

Coimbatore - 641 046, Tamil Nadu, India

Progra	mme Educational Objectives (PEOs)					
The M expecte	The M. Sc. Microbiology program describe accomplishments that graduates are expected to attain the following:					
PEO1	To provide an excellence in their microbiology subject along with research					
PEO2	To expertise in the fields of clinical microbiology and also quality controller in industries					
PEO3	The students shall become an industrialist and also an entrepreneur commercializing his own microbial product					
PEO4	To provide the students with subject proficiency, environmental awareness, ethical codes and guidelines, along with life education for a successful professional career.					



Programm	Programme Specific Objectives (PSOs)						
After the s students a	After the successful completion of M. Sc. Microbiology degree course, the students are able to						
PSO1	Recollect the fundamental aspects in the various branches of Microbiology, which enable them to be familiar with emerging and advanced scientific concepts in life sciences						
PSO2	Implement the obtained conceptual knowledge through connecting interdisciplinary areas of Microbiology						
PSO3	Evaluate the necessity and its effectiveness of scientific application towards the development of society						
PSO4	Analyze the advancement in Microbiology in research aspects which lead to new inventions						
PSO5	Create innovative ideas in technical areas of Microbiology, to become an industrialist, entrepreneur and a good citizen to the nation						



Programm	Programme Outcomes (POs)						
On succes	On successful completion of M. Sc. Microbiology degree course, the students are able to						
PO1	Acquire knowledge on microorganisms and its significance in various fields of microbiology						
PO2	Focus on innovation and entrepreneurial thinking to be successful in a rapidly changing world.						
PO3	Develop knowledge in qualitative, quantitative, analytical skills and Fulfill the necessity of Life Sciences stream through clearing NET/ SLET and other competitive exams.						
PO4	Conquer the novel and recent techniques to compete with the societal needs.						
PO5	Impart knowledge on progressing issues and its significance on ethical thinking.						
PO6	Manipulate the microbes using various molecular biology techniques for the benefit of living organisms.						
PO7	Scale up production of microbial metabolites using industrially important microorganism adopting bioprocess technology						
PO8	Apply bioinformatics tools for analyzing molecular biology data of Microbes						
PO9	Understand the Synthesize of Nano-materials and the impact on microbiological applications.						
PO10	Understand the importance of artificial intelligence and machine learning in microbiology and allied applications.						



BHARATHIAR UNIVERSITY, COIMBTORE: 641 046 Revised M.Sc. MICROBIOLOGY SCHEME OF EXAMINATION (CBCS PATTERN)

(Affiliated Colleges)

(For the students admitted during the academic year 2023-2024 Batch onwards)

To Adopt OBE Only

Study Components	Course Title	Sub. code	Inst Hrs/	Exam	Max Marks		5	Credit
			Week	Dur (hrs)	CIA	Univ exam	Total	
		SEM	ESTER I			•		
Paper I	Fundamentals of Microbiology	13A	5	3	25	75	100	4
Paper II	Microbial Physiology and Biochemistry	13B	5	3	25	75	100	4
Paper III	Applied Biotechniques	13C	5	3	25	75	100	4
Paper IV	Environmental and Agricultural Microbiology	13D	5 லக்கழகம்	3	25	75	100	4
Practical	Practical I	23P	5	*n (-	-	-	-	-
Elective	Paper I	1EA/1EB/1EC	5	23	25	75	100	4
	-	SEMI	ESTER II	9 (H				
Paper VI	Molecular Genetics	23A	5	- 3	25	75	100	4
Paper VII	Microbial Food Technology	23B	JAR UNIVER	2616010	25	75	100	4
Paper VIII	Bioprocess Technology	23C 5.5 & B.5	5 தப்பாரை உயர் Ducate to Elevate	から 3	25	75	100	4
Paper IX	Gene Manipulation and Bioinformatics	23D	5	3	25	75	100	4
Practical	Practical I	23P	-	9	40	60	100	4
Practical	Practical II	23Q	5	9	40	60	100	4
Elective	Paper II	2EA/2EB/2EC	5	3	25	75	100	4
		SEME	STER III		I			•
Paper X	Immunology and Immunotechnology	33A	5	3	25	75	100	4
Paper XI	Medical Microbiology	33B	5	3	25	75	100	4
Paper XII	Biotechnology and IPR	33C	5	3	25	75	100	4
Paper XIII	Bionanotechnology	33D	5	3	25	75	100	4

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Paper XIV	Biostatistics and Research	33E	5	3				. 10.05.	
ΛIV	Methodology								
Practical	Practical III	43P	5	-	-	-	-	-	
		SEME	STER IV						
Elective	Paper III	4EA/4EB/4EC	4	3	25	75	100	4	
Practical	Practical III	43P	5	9	40	60	100	4	
Project	Project and viva- voce	47V	16*	-	-	-	200*	8	
Training	Industrial training /Internship and viva- voce @	47A	-	-	-	-	50*	2	
Elective	Paper IV –Practical	4EPA/4EPB/ 4EPC	5	9	40	60	100	4	
	Total						2250	90	
	·	ONLINE	COURSES	5	-				
	SWAYAM – MOOC – Online Course	Non-scholastic with credits						2	





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Cou	rse code	13A	M. Sc., MICROBIOLOGY	L	Т	Р	С
	Cor	e	PAPER I – FUNDAMENTALS OFMICROBIOLOGY	4	1	-	4
Pre-	requisite		Basic Knowledge about Microbes	Sylla Vers	bus ion	202 202	0 - 1
Course Objective:							
To p	To provide the students with the foundation of the microbiology including bacteriology,						
phyc	cology, my	cology and	virology.				
Exp	ected Cou	rse Outcor	nes:				
On t	he success	ful complet	ion of the course, student will be able to:				
1	Acquire l	pasics and i	mportance of Microbiology			K1	-
2	Perform	Microscopy	y, staining, and characterization of microbes			K3	;
3	Describe	the classifi	cation of Bactria			K2)
4	Know in	detail the c	haracteristic features of algal and fungal classification	1		K2	2
5	Gain insi	ghts into th	e important characters for classification of animal viru	uses		K2	2
K1 -	Remembe	er; K2 - Un	derstands; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 - C	reate		
Unit	t :1		HISTORY AND DEVELOPMENT		1	3 ho	urs
Spor Jose Smit	ntaneous g ph Lister, 1 th, Temin d	eneration, C Edward Jer & Baltimore	Conflict - Contributions of Leeuwenhoek, Louis Paste iner, Winogradsky, Paul Ehrlich, Lederberg & Zinder e, Montaigner and Galo.	eur, Ro , Lwof	bert f, Ar	Kocł ber &	1, č
Unit	t:2		MICROSCOPY AND STAINING		1	5 ho	urs
Mic	roscopy: I	Principle ar	nd working of Bright field, Dark field, Phase Contr	ast, Fl	uores	cenc	e,
Con	focal scann	ning micros	cope and Electron (TEM, SEM) microscopes.Stainin	ng: Sin	nple,	Grar	n,
Neg	ative, Caps	sule, Spore	staining, Flag <mark>ellar, Nuclear staining,</mark> Acid fast and Fu	ngal st	ainin	g.	
Unit	t:3		BACTERIAL TAXONOMY		1	5 ho	urs
Don	nains and	kingdoms	of life - Bacterial Nomenclature - Classification	on of	bacte	ria	oy
phys	siological,	metabolic,	serological and molecular methods - Bergey's man	nual of	f syst	ema	tic
bact	eriology w	ith general	characteristics of each division - Numerical taxon	omy -	16S :	r RN A	4
base	d classifica	ation.					
Unit	t :4	CLA	ASSIFICATION OF ALGAE AND FUNGI		1	5 ho	urs
Gen	eral chara	cteristics a	nd classification of algae (Fritsch). Structure and	d repro	oduct	ion	of
Cha	lmydomon	as sp. Gen	eral characteristics and classification (Alexopolus) of	of fung	gi. Stu	uctu	re
and	reproduction	on of Asper	gillus niger and Saccharomyces cerevisiae. General c	haract	eristi	cs an	d
class	classification of Protozoa. Structure and reproduction of Paramecium sp.						
Unit	t :5		TAXONOMY OF VIRUSES		1	5 ho	urs
Gene Char genc and	Unit:5 TAXONOMY OF VIRUSES 15 hours General properties and Classification of Viruses. Cultivation of plant and animal viruses – Characterization and Enumeration of viruses – Quantitative assay. General properties, structure, genome replication, protein synthesis and assembly of: DNA containing plant viruses – CaMV and Comini Virus BNA containing plant viruses						

Un	it:6			CO	NTEM	PORAR	Y ISSUI	ES			2 ho	ours
Exp	pert l	lectures, o	nline ser	ninars –	webinars	8				•		
							Tota	al Lectu	re hours		75 ho	urs
Tex	xt Bo	ook(s)										
1	At	las, R.M.,	1997. Pi	rinciples	of Micro	obiology	2nd Ed.	WCB M	CGraw H	Hill Publi	ications, N	lew
	De	lhi.										
2	Bla	ack, J.G.,	1999. N	licrobiol	ogy: Pri	nciples a	and Expl	lorations	4th Ed.	., Prentic	ce Hall	
	Int	ernational	, Inc.									
3	Pre	esscott, L.	M., Harl	ey, J.P.	and Klei	n, D.A.,	2005. M	licrobiol	ogy. 6th	Ed., TA	TA McGr	aw
4	H1	$\frac{11}{1000000000000000000000000000000000$	elhi.		1 ()(1 • 1	<u>(1)</u>	- 1 T	1.D	1 D 1	1.1	.
4	Ale	camo E. 2	001. Fur	idamenta	als of M1	crobiolo	gy. 6th F	Ed., Jone	s and Ba	rtlett Pul	blishers, N	ew
5	De	$\frac{1111}{10} \wedge 1 20$	001 Eur	domonto	le and D	Principla	of Post	ariology	7th Ed	Toto N		
5	Gr	aw Hill N	Jew Delł	ni	lis allu F	meiples	S OI Daci	lenology	. /ui Eu	., Tata N		
Re	ferei	nce Books	s de la della de la della de la della d									
1	M	digon M	T Mortin	ako I M	Dunlon	D.V. and	Clark D	D 2009	Droals I	Diology	,f	
1	Mi	croorgani	1, 101a1111 sms $12t^2$	h Ed Pe	Duillap arson/Pr	r v allu entice H	oll	F. 2008	. DIUCK I	Slology (Л	
2	Ha	ves W 1	968 The	Genetic	s of Bact	teria and	their Vi	TISES				
-	Le	$\mathbf{P} \mathbf{R} \mathbf{E} 2$	0.08 Phys	rology (ambride	e Unive	rsity Pres	<u>s</u> s				
4	DN	/ Knipe. 1	PM How	$\frac{1}{1} \frac{1}{2} \frac{1}$	7. Fields	Virology	v. 5 th Edi	tion inp	incott W	illiams &	z Wilkins	
-	He	alth		109.200		10105.). o Lui	inom ipp		i i i i i i i i i i i i i i i i i i i		
Rel	lated	l Online (Contents	5 [MOO	C, SWA	YAM, N	PTEL,	Websites	s etc.]			
1	htt	p://ecours	esonline	.iasri.res	.in/cours	e/view.p	hp?id=1	08				
2	htt	ps://micro	benotes.	com/clas	ssificatio	n-of-fun	gi/	ipLi				
3	htt	ps://www	.onlineb	iologyno	te <mark>s.com</mark> /	classifica	ation-of-	bacteria/	1			
Co	urse	Designed	By: Dr.	R. Vijay	aragha	van	Ser.	₹.		1		
			r	Mappi	ing with	Program	nme out	comes		[
C	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO)1	М	L	L	Ľvz	LCoimba	M	sole L	М	L	М	
CO	2	М	S	М	Μ	S. MLING	π 2_M ^{5,9}	L	Μ	L	Μ	
CO	3	М	М	М	L	М	L	М	L	М	L	
CO	94	М	М	М	L	М	М	L	М	М	L	
CO	5	М	М	М	L	М	L	М	L	М	М	

Cou	rse code	13B	M.Sc., MICROBIOLOGY	L	Т	Р	C		
	Cor	e	PAPER II - MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY	4	1	-	4		
Pre-	requisite		Fundamentals of cell organelles	Syllabu Versio	ıs n	2020 2021	-		
Cou	Course Objectives:								
1. In	1. Introduce conceptual idea on physiology of the microorganism								
2. D	evelop kno	owledge on	the role of enzymes and its mechanism			C1 1			
3. In	npart knov	vledge on the	ne biosynthetic pathways to understand microbial	role in	bene	ficial a	ind		
na E-m	armful effe	ects	2003						
Exp On t	be success	ful comple	tion of the course, student will be able to:						
	Ine success		tion of the course, student will be able to.	1 .1		1710	W2		
1	Understa	and the ultra	astructure of prokaryotic and eukaryotic cells and	apply th	le	KI&	K3		
2	Comprok	aboratory a	a of putrients in microbial growth and their untak			K)			
2	mechania	sm underst	and growth kinetics and growth influencing facto	.C rs		κ <i>z</i>			
3	Understa	nd carbohy	drate metabolism, respiration and fermentation	15		K3			
4	To categ	orize on the	e types of enzymes and their mechanism			K4			
5	To priori	tize the im	portance of biosynthesis of macromolecules			K5			
K1 -	Remember	er: K2 - Un	derstands: K3 - Apply: K4 - Analyze: K5 - Evalu	ate: K6	- Cr	eate			
Unit	t:1	CI	ELL STRUCTURE AND ORGANIZATION		<u>a</u>	13 ha	ours		
Mic	robial cell	– Ultra s	structure of Prokaryotic and Eukaryotic cell –	Differe	ences	betw	een		
prok	aryotic an	d eukaryot	ic cells – Slime layer, Capsules, Pili, Flagella - Su	ub-cellu	lar o	rganell	es		
– sti	ructure and	d function	- cell envelope, cytoplasm, nucleus, nuclear en	velope,	mite	ochond	ria,		
ende	plasmic r	eticulum, C	Golgi Comp <mark>lex,</mark> ribosomes, lysosomes - Endospo	res, Cel	l me	embran	e –		
Lipo	somes –E	xtremophil	es - Archaebacteria – Adaptations to extreme envi	ironmen	ts.				
Uni	t:2	Μ	ICROBIAL NUTRITION AND GROWTH			15 ho	ours		
Nuti	itional g	rouping	of Microorganisms - Phototrophs, Chem	otrophs,	A	utotro	phs,		
Hete	erotrophs,	Lithotroph	s and Organotrophs. – Uptake of nutrients by	the cel] — рі	Facilit	ated		
01III Dhot	Ision – Ac	tive transp	ort – Group translocation, Iron uptake - Pinocyto	olvin or	Phag	gocyto	S1S -		
nutr	ient requir	ements G	rowth factors – Microbial growth – Growth cu	arvin Cy rve – M	LIC ·	remen	t of		
mici	obial grov	vth. Growtl	h kinetics – Batch, Continuous and Synchronous	cultures	. Fac	ctors	t OI		
influ	encing the	growth of	microorganisms.	e un un es					
Uni	t:3	R	ESPIRATION AND FERMENTATION			15 ho	ours		
Carl	ohydrate	metabolism	n – EMP, HMP and ED pathway – Kreb"s Cycle	- Glyo	xyla	te cycl	e –		
Aero	obic respir	ration – Su	bstrate level and Oxidative phosphorylation – A	ATP ger	ierati	ion. Li	pid		
cata	catabolism – β -oxidation. Anaerobic respiration – Sulphur compounds – Nitrate and Carbon -di								
- oxi	- oxide as electron acceptors. Fermentation.								
Uni	t :4	ENZY	MES CLASSIFICATION AND KINETICS			15 ho	ours		
Enz	Enzymes and co-enzymes: IUBMB classification and nomenclature of enzymes, active site,								
Rev	Reversible – Competitive, Noncompetitive, uncompetitive, Irreversible inhibition.								

Un	it:5	BIOSYNTHESIS OF MACROMOLECULES	15 hours
Pro	tein structu	res, Biosynthesis - Aminoacids: Aspartic and serine familie	es. Fatty acid
syn	thesis, Nuc	eotide biosynthesis- Bioluminescence.	
Un	it:6	Contemporary Issues	2 hours
Exp	pert lectures	, online seminars – webinars	
		Total Lecture hours	75 hours
Tey	xt Book(s)		
1	Microbiol	ogy. 7th edition, 2008. Prescott LM, Harley JP and Klein	DA. McGraw Hill,
	Newyork.		
2	Caldwell.	D.R. 1995. Microbial Physiology and metabolism, Wm C. Bro	own Publishers.
3	Moat. A.C	and Foster. J.W. 1988. Microbial Physiology, John Wily so	ns. White J.D.
	Motteshea	d. D.W. Harrison S.J. Enivronmental system 2ed. 1992.	
4	Stainier R	Y. Ingraham, J.L. Wheolis, H.H. and Painter. P,R. 1986. Micro	obiology.
5	Principles	of Biochemistry – Lehninger, Nelson, Cox, CBS publishers.	
Ref	ference Boo	bks	
1	Brock Bio	ology of Microorganisms, 15th edition, 2017. Michael M.	Madigan, Kelly S.
	Bender, D	aniel H. Buckley, W Matthew Sattley, David A. Stahl, Publish	hed by Pearson
2	The Physi	ology and Biochemistry of Prokaryotes, 4th Edition, 2011.	David White, James
	Drummon	d, and Clay Fuqua, Oxford University Press.	
3	Protein St	ructure, Stability and Folding by Kenneth P. Murphy. Publish	ed by Humana Press
	Inc. 2001		1 B
Rel	lated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onl	inecourses.swayam2.ac.in/cec20_bt14/preview	
2	http://web	.iitd.ac.in/~amittal/2007 Addy Enzymes Chapter.pdf	
		· · · · · · · · · · · · · · · · · · ·	
Cou	urse Design	ed By: Dr. A. Vijaya Chitra	

				The The		. F	.9			
			Mapp	ing with	Program	nme outo	comes			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	М	EDUCAT MELEVA	M M	S	S	L	М
CO2	S	S	М	М	М	L	М	М	М	L
CO3	S	М	М	S	М	М	S	L	М	L
CO4	М	М	S	М	S	L	М	S	М	L
CO5	S	S	L	S	S	L	S	L	М	М

Cou	rse code	13C	M.Sc., MICROBIOLOGY	L	Т	P	С	
	Cor	'e	PAPER III - APPLIED BIOTECHNIQUES	4	1	-	4	
Pre-	requisite		Aware on Bioinstrumentation	Sylla Vers	bus ion	202 202	0- 1	
Cou	rse Object	tives:						
The	main objec	ctives of this	course are to:					
1. M	ake the stu	idents know	about the principle behind the instruments and to a	cquaint	them	with	l	
the f	the fundamentals of research methods.							
Exp	ected Cou	rse Outcom	es:					
On t	he success	ful completi	on of the course, student will be able to:					
1	To help t	he students t	o identify the physical and chemical characters of n	nacrom	olecu	les	K1	
2	To facilit	ate the stude	ents with the principles and applications of the vario	us techi	nique	S	K3	
3	To apply	their knowle	edge in principles and instrumentation of centrifugation	tion			K3	
4	To imple	ment the ins	trumentation of chromatography				K3	
5	To determ	nine the prin	ciple and instrumentation of electrophoresis.				K3	
K1 -	Remembe	er; K2 - Und	erstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 - C1	reate			
Unit	Unit:1 FUNDAMENTALS OF MACROMOLECULES 15 hou							
Func	Fundamental building blocks – Atoms – Bonds and molecules. Macromolecules – Chemical nature							
and	functions of	of Carbohyd	rate, Lipids, Proteins and Nucleic acids. Radioisoto	opes – N	Aeası	ireme	ent,	
uses	and safety	aspects. Au	toradiography, GM counters, Scintillation – Instru	mentati	on ar	nd		
appl	ications.		Self Carlos					
Unit	::2		COLORIMETRY		1	5 ho	urs	
Prine	ciples, Ins	trumentatior	and Applications- Beer Lambert"s law and dev	viation	– Ar	nalysi	is –	
Qual	litative an	d Quantitati	ve. Basic principles of spectrophotometry: The	laws c	of ab	sorpt	ion,	
princ	ciples and	instrument	ation for UV- visible and IR spectroscopy. Pr	inciples	, the	ory	and	
appl	ications of	spectrofluo	rometry, and Flame photometry, NMR, 3D struct	ure by	x- ra	y .		
diffr	action, ES	SR - Princi	ples, Instrumentation and Applications. Analysi	s – Qi	ialita	live	and	
Quai	ntitative.				1	5 ho		
	.: <u>)</u>			<i></i>		<u>5 no</u>	urs	
Ann	cipies – in: lications	strumentatio	n – Types – Methods and Factors affecting sedimen	itation (co-en	licier	11 —	
Unit	•• 4		CHROMATOGRAPHY		1	5 ho	urs	
Prine	rinles Ins	trumentation	Types and Detection methods – Paper TLC I	IPI C	$\frac{1}{GC}$		<u>1</u> S/	
LCN	(S). Ion-ey	change. Col	lumn, Gel permeation, Chiral, Hydroxyapatite, Imr	nuno ac	lsorp	tion a	and	
Affi	nity Chron	atography –	Applications.		P.			
Unit	::5		ELECTROPHORESIS		1	5 ho	urs	
Prine	ciples, Inst	rumentation	, Types. Staining and Detection methods – Isoelect	rophore	sis –			
isoel	ectric focu	using – App	lications. Mass spectrometry based methods for pr	otein i	lentif	icati	on,	
MA	LDI-TOF,	2D gel elect	rophoresis.					
Unit	::6		Contemporary Issues			2 ho	urs	
Expe	ert lectures	, online sem	inars – webinars					
			Total Lecture hours		7	'5 ho	urs	

