and Elaine Holmes

B.Sc. BIO	Sc. BIOCHEMISTRY III year 5 th semester													
1. Name	of the Depart	ment: Bioso	ciences											
2. Course	e Name	INTR	ODUCTIO	N TO TISS	SUE CULTUR	RE TECHNO	LOGY]		Т	Р			
3. Course	e Code	BS342						, í		1	0			
4. Type o	of Course (use	tick mark)		Core	(√)		Founda	tion Cours	e () De	partmei	ntal Elective ()			
5. Pre-re	quisite (if any	7) 10+2	with Biolo	gy 6. Fre	equency (use t	ick marks)	Even	() Odd	() Either	Sem ()	Every Sem ()			
7. Total I	Number of Le	ctures, Tut	orials, Pra	cticals			•	•	•		-			
Lectures	= 30				Tutor	ials = 10	P	ractical =)0					
8. COUR	RSE OBJECT	TVES: : Th	is course a	ims to deve	lop an underst	anding of: Pla	int tissue cu	ulture, type	s and impo	ortance o	f culture media			
plant grov	wth regulators	, importance	e of aseptic	conditions,	haploid plant	production, e	conomic im	portance o	f plant tiss	ie cultur	e, Animal tissue			
culture, li	istory and see	pe, types me	uia, Fiiiiai	y culture all	lu Cell Illies									
9. COUR	SE OUTCON	MES (CO):												
After the s	successful cou	rse complet	ion, learne	rs will devel	lop following a	uttributes:								
COURSE (OUTCOME CO)					ATTRIBU	J TES							
(CO1	Understand culture	use of asep	tic Techniqı	ues, types of gr	owth media, t	ypes growt	h regulator	, and their	use in pl	ant tissue			
(CO2	Understand Embryogen	techniques, esis and the	, methods an ir applicatio	nd source of ha	ploid plant pronethods for Pr	oduction, te otoplast Cu	chniques u lture, soma	sed for org tic hybridi	an cultur zation, p	e, somatic otoplast fusion			
	203	Learn and u	nderstand t	he importan	ce of plant tiss	ue culture in v	various field	ls of applic	ation, vario	us metho	ods for			
	.03	developmen	t of transge	nic plants	1 70' 1	TT 1 /	1.1.	•	1	•.•	<u> </u>			
(CO4	Learn the history and scope of Animal Tissue culture, Understand the types, importance and composition of various growth media and growth factors												
	Learn and understand the types of cells in culture that includes primary cells, transformed cells and cell lines, different													
(cos methods of disaggregation of cells from tissues, monolayer formation and methods used for synchronization of cell													
	growth in culture													
10. Unit	wise detailed	content						•						
Unit-1	a hai an a Nu	Nui triant madia	nber of lec	tures = 08	Title of	t the unit: As	eptic Techi	niques	luc and au	nancion	01111110			
Aseptic To	echniques, Nu		, and use of	glowin leg		s, Cytokiiiiis		ennis). Ca	ius and sus	pension	culture.			
Unit-2		Nu	nber of lec	tures = 08	Title of	f the unit: Ha	ploid plant	t productio	n					
Haploid p	lant productio	n: microspor	e and ovul	e culture, Or	rgan Culture ar	nd their applic	ations, Som	atic Embry	ogenesis:	Techniqu	es and			
application	ns. Protoplast	Culture, son	natic hybrid	lization, met	thods of protop	last fusion: cl	emical and	electro fus	ion, practio	al applic	ation of			
somatic hy	ybridization.	N.T.	1 61 4	0.0			1 6 4	14						
Unit-3	ture horticult	Num	ber of lect	ures = 08	Tachnique of	transformation	le of tissue	culture	iatad and n	husiaalr	athoda			
Micro pro	iactile homba	dmont and	suly, mailsg	genic plants,	rechnique of		I. Agrobaci	enum-mec	lated and p	ilysical i	lietiious			
Unit-4	jeethe bolliba	Nu	nber of lec	$\frac{1011}{1011}$	Title o	f the unit. Hi	story and S	cone of A	imal Ticc	ie Cultu	ro			
History an	d Scope of A	nimal Tissue	Culture. C	ulture Medi	a. Simulating	natural conditi	ons for gro	wth of anir	al cells. N	atural me	edia: Plasma			
Clot, biolo	ogical fluids ti	ssue extract,	Importance	e of Serum i	n media, Chen	nical defined 1	nedia, serui	n free med	a					
Unit-5		Nu	nber of lec	tures = 08	Title o	f the unit: Pr	imarv Cult	ure						
Primary C	ulture: Cell lin	nes, and clor	ning, isolati	on and mecl	hanical disaggi	regation of tiss	sue, enzyme	e. Secondar	y Culture:	transform	ned animal			
cells and c	continuous cel	l lines. Mon	olayer form	ation, Syncl	hronization.	-	·							
11. CO-P	O mapping			-										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSC	03 PSO4			
CO1	3	1					1	3		3				
										3				
CO2	3	1					1							

