# CAUVERYCOLLEGE FOR WOMEN(AUTONOMOUS)

Nationally Accredited with 'A' Grade by NAAC

# ISO 9001:2015 Certified

# TIRUCHIRAPPALLI

# PG AND RESEARCH DEPARTMENT OF MICROBIOLOGY



B.Sc., MICROBIOLOGY SYLLABUS 2023 -2024 and Onwards



# CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS) PG AND RESEARCH DEPARTMENT OF MICROBIOLOGY

# **VISION**

Our vision is to encourage eminent research work through the conception of an attractive and vibrant environment to achieve goals of our department.

# **MISSION**

- To impart relevant, ultimate, principle-oriented education and practical expertise in the field of Microbiology.
- To strive to provide quality education conjugated with innovative technology so as to be able to gain technical and educational expertise locally, nationally, internationally.
- Our prime focus is to enrich the ambitions of our students, staff and steer with constructive collaboration towards excellence.

# PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	LEARNING ENVIRONMENT
	To facilitate value-based holistic and comprehensive learning by integrating
	innovative learning practices to match the highest quality standards and train
	the students to be effective leaders in their chosen fields.
PEO2	ACADEMIC EXCELLENCE
	To provide a conducive environment to unleash their hidden talents and to
	nurture the spirit of critical thinking and encourage them to achieve their
	goal.
PEO3	EMPLOYABILITY
	To equip students with the required skills in order to adapt to the changing
	global scenario and gain access to versatile career opportunities in
	multidisciplinary domains.
<b>DDO</b> (	
PEO4	PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY
	To develop a sense of social responsibility by formulating ethics and equity
	to transform students into committed professionals with a strong attitude
	towards the development of the nation.
PEO5	GREEN SUSTAINABILITY
1200	To understand the impact of professional solutions in societal and
	environmental contexts and demonstrate the knowledge for an overall
	sustainable development.

### PROGRAMME OUTCOMES FOR B.Sc., MICROBIOLOGY PROGRAMME

PONO.	On completion of B.Sc., Microbiology, the students will be able to
PO1	Academic Excellence and Competence: Elicit firm fundamental knowledge in
	theory as well as practical for coherent understanding of academic field to pursue multi
	and inter disciplinary science careers in future.
PO2	Holistic and Social approach: Create novel ideas related to the scientific research
	concepts through advanced technology and sensitivity towards sustainable
	Environmental practices as well as social issues.
PO3	Professional ethics and Team Work: Explore professional responsibility
105	through projects, internships, field trip/industrial visit and mentorship
	Programmes to transmit communication skills.
PO4	Critical and Scientific thinking: Equip training skills in Internships, Research
104	Projects to do higher studies in multidisciplinary path with higher level of
	specialization to become professionals of high-quality standards.
PO5	Social Responsibility with ethical values: Ensure ethical, social and holistic
105	values in the minds of learners and attain ender parity for building a healthy
	nation.

# PROGRAMME SPECIFIC OUTCOMES FOR B.Sc., MICROBIOLOGY

PSO NO.	Students of B.Sc., Microbiology will be able to	Pos Addressed
PSO1	Improve their knowledge on the basic concepts for retaining competence and confidence which enables them to develop interest in the new arena of Microbiology	PO1, PO5
PSO2	Acquire expertise in practical work within dependent equipment Handling skill along with collection and interpretation of scientific data	PO2, PO3
PSO3	Legitimize knowledge by emerging multiple aspects of current research.	PO3, PO5
PSO4	Pursue the importance of substantial original Research to meet the current and future expectation.	PO4, PO1
PSO5	Beware of the ethical issues for the benefit of the society by adding skilled scientific work for across the country.	PO5, PO2



# **Cauvery College for Women (Autonomous)**

PG & Research Department of MicrobiologyB.Sc., Microbiology Learning Outcome Based Curriculum Framework (CBCS-LOCF) (For the Candidates admitted from the Academic year 2023-2024 and onwards)

er				Course Code	ırse Code		Exam			
iest	art	Course	Title			lits		Marks	5	Γ
Sem	P	Course	The		Inst. Hrs.	Cred	Hrs.	Int	Ext	Tota
			பொதுத்தமிழ் - I	23ULT1						
		Language	Poetry, Grammar and	23ULS1						
		Course-I (LC)	History of Sanskrit		-					100
	1	languages	Literature		6	3	3	25	75	100
		languages	Hindi Ka Samanya Gyan	22ULHI						
			Foundation Course:	22ULF1						
т			PaperI- French-I							
1		English Language	General English -I	23UE1	6	3	3	25	75	100
	II	Course- I (ELC)	6							
		Core Course – I (CC)	Fundamentals of	23UMB1CC1	5	5	3	25	75	100
			Microbiology and							
			Microbial Diversity		2	2	2	40	(0)	100
	111	Core Practical - I (CP)	Fundamentals of Microbiology and	23UMBICCIP	3	3	3	40	60	100
			Microbial Diversity (P)							
		First Allied Course- I	Biochemistry I	23UMB1AC1	4	3	3	25	75	100
		(AC)								
		First Allied Course- II	Biochemistry I (P)	23UMB1AC1P	4	3	3	40	60	100
	117	(AC)			2	2		100		100
	11	Ability Enhancement	UGC JeevanKaushal	23UGVE	2	2	-	100	-	100
		Compulsory Course-I	ine skins - value Education							
		(ALCC)	TOTAL		30	22				700
		Language Course- II	பொகுக்குமிம்- ய	23ULT2	6	3	3	25	75	100
		(LC)Tamil / Other	Prose, Grammar and	23ULS2	-	-	-			
		languages	History of Sanskrit							
	T		literature							
П	1		Hindi Literature &	22ULH2						
			Grammar -II	22111 52						
			Basic French-II	22ULF2		-		2.5		100
	II	English Language Course- II (ELC)	General English - II	23UE2	6	3	3	25	75	100
		Core Course – II (CC)	Microbial Physiology	23UMB2CC2	4	4	3	25	75	100
		Core Course -III (CC)	Molecular Biology	23UMB2CC3	3	3	3	25	75	100
	III	Core Practical - II (CP)	Microbial Physiology and Molecular Biology (P)	23UMB2CC2P	4	3	3	40	60	100
		First Allied Course – III (AC)	Biochemistry II	23UMB2AC2	3	3	3	25	75	100
		Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
	IV	Ability	Innovation and	22UGIE	2	1	-	100	-	100
		Enhancement	Entrepreneurship							
		Compulsory								
	Example Coulse-III (AECC)									
	EXI		TOTAL		30	22				800
						1	1			

	_		பொதுத்தமிழ்- III	23ULT3						
	Ι	Language Course-	Hindi Litaratura & Crammar	22111.113						
		III(LC) Tomi1*/Other	III	2202113						
		I amili"/Other	Intermediate French-I	22ULF3	6	3	3	25	75	100
		Languages		22111 52						
			Drama, Grammer and History of Sanskrit	2301.55						
			Literature							
	Π	English Language	Learning Grammar Through	23UE3	6	3	3	25	75	100
III		Course- II(ELC)	Literature-I							
		Core Course–IV(CC)	Virology	23UMB3CC4	5	5	3	25	75	100
	III	Core Practical _III	Virology (P)	221JMB3CC3P	3	3	3	40	60	100
		(CP)	vilology (1)	220111150051	5	5	5	40	00	100
		Second Allied Course-I	Biostatistics	23UMB3AC3	5	3	3	25	75	100
		(AC)								
		Second Allied Course-	Biostatistics (P)	23UMB3AC2P	3	3	3	40	60	100
		II (AP)								
	TV	Generic Elective	A. Mushroom Technology	22UMB3GEC1	2	_	2	25	75	100
	1 V	(Offer to Other	B. Basic Tamil-I	22ULC3BT1	Z	2	3	25	15	100
		Department)	C. Special Tamil-I	220LC3S11						
	Extra	Credit Course	SWAYAM	As P	er UG	C Reco	omme	endatio	on	
	т		0 · 0 ·	TOTAL	30	22				700
	I	Language Course-	பொதுத்தமிழ்- IV	230L14						
		Tamil*/Other	Hindi Literature &	22ULH4	6	3	3	25	75	100
		Languages*	Functional Hindi							
			Intermediate French-II	22ULF4						
			Alankara, Didactic and	23ULS4						
			Modern Literature and							
IV	п	English Longuage	I ranslation	2211E4	6	2	2	25	75	100
	11	Course -IV(FLC)	Through Literature-II	23UE4	0	3	3	23	75	100
		course IV(LLC)								
		Core Course –	Immunology	23UMB4CC5	6	5	3	25	75	100
	111	V(CC)							- 0	
		Core Practical -	Immunology (P)	22UMB4CC4P	4	4	3	40	60	100
		IV(CP)								
		Second Allied	Bioinformatics	22UMB4AC4	4	3	3	25	75	100
		Internshin	Internshin	2211MB4INT		2	_		_	100
	IV/	interniship	A Diofortilizor							100
	1 V	Generic Elective	A. Dioleitilizei Technology	22UMID4GEC2						
		Course- II (GEC)	B. Basic Tamil-II	22ULC4BT2	2	2	3	25	75	100
			C Special Tamil II	22111 C4ST2						
		Claill Each on some and	Userbal Madiaina (D)	220LC4512	2	2	2	40	60	100
		Skill Ennancement Course $-I(SEC)$	Herbal Medicine (P)	22UMB4SECTP	2	Z	3	40	60	100
	Extr	a Credit Course	SWAYAM	As Per	r UGC	Reco	mme	endati	on	
			l	TOTAL	30	24				800
						-				

Semester: I	Internal Mar	ks : 25		External Marks : 75
COURSE	COURSE TITLE	CATEGORY	Hrs./	CREDITS
CODE			week	
23UMB1CC1	FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL	CORE	5	5
	DIVERSITY			

## **Course Objective**

- This subject aims to introduce the history and development of Microbiology. The contents of this course will help students understand history, biology of microorganisms, growth and control of microbes.
- Thus, the beginners are rightly exposed to foundation of Microbiology which would lead them towards progressive advancement of the subject.

## **Course Outcome and Cognitive level Mapping**

CO Number	CO Statement	Cognitive level
CO 1	Remember and understand the Development of Microbiology	K1, K2
CO 2	Analyze the Size and Shape of Microorganisms using Microscope	K3
CO 3	Evaluate the knowledge about Bacteria and Viruses	K4
CO 4	Compare the various Preservation Methods for preserving Microbes.	K5
CO 5	Summarize various modes of classification of microbes	K5

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	<b>PO1</b>	PO2	PO3	PO4	PO5
CO1	3	3	1	2	3	3	3	3	2	3
CO2	3	2	3	3	2	2	3	2	3	3
CO3	3	2	2	3	3	3	2	3	3	2
CO4	2	3	3	2	3	3	3	2	3	2
CO5	3	3	2	3	2	3	3	3	2	2

"1" – Slight (Low) Correlation "3" – Substantial (High) Correlation "2" – Moderate (Medium) Correlation

"-"indicates there is no correlation

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
Ι	History and scope of Microbiology - Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Flemming. Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology. Microscopy: Principles and applications of bright field, dark field, phase contrast, fluorescent SEM and TEM.	15	CO1, CO2, CO3, CO4, CO5.	K1, K2, K3, K4, K5.
II	General characteristics of cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) and acellular microorganisms - (Viruses, Viroids, Prions), Differences between prokaryotic and eukaryotic microorganisms. Structure of Bacterial cell wall, cell membrane, capsule, flagella, pili, mesosomes, spores, and gas vesicles.	15	CO1, CO2, CO3, CO4, CO5.	K1, K2, K3, K4, K5.
III	Sterilization: Principles and methods – physical methods- moist heat, dry heat, filtration and media preparation. Cultivation of microbes- Types of culture media-Stab, slant, broth, semisolid, solid media. Aerobic and Anaerobic culture techniques- Pure culture techniques – Maintenance and preservation of microbes. Principles and types of staining– Simple, differential, Capsule staining.	15	CO1, CO2, CO3, CO4, CO5.	K1, K2, K3, K4, K5.
IV	Introduction to microbial biodiversity Classification – Three kingdom, five kingdom, six kingdom and eight kingdom. Ecological niche. Basic concepts of Eubacteria, Archaebacteria and Eucarya. Conservation biodiversity	15	CO1, CO2, CO3, CO4, CO5.	K1, K2, K3, K4, K5.
V	International codes of nomenclature. Binomial nomenclature – species concept – Kingdom, division, class, order, family, and genus. Principles of classification – morphological, physiological biochemical basis of classification. Molecular basis of classification – chemotaxonomy & numerical taxonomy.	15	CO1, CO2, CO3, CO4, CO5.	K1, K2, K3, K4, K5.