Tey	Text Book(s)					
1	Physical Biochemistry: David Freifelder.					
2	Practical Biochemistry, Boyer					
Ref	ference Books					
1	Practical Biochemistry, Keith Wilson and John Walker, 4ed . 1994					
2	Foundation in Microbiology, Kathleen Talaro and Arthur Talaro, WCB Publishers.					
	1993.					
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://www.biopharmainstitute.com/course/GLP06					
2	https://study.com/academy/topic/equipment-instrumentation-for-microbiology-labs.html					
Cou	urse Designed By: Ms. N.Gunasheela					

			Mapp	oing with	Program	nme out	comes			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	М	S	М	М	М	L	М
CO2	S	S	М	S	М	М	S	L	М	L
CO3	S	М	S	М	S	S	S	М	М	М
CO4	S	S	М	S	S	S	S	М	L	L
CO5	S 📲	S	S	М	ுலச் S ழக	S	М	L	Μ	L



Cour	se code	13D	M.Sc., MICROBIOLOGY	L	T	Р	C
	C		PAPER IV- ENVIRONMENTAL AND		1		
	Core		AGRICULTURAL MICROBIOLOGY	4	I	-	4
D	•••		Basic knowledge about the importance of microbes in	Sylla	bus	2020)-
Pre-1	requisite		Agriculture	Versi	on	2021	l
Cour	se Objec	ctives:					
The r	nain obje	ctives of	f this course are to:				
1. To	give han	ds-on ex	sperience on isolation and characterization on environmental m	icrobio	logy.		
2. III stude	is paper in the	is design	soil microbiology	lory ski	ns to	1	
3. Th	e practica	al structu	ire is designed so that solid waste treatment.				
Expe	cted Cou	irse Out	comes:				
On th	e succes	sful com	pletion of the course, student will be able to:				
1	To make microbio	e the stud plogy	lents understand the contemporary issues associated with envir	onment	al	K2	2
2	To unde	rstand th	e significance of soil microorganisms and their impact in envir	onment	t	K	2
3	To make	e the stud	lents capable of applying fundamental principle of microbiolog	gy to wa	iste	K3	3
	water tre	eatment	an Nata Basis				
4	To facili	tate the	students understand microbial ecology and community develop	ment		K2	2
5	To facili solid wa	tate und stes and	erstanding about analysis and treatment of hazardous and non h treatment	nazardo	us	K2	2
K1 -	Rememb	er; K2 -	Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - C	Create			
Unit	1		AEROBIOLOGY		1	5 hou	ırs
Micro	obial co	ntaminat	ion of air-Sources of contamination-Biological indicators	of ai	r po	ollutic	on.
Enun	neration	of bacte	ria from air, Air sampling devices. Significance of air Mic	roflora	, Ou	tline	of
Airbo	orne dise	ases (Ba	cterial - Whooping cough, Diphtheria, Pneumonia; Fungal - A	Aspergi	llosis	5, 	
Cryp nlant	s and Hu	is; virai mans	- Cinckenpox, Influenza, Measles), Air sanitation. Effect of	a Air p	onu	.10n C	m
Unit	2	mans.	SOIL MICROBIOLOGY		1	5 hoi	irs
Struc	- ture. Tvr	es. Phys	ical and Chemical properties-Soil microbes (Types and Enume	eration)	-Wea	theri	ng
and H	Iumus fo	rmation,	Soil pollution-Sources. Biogeochemical cycling-Nitrogen, Ca	rbon, P	hosp	horou	ıs,
Sulph	nur, Iron	cycles a	nd its importance.				
Unit	3		AQUATIC MICROBIOLOGY		1	5 hou	ırs
Micro	obiology	of water	(Aquatic environment-Fresh and Marine)- Water Pollution an	d Wate	rbor	ne	
Patho	ogens. As	sessmen	t of water quality (Chemical and Microbial) Bacteriological ex	amınatı	on o	t wate	er-
Indic Unit	ator orga	nisms. v	MICROBIAL INTERACTIONS		1	5 hou	irc
Micr	- obial inte	raction_	among microbes with plants Phyllosphere Rhizosphere Myc	orhizza		mbio	ns tic
and f	Free-livin	g nitrog	en fixers (Rhizobium, Azotobacter, Azospirillum, Frankia,	BGA a	nd /	Azolla	10 1 -
Phos	phate sol	ubilizers	(Phosphobacterium and Aspergillus) - PhytopathogensBacter	erial, F	unga	l, Vir	al
disea	ses (Wilt	, Blight,	Canker, Mosaic) - Control measures.				

Unit	::5	BIODEGRADATION OF SOLID WASTE	15 hours
Recy	cling	of Solid wastes-Composting-Biogas, Mushroom and SCP	production from Waste.
Biod	legrada	tion of Complex Polymers (Cellulose, Hemicellulose, Lig	nin, Chitin and Pectin),
Bior	emedia	tion (In-situ, Ex-situ, Intrinsic, Engineered, Solid phase, Slurry	y phase, Mobilization and
Imm	obiliza	tion systems) Bioaugmentation and Biostimulation, Bioleaching	(Copper and Uranium) -
Degi	radatio	n of recalcitrant polymers and xenobiotics eg., cellulose, lignin a	and lignocellulose. GMOS
and l	Enviro	nment. Applications of GIS and RS techniques in Environmental m	onitoring
Unit	::6	Contemporary Issues	2 hours
Expe	ert lect	ures, online seminars – webinars	
		Total Lecture hours	75 hours
Text	t Book	(s)	
1	R. M.	Atlas and R. Bartha - 1998 - Microbial Ecology - Fundamentals and	d Applications. Campbell.
	R. 198	3. Microbial Ecology, 2ed	
2	Subbh	a Rao, M.S. 1995. Soil microorganisms and plant growth	
3	Martir	Alexander, 1997. Introduction to Soil Microbiology	
4	Reihei	mer. G. 1991. Aquatic Microbiology, 4ed	
Refe	erence	Books	
1	Mitch	ell. R. 1974. Introduction to environmental microbiology	
2	Dart. I	R.K. and Shettron R.J. 1980. Microbiological aspects of pollution co	ontrol. 2ed
3	Brock	Biology of microorganisms12ed, Madigan, Martinko, Dunlap, Clara,	,Pearson
		OBBIDs 1	
Rela	ted O	nline Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https:/	/onlinecourses.nptel.ac.in/noc20_ce17/preview	
2	https:/	/www.wur.nl/en/Education-Programmes/online-education/MOOC	<u>s.htm</u>
Cou	rse Des	igned By: Ms. N.Gunasheela	
		and the second sec	

			Mapp	ing with	Program	nme out	comes			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	ந்தப்பாரை	_ un M	S	М	М	L
CO2	S	S	М	S	M ^{TO ELE}	M	S	М	М	М
CO3	S	М	S	М	S	S	S	L	L	М
CO4	S	S	М	S	S	L	М	М	М	L
CO5	S	S	S	М	S	М	М	М	М	М



Cou	rse code	23A	M.Sc., MICROBIOLGY	L	Т	Р	С				
Core PAPER V - MOLECULAR GENETICS 4 1 Syllabus Syllabus Syllabus Syllabus											
Pre-	requisite		Basic knowledge about Molecular Biology	Sylla Versi	bus ion	202 202)- 1				
Cou	rse Object	tives:									
The	main objec	ctives of thi	s course are to:								
1. Pr	ovide knov	wledge on t	he genetic material of microorganisms and its replica	ation pro	ocess						
2. In	npart conce	eptual idea :	about the central dogma and gene regulation								
J. El	ected Cou	rse Outcon	nology concepts to suit industrial needs								
On f	he success	ful complet	ion of the course, student will be able to:								
1	Understa	nd the conc	ept of genetic material and its replication process			K 2)				
2	Understa	nd and app	ly the knowledge of the genetics of microorganism	ns and t	heir	K3					
-	molecula	r setun in g	ene regulation	ins and t	lien	110					
3	Understa	nd the cen	tral dogma of the prokaryotic and eukaryotic cell	s the c	rene	K 2)				
5	regulation	n and opero	n concept	is, the g	Selle						
4	Evaluate	the role of	genetic recombination in development of new micro	bial str	ains	K4	_				
•	naturally	and concer	tual knowledge on genetic manning	Joiui Su	ams						
5	Analyze	the molecu	lar mechanism behind mutation DNA damage and	l renair	and	K5	&				
Ũ	apply mo	lecular biol	ogy aspects	. repui	una	K3	a				
K1 -	Remembe	er: K2 - Und	lerstand: K3 - Apply: K4 - Apalyze: K5 - Evaluate:	$\overline{\mathbf{K6} - \mathbf{Cr}}$	eate						
Unit	:1	ORG	ANIZATION AND REPLICATION OF DNA		1	5 ho	urs				
DNA	A and Rep	lication: M	endelian principles – Discovery of DNA as genet	ic mate	rial -	DN	A				
struc	ture & alt	ernative fo	rms of DNA. Organization of genetic material: Vi	ruses an	d Ba	cteri	a-				
Euka	arvotes: Ni	cleus and i	nucleosomes, Lamp brush chromosomes, Giant chro	mosome	es - sa	atelli	te				
DNA	A. C-value	paradox. D	NA replication – prokaryotes and eukaryotes - theta	and Pla	smid	DNA	A				
repli	cation- rol	ling circle r	nodels of replication - Inhibitors of replication								
Unit	::2	U	TRANSCRIPTION		1	5 ho	urs				
Tran	scription:	Transcripti	on in prokaryotes and eukaryotes – structures of	rRNA,	tRNA	A an	d				
mRN	NA, post t	ranscriptior	al processes. Inhibitors of transcription. Reverse '	Franscri	ption						
Anti	sense RNA	A and its sig	nificance		-						
Unit	::3	TRA	ANSLATION AND GENE REGULATION		1	5 ho	urs				
Tran	slation: G	enetic code	e - Deciphering of genetic code and important pro	operties	of g	eneti	с				
code	. Translati	on in prok	aryotes and eukaryotes - post translational proces	sing. In	hibito	ors o	f				
trans	lation. Get	ne Regulati	on - Operon models - lactose, tryptophan and arabine	ose oper	on.						
Unit	:4	GEN	ETIC RECOMBINATION AND MAPPING		15	5 ho	urs				
Gen	etic Recom	bination in	Bacteria: Conjugation. F+ v/s F-, Hfr+ v/s F-, F' v/s	F-,							
Tran	sformatior	n, Transduc	tion: generalized and specialized. Mobile elements	in proka	ryote	s an	d				
euka	ryotes – Ir	sertion seq	uences, transposons - properties. : Linkage and gene	tic map	s. Ge	netic	S				
UI I Unit	+ and \wedge pna	ages – Gene MI	TATION AND MOLECULAR MARKERS		1	<u>3 ho</u>	urs				
Mut	agenesis a	nd DNA F	Repair: Mutation – spontaneous and induced mu	tation –	- Tvr	bes (of				
Mut	ation. Mut	agenesis –	Physical and Chemical - DNA damage and repair	mechan	ism.		-				
Mole	ecular Mar	kers, RFLP	, RAPD, AFLP and Isozyme Loci. CRISPR gene ed	iting.							

Un	it:6	Contemporary Issues	2 hours
Exp	pert lectures	, online seminars – webinars	
		Total Lecture hours	75 hours
Tey	xt Book(s)		
1	Principles	s of Genetics, 7th Edition, 2010. Robert H. Tamarin, McGraw H	ill Education
2	Molecular	Genetics of Bacteria, 5th Edition, 2010. Jeremy W. Dale, Simo	n F. Park. Wiley-
	Blackwell	Publishers	
3	Microbial	Genetics, 2nd edition, 2009, John Cronan, David Freifelder, Sta	anly R. Maloy,
	Narosa Pu	blishing House	
4	Principles	of Genetics, 3rd Edition, 2003. Gardner, Simmons, Snustad, Jo	hn Wiley & Sons.
5	Essentials	of Genetics, 1996. Klug, W.S. and Cummings, M.R., Prentice I	Hall, New Jersey
6	Microbial	Genetics, 2nd edition, 1994. Stanley R. Maloy, John E. Cronan,	, David Freifelder.
	Jones and	Bartlett Publishers.	
Ref	ference Boo	bks	
1	Genes XII	, 12th Edition, 2018. Benjamin Lewin; Jocelyn E Krebs; Elliott	t S Goldstein;
	Stephen T	Kilpatrick. Burlington, Massachusetts : Jones & Bartlett Learn	ing, 2018
2	Concepts	of Genetics,12th Edition, William S. Klug, Michael R. Cum	mings, Charlotte A.
	Spencer, N	Aichael A. Palladino, Darrell Killian, 2018	
Rel	lated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onl	inecourses.swayam2.ac.in/cec20_ma13/preview	
Cou	urse Design	ed By: Dr. A. Vijaya Chitra	

				ig the		519. Community				
			Mapp	i <mark>ng w</mark> ith	Program	nme Out	tcomes			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	M	M	S	М	L	М	М
CO2	S	S	Μ	М	THIAR UN	NS	S M	М	L	М
CO3	S	М	М	S	Mihaiore	S col	М	М	М	М
CO4	М	М	S	Μ	தேப்Sாரை பெராசாசாச		L	М	М	М
CO5	S	S	L	S	S	S	М	L	М	М

Course code	23B	M.Sc., MICROBIOLOGY	L	Т	Р	С
Co	ore	PAPER VI – MICROBIAL FOOD TECHNOLOGY	4	1	-	4
Pre-requisite		Fundamentals about food safety and role of microorganism in food processing	Sylla Versi	bus on	2020 2021)- 1
Course Object	ctives:					
The main obje	ectives of this	course are to:				
1. The course v	will enable stu	idents to understand the preservation techniques in	food.			
2. The course	will teach the	strategies to develop fermented and non-fermented	milk pi	oduc	ts.	
3. The student	can knowled	ge on National and International Food Laws and Re	gulation	n		
Expected Cou	irse Outcom	es:				
On the succes	stul completion	on of the course, student will be able to:				
1 To ident	ify appropriat	e processing, preservation and packaging methods			K2	
2 To unde	rstand the var	ious causes of food deteriorations and food poisoni	ng		K2	, ,
3 To analy	ze the food re	elated hazards and HACCP method			K4	-
4 To evalu	ate the produ	ct quality and effect of processing technique			K5	
5 Awaren	ess of food lav	ws and regulations			K2	,
K1 - Rememb	er; K2 - Unde	erstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 – C1	reate		
Unit:1	MICROB	IAL FOOD SPOILAGE AND PRESERVATION	N 🧕	1	5 ho	urs
Food as a sub-	strate – Incide	ence and typ <mark>es of microorganisms</mark> in food – Contan	nination	and		
Spoilage of M	eat, Poultry, S	Sea foods, Vegetables, Fruits.				
Principles of	food preserva	itions: Ase <mark>psi</mark> s, Preservation by use of High temp	erature,	Low		
temperature, C	Canning, Dryi	ng, Radiation and Food additives.				
Unit:2	FERME	NTED FOOD AND FOOD BORNE DISEASES		1	5 ho	urs
Food poisonin	g - Food born	ne diseases- Bacterial and Non- Bacterial. Ferment	ed food	s - M	eat a	nd
risnery product	ttor Duttor m	cured nams, Dry sausages, Idly batter and Sauerkr	aut. Fer	mente	ea m	1IK
Dioducts – Du		ANAL VSIS OF FOOD HAZA PDS		15	ho	urc
In house Com	mittae for au	ality assurance, Persons involved, Internal Microbi		1. ty	по	ui s
control Policy	Influee for qua	beck at every step from collection of raw mater	al Quali iale till	it		
reaches the cu	stomer Impl	ementation of ISO standards definitions principle	es and u	se		
of HACCP in	Food Industry	V.	is und u			
Unit:4	FOOD Q	UALITY AND PROCESSING TECHNIQUE		1	5 ho	urs
Indicator orga	nisms – Dire	ct examination – culture techniques – enumeratio	n metho	ods –	plat	e –
Viable & Tot	al Count; Al	ternative methods - Dye reduction tests , electr	ical me	thods	, A	TP
determination	: Rapid metho	ods, immunological methods – DNA / RNA metho	dology -	- Lab	orate	ory
accreditation.	1					
Unit:5		FOOD LAWS AND REGULATION		1	5 ho	urs
Food laws an	d regulations	A. National – PFA Essential Commodités Act	(FPO, N	ЛРО	etc.)	В.
International	– Codex Alir	nentarius, ISO – 9000 series, ISO 22000 & BS	5750.C	. Reg	gulat	ory
Agencies – W	TO Consume	er Protection Act - Relevance of Microbiological	standar	as &	crite	eria
for food safet	y – Sampling	g plans – Microbiological guidelines Hygiene an	u sanita	uon	in to	bod
accreditation. Unit:5 Food laws an International Agencies – W for food safet	d regulations – Codex Alir /TO Consume /y – Sampling	FOOD LAWS AND REGULATION A. National – PFA Essential Commodités Act nentarius, ISO – 9000 series, ISO 22000 & BS er Protection Act - Relevance of Microbiological g plans – Microbiological guidelines Hygiene an	(FPO, N 5750.C standar d sanita	1 APO C. Reg ds & tion	5 ho etc.) gulat crite	urs B. ory eria

personnel, cleaning and disinfect ion (Methods and agents commonly used in the hospitality industry). Unit:6 **Contemporary Issues** 2 hours Expert lectures, online seminars – webinars **Total Lecture hours** 75 hours Text Book(s) James. M. Jay, 1992, Modern food microbiology 4ed 1 Frazier, W. C. and Westhoff D.C. 1989. Food Microbiology 8 ed 2 **Reference Books** Dubey. R.C. and Maheswari. D.K. A Textbook of Microbiology, 1999. 1ed 1 2 Food Microbiology. 2nd Edition – M.R.Adams & M.O.Moss – Panima Publishers Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://onlinecourses.swayam2.ac.in/cec20_ag13/preview 2 https://onlinecourses.swayam2.ac.in/cec20 ag09/preview 3 https://onlinecourses.swayam2.ac.in/cec19_ag03/preview https://www.coursera.org/courses?query=food 4 Course Designed By: Ms. N.Gunasheela

			Mapp	ing with	Program	nme Out	comes			
COs	PO1	[•] PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	М	М	L	М
CO2	S	S	М	S	M	M	L	М	М	L
CO3	S	М	S	S	S	M	М	L	L	М
CO4	S	S	М	S	S	M	L	М	М	М
CO5	S	S	S	M	S		М	М	L	М