CO3	3	1					1	3	3	
CO4	3	1					1		3	
CO5	3	1					1	1	3	
BS342	3	1					1	1.4	3	
		3	: Strong c	ontribution	, 2: Average o	contribution	1, 1: Low co	ntribution		

12. Books recommended:

1. Ravishankar G.A and Venkataraman L.V(1997) Biotechnology applications of Plant Tissue & cell culture. Oxford & IBH Publishing co., Pvt Ltd.

2. H. S. Chawla "Plant Biotechnology: A Practical Approach"

3. Davis, Cell culture techniques. 4. Brown TA "Gene cloning: An introduction"

5. Ian Freshney Animal cell culture.(4th Edition)

6. Buttler. Elements of Biotechnology – P.k. Gupta (1st Edition -2000) Rastogi Publications.

B.Sc. BIOCHEMISTRY III year V semester														
1.Name of	f the Depai	rtment: B	iosciences											
2. Course	Name	TISS	UE CULTU	RE & BIOIN	NFORMATI	CS LAB	;	L		Т]	P		
3. Course	Code	BS34	13					0		0	(5		
4. Type of	Course (us	se tick ma	rk)	Core (√			Foundat	ion Course()	De	epartment	al Electi	ive()		
5.Pre-requ	uisite (if an	y) 10+2	with Biology	6.Freque	ncy(use tick	marks)	Even()	Odd ($$)	Either	: Sem ()	Every S	lem()		
7.TotalNu	mberofLe	ctures,Tu	torials,Prac	ticals										
8 COUDS		tures=00		6.41	Tutorials=	=00	1. 4. 1.	1	Pract	tical=10		1.		
8. COUKS	ce Alignme	nt FAST	In completio	n of this cour 'search Multi	se, students winder Sequence	Alionm	one to deve lent Protei	in Structure Vi	anding (sualizat	on Gene l	matics a	s toois as well		
as for tissu	e culture			search, matt	ipie bequeilee	, mgmi	ient, 110ter		suunzai	ion, Gene i	i manig a			
1. COURS	E OUTCO	MES (CO	D):											
2. After the	e successfu	l course c	ompletion, le	arners will d	evelop follow	ing attri	butes:							
COURSE	OUTCOM	1E				ATT	RIBUTES	5						
(CO1	Know	about seque	nce databases	and FASTA	& BLAS	ST search							
(202	Learn	Pair wise an	d multiple Se	quence Align	ment								
(CO3	Learn	how to visua	alize Protein S	Structure									
(CO4 Learn <i>In vitro</i> germination of seeds and maintenance of Callus and suspension culture													
(CO5 Learn Plant propagation through axillary and adventitious bud culture													
10. Syllabı	10. Syllabus													
E	xp-01	Introd	uction to typ	es of sequence	e databases (N	Nucleotic	les & Prot	ein)						
E	xp-02	Pair w	vise Sequence	e Alignment (l	NW and SW a	approacl	1)							
E	xp-03	FAST	A & BLAST	search										
E	xp-04	Multip	ole Sequence	Alignment (C	ClustalX & Tr	reeview)								
E	xp-05	Protein	n Structure V	isualization (RASMOL, Sv	wiss-PD	B Viewer)							
E	xp-06	Gene 1	Finding tools	(Grail or Ger	iscan)									
E	xp-07	Prepar	ation of plan	t culture med	ia and its steri	ilization.								
E	xp-08	In vitr	o germinatio	n of seeds.										
E	xp-09	Initiati	ion and main	tenance of Ca	llus and suspe	ension c	ulture.							
E	xp-10	Plant J	propagation t	hrough axilla	ry bud culture									
—— E	xp-11	Plant I	propagation t	hrough adven	titious bud cu	ilture								
11. CO-PO	mapping													
Cos		_ PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4		
CO1		- 3	5	ł				3	<u></u>		5	2		
CO2		3	3	1				3	2		3	2		
		3	3	1	ļ			3	2		3	2		
		3	3	1				3	2		3	2		
CO4														

CO5		3	3	1				3	2		3	2		
BS343		3	3	1				3	2		3	2		
			3: Strong co	ontribution, 2	: Average c	ontribut	ion , 1: Lo	w contribut	tion					
12.Brief description ofself learning/ E-learningcomponent														
13. Books	recomme	nded:												