VI	Self Study for Enrichment	-	CO1,	K1,
	(Not to be included for External		CO2,	K2,
	Examination)		CO3,	K3,
	Microscopic operations, Criteria for		CO4,	K4,
	Classification of Microorganisms,		CO5	K5
	cellular organizations, Isolation and			
	identification of Microorganisms,			

### **Text Books**

- 1. Dubey RC and Maheswari DK. (2015). *A Text Book of Microbiology*. 5th Edition. SChand, NewDelhi.
- 2. Ananthanarayan Paniker (2020). *A Text book of Microbiology*. 11th Edition.University Press.Singapore.
- 3. Madigan MT, Martinko JM, and Parker J. (2019). *Biology of Microorganisms*.12th Edition,MacMillan Press.England.
- 4. Pelczar MJ, Chan ECS and Kreig NR. (2015). *Microbiology*, 5th edition.McGraw-Hill. BookCo. Singapore.
- 5. Atlas RA and Bartha R. (2019). *Microbial Ecology. Fundamentals and Application*. 4th edition Benjamin Cummings, New York.

#### **Reference Books**

- 1. Prescott L. M, Harley, J.P. and Helin, D.A. (2017). *Microbiology*, 5th Edition. McGraw Hill.
- 2. Tortora GJ, Funke BR and Case CL. (2020). *Microbiology: An Introduction*. 9<sup>th</sup> Edition, Pearson Education, Singapore.
- 3. Black JG. (2018). *Microbiology-principles and explorations*, 6<sup>th</sup> edition. John Wiley and Sons, Inc. New York.
- 4. Moselio Schaechter and Joshua Leaderberg (2019). *The Desk encyclopedia ofMicrobiology*.2<sup>nd</sup> edition. Elseiver Academic press, California.
- 5. Madigan MT, Martinko JM, and Parker J. (2019). *Biology of Microorganisms*, 12<sup>th</sup> Edition. MacMillan Press, England.

#### Web Reference

1. https://microbenotes.com/history-of-microbiology/

2.https://byjus.com/biology/prokaryotic-and-eukaryotic-cells/

- 3.https://byjus.com/biology/archaebacteria/
- 4.https://thebiologynotes.com/sterilization-physical-and- chemical-methods/
- 5.https://microbenotes.com/microbiology-of-extreme-environments/

# Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar.

#### **Course Designer**

Dr.P.Bhuvaneswari

Semester : I	Internal Marks: 4	External M	larks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
23UMB1CC1P	FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY (P)	CORE PRACTICAL	3	3

## **Course Objective**

- To understand the rules and procedures to be observed in a laboratory.
- To know and familiarize with equipment and apparatus used in microbiology practical exercises.
- To familiarize and understand the parts and use of microscopes.
- To appreciate the abundance and diversity of microorganisms in different habitats

## **Course Outcome and Cognitive Level Mapping**

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Recall the safety practice in microbiological laboratory	K1
CO2	Demonstrate the pure culture technique	K2
CO3	Develop the microscopic techniques and staining methods	K3
CO4	Determine about preparation of different media	K4
CO5	Discuss different microorganisms in different media	K6

#### Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	<b>PO1</b>	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	3	3	2	3
CO2	2	3	2	2	2	3	3	2	3	3
CO3	3	2	3	3	2	2	3	3	3	2
CO4	3	3	3	3	3	3	3	2	2	3
CO5	2	3	2	2	3	3	2	3	2	2

"1"-Slight (Low) Correlation

"2" - Moderate(Medium) Correlation

"3"-Substantial (High) Correlation

"-"indicates there is no correlation

- 1. Cleaning of glass wares, Microbiological good laboratory practice and safety. Sterilization and assessment of sterility Autoclave, hot air oven, and membrane filtration.
- 2. Media preparation: liquid media, solid media, semi-solid media, agar slants and agar plates.
- 3. Preparation of basal, differential, enriched, enrichment, transport, and selective media preparationquality control of media, growth supporting properties, sterility check of media.
- 4. Pure culture techniques: Spread plate, streak plate and pour plate, decimal dilution.
- 5. Culture characteristics of microorganisms: growth on different media, growth characteristics, and description. Demonstration of pigment production.
- 6. Microscopy: light microscopy and bright field microscopy.
- 7. Staining techniques: smear preparation, simple staining, Gram's staining and endospore staining.
- 8. Study on Microbial Diversity using Hay Infusion Broth-Wet mount to show different types of microbes, hanging drop method.

#### **Text Books**

- 1. Saha, R (2022).Microbiology Practical Manual (2<sup>nd</sup> edition) CBS Publishers & Distributors Pvt. Ltd. India.
- Das, S (2020).Microbiology Practical Manual (1<sup>st</sup> edition) CBS Publishers & Distributors Pvt. Ltd. India.
- 3. Gunasekaran, P. (2018). Laboratory manual in Microbiology. New Age International Ld., Publishers, New Delhi.
- 4. R C Dubey and D K Maheswari (2010). Practical Microbiology. S. Chand Publishing.
- 5. James G Cappucino and N. Sherman MB(2013). A lab manual Benjamin Cummins, New York.

#### **Reference Books**

- 1. Atlas.R (1997). Principles of Microbiology, 2<sup>nd</sup> Edition, Wm.C. Brown publishers.
- 2. Amita J, Jyotsna A and Vimala V (2018). Microbiology Practical Manual. (1st Edition). Elsevier India
- 3. Talib VH (2019). Handbook Medical Laboratory Technology. (2<sup>nd</sup> Edition). CBS
- 4. Wheelis M, (2010). Principles of Modern Microbiology, 1st Edition. Jones and BartlettPublication.
- 5. Lim D. (1998). Microbiology, 2<sup>nd</sup> Edition, WCB McGraw Hill Publications.

#### Web References

- http://www.biologydiscussion.com/micro-biology/sterilisation-and-disinfection-methods-andprinciples-microbiology/24403.
- 2. https://www.ebooks.cambridge.org/ebook.jsf?bid=CBO9781139170635
- 3. https://www.grsmu.by/files/file/university/cafedry//files/essential\_microbiology.pdf
- 4. https://microbiologyinfo.com/top-and-best-microbiology-books/

#### Pedagogy

Chalk and talk, Power Point Presentation and Group Discussions

#### **Course Designer**

Dr. E.Priya

Semester : I	Internal Marks:25	Internal Marks:25					
COURSE CODE	COURSE TITLE	COURSE TITLE CATEGORY					
23UMB1AC1	<b>BIOCHEMISTRY I</b>	BIOCHEMISTRY I FIRST ALLIED					
		COURSE - I					

## **Course Objective**

• To understand the structure, functions of various biomolecules and consequences of deviation from normal

## **Course Outcome and Cognitive Level Mapping**

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive level
CO1	Remember and understand the concept of macromolecules	K1,K2
CO2	Illustrate an idea about structure and function macromolecules	K2,K3
CO3	Categorize the sources of macromolecules	K4
CO4	Classify and relate properties o macromolecules	K3,K4
CO5	Recommend the daily allowances of vitamins and its Significance	K5

# Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	3	3	2	2	3	2	3
CO2	3	3	2	3	3	2	2	3	3	3
CO3	2	3	3	2	3	3	3	2	3	3
CO4	2	3	3	3	2	3	2	3	3	3
CO5	3	3	2	3	3	3	3	2	3	3

"1"–Slight (Low) Correlation

"2" - Moderate(Medium) Correlation

"3"-Substantial (High) Correlation

"-"indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIV ELEVEL
Ι	<b>Carbohydrates</b> : Definition, sources, classification- monosaccharide, disaccharide,oligosaccharide and Polysaccharide, biological significance, digestion and absorption of carbohydrates	12	CO1, CO2, CO3, CO4	K1, K2, K3, K4
П	<b>Proteins</b> : Definition, sources, classification and structure of proteins - structural and nonstructural proteins, Amino acids–structure classification - essential and nonessential, protein and non-protein amino acids.Biological Significance of Proteins.	12	CO1, CO2, CO3, CO4	K1, K2, K3, K4
III	<b>Lipids:</b> Definition, Properties, Sources, Classification of lipids and fatty acids- saturated, unsaturated and polyunsaturated. Compound lipids - Structure and functions of phospholipids and glycolipids. Biological significance of lipids	12	CO1, CO2, CO3, CO4	K1, K2, K3, K4
IV	<b>Vitamins:</b> Definition, sources and functionsof Fat soluble vitamins (A, D, E and K) andWater soluble vitamins (B complex and C).	12	CO1, CO2, CO3, CO4	K1, K2, K3, K4
V	<b>Disorders of Metabolism:</b> Disorders of carbohydrate metabolism: diabetes mellitus, hypoglycemia, Disorders of amino acid metabolism: alkaptonuria, phenylketonuria, Disorders of lipid metabolism: hyperlipidemia, hyperlipoproteinemia and hypercholesterolemia. Disorders of vitamin metabolism – Night blindness, Ricketts,Scurvy, sterility, beriberi and anemia	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment (Not to be included for External Examination) Lactose intolerance - Inborn errors in aminoacid metabolism- Atherosclerosis – Myocardial infarction	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

# **Text Books**

- 1. Ambika Shanmugam (2016). Fundamentals of Biochemistry for Medical students.8<sup>th</sup> Edition, Wolters Kluwer (India) Pvt Ltd.
- 2. Rafi MD, (2014) Textbook of Biochemistry for medical students,2<sup>nd</sup> edition, Universities Press, (India) Pvt. Ltd, Hyderabad, India.
- 3. Charlotte W Prattand Sathya narayana U and Chakrapani U (2013) Biochemistry, 4<sup>th</sup> edition, Elsevier publishers.
- 4. DebAC (2011). Fundamentals of Biochemistry,10<sup>th</sup> edition, New Central Book Agency (p) ltd, London
- 5. Rajagopal G (2010). Concise textbookofbiochemistry,2<sup>nd</sup>edition, Ahuja Publishing House.

#### **Reference Books**

- 1. Lubert Stryer; Jeremy Berg; John Tymoczko; Gregory Gatto (2019). *Biochemistry*, 9<sup>th</sup> Edition. Macmillon Publication.
- 2. Denise R Ferrier, (2013) *Biochemistry*,6<sup>th</sup> edition, LWW publishers.
- 3. Reginald H Garrett and Charles M Grisham (2012). *Biochemistry*, 5<sup>th</sup> edition. Brooks Colepublishers.
- 4. Albert L Lehninger, David L Nelson and Michael MCox, (2010). *Lehninger Principles of Biochemistry*, 2<sup>nd</sup> edition, Wiley publisher

## Web References

- 1. https://www.slideshare.net/namarta28/monosaccharides
- 2. https://www.tuscany- diet.net/proteins/classification/#: ~:text=egg%20yolk%20phosvitin.
- 3. http://www.Protein%20classification%20based%20on%20shape,two%20classes%3A%20f ibrous%20and%20globular.
- 4. https://byjus.com/biology/lipids/#:~:text=There%20are%20two%20major%20types, than % 20alcohol%20and%20fatty%20acids.
- 5. https://www.thoughtco.com/dna-versus-rna-608191

## Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar

## **Course Designer**

Dr.B.Thamilmaraiselvi

Semester I	Internal ma	External mark:60		
COURSECODE	COURSE TITLE	CATEGORY	HRS/WEEKS	CREDITS
23UMB1AC1P	<b>BIOCHEMISTRY I (P)</b>	ALLIED	4	3

# **Course Objective**

• This course enables the students to explore the basic biochemistry practical skills.

### **Course Outcome and Cognitive Level Mapping**

On the successful completion of the course, students will be able to

CO NUMBER	CO STATEMENT	Cognitive Level
CO 1	Acquire knowledge about preparation of Buffer, principle of colorimeter	K4
CO 2	Analyse the constituents of carbohydrates and proteins	K1
CO 3	Analyse the constituents of lipids, Titrimetric estimation of Glucose	K6
CO 4	Titrimetric estimation Ascorbic acid and colorimetric estimation of DNA	K6
CO 5	Determination of Amino acids by Paper chromatography & Thin layer chromatography	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	2	1	3	3	3	3
CO 3	3	3	1	3	3	3	2	2	2	3
CO 4	3	3	2	3	3	3	3	1	3	2
CO 5	3	3	3	2	2	3	3	2	2	3

"1" - Slight (Low) Correlation

"2" – Moderate (Medium) Correlation

"3" - Substantial (High) Correlation

"-" indicates there is no correlation

- 1. Preparation of Buffer & estimation of pH
- 2. Verification of Beer Lambert's Law
- 3. Qualitative Analysis of Carbohydrates
- 4. Qualitative Analysis of Proteins
- 5. Qualitative Analysis of Lipids
- 6. Quantitative estimation of Glucose by Benedict's method
- 7. Quantitative estimation of Ascorbic acid
- 8. Qualitative estimation of DNA by Diphenyl amine method
- 9. Separation of Amino acids by paper chromatography (Demonstration)
- 10. Separation of Amino acids by Thin layer chromatography (Demonstration)

# **Text Books**

- 1. Vasudevan and Sabir Kumar Doss (2022). Practical Text book of Biochemistry for Medical students.
- 2. Damodaran Geetha K.(2016), Practical Biochemistry, JB brother medical publisher.
- 3. Ranjna Chawla. (2014). Practical clinical Biochemistry, JB brother medical publisher.
- 4. Manipal manual of clinical Biochemistry.(2013), JB brother medical publisher.
- 5. Shawn O' Farrell and Ryan T Ranallo (2006). Experiments in Biochemistry: A Hands on Approach-A manual for the undergraduate laboratory, Thomson Learning, Inc., Australia.