Cou	rse code	23C	M.Sc MICROBIOLOGY	L	Т	P	С
	Cor	e	PAPER VII - BIOPROCESS TECHNOLOGY	4	1	-	4
Pre-	requisite		Aware of industrially important microbes and its products	Sylla Versi	bus ion	202 202	0- 1
Cou	rse Object	tives:					
1. M a	ake the le	arner compe	etent on exploring industrially important microbe	s for c	omm	ercia	lly
impo	ortant prod	ucts					
2. Pr	ovide adec	uate knowle	edge on fermenters, its types, operation and other pa	rameter	s that	,	
gove	ern the fern	nentation pro	ocess				
3. A	uain conce	pluar knowr	microbial industrial products	le strate	gies i	or	
Exn	ected Cou	rse Outcom					
On f	he success	ful completi	on of the course, student will be able to:				
1	Acquire	knowledge	in industrial microbiology understand the	process	of	K7	,
1	fermentat	tion and its t	vnes	process	5 01	112	
2	Attain kn	owledge abo	but the design and components of bioreactors and fa	octors		K2	2
	affecting	the process	of fermentation				
3	Isolate, a	nalyze and	assess industrially important microorganisms from	differe	ent	K4	ļ
	sources to	o develop ne	w industrial microbial products				
4	Apply th	e downstrea	m process techniques and can design suitable stra	ategy fo	or	K3	&
	recovery	of an produc	ct in an industry process			Ke)
5	Develop microbia	in to an ent products th	repreneur with the acquired knowledge in the proc at are commercially important	luction	of	Ke)
K1 -	Remembe	er: K2 - Und	erstand: K3 - Apply: K4 - Analyze: K5 - Evaluate:	K6 - Cr	eate		
Unit	:1	,	FERMENTATION AND ITS TYPES		1	3 ho	urs
Indu	strial micr	obiology -	Types of fermentation-Solid, Submerged - Batch	, Conti	nuou	s, Fe	ed
batc	h - Compoi	nent parts of	fermentation process - Fermentation economics				
Unit	::2		FERMENTERS		13	3 ho	urs
Fern	nenter desi	gn and cons	truction, Fermenter types - Productivity, Yield coeff	ficients.	Heat	t	
prod	uction. St	irring and r	nixing. Gas exchange and mass transfer. Comput	er Apr	licati	ons	in
ferm	entation te	chnology.		F F			
Unit	:3	SCRE	ENING AND UPSTREAM PROCESSING		1	7 ho	urs
Industrially important microorganisms Isolation - Primary and Secondary screening - Screening							ing
for	Enzymos	portant fines	Superior Elevent Organic acide use of MALDI	TOE/T		nd I	ng C
101 -	DI for 1	- problotic r	hput acrossing of matchelites Preservation on	d imp		niu L	C-
IVIAI	LDI 101 1	ngn unoug	nput screening of inclation and and the screen and and the screen and according to the screen and the screen an	u inipi	oven farma	ient	
indu			is. Opstream processing – Development of moculu	Ins for	lerme	entati	ion
proc	ess - Medi	a for industr	Tal fermentation - Formulation, Optimization - Ster	111Zatio	n. Sta	iges	OI
upsti	ream- Grov	wth of inocu	lums, Fermenter preculture and Production fermenta	ttion.			
Unit	:4		DOWNSTREAM PROCESSING		1	s ho	urs
Dow	nstream P	rocessing- I	Recovery and purification of intracellular and extra	racellul	ar pr	oduc	ts-
Floc	culation,	Floatation,	Filter systems, Centrifugation, Disintegration,	Chro	matog	grapł	ıy,
Extr	action, Cry	stallization,	Precipitation and Drying.				

Uni	t:5			MI	CROBIA	AL PRO	DUCTS				15 hours
Mic	robi	al produc	tion of co	ommercia	ally impo	rtant pro	ducts - C	Organic a	cids (citr	ic acid, a	cetic acid)
- E1	nzyr	nes (Amy	ylase and	l Proteas	se) - Am	nino acid	ls (Lysin	ne and C	Blutamic	acid) -	Antibiotics
(Per	nicil	lin) - Vit	amins (R	liboflavir	n, cyanoo	obalami	ne and a	scorbic a	acid). Bi	osynthesi	is of Ergot
alka	loid	s. Microb	ial transf	ormation	- steroid	s and ste	rols. Nor	n steroid	compoun	ıds	
Uni	t:6				Contem	porary Is	sues				2 hours
Exp	ert l	ectures, o	nline sen	ninars – v	vebinars						
							Total	Lecture	hours		75 hours
Tex	t Bo	ook(s)		_							
1	Ind	ustrial Mi	crobiolog	gy, 2 nd Eo	dition, 20	19. L.E.J	R. Casic	da. New A	Age Inter	mational	Publishers
2	Cru	legers Bio	otechnolo	ogy: A T	extbook	of Indus	strial Mic	crobiolog	y, 3rd E	dition, 2	017. Wulf
	Cru	leger and	Annelies	e Cruege	r. MedTe	ch Publi	shers.				
3	Mie	crobial Bi	otechnolo	ogy, Prin	ciples an	d Applica	ations, 3r	d Editior	n, 2013. I	Lee Yuan	Kun,
	Wo	orld Scient	ific Publ	ishing Co	o. Pte. Lte	d					
4	Prii	nciples of	Fermenta	ation Tec	hnology,	2nd edit	ion, 1999	9. Stanbu	ry P F, W	/hitaker A	A, Hall SJ.
	But	terworth	Heinema	nn							
5	Bio	otechnolog	gy: A Te	xtbook o	f Industr	ial Micro	obiology,	1990. V	Vulf Crue	eger and	Anneliese
	Cru	leger.				oributou					
Ref	eren	ice Books			10	Peu Provent	10, Ca				
1	Prescott and Dunns' Industrial Microbiology, 4th Edition, 2004. Edited by Reed, CBS										
	Put	Publishers and Distributors, New Delhi									
2	Cre	euger and	r and Creuger (2001). Bio <mark>technology- A textbook of</mark> Industrial Microbiology, Sinauer						, Sinauer		
	Ass	sociates, I	es, Inc.								
Rela	ated	Online (Contents	[MOOC	, SWAY	AM, NP	TEL, W	ebsites e	tc.]		
1	http	os://online	ecourses.	nptel.ac.i	<u>n/noc20</u>	bt21/pre	view	aleso			
2	http	os://online	ecourses.	nptel.ac.1	$\frac{n}{noc20}$	_bt25/pre	view				
3 Cou	nu	Designed	D D		<u>n/noc20</u>	bt20/pre	view				
Cou	irse I	Designed	Ву: Dr. /	A. Vijaya Monn	<u>a Chira</u> ing with	Program	nmo Out	comos			
)e	PO1	PO2	PO3				PO7	PO8	PO0	PO10
	1	<u></u> S	S	L	M	M	L	S	M	M	L
CO	2	<u> </u>	S	M	M	M	M	S	L	M	 M
CO	3		M	M	S	M	M	S	M	L	M
CO	4	M	M	S	M	S	М	S	М	М	L
CO	5	S	S	L	S	S	L	S	М	М	М

Course code 23D	M.Sc MICROBIOLGY		L	Т	P	С
Core	PAPER VIII – GENE MANIPULATION AND BIOINFORMATICS)	5	-	-	4
Pre-requisite	Basics about Bioinformatics tools and Genetic Engineering		Syllal Versi	ous on	2020 2021)- 1
Course Objectives:						
1. To familiarize the stude	ents with the basic perceptions in genetic engineer	ng; to ex	plain	the	stude	ents
to multipurpose tools	and techniques employed in genetic engineerin	ng and r	ecom	binar	t D	NA
technology.						
2. To provide knowledge	and awareness of the basic principles and conc	epts of l	oiolog	gy, co	ompi	uter
science and mathematic	S.					
Expected Course Outcome						
On the successful completio	n of the course, student will be able to:				1	
1 Know the basics of ge	ne manipulation techniques				K1	
2 Understand the enzyr	ne involved in cloning, various techniques involv	ved in ge	ne		K2	2
- transformation						
3 Acquire knowledge or	n vectors and gene expressions in prokaryotes and e	ukaryotes	3		K2	, ,
4 Analyze the cloned D	NA with different characterization techniques				K4	-
5 Impart knowledge on	gene sequence using bioinformatic tools	6			K3	5
K1 - Remember; K2 - Unde	stand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K	6 - Create	e			
Unit:1	BASIC TECHNIQUES			1	5 ho	urs
Isolation and purification of	nucleic acids (chromosomal DNA, RNA & Plasm	ids) – Me	ethods	s of		
handling and quantification	of DNA and RNA. Blotting: Types of blotting – S	outhern, I	North	ern		
and Western Blotting. Chron	nosome walking. Dot and Colony Blotting.					
Unit:2 RESTRIC	TION ENDONUCLEASES, SCREENING AND TRANSFORMATION TECHNIQUES)		1	5 ho	urs
Restriction endonucleases	: Types and characteristics, DNA methylases, Liga	ases, Ada	pters,	Link	ters	and
Homopolymer tailing,	Genomic DNA libraries - cDNA lil	oraries.	Tra	nsfoi	mat	ion
techniques:Electroporation	, microinjection, protoplast fusion and microparticl	e				
bombardment.Screening:	Direct methods -Insertional inactivation, plaq	ue pher	otype	e,Indi	rect	
methods - Immunochemical	detection, nucleic acid hybridization,		1 - 1			
Unit:3	VECTORS	•1•. • • 7	151	lours	;	1
Vectors: Properties, types of	of vectors – plasmids– host range and incompatib	ility, Veo	tors (const	ructe	ed io
vectors - Veast vectors (VA	$(15 \propto Lamoua)$, cosmics, phasmics, phagemic	s and D	408,	EUK	uyot	IC
vectors (Ti plasmid based	vectors and caulimoviral vector) expression	vectors	shuttle	e ve	rtors	
Expression of genes in bacte	ria. animal. plant. algae & fungi.	, , , , , , , , , , , , , , , , , , , ,	Jiiutti	0 10		,
	PACTERIZATION OF CLONED DNA		15 I	hour	5	
Unit:4 CHA	RACIERIZATION OF CLONED DIA					
Unit:4 CHA Restriction mapping:Restric	tion fragment length polymorphism (RFLP), Polym	nerase cha	ain			
Unit:4CHARestriction mapping:Restricreaction (PCR) - Types of P	tion fragment length polymorphism (RFLP), Polyn CR and their applications. DNA sequencing: Prime	nerase cha r walking	ain g, Max	kam		
Unit:4CHARestriction mapping:Restricreaction (PCR) - Types of Pand Gilbert method, dideoxy	tion fragment length polymorphism (RFLP), Polym CR and their applications. DNA sequencing: Prime wethod, automated sequencing and micro array. S	nerase cha r walking ite	ain g, Max	kam		
Unit:4CHARestriction mapping:Restricreaction (PCR) - Types of Pand Gilbert method, dideoxydirected mutagenesis.	tion fragment length polymorphism (RFLP), Polym CR and their applications. DNA sequencing: Prime method, automated sequencing and micro array. S	nerase cha r walking ite	ain g, May	kam		
Unit:4CHARestriction mapping:Restrict reaction (PCR) - Types of P and Gilbert method, dideoxy directed mutagenesis.Unit:5	tion fragment length polymorphism (RFLP), Polym CR and their applications. DNA sequencing: Prime y method, automated sequencing and micro array. S BIOINFORMATICS	nerase cha r walking ite	ain g, Max 131	kam	5	
Unit:4CHARestriction mapping:Restricreaction (PCR) - Types of Pand Gilbert method, dideoxydirected mutagenesis.Unit:5Introduction to Bioinformation	tion fragment length polymorphism (RFLP), Polym CR and their applications. DNA sequencing: Prime method, automated sequencing and micro array. S BIOINFORMATICS	nerase cha r walking ite a bases: C	ain g, Maz 131 Genba	kam hour nk,	5	
Unit:4CHARestriction mapping:Restricreaction (PCR) - Types of Pand Gilbert method, dideoxydirected mutagenesis.Unit:5Introduction to Bioinformation	tion fragment length polymorphism (RFLP), Polym CR and their applications. DNA sequencing: Prime method, automated sequencing and micro array. S BIOINFORMATICS	nerase cha r walking ite	ain g, Maz 131 Genba	kam h our : nk,	5	

		S	<u>744 DATED: 18 05 2023</u>						
Unit	::6	CONTEMPORARY ISSUES	hours						
Expe	ert lectures,	online seminars – webinars							
		Total Lecture hours	50 hours						
Text	t Book(s)								
1	Old. R. W Genetic E	7. and Primrose S.B. 1995. Principles of Gene Manipulations - ngineering, 5Ed .	- An Introduction to						
2	Winnacke	er E.L, 1987, From Genes to Clones. – Introduction to Gene 7	Fechnology. Nicholl.						
2	D.S.1, 19	4. An introduction to Genetic Engineering.							
3	Brown. 1.	A. 1995. Gene Cloning.							
4	Pinier. A.	1995. Genetic engineering of microorganisms							
) D (Lesk, A N	1.2002. Introduction to Bioinformatics. Indian Ed. Oxford Univ	ersity Press.						
Refe	erence Bool	KS							
1	Protein St 2001	ructure, Stability and Folding by Kenneth P. Murphy. Publish	ed by Humana PressInc.						
2	Protein E Published	ngineering Principles and Practice by Jeffrey L. Cleland an by Wiley-Liss Inc., 1996.	d Charles S. Craik.						
3	Protein Er	ngineering and Design by Paul R. Carey. Published by Academi	c Press Inc., 1996.						
4	Andreas analysis of Publication	D B. and Francis Outlette B F. 2001. Bioinformatics – a profigenes and proteins. 2^{nd} Ed. Wiley Interscience, John wiley and New York.	cactical guide to the nd Sons, Inc.						
Rela	ted Online	Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://ww	vw.my-mooc.com/en/categorie/bioinformatics							
2	https://ww	w.coursera.org/specializations/bioinformatics							
3	https://np	tel.ac.in/courses/102/10 <mark>3/102103013/</mark>							
Cou	Course Designed By: Dr. R. Vijayaraghavan								
-									

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	М	М	HILL UN	S	M	S	М	L
CO2	М	L	М	Ľ ^s is	М	S	М	S	М	L
CO3	S	М	М	S		ATE S	М	S	L	L
CO4	М	S	S	М	М	S	L	S	М	М
CO5	S	S	S	М	S	S	М	S	L	L

Cou	rse code	23P	M.Sc., MICROBIOLGY	L	Т	Р	С	
	Co	re	PRACTICAL I		-	5	4	
Pre	requisite		Basic knowledge about microbial culture	Sylla	bus	202	0-	
110	requisite		Techniques	Versi	ion	202	1	
Cou	rse Objec	tives:						
1. I	Enhance th	e learner on p	ractical approaches of microbiological techniques					
2. I	Provide ski	llful training	in microbial identification through microscopic obse	rvatio	n anc	1		
	biochemic	al test						
Exp	be success	ful completion	s:					
	1 To impart the awareness of elemental principles and techniques in Microbiology K1							
			ss of elemental principles and techniques in Microbi	ology				
2 To acquire knowledge on culturing of microorganisms.					K2			
3	3 To study the isolation process and quantification of microorganisms.				K2			
4 To enable the students to identify microorganisms and characterise them K- biochemically.				K 4	-			
5 To assess the growth kinetics and the study basis of anaerobic culture techniques.				K3	;			
K1 -	Remembe	er; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K	6 - Ct	eate			
1. St	erility con	trol test	and an	-				
2. M	ledia prepa	ration – Liqu	id and Soli <mark>d media, Agar deep, sl</mark> ant and plate.					
3. Pı	are culture	techniques -	Streak plate, pour plate, spread plate, decimal dilution	on.				
4. M	licrometry	– measureme	nt of mic <mark>roo</mark> rganisms.					
5. M	lotility dete	ermination- H	anging drop and soft agar inoculation.					
6. Ei	numeratior	n of microorg	anisms from soil: Bacteria, Fungi and Actinomycetes	3.				
7. D	irect Micro	oscopic obser	vation of fungal spores, mycelium and and yeast					
8. St	aining: Sn	near fixation,	simple, Gram, acid fast, spore, capsule and negative.					
9. G	rowth curv	e: Direct mic	roscopic (Haemocytometer, Viable count)					
10. I	Effect of va	arious intrinsi	c factors on the growth of bacterium and fungi – pH,	Temp	perati	ure,		
Osm	notic pressu	ure.						
11. /	Anaerobic	culture techn	iques; RCM, Mc Intosh Fildes anaerobic jar, Wright	s tube	met	nod.		
12.1	Phenol Co-	efficient test.						
13.1	MV1C test	t 11.1.1.4.4						
14.1	Hydrogen s	sulphide test						
15. Oxidase test								
16. Calalase test								
17. Utease test 19. Nitrate reduction test								
10. Initiate reduction lest								
19.1	19. Polymer degradation – Starch, Geraun, Casem.							

20.	Carbohydrate fermentation.						
21.	Morphology of Algae						
	Total Practical hours 75 hours						
Tex	xt Book(s)						
1	Microbiology: A Laboratory Manual, 11th Edition, 2017. James G. Cappuccino and Chad T.						
1	Welsh, Pearson						
2	Laboratory Exercises in Microbiology, Fifth Edition, 2002. Harley-Prescott. The						
2	McGraw-Hill Companies.						
Ref	ference Books						
1	Microbiology A Laboratory Manual, 10 th Edition, 2014. James G. Cappuccino and Natalie						
1	Sherman, Pearson						
2	Microbiological Methods,8 th Edition, 2004. Collins and Lyne. Arnold Publishers.						
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://microbenotes.com/category/biochemical-test-of-bacteria/						
2	https://www.uwyo.edu/molb2210_lab/info/biochemical_tests.htm						
3	https://www.biologydiscussion.com/micrometry/micrometry-meaning-and-types-with-						
	diagram-biology/56994						
Cou	urse Designed By: Dr. A. Vijaya Chitra						

	Mappi <mark>ng w</mark> ith Programme outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	M	M	S	L	М	М	М	
CO2	S	S	Μ	S M	M	NSS	ું M	L	М	L	
CO3	S	М	S	S	Mihatore	M co	S	L	L	М	
CO4	М	S	S	Μ	ந்தப்Sாரை	2_LUNS	М	Μ	М	М	
CO5	S	S	М	S	S	М	М	М	L	М	

Co	ırse code	23Q	M.Sc MICROBIOLOGY	L	Т	P	С
	Co	re	PRACTICAL II	-	-	5	4
Pre	-requisite		Fundamentals of Microbial Techniques	Syllal Versi	bus on	2020 202)- 1
Co	ırse Objec	tives:					
	1. Impart	knowledge of	n microbial analysis of environmental samples and b	ioreme	ediati	on	
	2. Provide	e expertise tra	ining in development of industrially important micro	bial pi	roduc	ts	
Fvi	3. Ennanc	e the learner	skill in agricultural microbiology				
On	the success	ful completio	n of the course student will be able to:				
1	To exper	tise in the pro	duction of commercially important microbial produc	cts		K1	
2 To isolate and identify the microorganisms having agricultural importance K3							
3 To assess the quality of drinking water from sewage contamination				K4			
4	4 To acquire knowledge on selection of microorganism for bioremediation				K5	,	
5	To exper	tise in molec	ular techniques			K3	
K1	- Remembe	er; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K	16 - Cro	eate		
1.W	vine produc	tion – sugar e	stimation				
2.0	Organic acid	l production -	- Citric acid – Solid state and submerged fermentation	on.			
3.Is	olation of	antibiotic pr	oducing organisms and determination of antimic	obial	spect	rum	of
150	ates			. <u> </u>	<u>a 11</u>	1	1
4. I soli	d state ferm	of Extra cell entation.	ular enzymes – Protease by submerged fermentation	10n - 0	Cellu	lase	by
5.Is	olation of n	itrogen fixers	- free living, symbiotic, ammonification, nitrification	on, der	nitrifi	catio	on.
6. I	solation of l	Phosphate sol	ubilizers.				
7. I	solation of (Coliphage.					
8. N	licrobial de	ecolourisation	of textile dyes. When us				
9. I	solation of 1	mutants: Aux	otrophic and Antibiotic resistant mutants.				
10.	Isolation of	Plasmids and	d chromosomal DNA from microbes.				
11. elec	Size detern trophoresis	nination and s, SDS – PAC	fractionation of nucleic acids and proteins $-A$ E .	garose	gel		
	1		Total Lecture hours		7:	5 ho	urs
Tex	t Book(s)						
1	Microbiol Welsh, Pe	ogy: A Labor earson	atory Manual, 11th Edition, 2017. James G. Cappu	ccino a	and C	had	Τ.
2 Laboratory Exercises in Microbiology, Fifth Edition, 2002. Harley–Prescott. The McGraw–Hill Companies.							Гhe
Reference Books							
1	1 Microbiology A Laboratory Manual, 10 th Edition, 2014. James G. Cappuccino and Natalie Sherman, Pearson						lie
2	Microbiol	ogical Metho	ds,8 th Edition, 2004. Collins and Lyne. Arnold Publ	ishers.			