B. Sc. B	B. Sc. BIOCHEMISTRY 3 rd year/ 5 th semester														
1.Name	of the De	epartm	ent: Bioscience	S											
2. Cours	e Name		IMMUNOL	OGY LA	AB				L		Т	Р			
3. Cours	e Code		BS216						0		0	6			
4. Type o	of Course	e (use ti	ck mark)	(Core($$)			Founda	tion Co	urse () Department	al Elective()			
5.Pre-re	quisite (i	f any)	10+2 with Bi	ology 6	.Frequen	cy(use ticl	k marks)	Even $()$	Odd())	Either Sem ()	EverySem()			
7.TotalN	lumbero	fLectur	es,Tutorials,Pi	racticals											
	1	Lecture	es=00			Tutorial	s=00				Practical=10				
8. COUI counts, E	RSE OB. ELISA, O	JECTI uchterlo	VES: This court ony Double diffu	rse aims usion (Ol	to develo DD) and S	p the unde	erstanding of serum	g of basic from bloo	s of imm d & preci	unolog ipitatio	y, types of Bloo n of Immunoglob	od grouping, cell oulins			
9. COUR After the	SE OUT	COME	S (CO):	earners 1	will develo	on fallawin	o attrihu	tes.							
COURS	E OUTC	OME		currers		<i>p</i> jono	<u>а анг то а</u>		C						
	(CO) ATTRIBUTES CO1 Analyze Blood grouping														
	CO1 Analyze Blood grouping CO2 Perform and analyze differential counting of WBC and detergent lysis of RBC														
	CO2 Perform and analyze differential counting of WBC and detergent lysis of RBC CO3 Perform and analyze Dot Elisa, ELISA .														
CO3 Perform and analyze Dot Elisa, ELISA .															
CO4 Have knowledge of and can perform Ouchterlony Double diffusion assay.															
	CO5		Perform and an	alyze sep	paration of	f serum fro	m blood	& precipit	ation of I	[mmun	oglobulin.				
10.Sylla	bus														
	Exp-01		Blood grouping	2 11 1											
	Exp-02		Differential Cou	$\frac{1}{1}$ of RBC	BC										
	Exp-05		Det Elisa	OI KDC											
	Exp-04 Exp-05		ELISA – Demo	nstration											
	Exp-06		Ouchterlony Do	uble diff	fusion (OI	DD)									
	Exp-07		Separation of se	rum fror	n blood &	precipitat	ion of Im	munoglob	ulins						
11. СО-Р	O mappi	ng													
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO	3	PSO4			
C01	3	3	1				3		2			3			
CO2	3	3	1				3		2			3			
CO3	3	3					3		2		3	3			
CO4 CO5	3	3	1				3		2			3			
BS216	3	3	1				3		2			3			
			3. Strong	 2 contrib	ution 2.	Average o	 ontribut	ion . 1• L	ow contri	ibutior					
12. Bool	ks recom	mended	1:	, contrain		i verage t	Juniout	, 1. 1.	Sir contra	Juno	•				