# **Reference Books**

- 1. Vasudevan and Sabir Kumar Doss (2022). Practical Text book of Biochemistry for Medical students.
- 2. Damodaran Geetha K.(2016), Practical Biochemistry, JB brother medical publisher.
- 3. Ranjna Chawla.(2014). Practical clinical Biochemistry, JB brother medical publisher.
- 4. Manipal manual of clinical Biochemistry.(2013), JB brother medical publisher.
- 5. Shawn O' Farrell and Ryan T Ranallo (2006). Experiments in Biochemistry: A Hands on Approach-A manual for the undergraduate laboratory, Thomson Learning, Inc., Australia.

# Web References

- 1. https://www.youtube.com/watch?v=wmhmAESv72E
- 2. https://www.youtube.com/watch?v=VzYDk4t97Ok
- 3. https://www.youtube.com/watch?v=JdXbTWfOc18
- 4. https://www.youtube.com/watch?v=2LiA\_yNMIVs

# Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar

# **Course Designer**

Dr. N.Pushpa

Semester: II	Internal Marks: 2	External M	arks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
23UMB2CC2	MICROBIAL PHYSIOLOGY	CORE COURSE	4	4

### **Course Objective**

- To impart among the learners the fundamental principles of microbial physiology.
- To understand the kinetics of microbial growth and influence of varied physio chemical parameters.
- To provide basic knowledge about metabolism and respiration.

#### Prerequisites

General background in microbial physiology

### **Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive level
CO 1	State nutritional requirements and uptake of microorganisms.	K1, K2
CO 2	Explain phases and factors of growth	K3, K4
CO 3	Describe the Carbohydrate metabolism	K3, K4
CO 4	Compute the importance of Anaerobic Respiration and fermentation pathway.	K4, K5
CO 5	Impart knowledge about protein and lipid metabolisms.	K4, K5

#### Mapping of CO with PO and PSO

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	3	3	2	2	3	2	3
CO2	3	3	2	3	3	2	2	3	3	3
CO3	2	3	3	2	3	3	3	2	3	3
CO4	2	3	3	3	2	3	2	3	3	3
CO5	3	3	2	3	3	3	3	2	3	3

"1" – Slight (Low) Correlation

"2" – Moderate (Medium) Correlation "-" indicates there is no correlation

"3" – Substantial (High) Correlation

Syllab	us			
UNIT	CONTENT	HOURS	COS	COGNITIVE
				LEVEL
Ι	Metabolism and Nutrition: Introduction to	12	CO1,	K1,
	Metabolism – Definition, types of		CO2,	K2,
	metabolism and metabolic pathways.		CO3,	K3,
	Nutrition – Micro and macro nutrient		CO4	K4
	requirements of microorganisms. Nutritional			
	Classification – Autotrophs, heterotrophs,			
	photoautotrophs, chemoautotrophs,			
	chemolithotrophs, oligotrophs. Transport			
	mechanism - Passive diffusion, Facilitated			
	diffusion, Active transport and group			
	translocation.			
II	Microbial Growth: Phases of Growth,	12	CO1,	K1,
	Growth curve. Factors influencing the		CO2,	K2,
	growth of microorganisms - temperature,		CO3,	КЗ,
	pH, salt, Osmotic pressure, and radiations.		CO4	K4
	Growth measurements – batch, continuous,			
	synchronous and Diauxic culture.			
III	Anaerobic Respiration: Nitrate, sulphate &	12	CO1,	K1,
	Methane respiration. Fermentations –		CO2,	K2,
	alcohol, mixed acid, lactic acid fermentation.		CO3,	КЗ,
			CO4	K4
IV	Carbohydrate Metabolism: Embden	12	CO1,	K1,
	Mayer–Hoff–Parnas (EMP) pathway, HMP		CO2,	K2,
	Shut, Kreb's cycle (TCA) cycle - Electron		CO3,	K3,
	transport chain, Phosphorylation, oxidative		CO4	K4
	and substrate level phosphorylation.			
V	Protein, Lipid and Nucleic acid	12	CO1,	K1,
	metabolism: Synthesis and degradation of		CO2,	K2,
	amino acids (glycine and threonine),		CO3,	K3,
	peptides, proteins. Biosynthesis and B		CO4,	K4,
	Oxidation of fatty acids, Biosynthesis and		CO5	K5
	degradation of purine and pyrimide.			
VI	Self Study for Enrichment	-	CO1,	K1,
	(Not to be included for End Semester		CO2,	K2,
	Examination)		CO3,	K3,
	Enzymes: classification & nomenclature,		CO4,	K4,
	properties, Michaelis-Menton equation for		CO5	K5
	simple enzymes, coenzymes and cofactors,			
	1sozymes.			

#### **Text books**

1. Dubey, R.C. and D.K. Maheshwari. (2022) A Text Book of Microbiology, S. Chand and Company Ltd., New Delhi.

2. Rani Gupta and Namita Gupta. (2022). Fundamentals of Bacterial Physiology and Metabolism, Springer Nature, Singapore.

3. Ananthanarayan Paniker. (2020). A Text book of Microbiology. 11th Edition. University Press.

Singapore.

4. Madigan M.T., Martinko J.M., and Parker J. (2019). Biology of Microorganisms. 12th Edition, MacMillan Press. England.

5. Atlas R.A. and Bartha R. (2019). Microbial Ecology. Fundamentals and Application. 4th edition, Benjamin Cummings, New York.

# **Reference Books**

1. Tortora G.J., Funke B.R. and Case C.L.(2020). Microbiology: An Introduction. 9th Edition, Pearson Education, Singapore.

2. Black J.G. (2018). Microbiology-principles and explorations, 6th edition. John Wiley and Sons, Inc. New York.

3. MoselioSchaechter and Joshua Leaderberg. (2019). The Desk encyclopedia of Microbiology. 2<sup>nd</sup>edition. Elsevier Academic press, California.

4. Madigan M.T., Martinko J.M. and Parker J.(2019). Biology of Microorganisms, 12th Edition. MacMillan Press, England.

5. Michel Mandigan, Kelly S.Bender, Daniel buckley, W Mathew Sattley and David Stahl. (2019). Borck biology of microorganisms, 15<sup>th</sup> Edition, Pearson.

# Web References

1. https://uomustansiriyah.edu.iq/media/lectures/6/6\_2017\_08\_09!09\_50\_48\_AM.pdf

2. https://biologydictionary.net/anaerobic-respiration/

3.https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A\_Microbiology\_(Kaiser)/Unit\_7%3 A\_Microbial\_Genetics\_and\_Microbial\_Metabolism/18%3A\_Microbial\_Metabolism/18.3%3A\_Aer obic\_Respiration

4.https://bio.libretexts.org/Bookshelves/Biochemistry/Fundamentals\_of\_Biochemistry\_(LibreTexts) /02%3A\_Unit\_II-\_Bioenergetics\_and\_Metabolism 22%3A\_Biosynthesis\_

f\_Amino\_Acids\_Nucleotides\_and\_Related\_Molecules/22.02%3A\_Biosynthesis \_of\_ Amino\_Acids 5. https://www.youtube.com/watch?v=9CPIs-Qhg-M

# Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar

# **Course Designer**

Dr. N.Jeenathunisa

SEMESTER:II	INTERNAL MARK	S: 25	EXTERNAL MAI	RKS: 75
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDIT
23UMB2CC3	MOLECULAR BIOLOGY	CORE COURSE -III (CC)	3	3

#### **Course Objective:**

The paper Molecular Biology encompasses the basic study and understanding the central dogma. It helps in understanding the basic organization of the genome of prokaryotes and eukaryotes. It is followed by prokaryotic and eukaryotic replication, transcription, translation processes and regulation.

#### **Prerequisites**

Basic knowledge on function of various genes and proteins for better understanding of cellular life processes.

#### **Course Outcomes and Cognitive Level Mapping**

COs	CO Statement	Knowledge level
CO1	Define the basics Prosperities of DNA	K1
CO2	Recite the knowledge about replication of DNA	K1
CO3	Critique knowledge about central dogma of biology	K4
CO4	Generalize the basic idea of Gene transfer mechanisms	K6
CO5	Expand about mutation	K6

#### Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	<b>PO1</b>	PO2	PO3	PO4	<b>PO5</b>
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	3	2	3
CO3	2	3	3	3	3	3	3	2	3	3
CO4	3	3	2	3	3	3	3	3	3	2
CO5	3	3	3	3	2	3	2	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation "-"indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
Ι	UNIT I: History and concepts in Molecular Biology Milestones in history–Definition of nucleic acids-Experimental proofs of DNA as the genetic material (Griffith and Hershey Chase) – Experimental proofs of RNA as the genetic material - Chemistry and molecular structure of DNA double helix – Discovery of DNA structure – Brief account on types and forms of DNA –Definition of a gene. Organization of DNA in eukaryotic cell; Palindromic DNA; Types of RNA-rRNA; mRNA, SnRNA the 5' cap, non- coding region, initiation, coding region, termination codon; Poly (A) region, post transcriptional modification. Brief note on plasmids: structure and its types.	9	CO1, CO2, CO4, CO5	K1, K2, K3, K4,
Π	UNIT II : DNA Replication Watson and Crick's model of DNA replication (experimental evidence); Enzyme involved in DNA replication (DNA polymerase I, Pol II, Pol III, DNA ligase); Mechanism of DNA replication; Models of DNA replication, inhibitors of DNA replication. Exonuclease and endonuclease. Theta replication and Rolling circle replication. Replication of RNA – reverse transcriptase.	9	CO1, CO2, CO3, CO4,	K1, K2, K3, K4,
III	<b>UNIT III : Transcription and Translation</b> DNA Transcription: Definition – Brief account on transcriptional machinery and mechanism of transcription — RNA Translation: Definition – Brief account on translational machinery, mechanisms of translation and Splicing mechanism. Regulation of gene expression: Concept of Gene, Genetic code & its properties. Wobble concept, prokaryotic and eukaryotic ribosomes, detailed account of structure, function and regulation of <i>lac</i> operon, <i>trp</i> operon and <i>ara</i> operon.	9	CO1, CO2, CO3, CO4	K2, K3, K4, K5

IV	<b>UNIT IV: Gene transfer mechanism</b> Gene transfer mechanisms: Conjugation, Transformation and Transduction. Discovery of Transformation, Natural competence and its mechanism - Conjugation - Discovery, F+ v/s F-, Hfr+ v/sF. Transduction – Generalized and specialized transductions. Transposons – Structure, genetic organization andmechanism of transposition. PolymeraseChain Reaction & types.	9	CO1, CO2, CO3, CO4	K2, K4, K5, K6
V	UNIT V: Mutation Definitions of mutations, mutagenesis and mutants - types of mutations; Gene diversity; Split genes, overlapping gene; Molecular nature of Mutation, Spontaneous and Induced mutation; DNA damage repair – Types of damage (deamination, Oxidative damage, Alkylation, Pyrimidine dimmers. Hybridization techniques: Southern, Northern & Western Blotting. Physical and Chemical mutagens, Carcinogenicity testing (AMES Test)- Applications of Mutations.	9	CO1, CO4 , CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not included for End Semester Examinations Cancer- Types, properties, causes, treatment and Oncogenes and tumour suppressor genes.	-	CO1, CO2, CO3, CO4 CO5	K1, K2, K3, K4, K5

# **Text Books:**

- 1. Clark David (2019) Molecular Biology, Academic Cell.
- 2. Gerald Karp, JanetIwasa and Wallace Marshall(2016) Karp's Cell and Molecular Biology, Wiley.
- Joanne Willey, Linda Sherwood (2016) Prescott's Microbiology, Mc-Graw– Hill Publishing Company Ltd.
- 4. Veer BalaRastogi (2015) Principles of Molecular Biology Med tech.
- 5. Verma P S and Agarwal V K (2015) Cell biology, Genetics, Molecular Biology Evolution and Ecology, S. Chand and Company Ltd.