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1 https://www.mdpi.com/2076-3417/10/8/2958/htm

- 2 <u>https://www.biotechnologynotes.com/microbial-biotechnology/isolation-of-coliphages-from-</u> sewage-microbial-biotechnology/1324
- 3 https://www.frontiersin.org/articles/10.3389/fpls.2015.01225/full
- Course Designed By: Dr. A. Vijaya Chitra

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	М	М	S	S	М	L	М
CO2	S	S	М	М	М	S	S	М	М	М
CO3	S	М	М	S	М	S	S	М	L	L
CO4	М	М	S	М	S	S	S	L	М	L
CO5	S	S	L	S	S	S	S	М	L	М





Commente	22.4		т	T	n	C			
Course code	33A	MI.SC., MICROBIOLOGY	L	1	r	C			
Cor	e	PAPER IX- IMMUNOLOGY	5	-	-	4			
		Å IMMUNOTECHNOLOCY							
		IMMUNOTECHNOLOGY	Sylla	hus	202	0-			
Pre-requisite		Basic Knowledge about immune system	Versi	ion	202	1			
Course Object	tives:								
The main object	ctives of thi	s course are to:							
1. Provide the	basic conce	pts of immunology and organization of the immune	system						
2. Impart know	ledge on ar	largen and antibody interactions and immunological t	ecnniqu	les	ond	1			
autoimmune di	sorders	ierstand the concepts of hypersensitivity, transplanta		ngans	s and	L			
Expected Cou	Expected Course Outcomes:								
On the success	On the successful completion of the course, student will be able to:								
1 To recall	the history	and the development of immunology.			K1				
2 To under	stand the st	ructure, properties and functions of antigen and antib	odv		K2	,			
3 Apply the	3 Apply the immunological techniques to understand the antigen antibody interactions					L			
and for d	and for diagnosis								
4 To explain the role of MHC and hypersensitivity in immune system and discuss K3						3			
about the	immunity a	against various pathogens.	5						
5 To under	5 To understand the role of HLA in transplantation, immunodeficiency disorders and K3								
role of va	ccines in ir	nmune system.							
K1 - Remembe	er; K2 - Uno	derstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 - Cr	eate					
Unit:1		INTRODUCTION TO IMMUNOLOGY		1	<u>5 ho</u>	urs			
Historical back	kground an	d scope of immunology, Immunohaematology -Al	3O and	Rh f	acto	r.			
and tertiary line	ns of inninu	immunity HI and CMI	rimary,	Seco	nuar	У			
Unit:2	c. 1 ypcs of	ANTIGENS AND ANTIBODIES		13	3 ho	urs			
Antigens - pro	operties. Er	pitopes, haptens, adjuvant, cross reactivity, Antibo	dies - 1	prope	rties				
structure and is	otypes. Div	versity and specificity are to Elevate				,			
Unit:3	ANT	IGEN AND ANTIBODY INTERACTIONS		1	5 ho	urs			
Serology - Intr	roduction a	nd classification of antigens and antibody reactions -	- Agglu	tinatio	on ai	nd			
precipitation re	action. Stre	ength of antigen and antibody bindings - affinity & a	vidity.	Mono	clon	al			
antibodies and	their applic	cations. Complement pathway and complement fixa	tion read	ction.					
Innihunonuorse		ASI, ELISA and Flowcytometry.		1	5 ho	ure			
0111.4	WAJUI	HYPERSENSTIVITY		I.	5 110	u15			
MHC antigens	- types and	l functions. Response of B Cell to antigens. T cell p	roducts.	Imm	unit	у			
to infectious di	seases - Vir	al, bacterial and protozoan. Hyper sensitivity reaction	ns.						
Unit:5	TRANSPLANTATION IMMUNOLOGY AND 15 hours								
VACCINES									
Transplantation immunology - Tissue transplantation and grafting. Mechanism of graft acceptance									
immunodeficiency disorders: severe combined immunodeficiency (SCID disorders) and									
Secondary immunodeficiency disorders: AIDS, cancers of the immune system, leukemia, viral									
hepatitis - auto	immunity:	mechanism, types: Rheumatoid arthritis, Systemic l	upus er	ythem	natos	sus,			
Multiple sclero	sis and my	Multiple sclerosis and myasthenia gravis Vaccines - Types and vaccination methods							

Un	it:6	Contemporary Issues	2 hours					
Exp	pert lectures	, online seminars – webinars						
		Total Lecture hours	75 hours					
Te	xt Book(s)							
1	1 Coleman, R.M., Lourbard, M.F and Sicard, R.E., 1992. Fundamental immunology, 2nd							
	edition							
2	Kuby, J. 1997. Immunology, W.H Freeman and co., New York.							
3	Roitt, I.M	1988. Essential of Immunology, Black Well Scientific Publish	ers.					
4	Tizard, R.	I. 1983. Immunology - An introduction, Saunder's College public	lishers Philadelphia.					
5	Roitt's Ess	ential Immunology. Wiley-Blackwell. 12th Edition						
Re	ference Boo	bks						
1	Black S., S	Symour, Disinfection, Sterilization and Preservation, Philadelphi	a, London					
2	Gennaro,	Alfonso R., Remington: The Science and Practice of Pharmacy,	Vol-I & II,					
	Lippincott Williams & Wilkins, New York, 2001.							
Re	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	1 https://onlinecourses.nptel.ac.in/noc20_bt43/preview							
Co	urse Design	ed By: Dr. A. Vijava Chitra						

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	М	M	M	М	М	L	М
CO2	S	S	М	M	M	M	М	М	М	М
CO3	S	М	М	SA	M	M	L	М	L	L
CO4	М	М	S	M	S	L	М	М	М	L
CO5	S	S	L	SA	S	M	M	М	L	М

த்து இந்தப்பாரை உ EDUCATE TO ELEV P

Cou	rse code	33B	M.Sc., MICROBIOLOGY	L	Т	Р	С	
	Cor	e	PAPER X - MEDICAL MICROBIOLOGY	4	1	-	4	
Pre-	requisite		Basic Knowledge on microbial pathogens and it diagnosis	Sylla Versi	bus ion	202 202	0- 1	
Cou	rse Object	tives: The r	nain objectives of this course are to:					
1. To prep 2.Th and	o introduce aration for le course w particularl	basic princ physicians vill provide y address th	ciples and application relevance of clinical disease for the conceptual basis for understanding pathogenic n the fundamental mechanisms of their pathogenicity.	or studer nicroorg	nts wh anisn	no ar ns	e in	
3.lt	will also pi	rovide oppo	rtunities for a student to develop diagnostic skills in	microbi	ology	/		
Exp On t	be success	rse Outcon	ies:					
	ne success		ion of the course, student will be able to:	• .•	6	17.1		
1	1 To acquire knowledge on the basis of infectious diseases, diagnosis, examination of K1 the clinical sample						-	
2	To under bacteria	stand the m	orphology, pathogenesis and lab diagnosis of pathog	genic		K2	2	
3 To apply the new approaches in lab diagnosis of mycosis infections.					Ka	;		
4	To analys	se the life c	ycle, pathogenicity and lab diagnosis of parasitic infe	ections		K4	ł	
5	5 To understand the general properties, pathogenesis and lab diagnosis of viral K2 infections						2	
K1 -	Remembe	er; K2 - Und	lerstands; K3 - Apply; K4 - Analyze; K5 - Evaluate	; K6 - C	reate	1		
Unit	t:1		BASICS OF INFECTIOUS DISEASE			15 h	ours	
Mile colle sero	estones in r ection, trar logical test	nedical mic asport, exar . Virulence	robiology - Infectious Diseases process – Diagnosis ninations and discarding of clinical specimens. An factors of bacteria – Host parasite relationship.	– Proce ntibiogra	ess of am ai	sam 1d	ple	
Unit	t:2		MEDICAL BACTERIOLOGY			15 h	ours	
Gran diag Cory Trep Gran diag aeru men	Gram positive organisms - Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of Staphylococcus aureus, Streptococccus pyogenes, Pneumococcus, Bacillus anthracis, Corynebacterium diphteriae, Mycobacterium tuberculosis, Mycobacterium leprae. Spirochaetes – Treponema pallidum. Gram negative organisms:- Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of E. coli, Klebsiella pneumoniae, Salmonella typhi, Shigella dysentriae, Pseudomonas aeruginosa, Vibrio cholerae, Bordetella pertusis, Neiserria gonorrhoeae, and Neiserria							
Unit	Unit:3 MEDICAL MYCOLOGY 15 hours						ours	
Myc	ology: Ge	neral prop	erties and approaches to laboratory diagnosis. My	cosis -	Sup	erfic	ial,	
Subcutaneous and Systemic infections – Cryptococcosis, Madura mycosis, Histoplasmosis, Candida allbicans, Aspergillosis and Blastomycosis.								
Unit	t :4		MEDICAL PARASITOLOGY		1	<u>5 ho</u>	urs	
Para Tric lum	sitology: L homonas v pricoides, I	.ife cycle, F vaginalis, F Enterobious	Pathogenicity and laboratory diagnosis of Entamoeba Plasmodium vivax, Leishmania donovani, Taenia vermicularis and Wucheraria bancrofti.	a histoly solium,	rtica, Asca	uris		
Unit	t:5		MEDICAL VIROLOGY			15 h	ours	

Virology: General properties, structure, genome replication, protein synthesis and assembly, pathogenesis and laboratory diagnosis of: DNA containing animal viruses- Adeno viruses, Herpes viruses-type-I and type-II, Pox viruses – Variola virus. RNA containing animal viruses: Picorna virus, Rhabdo virus, Hepatitis viruses -A, B and C, Orthomyxo virus – Influenza H1N1, Paramyxovirus, Retroviruses - HIV and Rubella virus. Arbo virus – Dengue virus, Ebola virus, Prions.

Uni	it:6	Contemporary Issues	2 hours					
Exp	pert lectures	, online seminars – webinars						
		Total Lecture hours	75 hours					
Tex	xt Book(s)							
1	Essentials	of Diagnostic Microbiology - Lisa Anne Shimeld, Anne T. Roc	lgers					
2	Textbook	of Microbiology – Ananthanarayanan and Jayaram Panicker						
3	Textbook of Medical Parasitology – Subash. C. Parija							
4	Medical Mycology – Jagadesh Chander							
5	Luria. S.E. Darnall. J.E. Baltimore. D. and Compare. A. 1978. General Virology,							
	3ed.							
Ref	ference Boo	bks						
1	Laborator	y Manual in Microbiology-T. Sundararaj						
2	Freidfelde	r, D. 1995. Microbial genetics						
3	Medical M	ficrobiology - Geo. F. Brooks. S						
4	Hayes. W	1968. The Genetics of Bacteria and their Viruses	ā					
Rel	ated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://ww	w.coursera.org/courses?query=microbiology						
2	https://www	w.classcentral.com/course/canvas-network-intro-to-medical-microbiolo	ogy-1-bacteriology-					
	<u>12514</u>							
3	https://www.classcentral.com/tag/microbiology							
Coi	urse Design	ed By: Ms. N.Gunasheela						

Mapping with Programme Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	М	S	М	М	М	L	L	
CO2	S	S	М	S	М	М	L	L	М	L	
CO3	S	М	S	М	S	М	М	М	L	М	
CO4	S	S	S	S	М	L	М	L	М	L	
CO5	S	S	S	S	М	М	М	L	М	L	

Co	urse code	33C	M.Sc MICROBIOLOGY	L	LT		С			
	Core		PAPER XI - BIOTECHNOLOGY & IPR	5	-	-	4			
Pre-requisite			Basic knowledge about the intellectual Property rights in Biotechnology	Syll: Vers	Syllabus 202 Version 2		2020- 21			
Cou	rse Object	tives:								
The main objectives of this course are to:										
1. To develop the knowledge of gene expression and microbial production of recombinant										
mole	ecules	.1 1								
2.10	o describe	the new de	extending on Intellectual Property Dights (IDP)							
5. 10	o provide d	asic under	standing on intellectual Property Rights (IFR)							
Exp	ected Cou	rse Outco	mes:							
On t	he success	ful comple	tion of the course, student will be able to:							
1	To recoll	ect the bas	ic concepts in gene manipulation techniques			ŀ	K 1			
2	2 To understand the basics of microbial production of therapeutic agents and various types of modern vaccines.									
3	To acquire the knowledge of microbial products which are commercially important									
4	To ascertain the methodologies in Plant and Animal Biotechnology process									
5 To popularize the basic concepts of patents and the importance of related components										
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create										
Unit:1 Microbial Production of Recombinant Therapeutic 15										
Microbial Production of Therapeutic Agents and Vaccines: Emergence of molecular biotechnology – Commercialization – concerns and consequences - Pharmaceuticals - interferon's and growth hormones, enzymes: DNase I and alginate lyase, Monoclonal antibodies - HIV therapeutic agents. Subunit vaccines: Herpes simplex virus, Foot and mouth disease virus, TB, Peptide vaccines – genetic immunisation – attenuation through recombinant DNA technology, vector vaccines										
	Unit:2	t:2 Microbial Production of Recombinant Products 13				hours				
Synthesis of Commercial Products by Recombinant Microorganisms: Restriction endonucleases: PstI, Small biological molecules: Indigo, Antibiotics: Synthesis of Novel antibiotics. Biopolymers: Xanthan gum, Melanin, byssal adhesive, rubber and PHA.										
1	Unit:3 Plant biotechnology 17									
Plant Biotechnology: Plant growth promoting bacteria (PGPR) – genetic engineering of nitrogenase gene cluster, hydrogenase and Nodulation. Biocontrol of pathogens: Siderophores, antibiotics and enzymes. Plant transformation with Ti plasmid, Ti plasmid derived vectorsystems, physical method of gene transfer, developing plant strains by genetic engineering -insect, virus and herbicide resistant plants. Plant as bioreactors. Microbial insecticides: Insecticidal toxin of BT - genetic engineering of BT toxin genes – Baculovirus.										

									- SCA	A DATEI): 18.05.		
U	J nit:4												
Animal Biotechnology: Transgenic mice methodology – Retroviral vector, DNA microinjection, Engineered embryonic stem cell method. Applications – transgenic disease models – Alzheimerdisease. Transgenic cattle and sheep. Human gene therapy – in vivo and ex vivo gene therapy – gene delivery system. Molecular diagnostics for genetic diseases.													
τ	Unit:5Intellectual Property Rights (IPR)13 hours							3 hours					
Intellectual Property Rights (IPR): Patents - copy right and neighboring rights, patents for invention, trademarks, trade names - Conditions for patentability - Drafting and filing a patent application, infringement, copyright and development, exploitation of patented invention. Indian patent laws. Regulating the use of biotechnology: recombinant DNA Technology, food and agricultural ingredients, - patenting biotechnology inventions - Bio safety and Bioethics.													
Unit	:6			Conte	empora	ry Issue	5			2 hours			
Expe	rt lectures.	, online se	eminars -	– webina	ars								
						Т	otal Lec	ture ho	urs	7	5 hours		
Text	Book(s)												
1	Glick, B. R and Pasternak, J.J. 2003. Molecular Biotechnology – Principles and Applications of Recombinant DNA. ASM Press, Washington D.C.												
2	Chawla, H.S. Introduction to Intellectual Property Rights. 2020 edition. Oxford & IBH Publications.												
3	U. Satyana Kolkata 70	rayana. E 0009. Inc	Biotechn lia	ology. 2	010.Boo	oks and A	Allied (P) Ltd, 8/	'1 Chint	omoni Da	s Lane,		
Refe	rence Boo	ks				م بهوی الم							
1	Old, R.W. Genetic Er	and Pringineering	nrose, S g 5th Ed.	.B. 1995 Blackw	5. Princi ell Scier	ples of ntific Pu	Gene Ma	anipulati s, Londo	ion - A on.	n Introduc	tion to		
2	Brown T A., 2001. Gene cloning and DNA analysis introduction. 4th Ed. Blackwell Science										Science		
3	 Winnacker E.L., 2003. From Genes to Clones – Introduction to Gene Technology. First Indian reprint PANIAMA publishing Co-operation New Delhi 												
4 '	Watson, J.	D., Gill	man, M.	, Iknow	ski, J ar	nd Zolla	r, M 200	01. Reco	ombinar	nt DNA. 2	nd Ed.		
:	Scientific American Books, WH freeman and Company, New York.												
Rela	ted Online	e Conten	ts [MOC	DC, SW	AYAM,	NPTEI	., Websi	ites etc.]					
1	https://swa	yamprab	ha.gov.i	n/index.j	php/prog	gram/arc	hive/9						
2	https://onli	inecourse	s.nptel.a	<u>ic.in/noc</u>	20_bt21	/preview	<u>/</u>						
4	https://onli	inecourse	s.nptel.a	<u>ic.in/noc</u>	<u>20_bt32</u>	/preview	/						
Course Designed By: Dr. T. Savitha													
CUe	PO1	PO2			Program		PO7	POs	PU0	PO10			
	M	L	<u>ноз</u> М	S	S	S	S	I	M	L			
CO1	S	M	L	L	M	S	S	M	М	М			
CO3	L	М	S	L	S	S	S	L	М	L			
CO4	М	S	М	S	L	S	S	М	М	L			
CO5SLLMMSSMM					L								

Cou	rse code	33D	M. Sc. MICROBIOLOGY	L	Р	С				
	Cor	e	PAPER XII – BIONANOTECHNOLOGY 4 1							
Pre-requisite			Basic knowledge about Nano-materials	Syllabus2020-Version2021						
Course Objectives:										
1. To make the students acquire an understanding the Bio-nanoscience and Applications.										
2. To help them understand in broad outline of Bio-nanoscience and Nanotechnology.										
Expected Course Outcomes:										
On the successful completion of the course, student will be able to:										
1	List out and study nanostructures and bio inspired nanomaterials.									
2	Discuss various methods in the process of nanoparticle synthesis.									
3	Demonst	rate physiocl	nemical properties of materials at nano scale level.			K3				
4	Integrate	various instr	uments involved in characterizing nanomaterials.			K4				
5	Prioritize	the range of	biological applications of nanoparticles.			K3				
K1 -	Remembe	er: K2 - Und	erstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	$\overline{\mathbf{K6} - \mathrm{Cr}}$	reate					
Unit	:1	,	INTRODUCTION		1	3 ho	urs			
Defi	nition: N	anotechnolo	gy - Nanobiotechnology - Nanomaterial -	Nanoc	ompo	sites	_			
Clas	sification	of nanostruc	tures – Top down and Bottom Up approach - (Duantun	n dot	s - I	3io-			
inspi	ired nanom	aterials.	1 1 11							
Unit:2 SYNTHESIS METHODS OF NANOMATERIALS 15 hor										
Physical synthesis - Ball Milling - Thermal evaporation - Chemical synthesis - Solgel Process -										
Hydro thermal Synthesis - Biological Synthesis - Plant, Microbial compound based synthesis.										
Unit:3 PROPERTIES OF NANOMATERIALS 15 h							urs			
Phys	Physical properties - Optical, Magnetic, Surface Plasmon resonance - Electrochemical Properties									
of N	anoscale N	Aaterials, Int	ra-molec <mark>ular bonding, Inter-molec</mark> ular bonding, N	anocata	lysis,	Self	-			
asser	mbly – DN	A, Protein.	and the second second							
Unit	Jnit:4 CHARACTERIZATION METHODS 1					5 hours				
X-ra	X-ray diffraction (XRD) - Dynamic Light Scattering (DLS). Electron microscopes: Scanning									
Elec	tron Micro	scope (SEN	1) - Transmission Electron Microscope (TEM) -U	$\mathbf{V} - \mathbf{V}1$	sible					
Spec	trophotom	eter - Fourie	r Transform Infraked Spectrometer (FTIR).	[1	5 h a				
Dmi	.:5 	AP	PLICATIONS OF NANOPARTICLES		15 nours					
Drug	g delivery -	- Nanopartic	ging Military applications of Nanotochnology	lys - Cel	II DIO	cmp lo fo	5 r			
- INd		ons - Toxicit	y of Nanoparticles - Future Perspectives	INAHOIHA	alena	15 10	1			
Unit:6 CONTEMPORADVISSUES 2 h										
Exne	ert lectures	online sem	nars – webinars	L		– 110	u 15			
Lip		, onnie sem	Total Lecture hours		7	5 ho	urs			
Tovi	Book(s)			L	-					
ICA	Pradeen 7	7 2008 Nan	o. The Essentials: Understanding Nanoscience and	Nanote	cnolo	σv				
1	1 Tata McGraw-Hill Publishing Company Limited New Delhi									
	Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, 2005. Nanoscale Science and									
2	² Technology. John Wiley & Sons, Ltd., UK.									
3	GuozhongGao. 2004. Nanostructures & Nanomaterials: Synthesis, Properties & Applications.									
-----------------	--	--	--	--	--	--	--			
5	Imperial College Press.									
1	Richard C Brundle, Charles A. Evans Jr., Shaun Wilson. 1992. Encyclopedia of Materials									
-	Characterization. Butterworth-Heinemann Publishers.									
Reference Books										
1	Mick Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons, BurkhardRaguse. 2005.									
	Nanotechnology: Basic Science and Emerging Technologies. Overseas Press.									
2	Vladimir P Torchilin. 2006. Nanoparticles as Drug carriers. Imperial College Press, USA.									
3	Christ M.Niemeyer, Chad A.Mirkin. 2004. Nanobiotechnology: Concepts, Applications and									
5	Perspectives. Wiley-VCH, Weinheim.									
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://nptel.ac.in/courses/118/104/118104008/									
2	https://www.my-mooc.com/en/categorie/nanotechnology									
3	https://www.coursera.org/courses?query=nanotechnology									
Co	urse Designed By: Dr. R. Vijayaraghavan									