	B. Sc. BIOCHEMISTRY 3 rd year/ 6 th semester												
1. Name	of the Do	epartmen	t: Bioscie	nces				-					
2. Course	e Name	Î	PR AND	BIOSAFET	Y		L			Т	Р		
3. Course	e Code	F	3S204				3			1	0		
4. Type o	of Course	e (use tick	(mark)			Core (√)	Fo	indation Co	urse ()]	Departmental E	lective ()	
5. Pre-re	quisite (i	if any) 10	0+2 with 2	Biology	((1	5. Frequency use tick narks)	У Е	ven (√)	Odd ()	Either Ser)	n (Eve	ry Sem ()	
7. Total I	Number	of Lectur	es, Tutor	ials, Practic	als								
Lectures	= 30					Tutorials =	10 Pra	ctical = 00					
8. COUR bioethics.	RSE OBJ	ECTIVE	S: The ob	jective of thi	s course i	is to develop	the unde	rstanding of	Intellectu	al property	, IPR, Biosafety	, GMO and	
9. COUR After the s	SE OUT successfu	COMES Il course c	(CO): completion	n, learners w	vill develo	op following	attribute	s:					
COUI OUTCOM	RSE IE (CO)						ATTI	RIBUTES					
CO1Have basic concept of Intellectual Property and its typesCO2Know detailed description of various types of IPRs, its protection and infringement													
CO2Know detailed description of various types of IPRs, its protection and infringementCO3Have knowledge of International treaties and case studies													
CO3Have knowledge of International treaties and case studiesCO4Display understanding of Biosafety, GMOs and various Institutional committees													
CO4Display understanding of Biosafety, GMOs and various Institutional committeesCO5Have knowledge of Bioethics and its legal implications													
CO5 Have knowledge of Bioethics and its legal implications 10. Unit wise detailed content													
10. Unit wise detailed content Unit-1 Number of lectures = 08 Title of the unit: Concept of Intellectual Property Kinds of Intellectual Property													
Unit-1 Number of lectures = 08 Title of the unit: Concept of Intellectual Property. Kinds of Intellectual Property Patents Copyrights Designs Trademarks Geographical Indication Infringement of IDP. Its protection and Periodics Licensing and its													
Patents, Copyrights, Designs, Trademarks, Geographical Indication. Infringement of IPR, Its protection and Remedies Licensing and its													
types. Unit-2 Number of lectures = 08 Title of the unit: Requirement of a patentable novelty													
Issues rela	ated to IP n among	R protecti various fo	on of soft orms of IP	ware and dat R; Rights / p	abase; IP	R protection, infringeme	of life for the formation of the formati	orms; Interna	tional cor	vention in tinfringen	IPR; Geographi nent: civil and cr	cal indication; iminal.	
Unit-3	Ű	Number o	of lecture	s = 08]	Fitle of the u	nit: Obt	aining pater	nt	<u> </u>			
Invention	Unit-3 Number of lectures = 08 Title of the unit: Obtaining patent Invention step and prior art and state of art procedure: Detailed information on patenting biological products and biodiversity: Appropriate												
case stud	ies; India	n Patent A	Act 1970 (amendment	2000); M	ajor changes	in India	n patent syste	em as post	TRIPS ef	fects; Budapest t	reaty.	
Unit-4		Number	of lectur	res = 08]	Fitle of the u	nit: Bios	afety					
Primary (Containm	ent for Bi	ohazards;	Biosafety L	evels; Bio	osafety guide	elines - G	overnment o	f India; D	efinition o	f GMOs; Roles of	of	
Institution	nal Biosa	fety Com	mittee, RC	CGM, GEAC	etc. for	GMO applic	ations in	food and agr	iculture; I	Environme	ntal release of G	MOs;	
Unit-5	1ysis, Kis	Number	of lectur	managementer		Fitle of the u	nit. Bio	thics					
Introduction Bioathics	on, neces	sity and li	mitation;	Ethical conf	licts in B	iotechnology	; Differe	nt paradigms	of bioeth	ics: Nation	hal and Internation	onal;	
11. CO-P	O manni	ng	in nearth	care. Dioen	lical allel	innas in mee	ilear alla	surgreat treat	ment, Leg	sai impirea	dons in bioetine	5.	
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PS	502	PSO3	PSO4	
C01	3	1		3	3	100	3	2			3	2	
CO2	3	1		3	3	+ +	3	2			3	2	
CO2	3	1		3	3		3	2		2	3	2	
CO3	3	1		3	3		3	2			3	2	
C04	3	1	2	3	3		3	2			3	2	
R\$204	3	1	04	3	3		3	2		0.4	3	2	
10204	~	-	<u></u>	Strong con		1. 2. Averag	e contril	$\frac{1}{1 \cdot 1}$	w contri	hution	~	-	
12. Book	s recom	nended:	5.	, sti olig coli		., 2. 11 vei ag	e conti n			JULIOII			
1. C 2. N	Genome, Molecular	T.A. Brov r Cell Biol	vn, John V logy, H. L	Villey & Sor odish, A.Ber	is Inc. rk, S. Zip	ursky, P Ma	tsundaira	, D. Baltimor	e and J.E	. Barnell, V	W.H. Freeman ar	nd Company.	

- Molecular Biology of the Gene, J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison- Wesley Publishing.
 Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley and Sons Inc.
- 5. Biotechnology- B.D. Singh.