# **Reference Books**

- Tania A. Baker, Stephen P. Bell, Michael Levine and Richard Losick. (2013) Molecular Biology of the Gene. 7th Edition. Benjamin/Cummings Publ. Co., Inc., California.
- 2. Rosalee S. Hell berg T.A. Brown. (2011). *Introduction to genetics: A molecular approach*. 1st Edition. Garland Science.
- 3. Geoffrey M Cooper (2016) Cell: A Molecular Approach, Sinauer Associates Inc.
- 4. Bernard R Glick and Cheryl L Patten (2017). *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, ASM Press.

## Web Links:

- 1. https://pages.jh.edu/rschlei1/Random\_stuff/publications/molbiogene.pdf
- 2. https://www.fmed.uniba.sk/uploads/media/Introduction\_to\_Medical\_and\_Molecular\_Biology.pdf
- 3. https://www.aacb.asn.au/documents/item/3400
- 4. https://molbiomadeeasy.files.wordpress.com/2013/09/fundamental\_molecular\_biology.pdf https://users.ugent.be/~avierstr/pdf/principles.pdf
- 5. https://pages.jh.edu/rschlei1/Random\_stuff/publications/molbiogene.pdf

## Pedagogy

Power Point Presentations, Group Discussion, Seminar, Quiz, Assignment and Brain Storming Activity.

## **Course Designer**

Ms.S.Sathya

Semester: II	Internal Marks: 4	External N	larks: 60	
COURSE CODE	COURSE TITLE	HRS/WEEK	CREDITS	
23UMB2CC2P	MICROBIAL PHYSIOLOGY	CORE	4	3
	AND MOLECULAR	PRACTICAL		
	<b>BIOLOGY (P)</b>			

### **Course Objective**

The objective of this laboratory is to teach a variety of techniques used in physiology and molecular biology research.

# **Course Outcomes and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive level
CO 1	Develop the skills to grow microbes in the laboratory.	K1
CO 2	Illustrate effect of pH, temperature and salt on microbes.	K2
CO 3	Evaluate the growth of microbial cell and enzyme hydrolysis reactions.	K3
CO 4	Analyze biochemical test to identify bacteria.	K3
CO 5	Interpret isolation and characterization of genomic and plasmid DNA.	K4

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	3	3	2	2	2	3
CO2	3	2	3	3	2	3	2	2	3	3
CO3	3	3	3	2	3	3	3	3	3	2
CO4	3	3	2	3	2	3	2	2	3	2
CO5	3	3	3	2	3	3	3	3	3	2

"1" – Slight (Low) Correlation

"2" - Moderate (Medium) Correlation

"3" – Substantial (High) Correlation

"-" indicates there is no Correlation

- 1. Effect of pH on the growth of microbes.
- 2. Effect of Temperature on the growth of microbes.
- 3. Effect of salt on the growth of microbes.
- 4. Determination of growth curve direct count, viable count and spectrophotometric assay.
- 5. Enzymatic Hydrolysis of Starch, Gelatin, Casein.
- 6. Oxidase test.
- 7. Catalase test.
- 8. Biochemical test -Indole test, Methyl Red test, Voges Proskauer test, Citrate Utilization test,
- Triple Sugar Iron test and Carbohydrate fermentation test.
- 9. Isolation of Chromosomal DNA from bacteria.
- 10. Isolation of Plasmid DNA from bacteria.
- 11. Characterization of Plasmid DNA by Agarose gel electrophoresis.
- 12. Demonstration of PCR.

# **Reference Books**

1. Bharti Arora, D.R. Arora. (2020). Practical Microbiology, CBS Publishers & Distributors.

- 2. MudiliJ.(2020). Introductory Practical Microbiology, Narosa Publishers.
- 3. Das S (2020). Microbiology Practical Manual, CBS Publishers.

4. Swagat Kumar Dash, HrudayanathThatoi and Supriya Dash. (2020). Practical Biotechnology: Principles and Protocols, Dreamtech Press.

5. Saravanan R , D. Dhachinamoorthi and CH. MM. Prasada Rao. (2019). A Handbook of Practical Microbiology, LAP LAMBERT Academic Publishing.

6. Shukla Das and RumpaSaha. (2019). Microbiology Practical Manual, 1st Edition, CBS Publishers and Distributors.

7. Michael J Leboffe and Burton E. (2019). Pierce Microbiology: Laboratory Theory & Application, Morton Publishing Company.

8. Ashwani Kumar, Gakhar S K andMonikaMiglani. (2019). Molecular Biology: A Laboratory Manual, Dreamtech Press.

9. Siddra Ijaz and Imran Ul Haq. (2019). Recombinant DNA Technology, Cambridge Scholar UK.
 10. Amita Jain , Jyotsna Agarwal and Vimala Venkatesh. (2018). Microbiology Practical Manual, 1<sup>st</sup>edition, Elsevier India.

# Web References

1. https://www.youtube.com/watch?v=yDAcepSV-tU

2. https://www.youtube.com/watch?v=qGkpw5W25K0

 $3.\ https://www.jove.com/v/10511/growth-curves-generating-growth-curves-using-colony-forming-units$ 

 $\label{eq:linear} \begin{array}{l} \mbox{4.https://bio.libretexts.org/Courses/North_Carolina_State_University/MB352_General_Microbiolog} \\ \mbox{y\_Laboratory\_2021\_(Lee)/07\%3A\_Microbial\_Metabolism/7.01\%3A\_Introduction\_to\_Biochemical \\ \end{array}$ 

\_Tests\_Part I

5. https://www.youtube.com/watch?v=gkZ1CMKeP0w

6. https://microbiologyinfo.com/category/biochemical-test/

7.https://www.researchgate.net/publication/320508474\_Molecular\_Biology\_Laboratory\_manual

# Pedagogy

Power point presentations, Group Discussion, Quiz, Brain Storming Activity.

# **Course Designer**

Dr. N.Jeenathunisa

Semester: II	Internal Ma	External N	larks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS / WEEK	CREDITS
23UMB2AC2	<b>BIOCHEMISTRY II</b>	FIRST ALLIED COURSE	3	3

#### **Course objective**

· To Learn about the Types of Blood cells, composition, function, deficiency diseases of RBC and WBC.

• To make the students to know about the structural features of plasma membrane, cellular transport mechanisms with specific examples.

• To acquire about the Endocrine glands and it's structure, classification of Hormones and it's biosynthesis, functions and deficiency diseases.

#### Prerequisites

To understand the knowledge about the structure and function of plant hormones and secondary metabolites-Alkaloids and flavonoids.

## **Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive level
CO 1	Evaluate the basic Concept of Blood and its components, Deficiency Diseases	K2
CO 2	Describe the various models of cell Membrane and transport mechanisms	K2
CO 3	Discuss the Endocrine Glands and their hormones with deficiency diseases	К3
CO 4	Compare the Plant pigments with their biosynthesis and significance	K4
CO 5	Explain the structure of Plant hormones with its structure and function	K5

#### Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3	2	3	2	2	3
CO2	2	2	3	2	2	3	2	3	3	3
CO3	3	2	1	3	2	2	2	3	2	2
CO4	2	2	3	2	3	3	3	2	3	2
CO5	3	3	2	3	2	3	2	3	2	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation "-"indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE
				LEVEL
I	<b>Cytochemistry:</b> Cytochemistry –Plasma membrane-composition and functions–Danielli Davson Model- Fluid mosaic model, Trilaminar model. Mechnaism of cell membrane transport – Active, Passive and Facilitated diffusion – Uni, sym and antiports – Na <sup>+</sup> - K <sup>+</sup> ATPase and iron transport	9	CO1, CO2, CO4, CO5	K1, K2, K3 ,K4,
II	<b>Haematology :</b> Blood and it's components: Types of Blood cells – origin – Composition of Blood– Characterization and coagulation Significance of platelets–WBC-Types, structure and functions - Deficiency RBC–Structure, Formation-Functions– Anaemia – Sickle cell - Aplastic-Hemolytic	9	CO1, CO2, CO3, CO4,	K1, K2, K3, K4,
III	<b>Animal hormones:</b> Hormones of pituitary, thyroids, parathyroid, pancreas, adrenal Glands- testis and ovarian Hormones –Structure, functions, deficiency diseases associated hormones	9	CO1, CO2, CO3, CO4	K2, K3, K4, K5
IV	<b>Plant hormones:</b> Plant hormones – Discovery, structure and functions of Auxins - chemistry, biological function and metabolism of Gibberellins-Functions and mode of action of Cytokinin– Structure and functions of Abscisic acid.	9	CO1, CO2, CO3, CO4	K2, K4, K5, K6
V	<b>Plant pigments:</b> Plant pigments – chlorophyll, carotenoids –Phycobilins and anthocyanin structure – Biosynthesis – functions	9	CO1, CO4 , CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment (Not to be included for End Semester Examination) Hemophilin – Leucocytosis Polycythemia – Thalassemia – Van willebrand disease	-	CO1, CO2, CO3, CO4 CO5	K1, K2, K3, K4, K5

## **Text Books**

- 1. William, J. Marshall and Stephan, K. Bangert.2014. 3<sup>rd</sup> Edition. Clinical Biochemistry Metabolic and Clinical Aspects Churchill Livingston, New York.
- 2. Ambika Shanmugam.2016. Biochemistry for Medical Students. 8<sup>th</sup> Edition. Wolters Kluwer India Pvt. Ltd.
- 3. Satyanarayana. 2020.Biochemistry. 5<sup>th</sup> Edition. Elsevier. RELX India Pvt. ltd,
- 4. Seema Pavgi Upadhye.2020. Textbook of Biochemistry. 4<sup>th</sup> Edition. Dreamtech Press.
- 5. Harper's.2018. Illustrated Biochemistry. 31 Edition. McGraw Hill / Medical Publishers.

# References

1. Stryer, L.1995.Biochemistry. 4<sup>th</sup> Edition. W.H. Freeman and Company, New York.

th Dinesh puri.2020. Textbook of Medical Biochemistry.4 Edition. Elsevier India

- 2. Donald voet and Judith voet.1990. Biochemistry. John Wiley and Sons, New York.
- 3. Hubert, Stryer, 1995. Biochemistry Freeman and Company, New York.
- 4. Dawn, B.Markus, 1994. Biochemistry. Harwal Publishing, New York.

# Web References

- 1. https://byjus.com/neet/plant-hormones/
- 2. https://www.hopkinsmedicine.org/health/conditions-and-diseases/hormones-and-the-endocrine-system
- 3. https://byjus.com/neet/types-of-blood-cells-notes/

# Pedagogy

Power point presentations, Group Discussion, Brain Storming Activity.

# **Course Designer**

Dr. N. Pushpa

Semester: II		InternalMarks:100										
COURSE CODE	COURSETITLE	CATEGORY	HRS/ WEEK	CREDITS								
22UGEVS	ENVIRONMENTAL STUDIES	ABILITY ENHANCEMENT COMPULSORY COURSE	2	2								

# **Course Objective**

To train the students to get awareness about total environment and its related problems and to make them to participate in the improvement and protection of the environment.