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	М	М	L	М	L	S	S	L
CO2	М	L	М	L	M	M Solo M	М	S	S	М
CO3	S	М	М	S	M	M	L	S	S	М
CO4	М	S	S	M	М	Μ	М	S	S	L
CO5	S	S	S	M TR	S	M	M S	S	S	L



Cours	se code	33E	M.Sc MICROBIOLOGY	DLOGY L T		Р	С			
	Cor	e	PAPER XIII – BIOSTATISTICS AND RESEARCH METHODOLOGY	5	-	-	4			
Pre-re	equisite		Basic knowledge about Statistics & Research	Syllabus2020-Version2021			0- 1			
Cours	se Object	tives:								
1. Mak	the lear	mer compete	ent on biostatistics analysis							
2. Pro	vide adec	luate knowle	edge on measures of central tendency, correlation, T	-test and	1 AN	OVA	L			
3. Pro	ovide awa	ireness on re	search ethics and to inculcate research insight in the	e minds	orth	e				
Expo	Evented Course Outcomes:									
On the		ful completi	cs.							
	$\frac{1}{T_{0} r_{0} c_{0} l_{1} l_{1}}$	ha scope of h	iostatistics			V	>			
		heimlen ervlad	nostatistics.				<u> </u>			
2 To apply their knowledge in measure of central tendency.						K	,			
3 To understand the correlation of different statistical methods.						K 4	+			
4 To analyse the basic ideas of various significance test.						K 4	ŀ			
5 To explore the different aspects of research ethics. K							ł			
K1 - F	K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create									
Unit:1	Unit:1INTRODUCTION TO BIOSTATISTICS15 hours									
Defini	ition – Sc	cope of Bios	statistics, Probability analysis, Variables in Biology	y, Colle	ction	,				
Classi	fication a	and Tabulati	on of data. Graphical and diagrammatical represer	ntation -	-Scal	e				
diagra	ım - Histo	ogram- frequ	iency curve.							
Unit:2	2		MEASURES OF CENTRAL TENDENCY		1.	5 ho	urs			
Measu	ures of ce	entral tender	ncy - Arithmetic mean, Median, Mode. Calculation	n of Me	an, n	nedia	n,			
Mode	in series	of individua	al observations, discrete series, continuous, open en	nd class	es, m	leasu	re			
of disp	persion, s	tandard dev	lation, standard error. Variance, Range and Percenti	le	1	21				
Unit:	3		CORRELATION		1	3 ho	urs			
Simpl	e correlat	ion coefficie	ent, correlation regression- simple and linear.Skewn	ess						
Unit:4	4		T – TEST and ANOVA		1	5 ho	urs			
Basic test- c	ideas of s hi square	significant te , Goodness	est-Hypothesis testing, Level of significant test, test of fit. ANOVA	based of	on stu	dies	-t-			
Unit:	5		RESEARCH METHODOLOGY		1	5 ho	urs			
Plagia	rism and	research eth	ics. Selection of research problem – Formulation of	f researc	ch obj	jectiv	/es			
- proje	ect design	- review of	literature writing - Sources of data collection for bi	ioscienc	es re	searc	:h -			
proces	processing of data - presentation of data - editing - preparation of master's thesis. Presenting the									
resear	research findings in open defense.									
Unit:	b		Contemporary Issues			2 ho	urs			
Exper	t lectures	, online sem	inars – webinars							
	Total Lecture hours75 hou									

Tex	xt Book(s)						
1	S.P. Guptha-Statistical Methods						
2	Palanisamy and Manoharan-Statistical methods of Biology						
3	Khan and Khan- Fundamentals of Biostatistics						
4	Kothari-Research Methodology						
Ref	Reference Books						
1	Practical Statistics: R S N Pillai and Bhagavathi						
2	Fundamentals of Statistics: D. N. Elhance, Veena Elhance and B. M. Aggarwal						
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://onlinecourses.nptel.ac.in/noc20_bt28/preview						
2	https://onlinecourses.swayam2.ac.in/cec20_mg13/preview						
3	https://onlinecourses.swayam2.ac.in/cec20_bt23/preview						
Co	urse Designed By: Dr. T. Viswanathan						

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	L	М	М	L	М	М	L	М
CO2	L	L	L	L	L	М	L	S	М	L
CO3	М	S	М	L	М	L.	М	S	L	М
CO4	М	L	М	Μ	S	М	L	S	М	L
CO5	L	L	М	L 1	М	L	М	М	L	L

Co	urse code	43P	M.Sc MICROBIOLOGY	L	Т	Р	С		
	Core		PRACTICAL III	-	-	5	4		
Pre	-requisite		Aware of clinically important microbes and its diagnosis techniques	Sylla Versi	bus on	202 202	0- 1		
Co	urse Objec	tives:		•	•				
To	impart knov	vledge	on the sample collection, diagnosis and processing of clini	cal pat	thoge	n.			
To	evaluate the	e serolog	gical process in clinical pathogens						
Exp	pected Cou	rse Out	comes:						
On	the success	ful com	pletion of the course, student will be able to:						
1	To recall specimen	the isol s.	ation and identification of pathogen from various clinical			K1			
2	To under	stand th	e diagnostics of clinically important fungi.			K3	5		
3	To apply	serolog	y in the diagnosis of diseases.			K4	ł		
4	To impar parasitic	t knowl infectio	edge on performing serological experiments for the diagnons.	osis of	•	K3	;		
5	To under	stand vi	ral cultivation procedures.			K5	;		
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create									
1.D urir 2.Is <i>Cry</i> 3.A 4.Id 5.E 6.A 7.Pr 8.So 9.Pr	 1.Diagnostic Microbiology: Isolation and identification of pathogens from clinical specimens like urine, pus, faeces, sputum, CSF, blood and discharges. 2.Isolation and identification of clinically important fungi - <i>Candida albicans, Aspergillus</i> sp, <i>Cryptococcus neoformans</i> 3.Antibiotic susceptibility test Kirby Bauer technique 4.Identification and enumeration of Lymphocytes. 5.Examination of blood smear study for Plasmodium sp 6.Agglutination reaction - Blood grouping & Rh Typing - Cross matching demonstration. 7.Precipitation reaction - ODD Test. 8.Serological Tests - WIDAL (Slide & Tube Test), RA, ASO, CRP, RPR. 								
10.	FIISA H	V HB	V & HCV						
12.9	Separation t	echnia	es: Chromatography - Paper, TLC and Column						
13.	Virus cultiv	ation –	Egg inoculation techniques.						
			Total Lecture hours		75	5 ho	urs		
Tex	t Book(s)	I							
1	Microbiol Welsh , Pe	ogy: A earson	Laboratory Manual, 11th Edition, 2017. James G. Cappue	ecino a	and C	had	T.		
2	Laborator McGraw-	y Exer Hill Co	cises in Microbiology, Fifth Edition, 2002. Har mpanies.	ley-Pı	resco	tt. '	Гhe		
Ref	erence Boo	oks							
1	1 Microbiology A Laboratory Manual, 10 th Edition, 2014. James G. Cappuccino and Natalie 1 Sherman, Pearson								
	Microbiological Methods,8 th Edition, 2004. Collins and Lyne. Arnold Publishers.								
Rel	ated Onlin	e Conte	ents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	D '	1.0.1							
Οοι	arse Design	ed By: I	VIs. N.Gunasheela						



4

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	М	L	М	М	L
CO2	S	S	S	S	М	L	М	М	М	М
CO3	S	М	S	S	S	М	L	М	L	L
CO4	S	S	S	S	S	М	М	М	М	L
CO5	S	S	S	М	S	L	L	М	М	L





Cour	rse code	1EA	M.Sc., MICROBIOLOGY	L	Т	P	С				
			GROUP A - ELECTIVE PAPER I -								
	Electi	ve	ARTIFICIAL INTELLIGENCE	5	-	-	4				
			FOR BIOLOGICAL SCIENCES		 •	202					
Pre-1	requisite		Fundamentals about Machine learning	Sylla Versi	bus ion	202 202	0- 1				
Cour	rse Object	tives:									
The r 1	nain objec . Introdu . Facilita	ctives of thi ce Artificia te students	s course are to: I Intelligence & machine learning for biology students to learn & apply AI tools for solving research issues i	s n biolo	gy						
3. Understand the basics of automation											
4. Evno	4. Develop automated solutions for research problems in biology										
On th		ful complet	ion of the course, student will be able to:								
1 Understand the concept of Artificial Intelligence K2											
2 Apply the knowledge of Machine learning and Deep learning techniques to solve K											
2	real time problems										
3	Understa	nd the app	lication of Artificial Intelligence in microbe analysi	s and		K2	2				
	prediction of host – microbiome relationship										
4 Apply and validate Artificial Intelligence in clinical diagnosis of infectious disease K						K 4	ł				
5 Evaluate the role of Artificial Intelligence in the molecular mechanism behind drug K5							;				
	discovery	y, sequencii	ng and auto immune diseases								
K1 -	Remembe	er; K2 - Un	derstand; <mark>K3 -</mark> Apply; K4 - Analyze; K5 - Evaluate; I	X6 – Ci	reate						
Unit	:1		ARTIFICIAL INTELLIGENCE (AI)		1	5 ho	urs				
Intro Appl	duction to ication do	AI – Fur mains of A	ndamentals – Need for AI – Foundations of AI – I – AI tools – Challenges and Future of AI.	AI en	viron	men	t —				
Unit	:2		MACHINE LEARNING (ML) AND DEEP LEARNING (DL)		1	5 ho	urs				
Fund	amentals	of ML and	DL - ML algorithms to find associations across biological	ogical o	data,	cellu	lar				
imag	e classific	ation and ic	lentification of genetic variations.								
Unit	:3	ARTIFIC	CIAL INTELLIGENCE IN CLASSIFICATION		1	5 ho	urs				
		AN	ND PREDICTION IN MICROBIOLOGY								
AI in	bacterial	counting -	Prediction of Microbial Species - Prediction of Envir	onmen	tal ai	nd					
Host Using	Phenotyp g Microbi	al Commur	ities to Predict Disease – pest management - Predic	ease Astion of	the	ation	-				
Antir	nicrobial	Activity	IEICIAL INTELLICENCE IN CLINICAL		1/	5 ha					
	.4		MICROBIOLOGY		1;	5 110	urs				
Artif	icial Intel	ligence Dia	agnostic Testing - AI and Gram Stain - AI and Par	asitolo	gy -	AI a	nd				
Bacte	erial Cultu	re Plate Im	ages - AI and MALDI-TOF MS - AI and Whole Geno	ome Se	quen	cing					

Uni	it:5	ARTIFICIAL INTELLIGENCE IN MOLECULAR	13 hours
		BIOLOGY	
Art	ificial Intell	igence and Machine learning in autoimmune disease – Al in dr	ug discovery Al in
Phy	logeny – <i>F</i>	AI and whole Genome Sequencing - AI in next generation s	sequencing – AI in
<u>I</u> Ini	it.6	Contemporary Issues	2 hours
Exr	pert lectures	online seminars – webinars	2 11001 5
1		Total Lecture hours	75 hours
Тез	at Book(s)		
1	Paul P. B	purbeau, Nathan A. Ledeboer: Automation in Clinical Microbic	logy, Journal of
-	Clinical M	ficrobiology May 2013, 51 (6) 1658-1665; DOI: 10.1128/JCM.)0301-13
2	LeCun, Y	, Bengio, Y. & Hinton, G. Deep learning. Nature 521, 436-44	4 (2015).
	https://doi	.org/10.1038/nature14539	
3	Kenneth F	P. Smith, Anthony D. Kang, James E. Kirby, Automated Inte	erpretation of Blood
	Culture G	ram Stains by Use of a Deep Convolutional Neural Network,	Journal of Clinical
4	Microbiol	bgy Feb 2018, 56 (3) e01521-17; DOI: 10.1128/JCM.01521-17	
4	Mahdieh I	Poostchia, Kamolrat Silamut, Richard J.Maude, Stefan Jaeger	a, George Thomaa,
	104 April	2018 Pages 36-55 https://doi.org/10.1016/j.trsl.2017.12.004	i Research, volume
5	Cui W A	Aquidate A Wang S Yu O 1 Y Yuan S Discovering	Anti-Cancer
5	Drugs via	Computational Methods. <i>Front Pharmacol</i> . 2020:11:733. Publ	ished 2020 May 20.
	doi:10.338	39/fphar.2020.00733	
6	Clark RD.	Putting deep learning in perspective for pest management sci	ientists. Pest Manag
	Sci. 2020;	76(7):2267-2275. doi: <mark>10.1002/ps.5820</mark>	
Ref	erence Boo	ks	
1	Qu K, Gu	o F, Liu X, Lin Y and Zou Q (2019) Application of Machine L	earning in
	Microbiol	ogy. Front. Microbiol. 10:827. doi: 10.3389/fmicb.2019.00827	
2	Park HS,	Rinehart MT, Walzer KA, Chi J-TA, Wax A (2016) Autom	ated Detection
	of P. falcip	parum Using Machine Learning Algorithms with Quantitative	Phase Images of
	Unstained	Cells. PLoS ONE 11(9): e0163045. https://doi.org/10.1371/jou	rnal.pone.0163045
3	Yang X, Y	Wang Y, Byrne R, Schneider G, Yang S. Concepts of Artif	icial Intelligence for
	Computer	Assisted Drug Discovery. Chem Rev. 2019;12	19(18):10520-10594.
	doi:10.102	1/acs.chemrev.8b00728	
Rel	ated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onl	inecourses.nptel.ac.in/noc20_me88/preview_	
2	https://onl	inecourses.nptel.ac.in/noc20_cs62/preview	
3	https://ww	w.weforum.org/agenda/2019/05/how-artificial-intelligence-can-	-help-us-decode-
	<u>human-im</u>	<u>munity/</u>	
C		d Dr. Dr. A. Wilcres Chitas	
COL	irse Designe	CU BY: Dr. A. VIJAYA UNITA Monning with Programma Outcomes	
		wapping with Programme Outcomes	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	М	L	М	М	М	М	S
CO2	S	М	S	М	М	L	М	L	М	S
CO3	М	S	М	S	М	М	L	L	L	S
CO4	М	М	S	М	S	М	L	М	L	S
CO5	S	М	М	S	М	L	М	L	L	S



Co	ourse code	2EA	MSC MICROBIOLOGY	L	Т	Р	C			
	Electi	ve	GROUP A - ELECTIVE PAPER II - PRINCIPLES OF QUALITY ASSURANCEAND TOTAL QUALITY MANAGEMENT	5	-	-	4			
Pr	e-requisite		Aware of Management Skills	Syllab Versio	on 2	020-2	021			
Co	ourse Object	tives:								
Th 1. inv 2.0 3. 4.	 To understand the basics of quality assurance, aware of the good practices and regulations involved in management of hazardous substances Comprehend quality assessment and management of quality assurance in laboratories Make the learner competent on the concepts of Total Quality Management Provide adequate knowledge on representation of datas in graphical form 									
Ex	Expected Course Outcomes:									
Or	the success	ful complet	ion of the course, student will be able to:							
1To understand design and applications of microbiology lab and to outline good lab practicesK2and first aid proceduresK2										
2	2 To describe the maintenance of lab equipments and quality control records, facilitate the quality control of culture preparation and their maintenance									
3	3 To acquire the knowledge of effluent disposal with respect to biological reference and K2 standard									
4	To provide	informatio	n about the <mark>tools and techniques of to</mark> tal quality man	agement.			K2			
5	To impart l	knowledge	about data analysis and data representation.				K3			
K1	l - Remembe	er; K2 - Un	lerstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	$\mathbf{K6} - \mathbf{Cre}$	eate					
Ur	nit:1	OV	ERVIEW O <mark>F QUALITY ASSUR</mark> ANCE AND MANAGEMENT			15 ho	ours			
Qu Co kn Ur	ality assuration ontrol of qua owledge in F pit:2	nce – Intro lity – Appl First aid pro OI	duction and overview – Definition. Designing of m ications. Good laboratory practices – Management of cedures.	icrobiolo of labora	ogy la tory h	borato azards	ory – and			
01	ality assessi	nent of Eq	ipments, chemicals, glass wares and laboratory env	vironmen	ts - V	arian	ce –			
Qu ass Qu	ality contro surance in sto ality control	l calculation erilization a of media a	ns – Quality management – Maintenance of record and disinfection - Preservation of stock cultures, meand stains	ds and d	eports iagno	s. Qua stic ki	ality ts –			
Ūr	nit:3	Q	UALITY ASSESSMENT OF DISPOSAL			15 ho	ours			
Q ma sta	uality assess anagement in andards.	ment of di transporta	sposal – decontaminated matters and other biolog tions of cultures. National control of biological – B	ical efflu iological	ients refere	– Qua ences	lity and			
Ur	nit:4		TOTAL QUALITY MANAGEMENT			15 ho	ours			
Co im Be	oncepts in TO plementing To mefits of TQ	QM- Tools FQM – Qu M – Check	& techniques of TQM – Requirements for impleme estionnaire, Assessment through questionnaire – Mi list for implementing TQM – Case study.	nting TQ ssion sta	QM − ; temen	Steps t –	for			

Uni	it:5	DATA AND GRAPHCAL REPRESENTATION	15 hours						
Тур	bes of Data,	tabular and Graphical summarization of numeric data: - Histo	grams & Stem and Leaf						
disp	plays : Grap	bhs for categorical data - Bar, Pie charts & Pareto diagrams.	Graphs for time ordered						
data	data – Run charts, Cause effect diagrams – Check Sheets								
Unit:6		Contemporary Issues	2 hours						
Exp	pert lectures								
		Total Lecture hours	75 hours						
Tex	Text Book(s)								
1	Rajesh Bh	atia and Rattan lal Ichhpujani. 1995. Ied. "Quality assurance in	Microbiology						
2	Hugo B. S	., Rusell, Pharmaceutical Microbiology, Blackwell Science							
3	Twelve M	anagement skills for success – Ram Narain, Viva books private	e limited – Chennai.						
Ref	erence Boo	oks							
1	Black S., S	Symour, Disinfection, Sterilization and Preservation, Philadelphi	a, London						
2	Gennaro,	Alfonso R., Remington: The Science and Practice of Pharmacy,	Vol-I & II, Lippincott						
	Williams a	& Wilkins, New York, 2001.							
3	A cross fu	nctional perspective Total Quality Management – Rao, Carr, Da	ambolena and Kopp-						
	John Wile	y & Sons, New York .							
Rel	ated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	http://www	v.openlearningworld.com/books/Quality%20Management%20System	n/Quality%20Control/Qu						
	ality%20As	surance.html							
Cou	urse Design	ed By: N.GUNASHEELA							
		in the manual in the second se							