B. Sc. BI	B. Sc. BIOCHEMISTRY 3 rd year/ 6 th semester													
1. Name	of the De	epartme	nt: Bioso	ciences										
2. Course	e Name		BIONA	ANOTECH	INOLOGY	Y			L	Т	Р			
3. Course	e Code		BS 312	2					3	1	0			
4. Type o	of Course	e (use tic	k mark))	(Core ()		Found	ation Course	0	Departm	ental Elective ($$)		
5. Pre-re	quisite (i	if any)	10+2 w	vith Biology	, 6	5. Frequency use tick marks) Even	n (√)	Odd	0	Either Sem ()	Every Sem ()		
7. Total N	Number	of Lectu	res, Tut	orials, Pra	cticals									
Lectures	= 30				r	Tutorials = 10	Practic	cal = 00						
8. COUR	SE OBJ	ECTIVI	ES: The	objective of	this cours	e is to develop t	he understa	anding o	of the Basics o	f nanotech	nology and	overview of		
nanoscale	material	ls, Nanor	naterials	: Biosensor	s: Biophoto	onics and Bioin	naging and	Principl	es of toxicolog	gy;				
9. COURS	E OUT	COMES	(CO):											
After the s	successfu	l course	complet	tion, learne	rs will devo	elop following d	uttributes:							
COUI	RSE						ATTRI	RITES						
OUTCOM	IE (CO)													
CO	1	Understa	and the b	asics of nar	otechnolog	gy and overviev	v of nanosc	ale mate	erials					
CO	2	Understa	and the b	asics of Na	nomaterial	S								
CO	3	Understa	and the b	asics of Bio	sensors									
CO	4	Understa	and the b	asics of Bio	photonics	and Bioimaging	g							
CO5 Understand the Principles of toxicology 10. Unit wise detailed content														
10. Unit wise detailed content														
Jnit-1 Number of lectures = 08 Title of the unit: Introduction Introduction to panotechnology and overview of panoscale materials, effect of length scale on properties, introduction to biopanotechnology														
Introduction to nanotechnology and overview of nanoscale materials, effect of length scale on properties, introduction to bionanotechnology,														
Introduction to nanotechnology and overview of nanoscale materials, effect of length scale on properties, introduction to bionanotechnology, challenges and opportunities associated with biology on the Nanoscale, bionanotechnology systems, biological and medical applications of														
Bionanomaterials.														
Unit-2 Number of lectures = 08 Title of the unit: Nanomaterials Introduction to non-ometerials DNA based non-ostructures. Concrete surface and collected chemisters, principles, concretely techniques, surface.														
Introduction	ntroduction to nanomaterials. DNA based nanostructures. General surface and colloid chemistry, principles, experimental techniques, surface													
potential,	DLVO tř	neory; Ch	haracteris	stics of nand	oparticles,	chemical specia	tion of diss	solved sp	pecies, Enviro	nmental b	ehaviour of i	nanoparticles.		
Unit-5	on to hio	Number	the hiele	$res = v\delta$	I anont the		BIOSENSO	rs tion of t	ha sansan mal	agula Tra	naduation of	the concer		
signal: On	tical Ele	ctrochen	nical and	l Mechanica	l sensors	Sensor stabiliza	tion	uon or t	ne sensor mor	ecule, ITa	isduction of	the sensor		
Unit-4	tical, Ele	Numbe	er of lect	tures = 08		Fitle of the unit	• Bionhoto	nics an	d Rinimaging					
Overview	of imagi	ng hiolog	rical syst	tems from	the cellular	r level through t	o whole-bo	dy med	ical imaging	Introductio	n to bionhy	sics basic		
physical c	oncepts	in imagi	ng. Maic	or technique	es using io	nizing and non	-ionizing ra	adiation	fluorescence	and multi	i-photon mic	croscopy.		
spectrosco	py, OCT	, MRI, X	K-ray CT	, PET and S	SPECT ima	aging.	Tomizing N	adration	indorescence	una man	i photon init	nobeopy,		
Unit-5	1.0	Numbe	er of lect	tures = 08	Γ	Fitle of the unit	: Nanotoxi	icology						
Principles	of toxico	ology; to:	xicology	models, ex	perimental	toxicology stud	lies; activa	tion and	detoxification	n mechanis	sms, importa	nce of biological		
membrane	in toxic	ology; To	oxicolog	y and bioac	cumulatior	n of particles. B	iological ad	ctivity of	f nanomaterial	ls.	· 1	C		
11. CO-P() mappii	ng												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS	01 I	PSO2	PSO3	PSO4		
CO1	3	1					1	2	2		3	2		
CO2	3	1					1	2	2		3	2		
CO3	3	1					1	2	2		3	2		
CO4	3	1					1	2	2		3	2		
CO5	CO5 3 1 2 1 2 3 2													
BS312	3	1			0.4		1	2	2		3	2		
			II	3: Strong	contributi	on, 2: Average	contributi	ion , 1:]	Low contribu	tion	I			
13. Book	s recom	nended:		- 8		,		, , ,						

- 1. Engines of Creation, K E Drexler, Oxford Paperbacks, New York
- 2. Nanosystems: Molecular Machinery, Manufacturing and Computation, K E Drexler, Wiley, ISBN 0471575186
- 3. Our Molecular Future: How Nanotechnology, Robotics, Genetics and Artificial Intelligence Will Transform the World, Prometheus ISBN 1573929921
- 4. Web Resources: <u>www.nanotechweb.org</u>; <u>www.nanotec.org.uk</u>
- 5. Nanobiotechnology-Concepts, Applications and Perspectives edited by CM Niemeyer and CA Mirkin, Wiley-VCH ISBN 3-527-30658-7
- 6. NanoBiotechnology Protocols in Methods in Molecular Biology Series Edited by SJ Rosenthal and DW Wright, Humana Press, ISBN: 1-58829-276-2
- 7. Understanding Nanotechnology Scientific American, ISBN: 0446679569 Prey (a novel) by Michael Crichton, ISBN: 0066214122