## **Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
CO1	Outline the nature and scope of environmental studies	K1, K2
CO2	Illustrate the various types of natural resources and its importance.	K2
CO3	Classify various types of ecosystem with its structure and function.	K2, K3
CO4	Develop an understanding of various types of pollution and biodiversity.	K3
CO5	List out the various types of social issues related with environment and explain protection acts	K4, K5

# Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	3	2	2	3	2	3
CO2	3	3	2	3	3	3	2	3	3	3
CO3	2	3	3	2	3	3	3	3	3	2
CO4	2	3	3	3	2	3	2	3	3	3
CO5	3	3	2	3	3	3	3	2	3	3

"1"–Slight (Low)Correlation

"2" - Moderate (Medium) Correlation

"3"-Substantial (High)Correlation

"-"indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE
				LEVEL
Ι	Introduction to environmental studies		CO1,	K1,
	Definition, scope and importance. Need for	06	CO2,	K2,
	public awareness		CO3,	КЗ,
			CO4	
II	Natural Resources: Renewable and non-		CO1,	K1,
	renewable resources:		CO2,	K2,
	Forest resources: use and over-exploitation,	06	CO3,	K3
	deforestation, case studies. Timber		CO4	
	extraction, mining, dams and their effects			
	on forests and tribal people.			
	Water resources: Use and over-utilization			
	of surface and ground water, floods,			
	drought, conflicts over water, dams benefits			
	and problems.			
	Mineral resources: Use and exploitation			
	environmental effects of extract			
	incandescing mineral resources.			
	Food resources: World food problems,			
	changes caused by agriculture and			
	overgrazing, effects of modern agriculture,			
	fertilizer-pesticide problems, water logging,			
	salinity.			
	Energy resources: Growing energy needs,			
	renewable and non-renewable energy			
	sources, use of alternate energy sources.			
	Case studies. Land resources: Land as			
	resources, land degradation, man induced			
	Landslides, soli erosion and desertification.			
	Role of an individual in conservation of			
тп	Hatural resources.		CO1	<b>V</b> 1
111	of an access tem. Producers, consumers and		CO1,	NI, VD
	decomposers Energy flowing the	06	$CO_{2}$ ,	κ2, V2
	ecosystem and Ecological succession Food	00	CO3,	КJ
	chains food webs and cological pyramids		04	
	Introduction, types, characteristic features.			
	structure and function of the following			
	ecosystem: - Forest ecosystem, Grassland			
	ecosystem and Desert ecosystem, Aquatic			
	ecosystems (ponds, streams, lakes, rivers,			
	oceans, estuaries)			

IV	Biodiversity and Environmental Pollution Introduction, types and value of biodiversity. India as a mega diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Definition, Causes, effects and control measures of: a. Air Pollution b. Water Pollution c. Soil Pollution d. Noise pollution e. Nuclear hazards Solid waste Management: Causes, effects and control measures of urban and industrial wastes. E-Waste Management: Sources and Types of E-waste. Effect of E-waste on environment and human body. Disposal of E- waste, Advantages of Recycling E-waste. Role of an individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Social Issues and the Environment Water conservation, rainwater harvesting, watershed management. Climate change, global warming, acid rain, ozone layer depletion, Wasteland reclamation. Environment Protection Act Wildlife Protection Act. Forest Conservation Act. Population explosion – Family Welfare Programmes Human Rights – Value Education. HIV/ AIDS - Women and Child Welfare. Role of Information Technology in Environment and human health.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not to be included for End Semester Examination) Global warming – climate change – importance of ozone – Effects of ozone depletion. Biogeography –history, ecology and conservation. International laws and policy	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

#### References

- 1. Sarita Kumar . 2021. Fundamentals of Environmental Studies for Undergraduate Courses (1st edition). Sultan Chand
- 2. Aruna Kumari Nakkella. 2022. Environmental Science (1<sup>st</sup> edition). Bharti Publications.
- 3. Pallabigoswami. 2023. Environmental studies (1st edition). Ashok publication.
- 4. Beard, J.M. 2013. Environmental Chemistry in Society(2ndedition). CRC Press.
- 5. Girard, J.2013. Principles of Environmental Chemistry (3rdedition). Jones &Bartlett.
- 6. Brebbia, C.A.2013. Water Resources Management VII. WIT Press.
- 7. Hites, R.A. 2012. Elements of Environmental Chemistry(2ndedition). Wiley & Sons.
- 8. Harnung, S.E. & Johnson, M.S. 2012. Chemistry and the Environment. Cambridge University Press.
- 9. Boeker, E. &Grondelle, R. 2011. Environmental Physics: Sustainable Energy and Climate Change. Wiley.
- 10. Forinash, K.2010.FoundationofEnvironmentalPhysics. Island Press.
- 11. Evans, G.G. & Furlong, J. 2010. Environmental Biotechnology: Theory and Application (2ndedition). Wiley-Blackwell Publications.
- 12. Williams, D.M., Ebach, M.C.2008. Foundations of Systematics and Biogeography. Springer
- 13. Pani, B.2007. Textbook of Environmental Chemistry. IK international Publishing House.

## Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar

#### **Course Designer**

Dr. B. Thamilmaraiselvi

Semester : III	Internal Marks:	Internal Marks: 25		
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
23UMB3CC4	VIROLOGY	Core	5	5

#### **Course objective**

To enable the students to understand the basic knowledge about Viruses and their Specific Isolation, Cultivation Techniques. To provide the students awareness about the etiology, Pathogenesis, Treatment and prophylaxis of some Plant and Animal viral diseases.

## **Course Outcome and Cognitive Level Mapping:**

CO Number	СО	Knowledge
	Statement	level
CO 1	Define the basic knowledge of Viruses	K1,K2, K4
CO 2	Select the suitable Purification and Characterization methods of Viruses	K1,K2, K3
CO 3	Compare and Contrast Bacteriophages Life cycle	K1,K2, K3
CO 4	Illustrate impacts of the Plant Viral diseases	K1,K2, K4
CO 5	Organised views of Animal Viruses	K1,K2, K4

#### Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	3	3	3	3
CO2	2	3	2	3	3	3	3	2	3	3
CO3	3	2	3	3	2	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3	2	3
CO5	2	3	2	2	3	3	2	3	3	2

1- Slight (Low) correlation 2- Moderate (Medium) correlation

3- Substantial (High) correlation "-" indicates there is no correlation

UNIT	CONTENT	HOURS	COs	COGNITIVE
				LEVEL
I	Introduction – Definition, History of virology. General properties of viruses– Cultivation of Viruses– Structure and replications of viruses– classification of Viruses (ICTV classification).	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
П	Purification and Characterization of Viruses, Separation and Characterization of Viral Components. Assay of viruses – physical and chemical methods (protein, nucleic acid, radioactivity tracers, electron microscopy). Infective assay of Bacteriophages (plaque method). Infective assay of Plant Viruses.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Bacterial Viruses–Classification and structure of Bacteriophage, The Lytic life cycle (T- Even coli phages) – Lysogenic life cycle (Phage Lambda). Bacteriophage typing, Phage therapy.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Plant Viruses: Common Plant Viral Diseases: TMV, Bunchy top of Banana, Cauliflower Mosaic Virus and Rice Tungro Virus. Satellite Viruses, Viroid. Transmission of Plant Viruses with Vectors - Insects, Nematodes, Fungi - without vectors (Contact, Seed and Pollens). Control Measures of Plant Viruses- Vector Control.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	Animal viruses: Common Animal Viral Diseases: Prions, Rinder pest, Blue tongue, Raniketdion, Foot and Mouth Disease. Human Viruses–HIV, Hepatitis Pox, Polio, Rabies, Dengue, SARS – COVID and Oncogenic Viruses. Viral Vaccines. Prevention and Treatment of Viral Diseases. Antiviral agents.	15	CO1, CO2, CO3, CO4, CO5	K1 K2, K3, K4, K5, K6
VI	Self Study for Enrichment	-	CO1,	K1 K2
	(Not included for End Semester Examination) Baltimore Classification and LHT viral classification. Quantification of viruses. End point method of Bacteriophages. Study of Animal and Plant viral Replications. Generation of Virus- Virus free planting material, Visit to Virology Labs.		CO2, CO3, CO4, CO5	к2, К3, К4, К5, К6

## **Text Books:**

- Geo. Brooks, Karen C. Carroll, Janet Butel, Stephen Morse. Jawetz Mel nick & Adelbergs Medical Microbiology. 28<sup>th</sup> Edition, McGraw-Hill Education. 2019.
- 2. Mahendra Pal Yadav, Raj Kumar Singh, Yashpal Singh Malik. Recent Advances in Animal Virology. Springer. 2020
- 3. P. Saravanan. Virology. 1<sup>st</sup> edition, MJP Publishers, Delhi 2021.
- 4. Ananthanarayan and Paniker's Textbook of Microbiology. 12<sup>th</sup> E-edition, Universities Press .United States. 2022.
- 5. Baijayantimala Mishra. Textbook of Medical Virology. 2<sup>nd</sup> Edition, CBS Publishers & Distributors Pvt Ltd, India. Churchill Livingstone. 2022.

# **References:**

- 1. Apurba S Sastry, Sandhya Bhat.Essentials of Medical Microbiology 4<sup>th</sup> edition. Jaypee brothers med Pub Pvt Ltd 2022.
- 2. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller MD. Medical Microbiology, 9<sup>th</sup> edition. Elsevier Publishers 2020.
- 3. Levinson. Review of Medical Microbiology and Immunology. Mc Graw Hill / Medical Publishers 2021
- 4. Yi-Wei Tang, Charles W. Stratton. Advanced Techniques in Diagnostic Microbiology. 3<sup>rd</sup> edition. Springer Publishers 2018.
- 5. Abbas. Cellular and Molecular Immunology, 10<sup>th</sup> edition, Elsevier Publishers 2021

# Web links:

- 1. <u>http://www.bocklabs.wisc.edu/ed/virustax.html</u>
- 2. <u>http:// www.bocklabs.wisc.edu/ed/genomes.html</u>
- 3. http://www.virology.net/Big\_Virology/BVHomePage.html
- 4. https://www.youtube.com/watch?v=Iy-kidfj7Wc
- 5. <u>https://www.youtube.com/watch?v=Kt0miFrXMaY</u>
- 6. <u>https://www.youtube.com/watch?v=zw4jydUY1S8</u>
- 7. https://www.youtube.com/watch?v=Y5XU61wQS6E
- 8. <u>https://www.youtube.com/watch?v=4ua3qf1tij8</u>

# Pedagogy

Chalk and talk, Power Point Presentation, Quiz, Assignments, Group Discussions, Seminar and Assignment.

# **Course Designer**

Dr. S. Jeyabharathi

Semester : III	Internal Marks:	40	External	Marks: 60
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22UMB3CC3P	VIROLOGY (P)	Core Practical	3	3

#### **Course objective**

The practical aims to engage the students with virus detection, diagnosis and laboratory methods that are used in a wide range of Virology and biomedical research settings. To enable the students to perform hands-on training experience on methods and techniques used in virology. The practicals are also designed to offer an alternative learning situation for the ideas that underlie both the virus detection and the techniques.

#### **Course Outcome and Cognitive Level Mapping:**

CO Number	CO Statement	Cognitive level
CO 1	Define the basic knowledge of Viruses	K1,K2, K4
CO 2	Select the suitable Purification and Characterization methods of Viruses	K1,K2, K3
CO 3	Compare and Contrast Bacteriophages Life cycle	K1,K2, K3
CO 4	Illustrate impacts of the Plant Viral diseases	K1,K2, K4
CO 5	Organised views of Animal Viruses	K1,K2, K4

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	3	3	3	3
CO2	2	3	2	3	3	3	3	2	3	3
CO3	3	2	3	3	2	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3	2	3
CO5	2	3	2	2	3	3	2	3	3	2

1- Slight (Low) correlation

2- Moderate (Medium) correlation

3- Substantial (High) correlation

"-" indicates there is no correlation

- 1. Laboratory detection of viral samples (Collection and transport of samples).
- 2. Isolation of Bacteriophage from sewage.
- 3. Demonstration of mechanical transfer of viruses in plants.
- 4. Cultivation of Viruses in Embryonated eggs Amniotic, Allantoic, Yolk sac routes and Chorio-allantoic membrane.
- Observation of selected bacterial, plant and animal viruses T4 and M13 Phage, TMV, CaMV, HIV, Influenza, HSV, HBV, Rabies and Blue tongue virus
- 6. Visit to Hospitals, Viral Research Institutes and Clinical laboratories.

## **References:**

- 1. Ananthanarayan and Paniker's Textbook of Microbiology. 12<sup>th</sup> E-edition, Universities Press. United States. 2022.
- 2. Yi-Wei Tang, Charles W. Stratton. Advanced Techniques in Diagnostic Microbiology. 3<sup>rd</sup> edition. Springer Publishers 2018.
- 3. Baijayantimala Mishra. Textbook of Medical Virology. 2<sup>nd</sup> Edition, CBS Publishers & Distributors Pvt Ltd, India. Churchill Livingstone. 2022.
- 4. Geo. Brooks, Karen C. Carroll, Janet Butel, Stephen Morse. Jawetz Mel nick & Adelbergs Medical Microbiology. 28<sup>th</sup> Edition, McGraw-Hill Education. 2019.
- 5. Apurba S Sastry, Sandhya Bhat. Essentials of Medical Microbiology 4<sup>th</sup> edition. Jaypee brothers med Pub Pvt Ltd 2022.

# Web links:

- 1. <u>https://www.youtube.com/watch?v=Iy-kidfj7Wc</u>
- 2. <u>https://www.youtube.com/watch?v=Kt0miFrXMaY</u>
- 3. <u>https://www.youtube.com/watch?v=zw4jydUY1S8</u>
- 4. <u>https://www.youtube.com/watch?v=Y5XU61wQS6E</u>
- 5. <u>https://www.youtube.com/watch?v=4ua3qf1tij8</u>

# Pedagogy

Power point presentations, Group Discussion, Quiz, Brain Storming Activity.