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	L I	Μ	L	L	М
CO2	S	S	М	S	M	M	М	М	L	М
CO3	S	М	S	М	THISKUN	WEL	S M	L	L	М
CO4	S	S	М	S	Smbatore	M	L	М	L	L
CO5	S	S	S	Μ	தந்தப்Sாரை EDUCATE TO EVE		М	L	L	L

Cou	rse code	4EA	M. Sc. MICROBIOLOGY	L	Т	Р	С
	Electi	ive	GROUP A - ELECTIVE PAPER III - QUALITY ASSESSMENT IN PHARMACEUTICALS	5	-	-	4
Pre-	requisite		Aware of Quality systems in Pharmaceuticals	Sylla Versi	bus ion	202 202	0- 1
Cou	rse Objec	tives:					
1. T	o develop	knowledge	e of quality assurance guidance GMP, GLP and IC	CH in a	ll are	eas t	hat
impa	act drug qu	ality.	1 12 1 2 12 11 1 1 2				
2. 10 Even	o accompli	sh GMP an	a quality related issues as well as various regulatory	requirer	nents	6	
Exp On t	he success	ful complet	ion of the course student will be able to:				
	Eveloie t	ha rola of d	rugs and antibiotics in phormacouticals			V1	
1	Explaint		rugs and antibiotics in pharmaceuticals.				
2	State the	significanc	e of sterinty in pharmaceutical industry		. 1	K2	2
3	Impart k	nowledge of	in regulatory guidelines on production of natural, n	utraceut	tical	K:	5
1	Import k	ary anumic	roulity assurance in pharmaceutical manufacturing			K	2
5	 4 Impart knowledge on quanty assurance in pharmaceutical manufacturing 5 Mali data the measurable measuring means for big the measuring and male of microschild size 						
in HACCP							ŀ
K1 -	Remembe	er; K2 - Un	destand; K3 - Apply; K4 - Analyze; K5 - Evaluate; k	$\overline{\mathbf{K6} - \mathbf{Cre}}$	eate		
Unit	t:1		ANTIMICROBIAL DRUGS		1	3 ho	urs
An i	introductio	n to pharm	aceutical microbiology. Chemical growth control.	Chemic	cal		
antir	nicrobial a	igents for e	xternal use, synthetic antimicrobial drugs, naturally	occurri	ng		
antir	nicrobial c	lrugs: Antil	piotics. Antibiotics from prokaryotes, antiviral drugs,	1 1			
antii Unit	ungai arug	gs, antimicr	SPOULACE AND STEPULIZATION	a drugs.	15 h	oure	
Type	es of spoils	age Factor	affecting microbial spoilage – assessment of micro	bial	15 11	ours	1
spoi	lage – pre	servation.	Ecology of microorganisms as it affects the pharn	naceutic	al		
indu	stry – Ster	rile pharma	ceutical products – injections, Non injectable steri	le fluid	ls,		
Oph	thalmic pro	eparations,	dressings & implants.		,		
Unit	t:3		CONTROL MEASURES		1	5 ho	urs
Steri	ilization co	ontrol - me	ethods of sterility testing- sterilization monitors an	ıd Qual	ity		
assu	rance of p	products. T	he microbiological quality and regulatory require	ments	for		
natural and nutraceutical products, The regulatory control and quality assurance of							
1mm	immunological products, Containment system integrity – sterile products, Regulatory						
guia Unit	ennes (mic +•4	crobiology)	OUALITY ANALYSIS		1	5 ho	ure
The role of the Qualified Person in microbiological quality assurance. Safety in						uis	
microbiology Rapid enumeration and identification methods. Selection and use of							
cleaning and disinfection agents in pharmaceutical manufacturing. Prevention and							
elimination of microbial biofilms in the manufacturing environment using Clean-in-							
Place, Cleanroom design, operation and regulatory standards.							

Uni	it:5	QUALITY ASSURANCE	15 hours				
Mic	crobiologica	l quality assurance. Validation of aseptic processing and media	fills, International				
disi	nfectant tes	ting protocols, Measurement of biocide effectiveness, Microb	iological quality and				
regi	ulatory requ	irements for biotherapeutics and manufactured products, Th	ne role of the				
mic	robiologist	in HACCP, Auditing the pharmaceutical microbiology departm	ent.				
Uni	i t:6	CONTEMPORARY ISSUES	2 hours				
Exp	pert lectures	, online seminars – webinars					
Total Lecture hours75 h							
Tex	xt Book(s)						
1	1 Hugo W.B. and A.D.Russel. 2004. Pharmaceutical Microbiology. 4 th Ed, Blackwell Scientific Publications.						
	Dr Norman Hodges and Professor Geoff Hanlon (University of Brighton). Industrial						
2	Pharmace	utical Microbiology – Vol&Vol II: Standards & Controls Edito	rs, (REF;				
	www.euro	med.uk.com).					
Ref	erence Boo	ks					
1	Brock. Bio	ology of Microorganisms. 2006. Madigan M.T. 11 th Edition, Pea	arsonPrentice Hall,				
1	USA.						
Rel	ated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://ww	w.openlearning.com/courses/pharmaceutical-quality-assurance	>/				
2	https://www.mooc-list.com/tags/pharmaceutical						
3	https://npt	el.ac.in/noc/courses/noc19/SEM1/noc19-ge14/					
Cou	Course Designed By: Dr. R. Vijayaraghavan						

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	М	M	M	L	М	М	M	L
CO2	М	S	M	5 STR	M	WERL	'9 L	М	L	М
CO3	М	М	М	S	Smbatore	M	M	М	L	L
CO4	М	S	S	M	ந்தப்S	2 un M	М	М	М	L
CO5	S	S	S	S	S TO ELE	L	L	М	М	L

Co	urse code	4EPA	M.Sc., MICROBIOLOGY	L	Т	P	С
Ele	ctive	I	GROUP A - ELECTIVE PAPER IV QUALITY ASSURANCE AND ASSESSMENT	-	-	5	4
Pre	-requisite		Basic Knowledge in handling of Microbial cultures	Sylla Versi	bus on	2020 2021)- l
Co	urse Objec	tives:					
	1. Enhanc water o	e the ka quality	nowledge of microbiological techniques in analysis of	food	samp	les a	nd
	2. Make the	he learn	er to understand the concepts behind sterility in hospitals	and in	dustri	les ai	ıd
	provid	e expert	use training in sterility testing of pharmaceutical products				
Fvi	5. Droaue	$\frac{11}{rse Out}$	comes:				
On	the success	ful com	pletion of the course, student will be able to:				
	Enhance	the know	wledge in the field of testing of food products and be skill	fulas	a	K3	
1	quality su	uperviso	r in Food industry	iui us	u		
2	To under	stand an	d apply asepsis in pharmaceutical industry			K3	
3	Analyze	the cher	nical and biological quality of water			K4	
4	To evalua	ate the n	nicrobial load in the environment.			K5	
5	To analy	se the ir	npact of temperature on microbial death.			K4	
K1	K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
1. S	staining Tec	hniques	(Grams and LPCB)-Food samples- vegetables and packet	ed food	ls.		
2. S	sterility tests	s for Ins	truments – Autoclave & Hot Air Oven				
3. S	terility of A	Air and it	s relationship to Laboratory & Hospital sepsis.				
4. S	terility test	ing of Pl	narmaceutical products – Antibiotics, Vaccines & fluids				
5. (Quantitative	analysi	s of water – Membrane filter method				
6. E	Enumeration	n of mici	obes from industrial effluents.				
7. E	Evaluation o	of Drug	potency by MIC.				
8. I	solation & o	characte	rization of Bacteria from wood and Paints.				
9. V	Vater qualit	y analys	is - MPN.				
10.	Estimation	of BOD	and COD.				
11.	Isolation of	f microo	rganisms from spoiled foods – Meat, milk and Bread.				
12.	Milk qualit	y – Dye	reduction test.				
13.	Thermal de	eath poir	t and thermal death time.				
			Total Lecture hours		7	5 ho	urs
Tex	xt Book(s)						
1	Microbiol Welsh , Pe	ogy: A learson	Laboratory Manual, 11th Edition, 2017. James G. Cappud	ccino a	and C	had	Т.
2	Laboratory Exercises in Microbiology, Fifth Edition, 2002. Harley–Prescott. The McGraw–Hill Companies.						
3	3 Hugo and Russell's Pharmaceutical Microbiology, 7th Edition, 2004. Blackwell Publishers						

Ref	ference Books
1	Microbiology A Laboratory Manual, 10 th Edition, 2014. James G. Cappuccino and Natalie Sherman, Pearson
2	Microbiological Methods,8 th Edition, 2004. Collins and Lyne. Arnold Publishers.
3	Manual of Diagnostic Microbiology, Dr.B.J.Wadher & Dr. G. L.Bhoosreddy, First .Ed., Himalaya publishing house, Nagpur.
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://milnepublishing.geneseo.edu/suny-microbiology-lab/chapter/differential-staining-techniques/
2	https://www.cliffsnotes.com/study-guides/biology/microbiology/microscopy/staining-techniques
3	https://www.pharmaguideline.com/2013/06/determination-of-biological-oxygen.html
4	https://gibraltarlabsinc.com/services/microbiology/sterility-testing/
Cou	urse Designed By: Dr. A. Vijaya Chitra

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	М	М	М	L	М
CO2	S	S	S	S	S	L	М	S	М	М
CO3	S	S	М	S	ைத்கழ	L L	L	L	L	М
CO4	S	S	L	S	S	М	М	S	М	L
CO5	S	S	S	S	S	M	L	S	L	L

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Cou	rse code	1EB	M.Sc., MICROBIOLOGY	L	Т	Р	С
	Electi	ve	GROUP B - ELECTIVE PAPER I - ARTIFICIAL INTELLIGENCE FORBIOLOGICAL SCIENCES	5	-	-	4
Pre-	requisite		Fundamentals about Machine learning	Sylla Versi	bus ion	202 202	D- 1
Cou	rse Objec	tives:					
The	main objec	ctives of thi	s course are to:				
2	. muodu Facilita	te students	to learn & apply AI tools for solving research issues i	s n hiolo	σv		
3	Unders	tand the bas	sics of automation		' <i>5</i> '		
4	. Develo	p automate	d solutions for research problems in biology				
Exp	ected Cou	rse Outcor	nes:				
On t	he success	ful complet	ion of the course, student will be able to:				
1	Understa	nd the conc	ept of Artificial Intelligence			K2	
2	Apply th	e knowledg	ge of Machine learning and Deep learning technique	es to s	olve	K3	;
	real time problems						
3	Understa	nd the app	lication of Artificial Intelligence in microbe analysis	and		K2)
	prediction of host – microbiome relationship						
4	Apply an	d validate A	Artificial Intelligence in clinical diagnosis of infectious	s disea	se	K 4	
5	Evaluate	the role of	Artificial Intelligence in the molecular mechanism be	hind d	lrug	K5	í
	discovery	, sequencir	ng and auto immune diseases		U		
K1 -	Remembe	er; K2 - Un	derstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; H	X6 – Ci	reate		
Unit	:1		ARTIFICIAL INTELLIGENCE (AI)		1	5 ho	urs
Intro	duction to	AI – Fur	ndamentals – Need for AI – Foundations of AI –	AI en	viron	men	t —
App	lication do	mains of A	I – AI tools – Challenges and Future of AI.				
Unit	::2		MACHINE LEARNING (ML) AND		1	5 ho	urs
			DEEP LEARNING (DL)				
Func	lamentals	of ML and	DL - ML algorithms to find associations across biolo	ogical	data,	cellu	lar
imag	ge classific	ation and i	lentification of genetic variations.				
Unit	:3	ARTIFIC	CIAL INTELLIGENCE IN CLASSIFICATION		1	5 ho	urs
		AN	ND PREDICTION IN MICROBIOLOGY				
AI in	n bacterial	counting -	Prediction of Microbial Species - Prediction of Env	vironm	ental	and	Host
Pher	otypes -	Interaction	Between Microorganisms – Microbiome-Disease	Assoc	iatior	1 - I	Using
Mici	obial Cor	nmunities (to Predict Disease - pest management - Prediction	of the	Anti	micr	obial
Acti	vity						
Unit	:4	ART	IFICIAL INTELLIGENCE IN CLINICAL		1	5 ho	urs
			MICROBIOLOGY				<u> </u>
Artif	Artificial Intelligence Diagnostic Testing - AI and Gram Stain - AI and Parasitology - AI and						
Bact	Bacterial Culture Plate Images - AI and MALDI-TOF MS - AI and Whole Genome Sequencing						

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Un	11:5	ARTIFICIAL INTELLIGENCE IN MOLECULAR BIOLOGY	15 hours				
Art	ificial Intell	ligence and Machine learning in autoimmune disease – AI in dr	rug discovery AI in				
Phy	vlogeny – A	AI and Whole Genome Sequencing - AI in next generation	sequencing - AI in				
pro	tein structu	re prediction – AI in protein folding analysis.					
Un	it:6	Contemporary Issues	2 hours				
Exp	pert lectures	, online seminars – webinars					
		Total Lecture hours	75 hours				
1	Paul P. B	ourbeau, Nathan A. Ledeboer; Automation in Clinical Microbio	ology, Journal of				
	Clinical M	licrobiology May 2013, 51 (6) 1658-1665; DOI: 10.1128/JCM.	00301-13				
2	LeCun, Y	., Bengio, Y. & Hinton, G. Deep learning. Nature 521,	, 436–444 (2015).				
	https://doi	.org/10.1038/nature14539					
3	Kenneth H	P. Smith, Anthony D. Kang, James E. Kirby, Automated Inter-	erpretation of Blood				
	Culture G	ram Stains by Use of a Deep Convolutional Neural Network	, Journal of Clinical				
	Microbiol	ogy Feb 2018, 56 (3) e01521-17; DOI: 10.1128/JCM.01521-17					
4	Mahdieh 1	Poostchia, Kamolrat Silamut, Richard J.Maude, Stefan Jaege	ra, George Thomaa,				
	Image ana	lysis and machine learning for detecting malaria, Translationa	al Research, Volume				
	194, April	2018, Pages 36-55, https://doi.org/10.1016/j.trsl.2017.12.004.					
5	Cui W, Aouidate A, Wang S, Yu Q, Li Y, Yuan S. Discovering Anti-Cancer						
	Drugs via	Computational Methods. Front Pharmacol. 2020;11:733. Pub	lished 2020 May 20.				
	doi:10.338	39/fphar.2020.00733					
6	Clark RD.	Putting deep learning in perspective for pest management sc	ientists. Pest Manag				
	Sci. 2020;	76(7):2267-2275. doi:10.1002/ps.5820					
Ref	ference Boo	oks					
1	Qu K, Gu	o F, Liu X, Lin Y and <mark>Zou Q (2019) Appli</mark> cation of Ma	chine Learning in				
	Microbiol	ogy. Front. Microbiol. 10:827. doi: 10.3389/fmicb.2019.00827					
2	Park HS,	Rinehart MT, Walzer KA, Chi J-TA, Wax A (2016) Autor	mated Detection				
	of P. falci	parum Using Machine Learning Algorithms with Quantitative I	Phase Images of				
	Unstained	Cells. PLoS ONE 11(9): e0163045. https://doi.org/10.1371/jou	rnal.pone.0163045				
3	Yang X, Y	Wang Y, Byrne R, Schneider G, Yang S. Concepts of Artif	icial Intelligence for				
	Computer	Assisted Drug Discovery. Chem Rev. 2019;1	19(18):10520-10594.				
	doi:10.102	21/acs.chemrev.8b00728					
Re	lated Onlin	e Contents [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://onl	inecourses.nptel.ac.in/noc20_me88/preview					
2	https://onl	<u>inecourses.nptel.ac.in/noc20_cs62/preview</u>	h - 1				
3	https://ww	www.weiorum.org/agenda/2019/05/how-artificial-intelligence-can	-neip-us-decode-				
	<u>numan-1m</u>	<u>mumity/</u>					
Co	urse Design	ed By: Dr. A. Vijaya Chitra					
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	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	М	L	М	М	L	М	S
CO2	S	М	S	М	М	М	М	М	М	S
CO3	М	S	М	S	М	М	L	М	L	S
CO4	М	М	S	М	S	L	L	М	L	S
CO5	S	М	М	S	М	L	М	М	М	S

*S-Strong; M-Medium; L-Low

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Cou	urse code	2EB	M. Sc. MICROBIOLOGY	L	Т	P	С
	Electi	ve	GROUP B - ELECTIVE PAPER II -COMMUNICABLE AND NON- COMMUNICABLE DISEASES	5	-	-	4
Pre	-requisite		Aware of microbial pathogens and its diagnosis	Sylla Versi	bus on	202 202	0- 1
Cou	ırse Object	tives:					
1. E 2. A for	Develop know Apply know prevention	wledge and ledge of co and control	I choose epidemiological methods to investigate and ommunicable and non-communicable disease epider leading to improvements in public health.	manage niology	outb to sti	reak ateg	s. jies
Exp	Expected Course Outcomes:						
On	On the successful completion of the course, student will be able to:						
1	Describe	about vario	bus respiratory infections.			K1	
2	Elaborate	e on the vari	ous intestinal infections.			K2	!
3	Discuss a	bout differ	ent types of vector borne infections			K2	!
4	Acquire i	nformation	about superficial mycosis and their diagnosis and tre	eatment		K3	;
5	Know va	rious non-c	ommunicable diseases and their preventive measures	5		K3	;
K1	K1 - Remember; K2 - Undestand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1 RESPIRATORY INFECTIONS 13 H							urs
Infl	uenza, Mur	nps, Measle	es, Rubella, Acute respiratory infections and TB.				
Uni	it:2		INTESTINAL INFECTIONS		1	5 h	ours
Pol	io, Cholera	, Acute dia	urrhea diseases, Food poisoning, Typhoid, Amoeb	iasis,			
Asc	ariasis, Ho	ok worm, T	apeworm, Pinworm infections.		1	<u>5 h a</u>	
Lon	ICS		vector Borne Infections		1	5 110	urs
Lep	it• 4	-AIDS - L	SUPERFICIAL MYCOSES		1	5 ho	urs
Der	matophytos	ses – Onno	rtunistic fungal infections – Candidiasis – Diagno	stics	-	5 110	<u>ui 5</u>
Tec	hniques and	d Treatmen	t.				
Uni	it:5		NON-COMMUNICABLE DISEASES		1	5 ho	urs
Hyp Pre	per Tension ventive mea	– Diabetes Isures.	s - Coronary Heart diseases - Cancer, Obesity, Bli	ndness,	Acci	dent	s –
Uni	it:6		CONTEMPORARY ISSUES			2 ho	urs
Exp	ert lectures	, online sen	ninars – webinars				
			Total Lecture hours		7	5 ho	urs
Tex	t Book(s)						
1	Dr. JahanH	EverttPark.	2015.Park's Text book of Preventive and social med	icine.			
2	K C Sawa	nt. 1993. M	edical Microbiology. Dominant Publishers.				
3	3 K C Sawant. 2005. Virology. Dominant Publishers.						
4	4 SubrataBhattacharjee. 2005. Bacteriology. Dominant Publishers.						
5	5 Dr Reba Kanungo. 2017. Ananthanarayan and Paniker's Textbook of Microbiology. 10 th Edition.						

Ref	ference Books
1	Samuel Baron. 1996. Medical Microbiology. 4 th Edition
2	R. C. Dubey, D. K. Maheshwari. 2010. A Textbook of Microbiology. S. Chand Publication.
Rel	lated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.mooc-list.com/course/non-communicable-diseases-humanitarian-settings-
1	coursera
2	https://www.who.int/health-topics/noncommunicable-diseases#tab=tab_1
3	https://www.mooc-list.com/course/global-disease-masterclass-communicable-diseases-
5	epidemiology-intervention-and-prevention
C	

Course Designed	By: Dr.	R. Vija	yaraghavan
0	2		1 1

			Mapp	ing with	Program	nme Out	tcomes			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	М	М	М	Μ	L	М	М	L
CO2	М	S	М	М	М	М	М	L	М	L
CO3	М	L	М	М	S	L	М	М	L	L
CO4	М	М	S	L	М	М	М	М	М	L
CO5	М	М	М	S	S	L	М	М	М	L



Cou	rse code	4EB	MSC MICROBIOLOGY	L	Т	Р	С	
	Electi	ive	GROUP B - ELECTIVE PAPER III - HEALTH CARE OF THE COMMUNITY	5	-	-	4	
Pre-	requisite		Aware of Human Health Care Practices	Sylla Versi	bus on	2020 202)- 1	
Cou	rse Object	tives:						
The 1	main objec	ctives of thi	s course are to:					
1. Im	prove and	expand the	availability of comprehensive health service					
2. Ex	apand acce	ess to health	care services in underserved and rural areas.					
3. Fo	oster and e	ncourage th	ne use of health care delivery models that utilize team	-based	l app	roach	ies	
wher	where each member practices at the full scope of their training.							
Expe	ected Cou	rse Outcon	nes:					
On th	ne success	ful complet	ion of the course, student will be able to:					
1	To gain i measures	nformation	about nutrition, health, food adulteration and preventi	ve		K2	•	
2	To under	stand the in	portance of physical and mental health.			K2		
3	3 To emphasize the need of health programs and health education.						K3	
4 Top apply the social culture to find the solutions for mental illness and drug K3								
5	To insist	the need of	family planning and reproductive health education.	3		K4		
K1 -	Remembe	er: K2 - Uno	derstand: K3 - Apply: K4 - Analyze: K5 - Evaluate: K	$\overline{6 - \mathbf{Cr}}$	eate			
Unit	:1		Nutrition and Health		1	5 ho	urs	
Balar	nced Diet, f	food surveill	ance, food fortifications- addition of vitamins and mineral	s - Adı	ıltera	tion a	nd	
preve	entive steps							
Unit	:2		Physical health		1	5 ho	urs	
Care Walk	of skin,	hair, teeth, ogging – Yo	eyes. ears, hands and feet-physical exercises and ga and meditation – stress Relief.	their i	mpor	tance	e -	
Unit	:3		Health Education		1	5 ho	urs	
Heal	th Program	mmes and	health education-Malaria control – TB control – A	IDS co	ontro	1		
prog	rammes ar	nd Immuniz	ation programmes.					
Unit	:4		Mental Health		1	3 ho	urs	
Socia	al science	s and men	al health - Sociology; Social structure, culture and	l custo	ms -	- soc	cial	
prob	lems-Men	tal health –	cases of mental illness Alcoholism and drug dependence	dence -	– pre	venti	ion	
Raha	Rahabilitation.							
Unit	:5		Health programme		1	5 ho	urs	
Fami child	ly plannir Health pr	ng, Materna ogramme (1	al and child health – Antenatal and Postnatal care – RCH).	Repro	oduct	ive a	nd	
Unit	:6	· · · ·	Contemporary Issues			2 ho	urs	
Expe	ert lectures	, online sen	ninars – webinars					
			Total Lecture hours		7	'5 ho	urs	

Tex	at Book(s)
1	Park's Text books of preventive and social medicine
	Immune – biotechnology by Naha & Narain
2	
3	Immunology by Dulsy Fatima & N.Arumugam
Ref	Gerence Books
1	Food and Nutrition by L.Swaminathan
2	Dietics by Srilakshmi 6. Practice of fertility control & Comprehensive manual 6th edition by
	S.K.Choudhary
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.classcentral.com/subject/public-health
2	https://onlinecourses.nptel.ac.in/noc19_mg50/preview_
3	https://www.edx.org/learn/healthcare
Cou	urse Designed By: N.Gunasheela ,

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	М	М	М	L
CO2	S	S	S	S	М	М	М	L	L	L
CO3	S	М	S	S	S	L	М	М	М	L
CO4	S	S	S	S	Sale	S	L	S	М	L
CO5	S	S	S	^{to} M	S	S	М	L	М	L

Co	urse code	4EPB	M.Sc MICROBIOLOGY	L	Т	Р	С
Ele	ctive Pract	ical	GROUP B - ELECTIVE PRACTICAL IV WATER ANALYSIS AND HEALTH CARE	-	-	5	4
Pre	-requisite		Basic knowledge about Biochemical Techniques	Sylla Versi	bus on	2020 202)- 1
Co	urse Objec	tives:		•			
	1. To trair	n the lear	rner in quality analysis of physico-chemical parameters of	f water	•		
	2. Provide	e experti	se training in immunological testing procedures				
T	3. Enhanc	e the lea	urner skill in microscopic observation of parasites				
	pected Cou	rse Out	comes:				
On	the success		pletion of the course, student will be able to:	1 110	1	IZE	
1	a quality	the know	sor in Food and Dairy industries	skillfu	l as	KS	I.
2	Perform	immuno	logical assays and diagnosis of medical samples			K3	j
3	Perform	analysis	of environmental samples such as water.			K4	F
4	Understa	nd the c	oncepts of food adulteration			K3	;
5	Investiga	te samp	les for Protozoa and helminthic parasites.			K5	, I
K1	K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
1. V	Vater Analy	sis: Phy	sicochemical parameters -pH, Turbidity, TDS, TSS, BOD	D, COE) and	DO	
2. F	Pasteurizatio	on of mi	k & Methylene Blue Dye Reduction test.	4			
3. E	Diagnostic to	est: Dial	petic test, Hypertension test, Widal test, VDRL test				
4. F	Food Adulte	ration A	ny four Food Stuffs				
5. F	Radial Immu	ino diffi	asion test				
6.E	LISA test		action of Information Manufacture Incol				
7. I Tar	viicroscopic	alarial n	arasite and Filarial parasite	k wori	n, pi	nwor	m,
8. V	Vater Ouali	tv analy	sis- MPN				
	C		Total Lecture hours		7	'5 ho	urs
Tex	xt Book(s)	I	Company Company				
1	Microbiol Welsh, Pe	ogy: A] earson	Laboratory Manual, 11th Edition, 2017. James G. Cappud	ccino a	and C	Chad	T.
2	Laborator McGraw-	y Exer Hill Cor	cises in Microbiology, Fifth Edition, 2002. Har mpanies.	ley-P	resco	tt. '	Гhe
Ref	Reference Books						
1	Microbiol Sherman,	ogy A I Pearson	Laboratory Manual, 10 th Edition, 2014. James G. Cappu	iccino	and	Nata	lie
2	Microbiol	ogical N	Iethods,8 th Edition, 2004. Collins and Lyne. Arnold Publ	ishers.			
Rel	ated Onlin	e Conte	nts [MOOC, SWAYAM, NPTEL, Websites etc.]				
1							
Cou	urse Design	ed By: I	Dr. A. Vijaya Chitra				

	Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	М	М	М	L
CO2	S	М	S	S	S	S	М	М	L	L
CO3	S	S	М	S	S	М	М	М	L	L
CO4	S	S	L	S	S	L	L	М	L	L
CO5	S	S	L	S	S	М	L	L	М	L



Course	code	1EC	M.Sc MICROBIOLOGY	L	Т	P	С
	Flecti	VA	GROUP C - ELECTIVE PAPER I	5			4
	Litti	ve	FORBIOLOGICAL SCIENCES	J	_		
Pre-req	uisite		Fundamentals about Machine learning	Sylla Vers	bus ion	202 202	0- 1
Course	Object	ives:			-	-	
The mai	n objec	tives of thi	s course are to:				
1. I	ntrodu	ce Artificia	l Intelligence & machine learning for biology studen	ts			
2. H	Tacilitat	te students	to learn & apply Al tools for solving research issues	in biolo	ogy		
	Develor	and the day	acts of automation				
Expecte	ed Cou	rse Outcor	nes:				
On the s	uccessi	ful complet	ion of the course, student will be able to:				
1 Ur	ndersta	nd the conc	ept of Artificial Intelligence			K	2
2 Ar	only the	e knowledg	ye of Machine learning and Deep learning techniqu	ies to s	olve	K	3
rea	al time	problems			01.0		
3 Ur	ndersta	nd the app	lication of Artificial Intelligence in microbe analys	is and		K	2
prediction of host – microbiome relationship							
4 Apply and validate Artificial Intelligence in clinical diagnosis of infectious disease K4							
5 Ev	valuate	the role of	Artificial Intelligence in the molecular mechanism h	ehind d	Irug	K.	5
dis	scovery	, sequencir	ng and auto immune diseases	•••••••			
K1 - Re	membe	r; K2 - Uno	derstand; K3 - Apply; K4 - Analyze; K5 - Evaluate;	K6 – C	reate		
Unit:1			ARTIFICIAL INTELLIGENCE (AI)		1	5 ho	urs
Introduc	ction to	AI – Fur	ndamentals – Need for AI – Foundations of AI –	AI en	viron	men	t —
Applicat	tion do	mains of A	I – AI tools – Challenges and Future of AI.				
Unit:2			MACHINE LEARNING (ML) AND DEEP LEARNING (DL)		1	l5 ho	urs
Fundam	entals o	of ML and	DL - ML algorithms to find associations across biol	logical	data,	cellu	lar
image cl	lassific	ation and ic	lentification of genetic variations.				
Unit:3		ARTIFIC	CIAL INTELLIGENCE IN CLASSIFICATION		1	5 ho	urs
		AN	ND PREDICTION IN MICROBIOLOGY				
AI in ba	acterial	counting	- Prediction of Microbial Species - Prediction of	Enviror	nmen	tal a	nd
Host Ph	enotyp	es - Interac	ction Between Microorganisms - Microbiome - Dis	sease A	ssoci	atior	1 -
Using Microbial Communities to Predict Disease - pest management - Prediction of the							
Antimic	robial A	Activity					
Unit:4		ART	IFICIAL INTELLIGENCE IN CLINICAL MICROBIOLOGY		1	5 ho	urs
Artificia	l Intell	igence Dia	gnostic Testing - AI and Gram Stain - AI and Parasit	tology -	AI a	nd	
Bacterial Culture Plate Images - AI and MALDI-TOF MS - AI and Whole Genome Sequencing							

		S	CAA DATED: 18.05				
Uni	it:5	ARTIFICIAL INTELLIGENCE IN MOLECULAR BIOLOGY	13 hours				
Art	ificial Intell	igence and Machine learning in autoimmune disease - AI in da	rug discovery AI in				
Phy	vlogeny – A	AI and Whole Genome Sequencing - AI in next generation	sequencing - AI in				
pro	tein structu	re prediction – AI in protein folding analysis.					
Uni	it:6	Contemporary Issues	2 hours				
Exp	pert lectures	, online seminars – webinars					
		Total Lecture hours	75 hours				
Tex	xt Book(s)						
1	Paul P. E Clinical M	Sourbeau, Nathan A. Ledeboer; Automation in Clinical Microlicrobiology May 2013, 51 (6) 1658-1665; DOI: 10.1128/JCM.	obiology, Journal of 00301-13				
2	LeCun, Y	., Bengio, Y. & Hinton, G. Deep learning. Nature 521, 436–44	14 (2015).				
	https://doi	.org/10.1038/nature14539					
3	Kenneth I	P. Smith, Anthony D. Kang, James E. Kirby, Automated Int	erpretation of Blood				
	Culture G	ram Stains by Use of a Deep Convolutional Neural Network	, Journal of Clinical				
	Microbiol	ogy Feb 2018, 56 (3) e01521-17; DOI: 10.1128/JCM.01521-17					
4	Mahdieh Poostchia, Kamolrat Silamut, Richard J.Maude, Stefan Jaegera, George Thomaa						
	Image analysis and machine learning for detecting malaria. Translational Research Volume						
	194, April 2018, Pages 36-55, https://doi.org/10.1016/i.trsl.2017.12.004.						
5	Cui W. Aouidate A. Wang S. Yu O. Li Y. Yuan S. Discovering Anti-Cancer						
	Drugs via	Computational Methods. Front Pharmacol. 2020;11:733. Pub	lished 2020 May 20.				
	doi:10.338	39/fphar.2020.00733	5				
6	Clark RD	Putting deep learning in perspective for pest management sc	eientists. Pest Manag				
	Sci. 2020;	76(7):2267-2275. doi:10.1002/ps.5820	0				
Ref	erence Boo	oks line in the second s					
1		E Lin Y Lin Y and Zon O (2010) Application of Machina I	oorning in				
1	Qu K, Ou Microbiol	ory Front Microbiol 10:827 doi: 10.3389/fmich 2019 00827	Learning in				
2	Dork UC	Dipohert MT Wolzer KA Chi $I T A$ Wey A (2016) Auto	mated Detection				
4	гак по, of D falsi	Rinchart W11, Walzer KA, Cill J-1A, Wax A (2010) Auto	Detection Dese Images of				
	Unstained	Calls D oS ONE 11(0): a0162045 https://doi.org/10.1271/jou	rnal pope 0162045				
2	Visianieu Visianieu	Cells. PLos ONE 11(9). e0105045. <u>https://doi.org/10.15/1/jou</u>	<u>iniai.pone.0103045</u>				
3	rang X,	wang I, Byrne K, Schneider G, Yang S. Concepts of Artif	10(19),10520,10504				
	Computer	-Assisted Drug Discovery. Chem Rev. 2019;1	19(18):10520-10594.				
	do1:10.102	21/acs.chemrev.8b00/28					
Kel	ated Onlin	e Contents [MOUC, SWAYAM, NPTEL, Websites etc.]					
1	https://on	inecourses.nptel.ac.in/noc20_me88/preview_					
2	https://ON	mecourses.npter.ac.m/noc20_cso2/preview	halp va daarda				
З	human-im	/w.weiorum.org/agenda/2019/05/now-artificial-intelligence-can munity/	<u>-neip-us-decode-</u>				
Со	arse Design	ed By: Dr. A. Vijava Chitra					
		,					

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			Mapp	ing with	Program	nme Out	tcomes			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	М	L	М	L	М	L	S
CO2	S	М	S	М	М	L	L	М	М	S
CO3	М	S	М	S	М	М	М	L	М	S
CO4	М	М	S	М	S	М	М	М	М	S
CO5	S	М	М	S	М	L	М	L	L	S



Cot	ırse code	2EC	M. Sc. MICROBIOLOGY	L	Т	Р	С
	Elect	ive	GROUP C - ELECTIVE PAPER II - BIOPHYSICS AND BIOCHEMISTRY (2EA)	5	-	-	4
Pre	-requisite		Fundamentals about structural information of Biologically active molecules	Syllah Versi	ous on	2020 2021)- 1
Cou	irse Object	tives:					
CO	1: To develo	op the knowle	edge of biophysical methods in the analysis of biopc	olymers	5		
CO	2: To descri	be technolog	ical aspects of biological molecules				
CO.	3: To provid	le basic unde	rstanding on biochemistry principles of biomolecule	es			
Exp	ected Cou	rse Outcome	28:				
On	the success	ful completio	n of the course, student will be able to:				
1	To impart	knowledge ab	out biophysical methods used for analysis of biopolymer	rs		K1	
2	To provid	e information	on nucleic acid polymorphism			K2	,
3	To educat	e about radio-j	physics with respect to tracer techniques in biology			K2	,
4	To provid in metabo	e basic inform lism	ation on conversion and synthesis of macromolecules an	d their r	ole	K4	
5	To unders	tand various m	netabolic disorders and their molecular biology			K3	
K1	- Remembe	er; K2 - Unde	rstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; H	$\overline{\mathbf{X6} - \mathbf{C1}}$	eate	1	
Uni	t:1		BIOPHYSICAL METHODS		1	5 ho	urs
Prin	Principles of biophysical methods used for analysis of biopolymer structure, X-ray diffraction,						
Hyd	Hydrodynamic methods; plasma emission spectroscopy.						
Uni	t:2	NUCLE	IC ACID HYBRIDIZATION TECHNIQUES		1	5 ho	urs
Prin	ciples and t	echniques of	nucleic acid hybridization and Cot curves; Sequencing	g of Pro	teins	and	
nucl	leic acids; N	Aethods for m	neasuring nucleic acid and protein interactions. Struct	tural po	olymc	orphis	sm
Uni	111A, KINA (+-2		TPACEP BIOLOCY		1	2 ho	IPC
Prin	ciples and a	nnlications of	f tracer techniques in biology: Radiation dosimetry:		L	5 110	u15
Rad	ioactive iso	topes and half	life of isotopes: Effect of radiation on biological syste	em.			
Uni	t:4		BIOCHEMISTRY		1	5 ho	urs
Inte	rconversion	of hexoses a	nd pentoses; Amino acid metabolism; Coordinated o	control	of		
met	abolism; Oz	kidation of lip	bids; Biosynthesis of fatty acids; Triglycerides; Phos	oholipic	ls;		
Ster	ols, Group t	ransfer and Ĉ	oupled reactions.	· •			
Uni	t:5		CANCER BIOLOGY		1	5 ho	urs
Bio	chemistry a	nd molecular	biology of cancer; Oncogenes; Chemical carcinogene	esis;			
Gen	etic and	metabolic c	lisorders; Hormonal imbalances; Drug metabol	ism a	nd		
deto	exification.		CONTEMBODADY ICCLIEC			<u> </u>	
Unit:0 CONTEMPORARY ISSUES 2 nours						urs	
Exp	Expert lectures, online seminars – webinars						
Ŧ			Total Lecture hours		/	5 110	urs
Tex	Text Book(s)						
1	Gauri Mis 2017. Spri	sra. Introduct	tion to biomolecular structure and biophysics, ba	sics of	biop	ohysi	CS.
2	Peter Jomo Walla. Modern biophysical chemistry: detection and analysis of biomoleules. 2014. Second, updated and expanded edition. Wiley publications.						
3	Thomas Jue. Hand book of modern biophysics. Biomedical applications of biophysics.2010.Volume 3. Humana Press.						

Ref	ference Books
1	Keith Wilson and John Walker. Principles and Techniques of biochemistry and Molecular
1	biology. 2010. Seventh edition. Cambridge University Press.
2	Roger L. Lundblad, Fiona Macdonald. Hand book of biochemistry and molecular biology.
2	2018. CRC Press.
Rel	ated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://onlinecourses.swayam2.ac.in/cec20_bt12/preview
2	https://onlinecourses.swayam2.ac.in/cec20_bt19/preview
3	https://www.edx.org/course/medicinal-chemistry-the-molecular-basis-of-drug-di
Co	urse Designed by: Dr.T.Savitha

Mapping with Programme Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	М	L	М	S	S	S	М	L	L	L	
CO2	S	М	L	L	М	S	L	М	М	L	
CO3	L	Μ	S	L	S	S	М	L	М	L	
CO4	М	S	L	S	L	S	L	М	L	L	
CO5	S	L	М	М	M BBBBD	S	М	М	L	L	



Cou	rse code	4EC	M. Sc. MICROBIOLGY	L	Р	С					
	Elect	tive	GROUP C - ELECTIVE PAPER III - MOLECULAR CYTOLOGY AND TISSUEENGINEERING	5	-	-	4				
Pre-	requisite		Basic knowledge about Molecular Genetics Syllabus Version								
Cou	rse Objec	tives:			I						
CO1 CO2 CO3	CO1: To impart knowledge on molecular basis of signal transduction in life CO2: To provide technological aspects in cell and tissue culture CO3: To develop understanding of histological techniques										
Exp On t	be success	rse Outcome	s:								
			air malacular autology			IZ 1					
1	Acquire	ine technique	s in molecular cytology			K I					
2	To unders linked inh	stand the mole neritance.	cular background linked to signal transduction pathv	vays and	sex	K2	2				
3	To gain k	nowledge abo	out DNA constancy and mutagenesis			K2	2				
4	To Analy	To Analyze the different cell and tissue culture techniques.									
5	To acquir	e the knowled	ge about the basics of mammalian systems.			K3	}				
Unit	t•1		BASIC TECHNIQUES		1	<u>5 ho</u>	urs				
Mole sorti sex-	ecular basis ng, secreto linked inhe	s of signal trar ry and endocy ritance	sduction in bacteria, plants and animals; Model men tic pathways, cell cycle; Dosage compensation and s	nbranes; ex deterr	prote minat	in ion a	nd				
Uni	t:2	DNA	MUTAION AND EXPRESSION STUDIES		1	5 ho	urs				
The Mole Envi gene	The law of DNA constancy and C-value paradox; Numerical, and structural changes in chromosomes; Molecular basis of spontaneous and induced mutations and their role in evolution; polypoidy; Environmental mutagenesis and toxicity testing; Population genetics. Environmental regulation of										
Uni	t:3	TECHN	QUES OF CELL AND TISSUE CULTURE		1	3 ho	urs				
Cell cultu Prote	and tissue ires; Soma oplast fusio	culture in plan clonal variation on and somation	nts and animals; Primary culture; Cell line; Cell clon on; Micropropagation; Somatic embryogenesis; Haj c hybridization; Cybrides;	es; Callu ploidy;	us						
Uni	t :4	GEN	NE TRANSFER AND APPLICATIONS		1	5 ho	urs				
Gene transfer methods in plants and in animals; Transgenic biology; Allopheny; Artificial seeds; Gene targeting. Applications of genetic engineering in agriculture, health and industry.											
Uni	Unit:5HISTOLOGY, PHYSIOLOGY AND HAEMATOLOGY15 hours										
Histology – Basics of mammalian systems, nutrition, digestion and absorption; Circulation											
(open and closed circular, lymphatic systems, blood composition and function); Excretion											
IIni	t•6		CONTEMPORARY ISSUES			<u>2 ho</u>	ure				
Exp	ert lectures	, online semi	nars – webinars			<u> </u>	u13				
LAP			Total Lecture hours		7	5 ho	urs				

Tex	Text Book(s)									
1	Bailey & Scotts Diagnostic Microbiology. 12 th edition. 2007.									
2	Histology: A text and Atlas: with coorelated cell and Molecular biology. 2015.									
Reference Books										
1	Leopoid G.Koss & Myron R.Melamed (eds). Koss' Diagnostic cytology and its histopathologic bases. Volume2. 2005.									
2	2 Jean Brachet. Molecular cytology. Volume 1: Cell cycle. 1985.									
Rel	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://study.com/articles/List_of_Free_Online_Pathology_Courses_and_Classes.html									
2	2 <u>https://www.futurelearn.com/courses/histology</u>									
Co	urse Designed by: Dr.T.Savitha									

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	Μ	L	Μ	S	L	М	М	L	L	L
CO2	Μ	S	L	Μ	Μ	М	L	М	М	L
CO3	L	Μ	S	L	S	М	М	М	L	L
CO4	S	L	Μ	L	Μ	L	L	М	L	L
CO5	Μ	• L	L	Μ	S	L	М	L ·	L	L



Co	Course code 4EPC M.Sc MICROBIOLOGY L T P C											
Elective Practical			GROUP C –	-	-	5	4					
			ELECTIVE PRACTICAL IV TECHNIQUES IN CYTOLOGY									
			Basic Knowledge about cytogenetic Methods	Svlla	bus	202)-					
Pre	e-requisite		andplant tissue culture techniques Version 2									
Co	urse Objec	tives:	* * *		1							
1.T	o provide th	ne knowl	edge on cell divisions									
2.T	2. To enhance technical skill on electrophoresis techniques											
3.T	3. To impart the basics of callus and auxin production											
Ex	pected Cou	rse Outc	omes:									
On	the success	ful comp	letion of the course, student will be able to:									
1	To learn	the vario	ous stages of cell divisions.			K5						
2	To estim	ate the to	otal carbohydrate and proteins in the sample			K3						
3	To induc	induce mutation by UV radiations										
4	To visua	lize aggl	utination, precipitation patterns and agarose gel			K3						
	electrop	horesis										
5	To unde	rstand th	e phenomenon of callus, auxin production and			K5						
	biolumi	nescence	20^{0克历[25]}									
K1	- Remember	er; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K	6 – Ci	reate							
1. 5	Stages of ce	ll divisio	n-mitosis and meiosis									
2. E	Estimation of	of total ca	rbohydrates and proteins									
3. C	CS of dicot	and mone	b UV									
4.1	Antagonistic	c activity	of any one biocontrol agent									
6.4	Agarose gel	electroph	oresis									
7.7	Agglutinatic	n-Blood	grouping, Precipitation-ODD									
8 (allus induc	rtion	Brouping, I Post and Antipol									
9.7	Auxin produ	iction	FOURATE TO ELEVATE									
10.	Phenomeno	on of Bio	luminescence									
			Total Lecture hours		7	5 ho	urs					
Te	xt Book(s)											
1	Microbiol	ogy: A L	aboratory Manual, 11th Edition, 2017. James G. Cappu	ccino a	and C	Chad	T.					
1	Welsh, Pe	earson										
2	Laborator	y Exerc	ises in Microbiology, Fifth Edition, 2002. Har	rley-P	resco	tt. 7	Гhe					
	McGraw-	Hill Con	panies.									
Ref	ference Boo	oks										
1	Microbiol Sherman,	ogy A L Pearson	aboratory Manual, 10 th Edition, 2014. James G. Cappu	iccino	and	Nata	ie					
2	Microbiol	ogical M	ethods, 8th Edition, 2004. Collins and Lyne. Arnold Pub	lishers	•							
Co	urse Desigi	ned by: I	Dr.T.Savitha									

Mapping with Programme Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	М	М	М	L	L	
CO2	S	М	S	S	S	S	М	М	М	L	
CO3	S	S	М	S	S	S	М	М	L	L	
CO4	S	S	L	S	S	L	М	М	L	L	
CO5	S	S	L	S	S	S	L	L	М	L	





BHARATHIAR UNIVERSITY, COIMBATORE – 46 M.Sc., MICROBIOLOGY

(EFFECTIVE FROM THE ACADEMIC YEAR 2020 – 2021 ONWARDS)

VISION

Impart quality education with ethical values besides making the young minds to explore the world with great enthusiasm. Improve the academic qualities and capabilities, through building intellectual and imaginative minds with sophisticated education consequently making them a responsible citizen who can work for the advancement of the society.

MISSION

To nurture knowledge, skills, values and confidence in the students to grow, thrive and prosper. Inculcating optimistic thinking and positive spirit will establish global competence among students community. Promote the science of Microbiology through integrated application-oriented courses, with a view to pursue their goals and to produce all-round development of individuals in areas such as teaching-learning, research, entrepreneur and consultancy in the field of microbiology.


REGULATIONS OF SYLLABUS

- Project Report 160 Marks, Viva voce- 40 Marks * Students should undergo an institutional/industrial training/ Internship relevant to any one of theory paper for a continuous period of 15 days before semester IV and submit report along with attendance certificate.
- 16 hrs should be allotted for project guidance to the respective guides as per the University norms. 16 hrs of project guidance should be considered equivalent to 8 hrs of teaching while calculating work load of respective guides.
- ◆ Training Report 40 Marks, Viva voce- 10 Marks. @ No University Examinations.

Only Continuous Internal Assessment (CIA).

	GROUP A	GROUP B	GROUP C
Paper I/Sem I	Artificial Intelligence	Artificial Intelligence For	Artificial Intelligence For
IEA/IEB/IEC	ForBiological Sciences	Biological Sciences	Biological Sciences
Paper II/Sem II	Principles of Quality	Communicable and	Biophysics and
2EA/2EB/2EC	Assurance and Total	Non communicable	Biochemistry
	QualityManagement (TQM)	diseases	
Paper III/Sem IV	Quality Assessment	Health care of the	Molecular Cytology
4EA/4EB/4EC	inPharmaceuticals	community	and Tissue
			Engineering
Paper IV/Sem IV	Quality Assurance and	Water Analysis and	Techniques in Cytology
4EPA/4EPB/4EPC	Assessment	Health Care	

List of Value Added Courses offered (Colleges/Departments can choose any one of the papers in each/respective semester as Valued Added Course)

Comestar			Hrs	University examination		Credits
Semester	Paper	Subject Per wee		Duration in Hrs.	Max. Marks	
Odd Semester (I)	20PMBVAC1	Organic Farming	2	3	50	2
	20PMBVAC2	HACCP – Level 1 and 2	2	3	50	2
	20PMBVAC3	Human Anatomy and Medical Transcription	2	3	50	2
	20PMBVAC4	Introduction to Clinical research & Pharmaceutical medicine	2	3	50	2

Odd Semester (III)	20PMBVAC5	Basics in Bioinformatics	2	3	50	2
	20PMBVAC6	HACCP – Level 3	2	3	50	2
	20PMBVAC7	Medical Coding & Clinical data management	2	3	50	2
	20PMBVAC8	Entrepreneurial Microbiology	2	3	50	2

A. Conditions for award of degree:

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a college affiliated to the university for a period of not less than two academic years, passed the examination of all the four semesters prescribed with earning credits and fulfilled such conditions.

1. Duration of the course

The duration of the course is for two academic years consisting of four semesters.

2. Credits

The phrase credit denotes that the quantum of syllabus for various programmes in terms of study. It mainly focused on differential weightage given the contents and duration of the courses in the curriculum design. The total number of credits for this programme is 90.

3. Core and elective courses

Candidate admitted to PG Microbiology course should undertake 22 courses, of which 13 courses are of core theory papers, 3 courses of elective papers, 1 course of project and 4 practical courses along with 1 industrial training/ internship course.

4. Examinations

There will be four semester examinations: first semester examinations at the middle of the first academic year (November/ December) and the second semester examinations at the end of the first academic year (April/May). Similarly, the third and fourth semester examinations will be held at the middle and end of the second academic year respectively.

a. Theory examinations

The external evaluation will be based on the examinations to be conducted by the university at the end of each semester.

b. Practical examinations

Practical examinations will be conducted at the end of every semester.

5. Scheme of examinations

The scheme of examinations for different semesters will be as follows:

a. Theory paper	
External	: 75 marks
Internal	: 25 marks
Total	: 100 marks
Time	: 3hours

The following procedure will be followed for internal marks:

Theory papers Internal

Best two tests out of 3	: 15Marks
Seminar	: 5 Marks
Assignment	: 5 Marks

Total

	Stonovisal Day , C
b. Practical	: 40 Internal Marks
Experimental performance	: 25 Marks
Practical test (Best 2 out of 3)	: 10 Marks
Record	: 5 Marks
c. Project*	Coimbatore Contractore Contractore
Internal	: 30 Marks
Dissertation Project report	: 100 Marks
Presentation	: 30 Marks
Viva-voce	: 40 Marks

: 25 Marks

Passing Minimum

- i. There will be no passing minimum for internal
- ii. For external examinations, passing minimum will be of 50% of maximum marks allotted for the paper.
- iii. In the aggregate (external + internal), the passing minimum will be of 50% for each paper/practical/ project and viva-voce.
- iv. Grading will be based on overall marks obtained (external + internal).

Note: * to elaborate the following regarding to project:

- i. Students should carry out INDIVIDUAL PROJECT only
- ii. Project will be allotted at the beginning of IVth semester only
- iii. In-house projects are encouraged
- iv. Students may be allowed to undertake their project work in other research institutes
- v. Faculty members of the respective colleges must serve as their guides
- vi. Co-guide from other institutions maybe allowed only with the concern from guide.
- vii. Project report evaluation will be done and viva-voce will be conducted by both external examiner and the guide at the end of fourth semester itself.
- viii. Dissertation in THREE copies has to be submitted 15 days before the actual schedule of the exam.

d. Grading system

The performance of the students are indicated by the SEVEN POINT SCALE GRADING SYSTEM as per the UGC norms given below



RA 5.0 and above

Upto 49

Re-Appear

The overall performance level of the candidates will be assessed by the following formulae:

Cumulative weighted average of marks = Σ (marks + credits) / Σ credits

Cumulative weighted average grade points = Σ (Grade points x Credits) / Σ Credits.

e. Industrial visit

Academic industrial visits to institutions and industries correlated to the courses during the semesters of study will outline part of the curriculum to reinforce the understanding of concepts and applications educated theoretically and practically. This kind of visits will be a boon to collect specimens and samples, to understand the scope and avenues of different subjects studied by students and the expectations of the organisation, who are employing them after the finishing point of their degree. Based on the desires, students could develop the required skills. Staff accompanying the students should be given non-remunerative OD for such visits.

6. The question paper pattern for all theory papers should be as follows:

Section	Type of questions	Marks
Part – A	Multiple choice questions	1x10=10 Marks
	(2 questions from each unit)	
Part – B	Internal choice questions	5x5=25 Marks
	(One question from each unit)	
Part – C	Internal choice questions	8x5=40 Marks
	(One question from each unit)	

Total 75 Marks

Max.marks: 60

The question paper pattern for all practical papers should be as follows:

Duration of practical time: 9 hours

S.No	Components	Marks
1	Major experiment	25 Marks
2	Minor experiment	15 Marks
3	Identification of spotters (5x2	10 Marks
4	Record	5 Marks
5	Viva-voce	5 Marks



BHARATHIAR UNIVERSITY, COIMBATORE – 46 M.Sc., MICROBIOLOGY

(EFFECTIVE FROM THE ACADEMIC YEAR 2023 – 2024 ONWARDS)

VISION

Impart quality education with ethical values besides making the young minds to explore the world with great enthusiasm. Improve the academic qualities and capabilities, through building intellectual and imaginative minds with sophisticated education consequently making them a responsible citizen who can work for the advancement of the society.

- Project Report 160 Marks, Viva voce- 40 Marks * Students should undergo an institutional/industrial training/ Internship relevant to any one of theory paper for a continuous period of 15 days before semester IV and submit report along with attendance certificate.
- 16 hrs should be allotted for project guidance to the respective guides as per the University norms. 16 hrs of project guidance should be considered equivalent to 8 hrs of teaching while calculating work load of respective guides.
- ✤ Training Report 40 Marks, Viva voce- 10 Marks. @ No University Examinations.

Only Continuous Internal Assessment (CIA).



	GROUP A	GROUP B	GROUP C
Paper I/Sem I	Artificial Intelligence	Artificial Intelligence For	Artificial Intelligence For
1EA/1EB/1EC	ForBiological Sciences	Biological Sciences	Biological Sciences
Paper II/Sem II	Principles of Quality	Communicable and	Biophysics and
2EA/2EB/2EC	Assurance and Total	Non communicable	Biochemistry
	QualityManagement (TQM)	diseases	
Paper III/Sem IV	Quality Assessment	Health care of the	Molecular Cytology
4EA/4EB/4EC	inPharmaceuticals	community	and Tissue
			Engineering
Paper IV/Sem IV	Quality Assurance and	Water Analysis and	Techniques in Cytology
4EPA/4EPB/4EPC	Assessment	Health Care	

List of Group	Elective papers	(Colleges can	choose any one of	f the Group	papers as electives)
<u>.</u>	· · · · · · · · · · · · · · · · · · ·			· · · · · ·	I I I I I I I I I I

List of Value Added Courses offered (Colleges/Departments can choose any one of the papers in each/respective semester as Valued Added Course)

			Hrs	University examination		Cred its
Semester	Paper Subject		Per week	Durat ion in Hrs.	Max. Marks	
Odd Semester (I)	20PMBVAC1	Org <mark>anic</mark> Farming	2	3	50	2
	20PMBVAC2	HACCP – Level 1 and 2	2	3	50	2
20PMBVAC3 Human Anatomy and Medical Transcription			3	50	2	
	20PMBVAC4	Introduction to Clinical research & Pharmaceutical medicine	2	3	50	2
Odd	20PMBVAC5	Basics in Bioinformatics	2	3	50	2
Semeste r(III)	20PMBVAC6	HACCP – Level 3	2	3	50	2
	20PMBVAC7	Medical Coding & Clinical data management	2	3	50	2
	20PMBVAC8	Entrepreneurial Microbiology	2	3	50	2

A. Conditions for award of degree:

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a college affiliated to the university for a period of not less than two academic years, passed the examination of all the four semesters prescribed with earning credits and fulfilled such conditions.

8. Duration of the course

The duration of the course is for two academic years consisting of four semesters.

9. Credits

The phrase credit denotes that the quantum of syllabus for various programmes in terms of study. It mainly focused on differential weightage given the contents and duration of the courses in the curriculum design. The total number of credits for this programme is 90.

10. Core and elective courses

Candidate admitted to PG Microbiology course should undertake 22 courses, of which 13 courses are of core theory papers, 3 courses of elective papers, 1 course of project and 4 practical courses along with 1 industrial training/ internship course.

11. Examinations

There will be four semester examinations: first semester examinations at the middle of the first academic year (November/ December) and the second semester examinations at the end of the first academic year (April/May). Similarly, the third and fourth semester examinations will be held at the middle and end of the second academic year respectively.

a. Theory examinations

The external evaluation will be based on the examinations to be conducted by the university at the end of each semester.

b. Practical examinations

Practical examinations will be conducted at the end of every semester.

Scheme of examinations

The scheme of examinations for different semesters will be as follows:

c. Theory paper

External	: 75 marks
Internal	: 25 marks
Total	: 100 marks
Time	: 3hours

The following procedure will be followed for internal marks:

Theory papers Internal

	Best two tests out of 3	: 15Marks
	Seminar	: 5 Marks
	Assignment	: 5 Marks
	Total	: 25 Marks 550 c
d.	Practical	: 40 Internal Marks
	Experimental performance	: 25 Marks
	Practical test (Best 2 out of 3)	: 10 Marks R United and S Constant
	Record	: 5 Marks (Juneou 9 Jun 99)
		SALE ID ELEV.

e. Project*

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Internal		: 30 Marks
Dissertation	Project report	: 100 Marks
Presentation		: 30 Marks
Viva-voce		: 40 Marks

M.Sc. Microbiology - Syllabus w.e.f. 2023-24 onwards - Affiliated Colleges - Annexure No.24 SCAA DATED: 18.05.2023

Passing Minimum

- v. There will be no passing minimum for internal
- vi. For external examinations, passing minimum will be of 50% of maximum marks allotted for the paper.
- vii. In the aggregate (external + internal), the passing minimum will be of 50% for each paper/practical/ project and viva-voce.
- viii. Grading will be based on overall marks obtained (external + internal).

Note: * to elaborate the following regarding to project:

- ix. Students should carry out INDIVIDUAL PROJECT only
- x. Project will be allotted at the beginning of IVth semester only
- xi. In-house projects are encouraged
- xii. Students may be allowed to undertake their project work in other research institutes
- xiii. Faculty members of the respective colleges must serve as their guides
- xiv. Co-guide from other institutions maybe allowed only with the concern from guide.
- xv. Project report evaluation will be done and viva-voce will be conducted by both external examiner and the guide at the end of fourth semester itself.
- xvi. Dissertation in THREE copies has to be submitted 15 days before the actual schedule of the exam.

f. Grading system

The performance of the students are indicated by the SEVEN POINT SCALE GRADING SYSTEM as per the UGC norms given below

		PERCENTAGE OF	GE OF	
GRADE	GRADE POINT	MARKS	PERFORMANCE	
0	9.5 and above	95-100	Outstanding	
E	9.5 and above	85-94	Excellent	
D	8.5 and above	+75-84	Distinction	
А	7.5 and above	70-74	Very Good	
В	7.0 and above	60-69	Good	
С	6.0 and above	50-59	Average	
RA	5.0 and above	Upto 49	Re-Appear	

The overall performance level of the candidates will be assessed by the following formulae:

Cumulative weighted average of marks = Σ (marks + credits) / Σ credits

Cumulative weighted average grade points = Σ (Grade points x Credits) / Σ Credits.

g. Industrial visit

Academic industrial visits to institutions and industries correlated to the courses during the semesters of study will outline part of the curriculum to reinforce the understanding of concepts and applications educated theoretically and practically. This kind of visits will be a boon to collect specimens and samples, to understand the scope and avenues of different subjects studied by students and the expectations of the organisation, who are employing them after the finishing point of their degree. Based on the desires, students could develop the required skills. Staff accompanying the students should be given non-remunerative OD for such visits.

12. The question paper pattern for all theory papers should be as follows:

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Part – A	Multiple choice questions	1x10= 10 Marks
	(2 questions from each unit)	
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Part – C	Internal choice questions	8x5 = 40 Marks
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13. The question paper pattern for all practical papers should be as follows:

Duration of practical time: 9 hours

actical time: 9 hours		Max.marks: 60	
S.No	Components	Marks	
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7	Minor experiment	15 Marks	
8	Identification of spotters (5x2	10 Marks	
9	Record	5 Marks	
10	Viva-voce	5 Marks	