D So L		MISTDV	ard woon	6 th comos	on									
1. Nom			J year/											
1. Nam	e of the L	vepartme		N DHVSI			T			т	D			
2. Cour	se Name		RS 351		OLUGI		2 2			1	r			
J. Cour	se Coue	a (usa ti	DS 551			Coro	5	Found	lation Course ()		nartmant		tive (1)	
4. Type		se (use ti	ck mark)			Core ()	aney (use tick	Fun		Eithor				
5. Pre-	requisite	(if any)	10+2 w	ith Biology	7	o. Freque marks)	ency (use tick	()	Odd ()	Sem ()	E	very S	Sem ()	
7. Tota	l Number	of Lectu	ires, Tuto	orials, Pra	cticals									
Lecture	es = 30					Tutorial	s = 10	Practi	cal = 00					
8. COU	RSE OB	JECTIV	ES: The o	bjective of	this cour	se is to de	evelop the under	standing	of the Basics of	human ph	ysiolology	;		
9. COUH After the	After the successful course completion, learners will develop following attributes:													
COI OUTCO	COURSE ATTRIBUTES OUTCOME (CO) Understand the components of blood and diseases associated													
CO1 Understand the components of blood and diseases associated														
C	CO2Understand the basics of respiration, its regulation and respiratory illnessesCO3Understand the basics of excretion, its regulation and its role in homeostasis													
C	CO3 Understand the basics of excretion, its regulation and its role in homeostasis CO4 Understand the basics of diseases of kidney and pervous system													
CO4 Understand the basics of diseases of kidney and nervous system														
C	CO5 Understand the basics of digestion, diseases associated and liver function tests													
10. Unit wise detailed content														
Unit-1 Number of lectures = 08 Title of the unit: Blood														
Blood: composition of blood, plasma proteins, blood cells counting and its significance, Blood coagulation – mechanism and regulation, Blood														
Atherosc	lerosis.		bu pressu	те паетнаю	opoiesis.	Disease o	of Blood: Thalas	senna, s	sickle cell allelling	a, Anenna	s, Cardiov	ascula	r Disorders –	
Unit-2	10100101	Numb	er of lect	ures = 08		Title of tl	he unit: Respira	ation						
Respirati	on: Trans	fer of blo	od gases,	role of 2,3	-diphosph	oglycerat	e, Bohr's effect,	and Ha	ldane effect, chlo	ride shift,	Neural & c	chemic	cal regulation	
of respira	tion. Res	piratory i	llnesses: A	Asthma, CO	OPD, Cyst	tic Fibrosi	is, Emphysema,	Pneumo	onia.					
Unit-3	6 1	Number	r of lectu	res = 08		Title of tl	he unit: Excreti	on	1.1.0					
Structure composit	of nephroion of uri	on, glome ne, horme	ones of the	ation, reab e kidney.	sorption a	ind tubula	ar secretion. Hor	neostatio	c regulation of w	ater and el	ectrolytes,	Acid-	base balance,	
Unit-4		Numb	er of lect	ures = 08		Title of tl	he unit: Disease	s						
Diseases: & Alzhei	: Kidney: mer's sig	Uremia & nificance	k Glomeri of diagno	lonephriti stic enzym	s, Kidney ology.	stone; Sy	mapses, central a	and perij	pheral nervous sy	stem. Neu	rological:	Epilep	sy, Parkinson	
Unit-5		Numb	er of lect	ures = 08		Title of tl	he unit: Digesti	on						
Digestion Ulcers, L	n: function iver: Jaur	ns and reg idice, Liv	gulation of er Functio	f saliva, ga on Tests: S	stric, pand GOT, SG	creatic, in PT, CPK,	testinal and bile LDH, Hepatitis	secretio	ns. Digestion and	l absorptio	n of biomo	olecule	s. Gall Stone,	
11. CO-l	PO mapp	ing												
Cos	PO1	PO2	PO3	PO4	PO5]	PO6	PO7	PSO1	PSO	D2 PS	SO3	PSO4	
CO1	3	1						1	2			3	2	
CO2	3	1						1	2			3	2	
CO3	3	1						1	2			3	2	
CO4	3	1						1	2	2		3	2	
CO5	3	1						1	2			3	2	
BS351	3	1						1	2	0.	4	3	2	
	3: Strong contribution, 2: Average contribution, 1: Low contribution													
13. Boo	13. Books recommended:													
1. Introdu 2. Fox S	uction to I I – Huma	Physiolog n Physiol	y by Davi ogy. (Mc	dson H an Graw Hill	d Segal M 1998, ISF	[.B. Acade 3N: 00711	emic Press. 157069)							
2 Maff-	t D and C	ahouf C I		n Dhusici-	The Design of the Second		Enontiona (Mari	··· 1002	ICDN. 0010000	20)				

3. Moffett D and Schauf C L – Human Physiology: Foundations & Frontiers, (Mosby, 1993, ISBN: 801669030)

- Seeley R, Stephens T and Tate P Anatomy & Physiology, (McGraw-Hill, 1999, ISBN: 0071169881)
 Physiological chemistry by Harper.
 Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.