#### **Course Designer**

Dr. S. Jeyabharathi

Semester III	Internal Marks: 25	External Marks:75			
COURSE CODE	COURSE TITLE	CATEGOR	Hrs /Week	CREDIT	
		Y		S	
23UMB3AC3	BIOSTATISTICS	ALLIED	5	3	
23UMB3AC3	BIOSTATISTICS	ALLIED	5	3	

#### **Course Objective**

- Explain the basic concepts of statistics and sampling design.
- Emphasize analytical thinking to solve biological problems.
- Explore the mathematical methods formatted for major concepts.

#### **Course Outcomes**

# Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Remember and recall the basic concepts of biostatistics	K1
CO2	Illustrate the various notions in the respective stream.	K2
CO3	Apply the different terminologies of biostatistics	К3
CO4	Classify the solution of statistical methods using various techniques.	K4
CO5	Explain the solution of bio statistical problems.	K4

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	2	3	2	3	3
CO3	3	2	2	2	2	2	3	2	3	3
CO4	3	2	2	2	2	2	3	2	3	3
CO5	3	2	2	2	2	2	3	2	3	3

"1" – Slight (Low) Correlation

"2" - Moderate (Medium) Correlation

"3" - Substantial (High) Correlation

"-" indicates there is no correlation.

	CONTENT			COGNITI
UNIT			Cos	VE
				LEVEL
Ι	Importance, Functions, Limitations: Importance - Statistics in States – Statistics in Economics – Statistics in Business –Statistics in Astronomy – Statistics in Education – Statistics in Accounting Auditing – Statistics in Research – Statistics in Planning–Statistics in Mathematics – Statistics and the Common man–Statistics Functions of Statistics–Limitations of Statistics. <b>Classification and Tabulation:</b> Introduction, Meaning of Classification, Chief Characteristics of Classification, Objects of Classification, Roles of Classification, Types of Classification, Geographical Classification, Chronological Classification, Qualitative Classification, Quantitative Classification, Statistical Series, Types of series, Frequency Distribution, Individual observation, Discrete(ungrouped) Frequency Distribution.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
П	<ul> <li>Diagrammatic Representation: Introduction– Advantages– Limitations of a Diagram – Rules for Making a Diagram – Types of Diagrams – One Dimensional Diagram – Two-dimensional diagram – Three-Dimensional Diagram – Pictogram and Cartogram– Selection of a Diagram.</li> <li>Graphic Presentation: Advantages of Graphic Presentation, Construction of a Graph, General Rules, Difference between Diagram and Graph of Frequency Distribution: Histogram, Frequency Curves.</li> </ul>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Measures of Central Tendency: Measures of Central Tendency or Average – Characteristics of an Ideal Measure of Central Tendency-Arithmetic Mean-Weighted Arithmetic Mean- Combined Mean-Corrected Mean-Merits, Demerits and Uses of Arithmetic Mean-Median- Calculation of Median- Calculation of Median for Grouped Data- Calculation of Median for Continuous Series- Merits, Demerits and Uses of Median- Mode- Types of Model Series- Computation of Mode for Individual Series- Computation of Mode by Grouping Method- Computation of Mode in a Continuous Frequency Distribution-Merits, Demerits and Uses of Mode- Empirical Relation between Mean, Median and Mode-Mid Range- Geometric Mean -Merits, Demerits and Uses of Geometric Mean - Harmonic Mean- Merits, Demerits and Uses of Harmonic Mean . Measures of Dispersion: Variability – Range- Interquartile Range -Mean deviation or Average Deviation - Coefficient of Mean deviation -Standard Deviation-Merits, Demerits and Uses of Standard Deviation-Calculation of Standard Deviation – Individual Observations- Calculation of Standard Deviation – Discrete Series or Grouped Data- Calculation of Standard Deviation –Continuous Series- Limits of Variability-Empirical Relationships.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
	Skewness, Moments and Kurtosis: Skewness- Definition of		CO1,	K1,
IV	Skewness- Positively and Negatively Skewness-Purpose of	15	CO2,	K2,
	Measures of Skewness- Relative Measures- Karl Pearson's		CO3, CO4,	кз, К4

	Coefficient of Skewness- Bowley's Coefficient of Skewness. <b>Correlation Analysis:</b> Correlation –Covariance –Calculation of Covariance- Correlation Analysis- Correlation Coefficient Calculated from Ungrouped Data- Spearson's Rank Correlation Coefficient. <b>Regression Analysis:</b> Regression Analysis – Regression Coefficients- Properties of Regression Coefficients – Standard Error of Estimate or Prediction – Linear Regression Line or Equation.		CO5	
V	<b>Tests of Hypothesis:</b> Tests of Significance for Small Sampling Theory- Test of Hypothesis about the Population Mean- Test of Hypothesis about the Difference between Two Means (Using t- test)-Paired t-Test for Difference of Means – Testing the Hypothesis for Equality of Two Variances- Chi-Square Distribution- $\chi^2$ - Test of Goodness of fit- $\chi^2$ - Test of Independence of Attributes- Chi-Square Test for a Population Variance.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Graphs of Time Series: Horizontal Line Graphs or Histogram- Continuous or Grouped Frequency class frequency, Magnitude of class Intervals, Cumulative frequency distribution- Frequency Curve- Cumulative Frequency Curve(or) Ogive-Variance and Coefficient of Variation - Scatter or Dot Diagram – Graphical Method - Design of Experiments.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

# **Text Books**

- 1. Pillai.R.S.N & Bhagavathi (2019). *Statistics Theory and Practice*. S.Chand and Company Limited, New Delhi.
- 2. Arora. P. N, Malhan. P.K. (2020). *Biostatistics*. Himalaya Publishing house.
- 3. Subramani. K, Santha.A. (2021). *Statistics for Management*. Scitech Publications (India) Pvt. Ltd.

# **Chapters and Sections**

UNIT-I	Chapter 2: Pages (12 – 18) [1]
	Chapter 6: Pages $(50 - 56)$ [1]
UNIT-II	Chapter 7: Pages (81 – 93) [1]
	Chapter 8: Pages (100-107) [1]
UNIT-III	Chapter 5 Sections 5.1-5.24 [2]
	Chapter 6: Sections 6.1-6.12 [2]
UNIT- IV	Chapter 7: Sections 7. 1-7.9 [2]
	Chapter 8: Sections 8. 1-8.6 [2]
	Chapter 9: Sections 9. 1-9.5 [2]
UNIT- V	Chapter 3: Sections 3.7-3.15 [3]

#### **Reference Books**

- Baride. JP, Kulkarni. AP, Muzumdar. RD. (2003). *Manual of Biostatistics*. Medical publishers (P) Ltd.
- 2. Khan, Khanum (2004). Fundamentals of Biostatistics. Ukaaz Publications.
- 3. Pillai. R. S. N, Bagavathi. V. (2016). Statistics Theory and Practice, S.Chand.

## Web References

- 1. <u>https://www.youtube.com/watch?v=Vz5jztR6QFM&list=PLoNoar1DlEikWKiRSwtu2g-</u> <u>zAS\_NdHeVo</u>
- <u>https://www.lkouniv.ac.in/site/writereaddata/siteContent/202003271604164717neeraj\_jai</u> <u>n\_Graphical\_Representation.pdf</u>
- 3. https://youtu.be/2FdhaofDkJg
- 4. <u>http://digimat.in/nptel/courses/video/102101056/L01.html</u>
- 5. <u>https://youtu.be/XrGM0OANzaE</u>
- 6. <u>https://youtu.be/VnBDnVmQm6Y</u>
- 7. https://youtu.be/NmgbFJ4UwPs
- 8. <u>http://www.lscollege.ac.in/sites/default/files/e-content/limitations%20of%20statistics.pdf</u>

#### Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

#### Course Designers

- 1. Dr.P.Geethanjali
- 2. Ms.P.Sangeetha

Semester III	Internal Marks: 40	External Marks:60			
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS	
23UMB3AC2P	<b>BIOSTATISTICS (P)</b>	ALLIED PRACTICAL	3	3	

#### **Course Objective**

- Analyze the different types of data using appropriate statistical software
- **Demonstrate** a good understanding of descriptive statistics and graphical tools
- Emphasize analytical thinking to solve biological problems using SPSS.

#### **Course Outcomes**

#### **Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
CO1	Identify and collect various data for representation using biological materials.	K1
CO2	Illustrate 'chi' square test, standard Deviation using SPSS programme.	K2
CO3	Interpret results of commonly used statistical analyses in SPSS Package.	K2
CO4	Apply basic statistical concepts commonly used in public health and health Sciences.	К3
CO5	Discriminate the basic analytical techniques to generate results.	K4

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	2	3	2	3	3
CO3	3	2	2	2	2	2	3	2	3	3
CO4	3	2	2	2	2	2	3	2	3	3
CO5	3	2	2	2	2	2	3	2	3	3

"1" – Slight (Low) Correlation – "2" – Moderate (Medium) Correlation –

"3" – Substantial (High) Correlation  $\neg$  "-" indicates there is no correlation.

#### **BIOSTATISTICS (P):**

Listing the following Programmes using SPSS:

- 1. Tabulation of Data
- 2. Frequency Tabulation
- 3. Simple Bar Chart for Qualitative Variables
- 4. Simple Bar Chart for Quantitative Variables
- 5. Pie Chart
- 6. Line Graph
- 7. Clustered Bar Charts
- 8. Histogram
- 9. Chi-Square Test
- 10. Descriptive Statistics
- 11. Correlation
- 12. Regression

#### Web References

- 1. https://www.youtube.com/watch?v=Nbjz6G\_Z74A
- 2. <u>https://www.youtube.com/watch?v=0NeaD1Mojp0</u>
- 3. <u>https://www.youtube.com/watch?v=m89l1gbP\_g0</u>
- 4. <u>https://www.youtube.com/watch?v=OopxVjGQDOo</u>
- 5. <u>https://www.youtube.com/watch?v=d57zpZampRk</u>
- 6. <u>https://www.youtube.com/watch?v=06QOdHv68pM</u>
- 7. https://www.youtube.com/watch?v=Kp8QFo4XyME
- 8. <u>https://www.youtube.com/watch?v=Ot-ztTT-9Jk</u>
- 9. https://www.youtube.com/watch?v=VudrNXCYJt4

#### Pedagogy

Power Point Presentations, Group Discussion, Seminar, Quiz, Assignment, Brain Storming Activity.

#### **Course Designers**

- 3. Dr.P.Geethanjali
- 4. Ms.P.Sangeetha

Semester : III	Internal Marks	Internal Marks: 25		
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22UMB3GEC1	MUSHROOM	GENERIC	2	2
	TECHNOLOGY	ELECTIVE		
		COURSE		

## **Course Objective**

To enable the students to identify the edible and poisonous mushrooms. To provide the students awareness about the marketing trends of Mushrooms. To give the students exposure to the experiences of experts in the field and to functioning mushroom farms.

Course	<b>Outcome and</b>	Cognitive ]	Level Mapping
Course	Outcome una	Cogmerce	Dever mapping

СО	CO Statement	Cognitive Level
Number		
CO1	Differentiate edible and Poisonous mushrooms	K2,K3
CO2	Examine Spawn preparation	K4,K5
CO3	Illustrate the cultivation of mushroom	K5,K6
CO4	Discuss about nutritional value of mushroom	K5,K6
CO5	Determine medicinal value of mushroom	K4,K5

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	3	3	3	3
CO2	2	3	2	3	3	3	3	2	3	3
CO3	3	2	3	3	2	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3	2	3
CO5	2	3	2	2	3	3	2	3	3	2

1- Slight (Low) correlation 2- Moderate (Medium) correlation

3- Substantial (High) correlation "-" indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE
				LEVEL
Ι	Introduction – History of mushroom	6	CO1,	K1,
	cultivation; Classification and distribution of		CO2,	K2,
	mushroom; life cycle of mushroom.		CO3,	КЗ,
	Identification of poisonous mushrooms.		CO4,	K4,
			CO5	K5
II	Spawn preparation - Isolation of pure culture;	6	CO1,	K1,
	Nutrient media for pure culture; layout of		CO2,	K2,
	spawn preparation room; raw material of		CO3,	КЗ,
	spawn; sterilization; preparation of mother		CO4,	K4,
	spawn and multiplication.		CO5	K5
		-	<b>2</b> 24	
	Cultivation of mushroom, layout of mushroom	6	CO1,	K1,
	shed - small scale and large scale production		CO2,	K2,
	unit. Types of raw material – preparation and		CO3,	K3,
	sterilization; Mushroom bed preparation –		CO4,	K4,
	maintenance of mushroom shed; harvesting		CO5	K5
	method and preservation of mushrooms. short			
	and long term storage of mushroom			
IV	Cultivation of following types of mushroom –	6	CO1,	K1,
	milky mushroom, oyster mushroom, button		CO2,	К2,
	mushroom and medically valuable mushroom -		CO3,	КЗ,
	shiitake mushroom and Reishi mushroom.		CO4,	K4,
	Spent mushroom compost.		CO5	K5,
				K6
V	Nutrient values of mushroom - protein,	6	CO1,	K1
	carbohydrate, fat, fibre, vitamins and minerals.		CO2,	К2,
	Preparation of various dishes - soup, sauce,		CO3,	КЗ,
	cutlet, omelette, samosa, pickles, curry &		CO4,	K4,
	biriyani. Pharmacological and economic values		CO5	K5,
	of mushroom.			K6
VI	Self Study for Enrichment	-	CO1,	K1
	(Not included for End Semester Examination)		CO2,	K2,
	Visit to relevant Labs/Field Visits of mushroom		CO3,	КЗ,
	cultivation		CO4,	K4,
			CO5	K5,
				K6

### **Text Books**

- 1. Paul Stamets, J.S. and Chilton, J.S (2019) Mushroom cultivation A practical guide to growing mushrooms at home, Agarikon Press.
- 2. Tewan and Pankaj Kapoor S.C. (2020) Mushroom cultivation. Mittal Publication. Delhi.
- 3. Nita Bahl. 2016. Hand book of Mushrooms, 2<sup>nd</sup> Edition, Vol I & II.
- 4. Shu Fing Chang, Philip G. Miles and Chang, S.T. (2004) Mushrooms Cultivation, nutritional value, medicinal effect and environmental impact. 2<sup>nd</sup> ed., CRC press.
- 5. R.Gogoi, Y.Rathaiah, T.R.Borah (2019) Mushroom Technology Cultivation, Scientific Publisher.