P So PIOCHEMI	TDV 2rd	waan/ 6 th com											
1. Name of the D	epartment	t: Biosciences											
2. Course Name		SEMINAR											
3. Course Code	•	BS352											
4. Type of Course	e (use tick	mark)	Core ($$)	Foundatio	on Course ()	Departmental Elective ()							
5. Pre-requisite (i	f any)	10+2 with Biology	6. Frequency (use tick marks)	Even $()$	Odd ()	Either Sem ()	Every Sem ()						
7. Total Credits = 02													
8. COURSE OBJ	8. COURSE OBJECTIVES: The students will be able to summarise and present the existing data related to a specific topic in the form of a report. Every student will present a seminar on a topic related to theoretical or experimental advanced topic.												
9. COURSE OUT	COMES (CO):	related to incoretical of experimen	tur, uu vurieeu	topie								
After the successfu	l course co	mpletion, learners will d	levelop following attributes:										
COURSE OUTCOME (CO)			ATTRIBUTE	ES									
601	The stude	ents will understand and	interpret latest advancements throug	gh different te	chnical paper	rs, reports, Journ	nals, Data						
COI	sheets, bo	ooks etc											
CO2	The stude	ents will inculcate the ski	lls for literature survey and will lear	rn to manage	resources eff	ectively.							
	The stude	ents will be able to summ	narize the recent research and technol	ologies in the	form of revie	w and will be a	ble to deliver						
CO3	power po	oint presentations on an a	ssigned topic.										
<u> </u>	Commun	icate his/her ideas with h	is peers as audience, which will enh	nance both ora	al and written	communication	ı skills.						
UU4													

10. CO-I	0. CO-PO mapping													
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4			
C01	3	2	1		2		2	2		3	2			
CO2	3	2	1		2		2	2		3	2			
CO3	3	2	1		2		2	2		3	2			
CO4	3	2	1		2		2	2		3	2			
CO5	3	2	1		2		2	2		3	2			
BS352	3	2	1		2		2	2		3	2			
				3: Strong cor	tribution, 2: A	verage contributi	on, 1: Low cont	ribution						

CO5

Create interest to pursue lifelong learning.

B. Sc. BIOCHEMISTRY 3 rd year/ 6 th semester													
1.Name of the Departme	1.Name of the Department: Biosciences												
2.Course Name	PROJECT & T	FRAININ	NG										
3.Course Code	BS315												
4.Type of Course (use ti	ck mark)	Core	e(√)		Foundat	ion Course ()	Departmer	tal Elective()					
5.Pre-requisite (if any)	10+2 with Biolog	y 6.Fre q	quency(use ticl	k marks)	Even (√)	Odd ()	Either Sem ()	Every Sem()					
7. Total Credits = 04	4												
8. COURSE OBJECTIVES: The main objective of this course is to acquaint the student with various techniques used in contemporary esearch in biochemistry or allied areas.													
9. COURSE OUTCOMES (CO): After the successful course completion, learners will develop following attributes:													
COURSE OUTCOME (CO)				ATT	RIBUTES								
CO1	To be able to define	a researc	ch problem.										
CO2	To conduct bench w	vork.											
CO3	To prepare the resea	arch repor	rt and its oral de	emonstrat	ions.								
CO4	To coorealate theore	etical kno	wledge of tech	niques wi	th practical	application							
CO5	To promote lifelong	learning											
 Students would carry o detailed project report/disse 	ut individual project ertation should be su	s at any r Ibmitted i	esearch institut	tion/industent follow	try/in hous ed by prese	e trainings of the trainings of the training of the training and visual training and visua	neir choice for 3 va.	months. The					
11. CO-PO mapping													

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3		1	1		3	2		3	2
CO2	3	3	2	1	3		3	2		3	2
CO3	3	3	2	1	3		3	2		3	2
CO4	3	3					3	2		3	2
CO5	3	3					3	2		3	2
BS315	3	3	0.8	0.6	1		3	2		3	2
			3. Strong	a contributi	ion 2. Average	contribution	1. Low conf	ribution			

3: Strong contribution, 2: Average contribution, 1: Low contribution

Students are allocated a dissertation topic individually under the supervision of faculty of the department.
The dissertation must be similar to the thesis style and encompass:

(i) Introduction / Rationale and Review of Literature

(ii) Materials and Methods,

(iii) Results,

(iv) Discussion and (v) Bibliography.The dissertation should be submitted in type-written, bound form to the department for record.