#### **Reference Books**

- 1. Russell, Stephan (2018) The Essential Guide to Cultivating Mushrooms: Simple and Advanced Techniques for Growing Shiitake, Oyster, Lion's Maneand Maitake Mushroom at Home. Storey Publishing.
- B.C.Suman, Sharma V.P(2017) Mushroom India Cultivation in India. Daya Publishing House.
- 3. Marimuth, (1991) Oyster Mushrooms. Dept. of Plant pathology, TNAU, Coimbatore.

#### Web References

- 1. http://www.fungi.com
- 2. http://www.mushworld.com/home
- 3. http://forums.mycotopia.net/faq-frequently-asked-questions/5594-mushroom-growershandbook-1-mushworld-com.html.
- 4. http://forums.mycotopia.net/faq-frequently-asked-questions/6556-mushroom-growershandbook-2-mushworld-com.html
- 5. http://www.americanmushroom.org/news.html
- 6. https://www.brainkart.com/article/Mushroom-Cultivation\_39985/

# Pedagogy

Chalk and talk, Power Point Presentation, Quiz, Assignments, Group Discussions, Seminar, and Assignment.

#### **Course Designer**

Dr. E.Priya

Semester: IV	Interna	al Marks:25	External N	Marks :75
Course Code	Course Title	Category	HOURS/WEEK	CREDIT
23UMB4CC5	IMMUNOLOGY	CORE COURSE	6	5

#### **Course Objectives**

The aim of the course is to teach the types of immunity, immune system, antigen, antigen – antibody reaction, T and B cell activation, lymphokines and cytokines, hyper sensitivity reaction, autoimmune diseases and transplantation of immunity.

#### Prerequisites

Basic knowledge and concepts of immunology

#### **Course Outcome and Cognitive Level Mapping**

CO	CO Statement	Cognitive
Number		Level
CO1	Understand the history and types of immunity.	K1, K2, K4
CO2	Demonstrate the various antigen- antibody techniques.	K3, K4
CO3	Differentiate the structure of MHC, Cytokines and lymphokines.	K4, K5,K6
CO4	Explain immune technology and its applications.	K4, K6
CO5	Explain the knowledge about hypersensitivity reactions	K5, K6

#### **Mapping with Programme Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	<b>PO1</b>	PO2	PO3	PO4	PO5
CO1	3	3	1	2	3	3	3	3	2	3
CO2	3	2	3	3	2	2	3	2	3	3
CO3	3	2	2	3	3	3	2	3	3	2
CO4	2	3	3	2	3	3	3	2	3	2
CO5	3	3	2	3	2	3	3	3	2	2

"1" - Slight (Low) Correlation

"2" - Moderate (Medium) Correlation

"3" - Substantial (High) Correlation

"-"indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
Ι	History and overview of the Immune system: Cells and organs of the Immune system - Origin, development. Immuno haematology - blood groups, blood transfusion, Rh incompatibility. Immunity - types of immunity - cell mediated, Innate and acquired immunity. Differentiation of T and B cells and their receptors.	18	CO1, CO2, CO4, CO5	K1, K2, K3, K4, K5
Π	Antigen - antibody reactions: Antigens- properties, types, biology of antigens, Haptens, adjuvants, epitope, paratope, cross reactivity and Forssman antigen. Immunoglobulin - structure, properties, types and functions. Theories of antibody production. Complement- alternative and classical pathways. Antigen - Antibody reaction - Precipitation, Agglutination, Immunodiffusion and Complement Fixation.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<b>Immune response</b> : Cell mediated and humoral. MHC, Cytokines, lympokines - structure, function and their receptors. Types of vaccines Transplantation Immunology- types of transplants, Tissue typing, Graft - rejection mechanism. Hyper acute, acute and chronic Reactions	18	CO1, CO2, CO3, CO4, CO5	K2, K3, K4, K5
IV	<b>Immuno techniques:</b> Monoclonal antibody production, properties and its applications. ELISA, RIA, Immuno fluorescence - FISH, Immuno electrophoresis and WIDAL.	18	CO1, CO2, CO3, CO4, CO5	K2, K4 K5, K6
V	<b>Hypersensitivity Reactions</b> : Introduction, Definition - allergy, allergens, types – Immediate (Type I, Type II, Type III) and delayed (Type IV) Hypersensitivity reactions. Cancer Immunology - Introduction, tumour antigens, types of tumours and immuno therapy. Basic concept of autoimmunity – Organ specific and systemic auto immune diseases.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not included for End Semester Examinations Clinical manifestations of graft rejection – CRP, Pregnancy test, RPR and VDRL	-	CO1, CO2, CO3, CO4, CO5	K2, K3, K4, K5

# **Text Books**

- 1. AbulK. Abbas, Andrew, H.Lichtman, ShivPillai (2019).Basic Immunology :Functions and Disorders of the Immune System 6<sup>th</sup> Edition, Elsevier
- 2. Robert R. Rich, Thomas A Fleisher, William T. Shearer, Harry Schroeder, Anthony
- 3. J. Frew, Cornelia, M. Wey and (2018). Clinical Immunology: Principles and Practice, Elsevier
- Abul K. Abbas, Andrew, H. Lichtman, ShivPillai (2017). Cellular and Molecular Immunology 9<sup>th</sup> Edition, Elsevier
- 5. Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt (2017). Roitt's Essential Immunology, Wiley- Black well

## **Reference Books**

- 1. A Wesley Burks, Stephen T Holgate, Robyn EO' Hehir, Leonard B.Bacharier, David
- 2. H. Broide, Gurjit K. Khurana Hershey, Jr. R. Stokes Peebles (2019).Middleton's Allergy E-Book :Principles and Practice, Elsevier
- 3. Lauren M. Sompayrac (2019). How the Immune System Works, Wiley-Blackwell
- 4. Kenneth Murphy, Casey Weaver (2016). Janeway'sImmunobiology9thEdition, Garland Science
- 5. William E.Paul (2012). FundamentalImmunology7thEdition, Kindle Edition

#### Web links

- 1. https://www.immunology.org/public-information/what-is-immunology
- 2. https://aacijournal.biomedcentral.com/articles/10.1186/1710-1492-7-S1-S1
- 3. https://onlinelibrary.wiley.com/journal/13652567
- 4. https://www.frontiersin.org/articles/10.3389/fimmu.2019.00684/full
- 5. https://emedicin e.medscape.com/allergy\_immunology

#### Pedagogy

Power point presentations, Group Discussion, Seminar, Quiz, Assignment, Brain Storming activity

# **Course Designer**

Dr.B.Thamilmaraiselvi

Semester: IV	Internal Mar	ks:40	External	Marks:60
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22UMB4CC4P	IMMUNOLOGY (P)	CORE PRACTICAL	4	4

## **Course Objective**

To enable the students to identify, analyze and observe various techniques in immunology.

#### Prerequisites

To acquire adequate skill to handle immune techniques.

## **Course Outcomes and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive level
CO1	Recall the immunological reactions.	K1
CO2	Demonstrate the advance immunological techniques.	K2
CO3	Develops kills to hem agglutination.	K3
CO4	Competently count blood cells and its differentiation	K3
CO5	Explain various techniques in immunology.	K4

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	3	3	2	2	2	3
CO2	3	2	3	3	2	3	2	2	3	3
CO3	3	3	3	2	3	3	3	3	3	2
CO4	3	3	2	3	2	3	2	2	3	2
CO5	3	3	3	2	3	3	3	3	3	2

"1"–Slight (Low)Correlation

"2" – Moderate (Medium) Correlation "-" indicates there is no correlation

"3"-Substantial (High)Correlation

### Syllabus (60 Hours)

- 1. Haemagglutination ABO Blood grouping.
- 2. Rh Typing
- 3. Total count (RBC and WBC).
- 4. Differential Count (WBC).
- 5. Agglutination reactions–WIDAL, RPR, CRP.
- 6. ASO
- 7. Precipitation reactions: Single and Double immune diffusion.
- 8. Demonstration of ELISA
- 9. Demonstration of western blotting

# **Reference Books**

- 1. AbbasAK, LichtmanAH ,ShivPillai. Cellular and Molecular Immunology, 10<sup>th</sup> Edition. Elsevier, 2021.
- 2. Tobili Y. Sam-Yellowe. Immunology: Overview and Laboratory Manual. 2021(1<sup>st</sup> edition) Elsevier.
- 3. Saha r. Microbiology practical manual (2<sup>nd</sup> edition).Cbs publishers & distributors pvt. Ltd,2022.
- 4. Fumiichiro Yamamoto. ABO +logy (1st edition ).Assign me a free ISBN; 2023.
- 5. Abbas. Cellular and Molecular Immunology(10<sup>th</sup> edition).South Asia Edition Paperback,2021.
- 6. Shrimati Dharmapal Shetty. CMR-NIIH Practical Guide to Laboratory Immuno hematology (1<sup>st</sup>edition). Jaypee Brothers Medical Publishers, 2020.

# Web link

- 1. https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelingerlab/ documents/Immunology-Lab-Manual.pdf
- 2. https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/fr
- 3. Monica Cheesbrough. District Laboratory Practice in TropicalCountries -Part Iand II (Second Edition). Cambridge University Press, New Delhi.
- 4. https://www.sciencedirect.com/book/9780128180068/clinical-immunology
- 5. https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelingerlab/documents/Immunology-Lab-Manual.pdf
- 6. https://www.scribd.com/doc/53764085/Immunotechniques

# Pedagogy

Power point presentations, Group Discussion, Quiz, Brain Storming Activity.

# **Course Designer**

Ms.R. Kiruthiga

Semester: IV	Internal Ma	nrks:25	External Marks:75		
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDIT	
22UMB4AC4	BIOINFORMATICS	ALLIED COURSE	4	3	

## **Course Objective:**

This course is designed to provide comprehensive knowledge to the students regarding Bioinformatics.

#### Prerequisites

To Comprehend and analyze the basics of bioinformatics.

# **Course Outcomes and Cognitive Level Mapping**

COs	CO Statement	Cognitive Level
CO1	Define the basics of bioinformatics	K1
CO2	Recite the knowledge about biological databases	K1
CO3	Critique knowledge about sequences	K4
CO4	Generalize the basic idea of metadata	K6
CO5	Expand the role of molecular biology	K6

#### Mapping with Programme Outcomes:

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	3	3	2	2	2	3
CO2	3	2	3	3	2	3	2	2	3	3
CO3	3	3	3	2	3	3	3	3	3	2
CO4	3	3	2	3	2	3	2	2	3	2
CO5	3	3	3	2	3	3	3	3	3	2

"1" - Slight (Low) Correlation

"2" - Moderate (Medium) Correlation

"3" - Substantial (High) Correlation

"-"indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
Ι	Introductiontobioinformatics:Bioinformatics - Definition, History, Scope and Applications. Opportunities in Bioinformatics. Emerging areas of Bioinformatics	12	CO1, CO2, CO4, CO5	K1, K2, K3, K4, K5
Π	BasicconceptsinMolecularBiology:Introduction toMolecularBiologyand genetics.Central dogma of life:DNA –RNA -Protein.Role ofBioinformatics inHumanGenomeProject.Introduction toMedline,Pubmed,OMIM.Genomics andproteomics (Basic concepts),Data mining.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<b>Biological database:</b> Biological databases, Importance of databases,Sequence and structure databases: EMBL, DDBJ, GenBank, PIR, SwissProt, CSD, PDB, NCBI.	12	CO1, CO2, CO3, CO4	K2, K3, K4, K5
IV	Sequence Alignments and Visualization: Introduction to Sequences, alignments and Dynamic Programming, Local alignment and Global alignment (algorithm and example), Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm).	12	CO1, CO2, CO3, CO4	K2, K4 K5, K6
V	Meta data and Search: Introduction to Metadata and search; Indices, Boolean, Fuzzy, Neighboring search. The challenges of data exchange and integration. Ontologies, interchange languages and standardization efforts. General Introduction to XML, UMLS, CORBA, PYTHON.	12	CO1, CO4 , CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not included for End Semester Examinations EXPASY, OMG / LIFESCIENCE, ENTREZ and SRS.	-	CO1, CO2, CO3, CO4	K2, K3, K4, K5

## **Text Books**

- 1. Tiago Antao (2022). Bioinformatics with Python Cookbook, Packt Publishing Limited.
- 2. R. Sundaralingam, V. Kumaresan (2021). Bioinformatics, Saras Publication.
- 3. Vinita Chougule And MasiddKhalate (2020). Basics in Bioinformatics, Notion Press.
- Andreas D. Baxevanis, Gary D. Bader, David S. Wishart (2020). BIOINFORMATICS Fourth Edition, Wiley.
- 5. Arthur Lesk (2019). Introduction to Bioinformatics Fifth Edition, OUP Oxford.

#### **Reference Books:**

- 1. Jonathan Pevsner(2022). Bioinformatics and functional genomics, 3<sup>rd</sup> edition, John Wiley.
- 2. Namita Mendiratta, Parag Rastogi, S.C. Rastogi (2022). Bioinformatics: Methods and
- 3. Applications: Genomics, Proteomics and Drug Discovery, PHI Learning.
- 4. Dr. Prachi Srivastava, Dr. Neha Srivastava, Er. Prekshi Garg, Er. Payal Trivedi (2021).
- 5. Bio Informatics (Vision and Approaches), Vayu Education of India.
- 6. Ken Youens-Clark (2021). Mastering Python for Bioinformatics: How to Write Flexible, Documented, Tested Python Code for Research Computing, Shroff/O'Reilly.
- 7. S.Gladis Helen Hepsyba, C.R.Hemalatha (2021). Basic Bioinformatics, MJP Publishers.

## Weblinks:

- 1. https://en.wikipedia.org/wiki/Bioinformatics#:~:text=Bioinformatics%20(%2F%CB%8C ba%C9%AA.,sets%20are%20large%20and%20complex.
- 2. https://www.genome.gov/genetics-glossary/Bioinformatics
- 3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122955/
- 4. https://academic.oup.com/bioinformatics
- 5. https://www.britannica.com/science/bioinformatics

#### Pedagogy

Power point presentations, Groupdiscussion, Seminar, Quiz, Assignment, Brain storming activity

# **Course Designer**

Dr.P.F.Steffi

Semester: IV Internal Marks:25			External Marks:75		
COURSE CODE	COURSE TITLE	CATEGORY	HRS./WEEK	CREDITS	
22UMB4GEC2	BIOFERTILIZER TECHNOLOGY	GENERIC ELECTIVE COURSE	2	2	

### **Course Objectives**

To enable the students to understand the role of beneficial microorganisms in biofertilizer production technology.

#### **Prerequisites**

Basic knowledge and concepts of Biofertilizer Technology

#### **Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
CO1	Define and understand importance of biofertilizer	K1, K2
CO2	Analyze and explain mass production of <i>Rhizobium</i>	K3, K4
CO3	Determine and apply Azospirillum and Azotobacter biofertilizer	K3, K4
CO4	Evaluate and categorize Blue green algae biofertilizer	K4, K5
CO5	Criticize and manage production of phosphate biofertilizer and VAM	K5, K6

#### Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
C01	3	3	3	2	1	3	2	3	3	2
CO2	2	2	2	2	2	3	2	3	2	2
CO3	2	3	1	2	3	3	2	3	2	2
CO4	3	2	3	2	2	3	2	3	2	1
CO5	3	3	3	3	2	3	2	3	3	2

"1" – Slight (Low) Correlation "3" – Substantial (High) Correlation "2" – Moderate (Medium) Correlation "-" indicates there is no correlation

UNIT	CONTENT	HOURS	COS	COGNITIVE
				LEVEL
Ι	Biofertilizers: Definition - types,	6	CO1,	K1,
	importance of biofertilizers in		CO2,	К2,
	agriculture. Advantages and applications		CO3	КЗ,
	of Biofertilizers.			K4
II	Rhizobium: characteristics, isolation,	6	CO1,	K1,
	identification, mass multiplication,		CO2,	К2,
	carrier-based inoculants, Field		CO3,	КЗ,
	applications.		CO4	К4,
				K5
III	Azospirillum and Azotobacter: isolation	6	CO1,	K1,
	and mass multiplication carrier-based		CO2,	К2,
	inoculant, field applications.		CO3,	КЗ,
	Azotobacter- characteristics, isolation,		CO4,	K4,
	mass multiplication and field			K5,
	applications.			
IV	Blue green algae as biofertilizer:	6	CO1,	K1,
	isolation, mass culture and field use of		CO2,	К2,
	BGA inoculants. Azolla – mass		СОЗ,	КЗ,
	cultivation and field application.		CO4,	К4,
			CO5	К5,
				К6,
V	Phosphate biofertilizers: isolation, mass	6	CO1,	K1,
	production and field application. VAM-		CO2,	К2,
	isolation, mass production, importance		СОЗ,	КЗ,
	and field application.		CO4,	K4,
			CO5	К5,
				K6
VI	Self Study for Enrichment (Not	-	CO1,	K1,
	included for End Semester		CO2,	К2,
	Examinations)		СОЗ,	КЗ,
	Green manure, organic manure, organic		CO4,	К4,
	farming, bio compost, vermicomposting		CO5	К5,
	– field Application.			K6

# **Text Books**

- 1. Kannaiyan S, Kumar, K., Govindarajan K. (2010). Biofertilizer Technology. 1<sup>st</sup> Edition. Scientific Publishers.
- 2. Kumaresan V. (2015). Biotechnology. 1st Edition. Saras Publication.
- Eric Davis. (2018). Biofertilizer Technology: Importance and their uses. 1<sup>st</sup> Edition. DSR Book distributors.
- 4. Dubey R.C. (2022). A Textbook of Biotechnology. 1st Edition. S Chand and company Ltd.
- 5. Malati Hitendra Aher. (2022). Biofertilizer and Algal Technology. 1<sup>st</sup>Edition. Sahitya Sagar Publications.
- 6. Namita Nath, Dharmeswar Barman. (2022). Biofertilizer. 1<sup>st</sup> Edition. ARB Publications.

# **Reference Books**

- 1. Anil K Thakur, Susheel K Bassi, Kamajit Singh, Dinesh. (2020). Biofertilizers (Skill Enhancement course). 1<sup>st</sup> Edition. S Dinesh & Co.
- Himadri Panda. (2022). The complete technology book on Biofertilizer and organic farming. 3<sup>rd</sup> Edition. NIIR Project consultancy services.
- 3. Joanne Willey, Kathleen Sandman, Dorothy Wood. (2022).Prescott's Microbiology. 12<sup>th</sup>Edition. Mc Graw Hill.
- Krishnendu Acharya, Surjit Sen, Manjula Rai. (2019). Biofertilizers and Biopesticides. 1<sup>st</sup> Edition. Techno World.
- Amitava Rakshit, Vijay Singh Meena, Manoj Parihar, Singh H B, Singh A K. (2021). Biofertilizers: Advances in bio- inoculants. 1<sup>st</sup> Edition. Woodhead Publishing.
- 6. Ramanathan N. (2019). Biofertilizer Technology. 1<sup>st</sup> Edition. Kalyani Publisher.

# Web References

- 1. https://byjus.com/biology/biofertilizers/
- 2. https://www.onlinebiologynotes.com/biofertilizer-advantages-types-methods-of-application-and-disadvantages/
- https://biocyclopedia.com/index/biotechnology/plant\_biotechnology/biofertilizers/biotech\_ masscultivation.php#:~:text=Mix%20this%20carrier%20based%20culture,105%20to%201 06.
- 4. https://biotecharticles.com/Agriculture-Article/Blue-Green-Algae-Bio-Fertilizer-1073.html
- 5. https://krishi.icar.gov.in/jspui/bitstream/123456789/45882/1/AAU-PSB%20Biofertilizer.pdf
- 6. https://www.biotechnologynotes.com/biotechnology/vesicular-arbuscularmycorrhiza-vam-biotechnology/1153

# Pedagogy

Power point presentations, Group Discussion, Seminar, Quiz, Assignment, Brain Storming Activity.

# **Course Designer**

Dr. S. Jenny

Semester: IV	Internal Marks: 40	Exter	rnal Marks: 60		
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS	
22UMB4SEC1P	HERBAL MEDICINE (P)	SKILL ENHANCEMENT COURSE	2	2	

## **Course Objective:**

To create a traditional knowledge of medicinally important plants in day to day life.

# Prerequisites

To acquire a Practical Knowledge in collection and processing of Medicinal Plants

CO Number	CO Statement	Cognitive level
CO1	Cultivation of Medicinal Plants	K1
CO2	Recite the knowledge about medicinally important plants.	K2
CO3	Describe about tribal medicine and their uses in diseases.	К3
CO4	Apply the traditional knowledge of medicinal plants in Tamil nadu	K4
CO5	Associate of plants in day to day life	K5

# Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2	3	2	3	3	2
CO2	2	2	2	2	1	3	2	3	2	2
CO3	2	3	1	2	3	3	2	3	2	2
<b>CO4</b>	3	2	3	2	2	3	2	3	2	1
CO5	3	3	3	3	2	3	2	3	3	2

"1" Slight (Low) Correlation"3"- Substantial (High) Correlation

"2"- Moderate (Medium) Correlation "-" indicate there is no correlation

- 1. Cultivation of Medicinal Plants, *Aloe vera*, *Senna auriculata*, *Zingiber Officinale*, *Curcuma aromatic, and Curcuma aromatic*.
- 2. Standardization of herbal Raw material, Extract and Formulation of herbal plants.
- 3. Preliminary Phytochemical Screening, Quantitative of plant extract.
- 4. Determination of Aldehyde content.
- 5. Determination of Total Alkaloids
- 6. Determination of Flavonoids
- 7. Determination of Phenols
- 8. Preparation and evaluation of Turmeric cream.
- 9. Preparation and Standardization of Herbal lotion.
- 10. Preparation of herbarium and storage (Herbaira, Museum)

#### **Text Books**

- 1. Iris F. F. Benzie and Sissi Wachtel-Galor,2011. Herbal Medicine, 2nd edition CRC Press/Taylor & Francis;
- 2. Joanne Barnes, Linda A. Anderson, John David Phillipson.2007, Herbal Medicine.
- 3. K. G. Ramawat, 2013. Herbal Drugs: Ethnomedicine to Modern Medicine.
- 4. Dr.Pragati Kumar (Author), Dr. Pranay Wal (Author), Mr. Yatendra Singh (Author), 2022. A Text Book of herbal drug technology .

#### **Reference Books**

- 1. Evans M, Shaw A, Thompson E. A, Falk S, Turton P, Thompson T, Sharp D. 2007. BMC Complement Altern Med. 25. Vol. 7. Decisions to use complementary and alternative medicine (CAM) by male cancer patients: Information-seeking roles and types of evidence used.
- 2. Finkel T, Holbrook N. J. 2000.Oxidants oxidative stress and the biology of ageing. Nature;408:239–47.
- 3. Akhtar M.A, Hatwar S.K. 1996.Efficacy of Aloe vera extract cream in management of burn wound. J Clin Epidemiol. ;49 1:24.
- 4. Ashley F.L, O'Loughlin B.J, Peterson R, Fernandez L, Stein H, Schwartz A.N.2010 The use of Aloe vera in the treatment of thermal and irradiation burns in laboratory animals and humans. Plast Reconstr Surg. 20:383–96.

#### Web Reference

- 1. https://openstax.org/books/introduction-anthropology/pages/17-2-ethno medicine#
- 2. https://en.wikipedia.org/wiki/Plant\_morphology

#### Pedagogy

Power point presentations, Group Discussion, Seminar, Quiz, Brain Storming Activity.

#### **Course Designer**

Dr. J. Ambika