B. Sc. BI	B. Sc. BIOCHEMISTRY 3 rd year/ 6 th semester														
1.Name o	of the Dep	partme	nt: Bioso	ciences											
2.Course	Name		EDU	CATIONA	L TOUR										
3.Course	Code		BS31	.6											
4.Type of	f Course	(use tio	ck mark)		$Core(\sqrt{)}$		Foundati	ion Cours	se ()	Departmental Elective()					
5.Pre-rec	quisite (if	any)	10+2 w	vith Biology	6.Frequen cy(use tick marks)	Even (√)		Odd ()	Either Sem	() EveryS	lem()			
7. Total C	Credits =	02													
 8. COURSE OBJECTIVES: The main objective of this course is to provide the students an exposure to various research activities in the country and acquaint the student with state of the art technique/instruments used in various research institutions and industries of national repute. The student needs to submit a report after completion of the tour. 9. COURSE OUTCOMES (CO): 															
After the successful course completion, learners will develop following attributes:															
COURSI	COURSE OUTCOME (CO) ATTRIBUTES														
	<u> </u>		Develop	o understanc	ling of state of	the art te	echniques/ins	struments	used in variou	s reputed rese	arch instituti	ions.			
	CO1		and indu	ustries											
	CO2		Take pa	rt in Group	discussion and	d learn Te	eam work.								
	CO3		Enhance	e communic	ation and soci	al skills t	by communic	cation with	n peers.						
	CO4		Student	shall be abl	e to plan and i	mprove t	he Technica	l Report v	vriting skills						
10. The s	tudents v	vould b	nave cr	to a nation	al scientific la	boratory	y or industry	y for one	week.						
11. CO-PO) mappin	ıg				1	T	T	T			-			
Cos	PO1	PO	2 I	203	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4			
C01	3	2	1					3	2		3	2			
CO2	3	2	2	1				3	2		3	2			
CO3	3	2	2	1				3	2		3	2			
CO4	3	2						3	2		3	2			
CO5	3	2		1			2	3	2		3	2			
BS316	3	2	1	0.6			0.4		2		3	2			
			3:	Strong con	tribution, 2:	Average	contributio	n , 1: Lov	v contribution	1					

			1						1	1		
PO-PSO	01	03	03	04	05	90	22	80	01)S2	03	04
Course	Р	Р	Р	Р	PC	Р	Р	PC	Sd	PC	S	Sd
BS112	3	1					1	3		3	2	3
BS141	3	1		2.4	1	2.4		1.4	0.4	1.8	1.2	3
BS232	3	1			3		1	1.4	0.4	1.8	1.2	3
BS233	3	1					1			3		3
BS113	3	1				3	1				3	3
BS205	3	3	1	0.4		3		3	2		3	3
BS202	3	3	1	0.4		3		3	2		3	3
BS242	3	1					1	1	0.4			3
BS243	3	1				2		1	3		0.4	3
BS244	3	3	1			2	3	1		0.4		3
BS206	3	3	1				3	3	1		1	3
BS251	3	1		0.4	1.8		1		3	0.4	0.8	3
BS212	3	1		0.4	1		1	3	0.4	0.8		3
BS252	3	1		0.4			1	3	0.4	0.8		3
BS253	3	1	0.4				1		3	0.4	0.8	3
BS201	3	1	0.4				2	2.4		0.8	0.4	3
BS255	3	3	1		0.4		3	2.4		0.8	0.4	3
BS308	3	3		0.4		0.4	3		2.4		0.8	3
BS211	3	1		0.4	2	0.4	3	0.4	2.4		0.8	3
BS341	3	1					1	2.4		0.8	0.4	3

B.Sc. Biochemistry Program Articulation Matrix: (Mapping of Courses with POs and PSOs)

BS303	3	1		0.4	0.4	0.4	2	2.2	0.2	1.2		3
BS306	3	1			0.8	1	2.2	2.2	0.2	1.2	0.4	3
BS305	3	1					1	3		3	2	3
BS342	3	1		2.4	1	2.4		1.4	0.4	1.8	1.2	3
BS343	3	1			3		1	1.4	0.4	1.8	1.2	3
BS216	3	1					1			3		3
BS204	3	1				3	1				3	3
BS312	3	3	1	0.4		3		3	2		3	3
B8351	3	3	1	0.4		3		3	2		3	3
BS352	3	1					1	1	0.4			3
BS315	3	1				2		1	3		0.4	3
BS316	3	3	1			2	3	1		0.4		3
Average	3	2	1	1	1	2	2	2	1	2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation