ST. MARY'S COLLEGE (AUTONOMOUS)

Re-accredited with A+ Grade by NAAC

Thoothukudi – 628001, Tamil Nadu

(Affiliated to Manonmaniam Sundaranar University)

Syllabus

B.Sc. Microbiology

School of Biological Sciences

Outcome Based Curriculum

(w.e.f. 2021)

Preamble

Microbiology is the branch of biology dealing with the structure, function, uses, and modes of existence of microscopic organisms. Microbiology is the study of microorganisms such as bac teria, fungi, algae, protozoa and virus. Microbiology encompasses numerous sub- disciplines including virology, parasitology, mycology and bacteriology.

Vision

To make young women as an effective science personality through experimental scientific education.

Mission

To empower and enrich women with scientific knowledge so that they are skilled to compete in this global sphere of education as an eminent personalities.

Programme Outcome

PO .No	Upon completion of B.Sc Degree programme , the graduates will be able to
PO 1	Apply the acquired knowledge of fundamental concepts in the field of science and to findsolutions to various problems.
PO 2	Inculcate innovative skills and team – work among students to meet societal expectations.
PO 3	Perform analysis to assess, interpret, and create innovative ideas through practical experiments.
PO 4	Facilitate to enter multidisciplinary path to solve day-to-day scientific problems.
PO 5	Carry out fieldworks and projects, both independently and in collaboration with others,and to report in a constructive way.
PO 6	Improve communication ability and knowledge transfer through ict aided learning integrated with library resources.
PO 7	Transfer the knowledge to the other stakeholders through extensive communitydevelopment programme.
PO 8	Attain competency in job market / entrepreneurship.
PO 9	focus on developing domain specific language skills and knowledge of the students.

Programme Specific Outcome

PSO No.	Students of B.Sc. Microbiology will be able to	PO Mapped
PSO-1	study the vast array of microbes around; to their diversity; structure and influence on the world	PO - 1
PSO-2	provide students with the basic laboratory skills required for a career in either applied or research microbiology	PO – 5, 9
PSO-3	expose the students to different processes used in industries.	PO - 1
PSO-4	expose the students to various emerging areas of Microbiology	PO – 7,6
PSO-5	the skill to identify individual microbial species, use aseptic techniques to grow them in pure culture, safely handle and examine them bymicrobiological methods.	PO - 2
PSO-6	the knowledge of microbiology will enable the students to improve the quality of human lives in relation to environment, fighting diseases.	PO – 4, 2
PSO-7	exploit microbes in the production of food	PO - 8
PSO-8	microbiology play a key role in genetic engineering and other modern biotechnologies such as antibiotic production and exploitation of new sources of food and energy.	PO – 3,8

Department of Microbiology

Course Structure (w.e.f. 2021)

Semester –I

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil French	21ULTA11 21ULFA11	பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, சிறுகதை) Introductory FrenchCourse	6	3	40	60	100
II	General English	21UGEN11	Poetry, Prose, Extensive Reading and Communicative English-I	6	3	40	60	100
III	Core I	21UMIC11	Introduction toMicrobiology	6	6	40	60	100
	Core Practical I	21UMICR1	Laboratory in Introduction toMicrobiology	2	1	40	60	100
	Allied I	21UMIA11	Dairy Technology	4	3	40	60	100
	Allied Practical I	21UMIAR1	Laboratory in DairyTechnology	2	1	40	60	100
IV	Skill Enhancement CourseI	21UMIPE1	Professional Englishfor Microbiology-I	2	2	20	30	50
	Ability EnhancementCourse-I	21UAVE11	Value Education	2	2	20	30	50
Total				**30**	**21**			

Semester II

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	21ULTA21	பொதுத்தமிழ் தாள் 2 சமய இலக்கியங்களும் நீதி இலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, வாழ்க்கை வரலாறு)	6	3	40	60	100
	French	21ULFA21	Intermediate French Course					
II	General English	21UGEN21	Poetry, Prose, Extensive Reading and Communicative English - II	6	3	40	60	100
III	Core II	21UMIC21	Microbial Diversity	6	6	40	60	100
	Core Practical II	21UMICR2	Laboratory in Microbial Diversity	2	1	40	60	100
	Allied II	21UMIA21	Biochemistry	4	3	40	60	100
	Allied Practical II	21UMIAR2	Laboratory inBiochemistry	2	1	40	60	100
IV	Skill Enhancement Course - II	21UMIPE2	Professional English forMicrobiology - II	2	2	20	30	50
	Ability Enhancement Course - II	21UAEV21	EnvironmentalStudies	2	2	20	30	50
Total				**30**	**21**			

Semester III

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil French	21ULTA31 21ULFA31	பொதுத்தமிழ் தாள் 3 : காப்பியங்களும் சிற்றிலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, புதினம்) Advanced French Language	6	4	40	60	100
II	General English	21UGEN31	Poetry, Prose, Extensive Reading and CommunicativeEnglish-III	6	4	40	60	100
III	Core III	21UMIC31	Microbial physiologyand Metabolism	4	4	40	60	100
	Core Practical III	21UMICR3	Laboratory in Microbial physiology and Metabolism	2	2	40	60	100
	Allied III	21UMIA31	Genetic Engineering	4	3	40	60	100
	Allied Practical III	21UMIAR3	Laboratory in GeneticEngineering	2	1			
	Skill Based Elective	21UMIS31/ 21UMIS32	Bioinstrumentation /Vermi Technology	2	2	20	30	50
	NME I	21UMIN31	Food Microbiology	2	2	20	30	50
IV	Ability Enhancement Course - III	21UAWS31	Women's Synergy	2	2	20	30	50
	Self Study or On-line Course / Internship (Compulsory)	21UMISS1	Food PackagingTechnology		2		50	50
Total				**30**	**26**			

Semester IV

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	21ULTA41	பொதுத்தமிழ் தாள் 4: சங்க இலக்கியம்: (செய்யுள், இலக்கணம்,இலக்கிய வரலாறு, உரைநடை, நாடகம்)	6	4	40	60	100
	French	21ULFA41	French Course and Literature					
II	General English	21UGEN41	Poetry, Prose, ExtensiveReading and Communicative English-IV	6	4	40	60	100
III	Core IV	21UMIC41	Molecular Biology AndMicrobial Genetics	4	4	40	60	100
	Core Practical IV	21UMICR4	Laboratory in Molecular Biology And MicrobialGenetics	2	2	40	60	100
	Allied IV	21UMIA41	Mushroom Technology	4	3	40	60	100
	Allied Practical IV	21UMIAR4	Laboratory in MushroomTechnology	2	1			
	Skill Based Elective	21UMIS41/ 21UMIS42	Practical in Medical Laboratory Technology /Practical in Parasitology	2	2	20	30	50
	NME II	21UMIN41	Clinical Microbiology	2	2	20	30	50
IV	Ability Enhancement Course - IV	21UAYM41	Yoga & Meditation	2	2	20	30	50
	Self Study / Online Course / Internship (Optional)	21UMISS2	Probiotics		+2		50	50
V	NCC, NSS & Sports				1			
	Extension Activities CDP				+1			
			Total	**30**	**25+3**			

Semester V

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core V (Common Core)	21UBCC51	Psychology and Micro-biology for health care	6	4	40	60	100
	Core VI	21UMIC51	Immunology	4	4	40	60	100
	Core VII	21UMIC52	Clinical Microbiology	4	4	40	60	100
	Core VIII	21UMIC53	Biostatistics andBioinformatics	4	4	40	60	100
	Core PracticalV	21UMICR5	Laboratory in Immunology and Clinical Microbiology	6	3	40	60	100
	Core Elective	21UMIC51/ 21UMIC52	Microbial Nanotechnology / Marine Microbiology	4	3	40	60	100
IV	Common Skill Based Course	21UCSB51	Computer for DigitalEra and Soft skills	2	2	20	30	50
	Self Study or On-line Course (Optional)	21UMISS3	Sea Food Processing	--	+2		50	50
Total				**30**	**24 +2**			

Semester VI

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core IX	21UMIC61	Food Microbiology	4	4	40	60	100
	Core X	21UMIC62	Industrial Microbiology	4	4	40	60	100
	Core XI	21UMIC63	Environmental and Agricultural Microbiology	4	4	40	60	100
	Core XII	21UMIC64	Microbial Biotechnology	4	4	40	60	100
	Core Practical VI	21UMICR6	Laboratory in Food Microbiology and Industrial Microbiology	4	2	40	60	100
	Core Practical VII	21UMICR7	Laboratory in Environmental, Agricultural Microbiology andMicrobial Biotechnology	4	2	40	60	100
IV	Project	21UMIP61		6	3	40	60	100
Total				**30**	**23**			

Semester	Hours	Credits	Extra Credits
I	30	21	---
II	30	21	---
III	30	24	2
IV	30	25	3
V	30	26	--
VI	30	23	--
Total	**180**	**140**	**5**

Courses	Number of Courses	Hours / week	Credits	Extra Credits
Tamil	4	24	14	--
English	4	24	14	--
Core	12T+7P	54T+22P	51T+13P	--
Core Skill Based	2	4	4	--
Core Elective	1	4	4	--
Group Project	1	6	3	--
Allied	4T+4P	16T+8P	12T+4P	--
NME	2	4	4	--
Skill Enhancement Course	2	4	4	--
Ability Enhancement Course	4	8	8	--
Common Skill Based	1	2	2	--
NCC, NSS & Sports		--	1	
Extension Activities		--		1
Self Study Papers (Optional)	2	--		4
Self Study Papers (Compulsory)	1	--	2	--
Total		**180**	**140**	**5**

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, சிறுகதை)			
Course Code: 21ULTA11	**Hrs/Week:6**	**Hrs/Semester: 90**	**Credits: 3**

Objectives:

- மாணவியருக்கு நல்ல மதிப்பீடுகளைக் கற்பித்து வாழ்வில் அவற்றைப் பின்பற்ற வழிவகுத்தல்.
- இலக்கிய மாந்தரின் வாழ்க்கை அனுபவங்கள் மூலம் வாழ்வில் பிரச்சனைகளை எதிர்கொள்ளும் திறம், தன்னம்பிக்கை, ஆளுமைத்திறம், மொழிஅறிவு இவற்றை உருவாக்குதல்

Course Outcome:

CO.NO	இப்பாடத்திட்டம் மாணவியருக்கு	அறிவுசார் மதிப்பீடு
CO-1	பெண் சார்ந்த விடுதலை உணர்வை வளர்க்கிறது.	வளர்ச்சி
CO-2	பொதுமைச் சிந்தனையை வளர்க்கிறது	வளர்ச்சி
CO-3	இனம் சாதி குறித்த பாகுபாட்டிலிருந்து விடுதலை பெறும் வழிவகைகளைக் கற்றுக்கொடுக்கிறது.	நடைமுறைப்படுத்துதல்
CO-4	இயற்கையைப் பேணுதற்கும் வாழ்வின் வளர்ச்சி நிலையை மேம்படுத்திக் கொள்ளுதற்கும் உதவுகிறது.	நடைமுறைப்படுத்துதல்
CO-5	சமய நல்லிணக்கம், ஒற்றுமை உணர்வு, இறை நம்பிக்கை இவற்றை உருவாக்குகிறது.	உருவாக்கம்
CO-6	மொழியைப் பிழையின்றி பேசவும் எழுதவும் உதவுகிறது.	புரிதல் திறன் மேம்பாடு
CO-7	எதார்த்த வாழ்வை மேற்கொள்ள உதவுகிறது.	புரிதல் திறன் மேம்பாடு
CO-8	தனிமனித வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	நடைமுறைப்படுத்துதல்
CO-9	சமுதாயப் பிரச்சனைகளை எதிர்கொள்ளும் திறம் கிடைக்கிறது.	நடைமுறைப்படுத்துதல்
CO-10	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல் திறன் மேம்பாடு

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, சிறுகதை)			
Course Code: 21ULTA11	Hrs/Week:6	Hrs/Semester: 90	Credits: 3

அலகு – 1 செய்யுள் - 2 மணி

1. தமிழ்மொழி வாழ்த்து – பாரதியார்
2. புதுமைப் பெண் - பாரதியார்
3. புதிய உலகு செய்வோம் - பாரதிதாசன்
4. உலகை மாற்றுவோம் - கவியரசு முடியரசன்
5. கண்ணீரின் இரகசியம் - அப்துல் ரகுமான்
6. மரங்கள் - மு.மேத்தா
7. கால வித்தியாசம் - வைரமுத்து
8. வையத்தை வெற்றி கொள்ள - சி.சிவரமணி
9. கவிதைப் பூங்காடு – பா.விஜய்
10. பெண் இனமே – மைத்ரேயி
11. ஹைக்கூ கவிதைகள்
12. நாட்டார் பாடல்கள்

அ. தாலாட்டுப் பாடல்
ஆ. மீனவர் பாடல்

அலகு - 2 இலக்கணம் - 1 மணி

எழுத்து

1. எழுத்து - விளக்கம்,
2. முதலெழுத்துகள், சார்பெழுத்துகள்
3. சுட்டெழுத்துகள், வினா எழுத்துகள்
4. மொழி முதல் எழுத்துகள், மொழி இறுதி எழுத்துகள்
5. வல்லினம் மிகும் இடங்கள், வல்லினம் மிகா இடங்கள்
6. மொழிப்பயிற்சி : புதுக்கவிதை, சிறுகதை, பத்திரிகைக்குச் செய்தி அனுப்புதல்

அலகு - 3 இலக்கிய வரலாறு - 1 மணி

1. புதுக்கவிதை தோற்றமும் வளர்ச்சியும்
2. சிறுகதை தோற்றமும் வளர்ச்சியும்
3. உரைநடை தோற்றமும் வளர்ச்சியும்
4. நாட்டுப்புற இயல் அறிமுகம்

அலகு - 4 உரைநடை - 1 மணி

நீயே வெல்வாய் - க.ப.அறவாணன்

அலகு – 5 சிறுகதை - 1 மணி

1. கேதாரியின் தாயார் - கல்கி
2. விடியுமா? - கு.ப.ராஜகோபாலன்
3. காலனும் கிழவியும் - புதுமைப்பித்தன்
4. கருப்பண்ணசாமி யோசிக்கிறார் - அறிஞர் அண்ணா
5. நாற்காலி - கி.ராஜநாராயணன்
6. ராஜா வந்திருக்கிறார் - அழகிரி சாமி
7. ஜோடிப் பொருத்தம் - ஜெயரதி அகஸ்டின்

I B.A., / B.Sc Part I FRENCH

SEMESTER – I			
Course Title : PART – I French Paper – I Introductory French Course			
Course Code :21ULFA11	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 3**

Objectives

To initiate a beginner to the francophonic world and to train them to make their maiden efforts in spoken and written French.

To create a number of real-life situations to make the learner express herself in the target language through experiential teaching method.

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	greet and introduce oneself and others	Kn, Ap
2.	fill an identity form	Ap, Cr
3.	ask, give and understand directions	Kn, Ap
4.	frame a questionnaire	Cr
5.	place order in a restaurant	Ap, Cr
6.	tell and understand opening and closing time	Kn
7.	express likes and dislikes	Ap
8.	describe an object and to say what it serves for	Kn, Un
9.	ask and say a price of a product	Ap
10.	understand the French and francophonic lifestyle	Kn

Unit 1 – Bienvenue !

1.1- Une introductionà la langue française
1.2 – Les Salutations
1.3 – Les pronoms
1.4 – Les couleurs
1.5 – Dans la classe

Unit 2 – Et vous ?

2.1 – Se présenter, demander de se présenter
2.2 – Donner des informations personnelles
2.3 – Demander et donner des coordonnes
2.4 –Artistes francophone
2.5 – Réaliser une fiche d'identité

Unit 3 – On va où ?

3.1 – Demander / Indiquer un chemin
3.2 – Comprendre un itinéraire
3.3 – Se déplacer en métro ou en bus
3.4 – Paris / Montréal : deux villes à découvrir
3.5 – Réaliser un questionnaire sur la vie dans un quartier

Unit 4 – Qu'est-ce qu'on mange ?

4.1 – Comprendre / Donner des horaires
4.2 – Faire des courses / Commander au restaurant
4.3 – Exprimer ses gouts
4.4 – Québec / France : qu'est-ce que vous mangez ?
4.5 – Créer la carte d'un bar a jus

Unit 5 – Les soldes, c'est parti !

5.1 – Situer un moment dans une année
5.2 – Parler du métro
5.3 – Demander / dire la taille et la pointure
5.4 – Décrire un objet, dire à quoi ça sert
5.5 – Demander / Dire un prix

Prescribed Textbook :

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz.*Edito A1Méthode de français*. Paris : Didier, 2016.
Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1 Cahier d'exercises*. Paris : Didier, 2016.

Books, Journals and Learning Resources

- J.Girardet&J.Pécheur avec la collaboration de C.Gibble.*Echo A1*. Paris : CLE International, 2012.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I*. Paris : CLEInternational, 2003.
- Cocton Marie-Noëlle.*Génération 1 Niveau A1, Méthode de français et cahier d'exercices*.Paris : Didier, 2016.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, DupleixDorothée, Cocton Marie-Noëlle.*Saison 1 Niveau 1, Méthode de français et cahierd'exercices*. Paris : Didier, 2015
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com

SEMESTER-I			
Part II General English	**Poetry, Prose, Extensive Reading and Communicative English-I**		
Course Code 21UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Objectives:

- To provide adequate exposure and opportunities for students to imbibe, develop, practise and use LSRW skills
- To help students read and comprehend contents in English

Course Outcome:

CO. No.	**Upon completion of this course, students will be able to**	**Cognitive Level**
CO- 1	improve their listening and writing skills.	Un
CO- 2	apply and incorporate basic grammar and mechanics in writing.	Ap
CO- 3	paraphrase main ideas through reading passages.	Ap
CO- 4	communicate in English with confidence.	Ap
CO- 5	appreciate literary pieces.	Ap
CO- 6	label and paraphrase main ideas through reading passages.	Ap
CO- 7	imbibe ethical and moral values through the study of the literary pieces.	Ev
CO- 8	construct simple sentences and short paragraphs in response to reading and writing.	Cr

SEMESTER-I			
Part II General English	**Poetry, Prose, Extensive Reading and Communicative English –I**		
Course Code 21UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Unit I –Poetry

Rabindranath Tagore – Leave This Chanting

W.W. Gibson – The Stone

Ted Hughes – Hawk Roosting

Unit II – Prose

Stephen Leacock – My Lost Dollar

J.B. Priestley – On Doing Nothing

Robin Sharma – Your Commitment to Self- Mastery: Kaizen

Unit III – Short Story

Oscar Wilde – The Model Millionaire

Leo Tolstoy – Three Questions

K.A. Abbas – The Refugee

Unit IV – Grammar

Parts of Speech – Noun, Pronoun, Article, Adjective, Verb - Modals and Auxiliaries – Types of Sentences - Subject -Verb Agreement

Unit V- Communication Skills

Vocabulary, Listening Comprehension – Speaking – Reading, Filling Forms

(TANSCHE – Module I)

Text Books:

Units I-III – To be compiled by the Research Department of English

Unit IV- Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006. Print.

Unit – V – CLIL (Content & Language Integrated Learning) – Module I by TANSCHE (Tamil Nadu State Council for Higher Education)

SEMESTER - I			
Core – I - Introduction to Microbiology			
Course Code: 21UMIC11	**Hrs/ Week: 6**	**Hrs/ Sem: 90**	**Credits: 6**

Objectives:

To highlight the basic concepts and principles about the different aspects of microbiology including recent developments in the area.

To inculcate about the techniques involved in culturing microorganisms.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	get an idea about the historical events in microbiology.	1	Un
CO -2	understand the diversity in microbiology.	1	Un
CO-3	know the scope of microbiology	4	An
CO-4	know parts of microscope, type and its principle	1, 2	An
CO-5	get the theoretical concepts of related stain	2	Un
CO-6	distinguish different methods of staining techniques	2	Ev
CO-7	analyse nutritional requirements of microbes.	2	An
CO-8	understand the techniques involved in culturing microorganisms.	2	Un

SEMESTER - I			
Core – I Introduction to Microbiology			
Course Code: 21UMIC11	**Hrs/ Week: 6**	**Hrs/ Sem: 90**	**Credits: 6**

Unit –I: The scope of Microbiology

The History and contributions of Antony Van Leewenhoek, Joseph Lister, Louis Pasteur, Robert Koch, Edward Jenner, Winogradsky and Beijerinck and development of microbiology
Applied fields of Microbiology.

Unit II: Microscopy

Resolving power, Numerical aperture – Limit of resolution - Magnification Types of Microscopy – Dark field microscopy – Bright field microscopy – Phase contrast microscopy – Electron microscopy.

Unit III: Microbiological staining

Types – Simple, Differential staining, Gram's staining, Endospore staining, Capsule, Flagella, Cytoplasmic inclusion staining, Giemsa staining and their applications.

Unit IV: Structure of bacterial cells

Structure and functions of capsule, flagella, Fimbrae or pili: The cell wall- chemical composition , characteristics and functions of cell wall, Plasma membrane (Fluid mosaic model), mesosomes, cytoplasm: Subunits and chemical compositon, Nucleoids: Cytoplasmic inclusions, Spores and cysts.

Unit V: Sterilization

Principles – Dry heat, Moist heat, Filtration, Pasteurization, Radiation, Disinfectant – Development of Pure culture techniques – Basic component of growth media – Types of growth media, purpose – General, selective&, differential-Nutrient and Mac Conkey agar, enrichment-blood agar, transport and preservation media. Isolation and purification of pure culture.

Text Books:

1. Rajan S., Selvi Christy R. *Essentials of Microbiology*. Chennai: CBS Publishers and Distributers. 2015
2. Rao A.S. *Introduction to Microbiology*. New Delhi: PHI Learning PVT Ltd. 1997

Books for Reference:

1. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology* New York: McGraw-Hill Inc, 7th edition, 2008.
2. Tortora, Funke Case Addison, *Microbiology – An Introduction* Wesley Longman Inc. 7th edition, 2001.
3. Dubey R.C., and Maheswari, S. A *Text Book of Microbiology*, New Delhi: S.Chand & Co. 2003.
4. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology*- , New York: McGraw- Hill Inc 1993.
5. Jogn L. Ingraham & Catherine A, *Introduction to Microbiology,* Newyork : Ingraham, Brooks / Cole,. 2nd Edition 2000
6. Jeffrey C. Pommerville., Alcamo's *Fundamentals of Microbiology.* Ninth edition. Jones & Bartlett learning. 2010.

SEMESTER - I			
Core Practical –I Laboratory in Introduction to Microbiology			
Course Code : 21UMICR1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To introduce the general public to microbiology and encourage interest in it, stressing its importance and possibilities for man and nature.

To impart advanced level information in the field of techniques in general microbiology and diversity.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	know bio-safety procedures in microbiology.	1, 2	Un
CO -2	develop basic skill in aseptic techniques	2	Un
CO-3	perform various staining techniques.	2	Ap
CO-4	cultivate bacteria with different cultivation techniques.	1,2	Ap
CO-5	be acquainted with various sterilization techniques.	2	Ap
CO-6	understand the preparation of various culture media	2	Un
CO-7	isolate bacteria on solid media	2 ,3,4	Ev
CO-8	isolate and characterize bacteria by streak plate method.	2, 3,4	Ev

SEMESTER – I			
Core Practical –I Laboratory in Introduction to Microbiology			
Course Code : 21UMICR1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Practicals:

1. Safety guidelines
2. Sterilization – Physical method (Filtration) - Demonstration
3. Instruments used in Microbiology
4. Preparation of media – Soild, Liquid and Semi solid media.
5. Preparation of slant, deep tube and deep agar plate.
6. Microscopic handling – Cell shape and arrangement.
7. Hanging drop technique
8. Simple staining
9. Negative Staining
10. Gram's staining
11. Serial dilution technique
12. Pure culture technique
    a) Pour plate
    b) Spread plate
    c) Streak plate
13. Enumeration of bacteria - water and soil samples

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. Kannan, N. *Laboratory Manual in General Microbiology.* Palani Paramount Publication, 1996.
3. Murray P.R, Baron E.J, Jorgerson J.H, Pfaller M.A. and Yolker R.H *Manual of Clinical Microbiology,*. Vol. 1 & 2 ASM Poem Washington D.C. 8th edition . 2003.
4. Sundararaj. T. *MB Lab Manual* . publications Sundararaj. A. 1st edition, 2005.
5. Gunasekaran, P. *LaboratoryManual in Microbiology*. New Delhi: New Age International Ltd.,Publishers,.1996.

SEMESTER - I			
Allied – I - Dairy Technology			
Course Code -21UMIA11	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 3**

Objectives:

To provide the leadership, voice and programs for a vibrant dairy industry where farm families, dairy businesses and associated organizations can thrive and be profitable.

To create a sustainable environmentally and technologically advanced dairy farm.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	understand the process involved in production of milk and milk products	1,2	Un
CO-2	classify and explain the different types of milk products	2	Un
CO-3	understand purpose and functions of hygiene in dairy industry	2	Un
CO-4	produce flow chart for the production processes of various milk products	1, 2	Ap
CO-5	explain organization and operations involved in milk processing units	2	Co
CO-6	outline precautions when processing milk and dairy products	2	An
CO-7	organize students to processing of milk and its products	2 ,3,4	Un
CO-8	understand the various agents causing food infection, toxi-infection and intoxication that can be transmitted through consumption of milk and milk products which be immensely useful in preventing the food borne illnesses ensuring the safety of the consumers.	2 ,3,4	Un

SEMESTER – I			
Allied – I - Dairy Technology			
Course Code -21UMIA11	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 3**

Unit I Clean milk production technique

Clean milk production technique- secretion of milk in the udder- sources of micro organisms- cleanliness of the animal- Udder- Utensils- Detergents and Sanitizers- Different micro organisms of milk – Differences between goat's, buffaloe's and cow's milk - Colostrums- Importance of colostrums

Unit II Importance of milk and its composition

Importance of milk and its composition, properties and nutritive value of milk - Specific gravity of milk- Lactometer reading- Acidity test estimation of fat, SNF, total solids of milk- Factors that alter the quality and quantities of milk – common adulterants of milk, detection of adulterants- water adulteration- MBRT- Resazurin Test

Unit III Milk processing

Chilling – Heat processing – Sterilization- pasteurization- test for effective pasteurization – phosphates test – Holding the milk – packing – transport- various types of transports – marketing of fluid milks – special milks- Toned milk, standard milk, UHT milk

Unit IV Starter culture and milk products

Starter culture preparation and their biochemical activities- Methods of manufacture and uses of fermented and non fermented milk products, yoghurt, cheese skim milk, condensed milk.

Unit V Milk borne disease

Milk Borne disease- An Introduction to milk Borne disease, Milk borne infections, *Salmonella* poisoning, bacillary dysentery (Shigellosis). Milk borne intoxication – *Staphylococcal* poisoning, Botulism. Other milk borne diseases- Tuberculosis, Brucellosis

Text book:

1. Sugumar De.. *Outlines of dairy technology*, Oxford University press, 1997.

Books for Reference:

1. Clarence Henry, Heckles, *Milk and Milk products,* New Delhi: Tata. McGraw Hill Publishing company Ltd. 4th edition, 1957.
2. Sugumar D. *Outlines of dairy technology*, Oxford University press. 1997.
3. Ramasamy. *Hand book of Dairy technologies*, International Book distributing and Company, 1996.

SEMESTER – I			
Allied Practical– I - Laboratory in Dairy Technology			
Course Code - 21UMIAR1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To create the ability to be multi-skilled in the field of dairy microbiology with a good technical knowledge.

To educate with the prime intension of providing practical training in the area of milk processing and preparation of various milk products

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	prepare students to scientifically undertake all operations of dairy technology	1, 2	Ap
CO-2	create entrepreneur in dairying and dairy associated activities	2	Sy
CO-3	organize students to processing of milk and its products	2, 3, 4	Sy
CO-4	develop skill, instill confidence by enhancing life skill	1, 2	Ap
CO-5	establish nutritional status of community through dairy farming.	2	Ap
CO-6	establish income of community through dairy farming.	2	Ap
CO-7	develop organizational capabilities among youth in dairy industry.	2 ,3,4	Ap
CO-8	examine the production in small and large scale production.	2,3,4	An

Practicals:

1. Sampling of milk
2. Platform test, COB, MBRT, acidity test
3. Estimation of fat in milk and skim milk
4. Estimation of SNF and total solids
5. Detection of adulterants and preservatives
6. Preparation and enumeration of cream, yoghurt
7. Preparation and enumeration of butter and ghee
8. Preparation and enumeration of koha and flavoured milk
9. Preparation and enumeration of ice cream
10. Grading of milk and milk products by standard plate count
11. Grading of milk and milk products by coliform count
12. Visit to important places related to dairy products and dairy federations.

Books for Reference:

1. Clarence Henry, Heckles, *Milk and Milk products.* New Delhi: 4th edition Tata Mc Graw Hill Publishing Company Ltd., 1957.
2. Sugumar D. *outlines of dairy technology*, Oxford University press. 1997.
3. Ramasamy. *Hand book of Dairy technologies*, Lucknow: International Book distributing and Company. 1996.

SEMESTER I			
Skill Enhancement Course – I Professional English for Microbiology - I			
Course Code -21UMIPE1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

Objectives:

- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year students.
- To develop the language skills of students by offering adequate practice in professional contexts.
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

Course outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Recognise their own ability to improve their own competence in using the language	1	An
CO-2	Use language for speaking with confidence in an intelligible and acceptable manner	2	Ap
CO-3	Understand the importance of reading for life	1	Un
CO-4	Read independently unfamiliar texts with comprehension	1,2,3	Re
CO-5	Understand the importance of writing in academic life	7	Un
CO-6	Write simple sentences without committing error of spelling or grammar	1	Re
CO-7	Know presentation skills	1	An
CO-8	Get critical thinking skills	1	Un

SEMESTER I			
Skill Enhancement Course – I Professional English for Microbiology – I			
Course Code : 21UMIPE1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

Unit 1: Communication

Listening: Listening to audio text on history of Microbiology and answering questions

- Listening to Scope of Microbiology

Speaking: Pair work and small group work on difference between prokaryotes and eukaryotes.

Reading: Comprehension passages on bacterial cell wall – Differentiate between facts and opinion

Writing: Developing a story with pictures on structure of bacterial cell**.**

Vocabulary: Register specific - Incorporated into the LSRW tasks

Unit 2: Description

Listening: Listening to process description of Gram's staining - Drawing a flow chart.

Speaking: Role play about the contributors of Microbiology

Reading: Skimming/Scanning- Reading passages on Smear preparation

Writing: Process Description – Sterilization

Paragraph-Sentence Definition and Extended definition on methods of sterilization.

Vocabulary: Register specific -Incorporated into the LSRW tasks.

UNIT 3: Negotiation strategies

Listening: Listening to interviews of specialists / Inventors in fields of Microbiology

Speaking: Brainstorming on Microscopy (Mind mapping).

Small group discussions (Development of Microbiology)

Reading: Longer Reading text on culture media preparation.

Writing: Essay Writing (250 words) types of media.

Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 4: Presentation skills

Listening: Listening to lectures on Electron Microscope.

Speaking: Short talks on importance of Microscope.

Reading: Reading Comprehension passages on Whittaker's five kingdom classification.

Writing: Writing an essay on Algae. Interpreting Visuals inputs

Vocabulary: Register specific -Incorporated into the LSRW tasks

UNIT 5: Critical thinking skills

Listening: Listening comprehension- Audio on Virus - Listening for information.

Speaking: Making PPT on structure of virus.

Reading : Comprehension passages on Life cycle of

Virus –Note making. Comprehension:

Research article on current trends about

virus

Writing: Problem and Solution essay– Creative writing –

Summary writing on vaccine production

Vocabulary: Register specific - Incorporated into the LSRW tasks

Text Books:

1. Tamil Nadu State Council for Higher Education (TANSCHE*),*

Professional Englishfor Life Science- I

2. Rajan S., Selvi Christy R*., Essentials of Microbiology*. CBS Publishers and Distributers. 2015

Books for Reference:

1. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology* New York: McGraw- Hill Inc, 7th edition, 2008.
2. Dubey R.C., and Maheswari, S. *A Text Book of Microbiology*, New Delhi: S.Chand & Co, 2003.
3. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology,* New York: McGraw- Hill Inc, 1993.
4. Pelczar, *Microbiology*, Tata McGraw-Hill Education. 1998.

SEMESTER - I			
Ability Enhancement Course -Value Education			
Code : 21UAVE11	**Hrs/Week : 2**	**Hrs / Semester: 30**	**Credits : 2**

Unit I: Introduction to Value Education

Concept of Values -Types of Values- Approaches to values - Benefits of Value Education-Characteristics of Values

Unit II: Human Values

Human Values -Sources of Human Values - Love -Compassion - Gratitude - Courage - Optimism - Forgiveness- the need and urgency to reinforce Human Values

Unit III: Social Values

Role of family and society in teaching values - Role of educational institutions in inculcating values-Three general functions of education for society-Self-Reflection- Our society's needs - Social Responsibilities of a student

Unit IV: Spiritual Values

Spiritual Values - Spiritual Development -Moral Development - Importance of Spiritual Values - Cultivation of Spiritual Values -Five most common spiritual values -Spiritual Resources

Unit V: Values for Life Enrichment

Goal Setting - Building relationship **-** Friendship - Love relationship - Family relationship - Professional relationship Interpersonal Relationship -Essential Life Skills that Help in Students Future Development-Life Enrichment Skills Domain

Books for Reference:

1. Sneha M. & K. Pushpanadham Joshi. *Value Based Leadership in Education Perspective and Approaches*, Anmol Publications Pvt. Limited, 2002.
2. Venkataiah.N. *Value Education*, APH Publishing, 1998
3. Pramod KumarM.*A Handbook on Value Education*, Ramakrishna Mission Institute of Culture (RMIC) 2007
4. Jagdosh Chand.*Value Education*. Shipra Publication 2007
5. Indrani Majhi (Shit)Ganesh Das, *Value Education*, Laxmi Publication Pvt. Ltd., 2017
6. Arumugam, N. S. Mohana, Lr.Palkani, *Value Based Education*, Saras Publication 2014

SEMESTER - II			
Part -1 பொதுத்தமிழ் - தாள் 2 சமய இலக்கியங்களும் நீதி இலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, வாழ்க்கை வரலாறு)			
Course Code: 21ULTA21	**Hrs/Week:6**	**Hrs/ Semester : 90**	**Credits :3**

Objectives:

- வாழ்வியல் நன்னெறிகளான மனிதநேயம், சமத்துவம் போன்றவற்றை வளர்த்துக் கொள்ளக் கற்றுக் கொடுத்தல்
- அறநெறியைக் கடைப்பிடிப்பதே நிலையானதும் நீடித்ததுமான நன்மையைத் தருவது என்பதைச் சான்றோரின் வாழ்க்கை நெறிகள் மூலம் உணரச்செய்தல், மொழி அறிவு, இலக்கிய அறிவு இவற்றை வளர்த்துக் கொள்ளக் கற்றுக் கொடுத்தல்

Course Outcome

Co.No.	இப்பாடத்திட்டம் மாணவியருக்கு	அறிவுசார் மதிப்பீடு
CO-1	இறை ஆற்றலை உணர்ந்துகொள்ள உதவுகிறது	மதிப்பீடு
CO-2	நல்ல நண்பர்களையும் நல்ல மனிதர்களையம் இனம் கண்டுகொள்ள வழி வகுக்கிறது.	நடைமுறைப்படுத்துதல்
CO-3	அன்பு, இரக்கம், நற்சொல், நற்செயல் போன்ற நற்பண்புகளோடு வாழ வழி வகுக்கிறது.	மதிப்பீடு
CO-4	மனித நேய பண்புகளோடு வாழ்ந்த சான்றோரின் அனுபவங்களைப் பெற்றுக்கொள்ள உதவுகிறது	நடைமுறைப்படுத்துதல்
CO-5	மொழியைப் பிழையின்றி பேசவும் எழுதவும் பயன்படுகிறது	புரிதல், திறன் மேம்பாடு
CO-6	தனிமனித வாழ்க்கைச் சிக்கல்களையும் பிரச்சனைகளையும் எதிர்கொள்ளும் ஆற்றலை உருவாக்குகிறது.	நடைமுறைப்படுத்துதல், திறன் மேம்பாடு
CO-7	இறைவன் முன் அனைவரும் சமம் என்ற சிந்தனையை உருவாக்குகிறது.	மதிப்பீடு
CO-8	போட்டித்தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல்

SEMESTER - II			
Part -1 பொதுத்தமிழ் - தாள் 2 சமய இலக்கியங்களும் நீதி இலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, வாழ்க்கை வரலாறு)			
Course Code: 21ULTA21	**Hrs/Week:6**	**Hrs/ Semester : 90**	**Credits :3**

அலகு - 1 செய்யுள் - 2 மணி

சமய இலக்கியங்கள்

இறைவணக்கம் - திருநாவுக்கரசர்

சைவம் 1. தேவாரம் - திருஞான சம்பந்தர், திருநாவுக்கரசர், சுந்தரர்
2. திருவாசகம் - மாணிக்கவாசகர்
3. திருமந்திரம் - திருமூலர்
4. திருப்புகழ் - அருணகிரி நாதர்

வைணவம்: 1. திருப்பாவை - ஆண்டாள்
2. திருவாய்மொழி- நம்மாழ்வார்

பௌத்தம்: மணிமேகலை - சீத்தலைச் சாத்தனார்

கிறித்தவம்: 1. தேம்பாவணி - வீரமாமுனிவர்
2. இயேசு காவியம் - கவிஞர் கண்ணதாசன்

இசுலாமியம்: பேட்டை ஆம்பூர் அப்துல் காதிர் சாகிபு பாடல் - சக்கறாத்து நாமா

நீதி இலக்கியங்கள்

1. திருக்குறள் - ஊக்கமுடைமை
2. நாலடியார் - 1. நன்னிலைக் கண்
2. உறங்கும் துணையது
3. பழமொழி நானூறு- 1. பொல்லாத சொல்லி
2. வருவாய் சிறிதெனினும்

அலகு - 2 இலக்கணம் - 1 மணி

1. சொல்லின் பொது இலக்கணம்
2. ஒரெழுத்து ஒருமொழி, சொல்லின் வகைகள்
3. பெயர்ச்சொல் - அறுவகைப் பெயர்கள்
4. வினைச்சொல் - வகைகள்- முற்று, எச்சம், ஏவல், வியங்கோள், செய்வினை, செயப்பாட்டுவினை, தன்வினை, பிறவினை
5. இடைச்சொல் - ஏகார, ஓகார, உம்மை இடைச்சொற்கள்
6. உரிச்சொல் - இலக்கணம், வகைகள்

மொழிப்பயிற்சி – ஒலி வேறுபாடு அறிதல்

அலகு - 3 இலக்கிய வரலாறு – 1 மணி

1. சைவ இலக்கியங்கள்
2. வைணவ இலக்கியங்கள்
3. கிறித்தவம் தமிழுக்குச் செய்த தொண்டு
4. இசுலாமியம் தமிழுக்குச் செய்த தொண்டு
5. பதினெண் கீழ்க்கணக்கு நூல்களில் 11 அறநூல்கள்

அலகு - 4 உரைநடை - 1 மணி

நிறைவான வாழ்க்கைக்கு நேரம் ஒதுக்குங்கள் - ஜே.மௌரஸ்
(10 முதல் 19 வரை உள்ள கட்டுரைகள்)

அலகு – 5 வாழ்க்கை வரலாறு - 1 மணி

மனிதமே புனிதம் - சுடர்ந்தெழு - முனைவர் அருட்சகோதரி ஆ.மரிய சாந்தி

I B.A., / B.Sc Part I FRENCH

SEMESTER – II			
Course Title : PART – I French Paper – II Intermediate French Course			
Course Code :21ULFA21	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 3**

Objectives

To develop and improve upon the acquisition of four competencies of language learning.
To motivate the learner through role plays as to create real life situations. To prepare her for the real communication challenges.

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	talk about her activities, hobbies	Kn, Ap
2.	ask and say time	Ap, Cr
3.	fix, accept or refuse a meeting	Kn, Ap, Cr
4.	talk about her family and describe a character	Kn, Un
5.	describe and give information about a lodging	Ap
6.	express her preferences	Ap, Un
7.	write a formal mail and a postcard	Cr, Ap
8.	express emotions and surprise	Ap
9.	get a gist of the French literature	Kn, Un

Unit 1 – C'est quoi le programme ?

1.1 –Parler de ses activités quotidiennes
1.2 – Demander/ Dire l'heure
1.3 – Proposer/ fixer / accepter ou refuser un rendez-vous.
1.4 – Réserver par téléphone
1.5 – Créer un mini-article sur un loisir

Unit 2 – Félicitations !

2.1 – Comprendre un arbre généalogique
2.2 – Présenter sa famille
2.3 – Féliciter / adresser un souhait
2.4 – Décrire le physique et le caractère d'une personne
2.5 – Créer les personnages d'une famille pour un film

Unit 3 – Chez moi

3.1 – Comprendre un état des lieux simple
3.2 – Se renseigner sur un logement
3.3 – Comprendre un règlementintérieur d'immeuble
3.4 – Exprimer des règles de vie commune
3.5 – S'excuser dans un message

Unit 4 – Bonnes vacances

4.1 – Comprendre un site de réservation en ligne
4.2 – Exprimer la préférence / Hésiter
4.3 – Ecrire un mail formel / une carte postale
4.4 – Exprimer des sensations, une émotion positive, la surprise
4.5 – Ecrire une liste de voyage

Unit 5 – Le texte littéraire

5.1. Le Petit Prince (Chapitre 1) - Antoine de Saint Exupéry
5.2. La colombe poignardée et le jet d'eau – Calligramme - Guillaume Apollinaire

PrescribedTextbook :

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1Méthode de français*. Paris : Didier, 2016.
Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1 Cahier d'exercises*. Paris : Didier, 2016.

Books, Journals and Learning Resources

- J.Girardet&J.Pécheur avec la collaboration de C.Gibble.*Echo A1*. Paris : CLE International, 2012.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I*. Paris : CLEInternational, 2003.
- Cocton Marie-Noëlle.*Génération 1 Niveau A1, Méthode de français et cahier d'exercices*.Paris : Didier, 2016.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, DupleixDorothée, Cocton Marie-Noëlle.*Saison 1 Niveau 1, Méthode de français et cahier d'exercices*. Paris : Didier, 2015
- Apollinaire Guillaume, *Calligrammes :Poèmes de la paix et de la guerre 1913-1916*.Paris: Gallimard, 1966.
- Antoine de Saint-Exupéry.*Le Petit Prince*. Paris : Gallimard, 2007.
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com

SEMESTER-II			
Part II General English	**Poetry, Prose, Extensive Reading and Communicative English –II**		
Course Code 21UGEN21	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Objectives

- To help students realise how life, literature and language are closely connected
- To expose students to language skills through the core subjects

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	comprehend passages.	Un
CO- 2	build effective communication skills.	Un
CO- 3	demonstrate improved oral fluency.	Un
CO- 4	use vocabulary through the study of word parts.	Ap
CO- 5	construct paragraphs and essays through prose writings.	An
CO- 6	develop the skills of interpretation, critical thinking, and clear writing.	An
CO- 7	make use of context clues and analyse poetic content and correlate to experiences.	An
CO- 8	support future academic study by developing a high social, aesthetic and cultural literacy.	Cr

SEMESTER-II			
Part II General English	**Poetry, Prose, Extensive Reading and Communicative English–II**		
Course Code: 21UGEN21	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Unit I –Poetry

William Wordsworth – Resolution and Independence
Henry W. Longfellow – Psalm of Life
Toru Dutt – The Lotus

Unit II – Prose

A.G. Gardiner – On Courage
Desmond Morris – A Little Bit of What You Fancy
Kalpana Chawla – The Sky is the Limit

Unit III – Short Story

Saki – Mrs. Packletide's Tiger
Liam O'Flaherty – The Sniper
Langston Hughes – Thank You Ma'am

Unit IV – Grammar

Tenses: Present, Past and Future

Unit V- Communication Skills

Listening, Reading, Pronunciation, Key Functions, Speaking (TANSCHE - Module - II)

Text Books:

Units I-III – To be compiled by the Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Unit - V – CLIL (Content & Language Integrated Learning) – Module II by TANSCHE (Tamil Nadu State Council for Higher Education)

SEMESTER - II			
Core – II Microbial Diversity			
Course Code : 21UMIC21	**Hrs/ Week: 6**	**Hrs/ Sem: 90**	**Credits: 6**

Objectives:

To illustrate the evolutionary approaches and diversified nature of microorganisms

To demonstrate the students to be aware of ubiquitous nature of micro organisms and their detailed account on taxonomic approaches and survey of prokaryotic phylogeny and phylogenetic groups of eukaryotes.

Course Outcome:

CO .No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	list out the general classification of microbes.	1,5	Kn
CO -2	distinguish the taxonomic ranks of micro organisms	2	An
CO-3	illustrate the Bergey's manual classification about bacteria	2,4	Co
CO-4	know the Alexopoulous classification of fungi and their general features	1	Kn
CO-5	interpret the general morphological characteristics and the algal diversity	1,2	Co
CO-6	demonstrates the morphology and genetic material of viruses	2	Co
CO-7	know about diversification of microbes	2	Kn
CO-8	analyse the classification, replication, cytocidal effects of plant and animal viruses	2,5	An

SEMESTER - II			
Core – II Microbial Diversity			
Course Code : 21UMIC21	**Hrs/ Week: 6**	**Hrs/ Sem: 90**	**Credits: 6**

Unit-I – Introduction to Taxonomy and classification

General principles of classification. Evolution methods in classification – International codes of nomenclature – Taxonomic approaches and phylogeny.

Unit-II – Bacteria and its classification

General introduction – type study: gram positive bacteria (*Bacillus*), Gram negative bacteria (*E.coli*) – Archaebacteria, Methanogens, Appendage bacteria. Determinative classification of Bergey's manual, cyanobacteria.

Unit-III – Fungi and its classification

– General introduction, morphology, Alexopoulous classification and their general features – Life cycle – filamentous fungi (*Actinomycetes*), molds (*Aspergillus*), macroscopic fungi (*mushroom-Agaricus bisporus*) – unicellular fungi (*Yeast-Saccharomyces cerevisiae*)

Unit- IV – Algae, Protozoa - classification

General characteristics – algal diversity - morphology –classification- General features and Life cycle –blue green algae (*Nostoc*) – Red algae (*Gracilaria*) Protozoa - General introduction –morphology –classification – General features and Life cycle - Sarcodina (*Entamoeba histolytica*) – Mastigophora (*Euglena gracilis*)

Unit- V – Viruses and its classification

Introduction –structure –classification based on morphology and genetic material. Plant virus (TMV) –Animal virus (*Adeno virus*) –Bacteriophage (*T4 phage*).

Text Book:

1. Rajan S., Selvi Christy R., *Essentials of Microbiology*. CBS Publishers and Distributors. 2015

Books for Reference:

1. Stanier, Y. Roger, John L. Ingrahm, Mark L. Wheelis and Page R. Painter. *General Microbiology.* New Jersey: V Ed. MacMillan Press Ltd. 2003.
2. R.C. Dubey. *Text Book of Microbiology* S. Chand and Company Ltd., 2004
3. Pelczar*, Microbiology*, Tata McGraw-Hill Education. 1998.
4. Lansing M. Prescott, John P. Harly and Donald A. Klein. *Microbiology,*. WCB/ McGraw Hill Company. 5th edition, 1999.

SEMESTER - II			
Core Practical –I Laboratory in Microbial Diversity			
Course Code : 21UMICR2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To introduce the concept of microbial diversity and its importance.

To impart the knowledge of the techniques adapted in Microbial diversity.

Course Outcome:

CO No	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO-1	know about the knowledge on evolution and microbial diversity	1, 2	Un
CO -2	develop a knowledge on study of Bacteria	2	Un
CO-3	perform the techniques of microbial diversity	2	Ap
CO-4	cultivate Cyanobacteria from natural sources	1,2	Ap
CO-5	be acquainted with the ultra structure of prokaryotic and eukaryotic cell	2	Ap
CO-6	understand Bacterial taxonomy	2	Un
CO-7	understand the structure of Protozoa, Algae, Virus	2 ,3,4	Un
CO-8	develop a knowledge on isolation of microbes from different sources	2, 3,4	Un

SEMESTER - II			
Core Practical –II Laboratory in Microbial Diversity			
Course Code : 21UMICR2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

1. Cultural characteristics of microorganisms
2. General morphology of Bacteria
   a) Cocci – Mono, Diplo, Tetra, Chain
   b) Rod – Thick, Thin
   c) Vibrio
   d) Spirillum
3. Study of ultra structure of prokaryotic and eukaryotic cell – (Demonstration)
4. Study of *Candida albicans* – Germ tube test
5. Isolation of fungi from bread
6. Isolation of Actinomycetes from soil sample.
7. Microscopic examination of Cyanobacteria.
8. Isolation of algae from fresh water sample
9. Study of virus using photographs
   a) TMV
   b) Adeno virus
10. Study of protozoa using photographs

a) Entamoeba histolytica

b) Plasmodium

10. Study of symbiotic association between algae and fungi

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. Kannan, N. *Laboratory Manual in General Microbiology*. Palani: Palani Paramount Publication, 1996.
3. Murray P.R; Baron E.J; Jorgerson J.H; Pfaller M.A. and Yolker R.H *Manual of Clinical Microbiology*, Vol. 1 & 2 ASM Poem Washington D.C. 8th edition, 2003.
4. Gunasekaran, P. *Laboratory Manual in Microbiology*. New Delhi: New Age International Ltd., Publishers, 1996.
5. Jayaraman, J., *Laboratory Manual in Biochemistry*. New Delhi: Wiley Eastern Ltd., 1985
6. Plummer, D.T, *An Introduction to Practical Biochemistry*. New Delhi: Tata McGraw-Hill. 1998.
7. Palanivelu. P. *Analytical Biochemistry and Separation Techniques*.21st Century Publications. 1998.
8. Kanai L. Mukherjee, - *Medical Laboratory Technology*- New Delhi: A procedure Manual for routine diagnosis tests- Tata McGraw-Hill.. Vol.I- III. 1998.

SEMESTER – II			
Allied-II Biochemistry			
Course Code -21UMIA21	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 3**

Objectives:

To extend the fundamental knowledge of biochemistry and to provide the highest quality of translational biomedical research, education and service.

To enhance the students with knowledge on various biochemical aspects of the bio- molecules.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	develop fundamental knowledge about various bio-molecules.	2	Un
CO -2	learn the element present in biomolecules	2	Un
CO-3	differentiate between monomers and polymers	2	Un
CO-4	compare and contrast the structure and function of the carbohydrates, protein, and lipid.	2	Ap
CO-5	summarize the functions of carbohydrates, proteins, lipids, enzymes and vitamins	2	Sy
CO-6	compare and contrast saturated, mono-saturated and poly-saturated fatty acids.	2	Un
CO-7	recognize the importance of the three dimensional shape of a protein on its function and its role.	2	An
CO-8	know the working principle of spectrophotometer and able to handle.	2 ,3	Kn

SEMESTER – II			
Allied-II Biochemistry			
Course Code -21UMIA21	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 3**

Unit I Basis of Biomolecules

Structure of atom – chemical bonds – principles of bioenergetics - Laws of thermodynamics – Structure and functions of energy rich phosphate ATP, PEP and creatine phosphate – Role of pH and buffers in biological systems.

Unit II Carbohydrates

Monosaccharides, Disaccharides, oligosaccharides and Polysaccharides - Structure, classification
and functions.

Unit III Proteins

Amino Acids – Peptides – Types, Structure, classification and functions. Nucleic acids – structure and forms and types of DNA and RNA- Functions of nucleic acids.

Unit IV Lipids

Classification – Structure and functions. Enzymes: Classification – Functions of enzymes - Active site – Allosterism – Determination of Michaelis Menten constant – Factors affecting Km Value – Mode of Enzyme action (Lock and Key model and Induced fit model)- coenzymes – Cofactors – Isozymes and Inhibitors.

Unit V Vitamins

Introduction – Fat soluble vitamins (A,D,E & K) – Water Soluble vitamins (B- complex and Vitamin C) – sources, functions ,deficiency and syndromes.

Text book:

1. Santhyanarayana. U. Essentials of Biochemistry. (1st Edition) Books and Allied Ltd., Kolkata , 2002.

Books for Reference :

1. Stryer,L. *Biochemistry.* Newyork: Ed.W.H.Freeman and company, 1995.
2. J.L.Jain, , *Fundamental of Biochemistry*, New Delhi : S.Chand& company Ltd, , 1999.
3. A.C.Deb . *Concepts of Biochemistry.* Kolkata: (7st Education), Books and Allied (P) Ltd., 1999.
4. Hubert,Styer,. *Biochemistry*. Newyork: Freeman and Company,. 1995
5. Lehninger, *Principle of Biochemistry*. 3rd editions by Nelson and Cox (Worth**),** 2009.

SEMESTER – II			
Allied Practical - II Laboratory in Biochemistry			
Course Code 21UMIAR2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To extend the fundamental knowledge of biochemistry to understand life at molecular level, application of scientific methods in innovative research and provide health care to the community.

To promote basic practical skills in conducting and interpreting laboratory investigations.

Course Outcome:

CO No	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO-1	know hazards and safety measure in laboratory.	2	Kn
CO -2	perform normality, molarity, percent solution.	2	Sy
CO-3	perform qualitative tests for carbohydrates, lipids, and amino acid.	2	Sy
CO-4	determine saponification and acid values of fats.	2, 4	An
CO-5	identify the effect of various factors on enzymes.	2	An
CO-6	know and separate the amino acids by paper chromatography technique	2,4	Kn
CO-7	estimate proteins, carbohydrates, and amino acids.	2	Ev
CO-8	know the working principle of spectrophotometer and able to handle.	2 ,3	Kn

Practicals:

1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of proteins.
3. Qualitative analysis of urea.
4. Qualitative analysis of creatinine
5. Qualitative analysis of cholesterol.
6. Qualitative test for amino acids.
7. Qualitative saponification test.
8. Determination saponification value of fats.
9. Determination of acid value of fats.
10. Effect of pH on activity of enzyme
11. Effect of temperature on activity of enzyme
12. Estimation of carbohydrates (Anthrone method) Demonstration.
13. Estimation of proteins (Lowry's method) Demonstration.
14. Separation of amino acids paper chromatography

Books for Reference:

1. Jayaraman, J. *Laboratory Manual in Biochemistry.* New Delhi: Wiley Eastern Ltd.,. 1985.
2. Plummer, D.T. *An Introduction to Practical Biochemistry*. NewDelhi: Tata McGraw-Hill. 1998.
3. Palanivelu. P. *Analytical Biochemistry and Separation Techniques.* 21st Century Publications. 1998.
4. Keith Wilson.K and Walker.*J Principles of Practical Biochemistry* – Cambridge Univ Press. 2003.

SEMESTER II			
Skill Enhancement Course – II Professional English for Microbiology – II			
Course Code -21UMIPE2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

- **Objectives:**

• Develop their competence in the use of English with particularreference to the workplace situation.

• Enhance the creativity of the students, which will enable them tothink of innovative ways to solve issues in the workplace.

• Develop their competence and competitiveness and therebyimprove their employability skills.

• Help students with a research bent of mind develop their skills inwriting reports and research proposals.

Course outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO – 1	Attend interviews with boldness and confidence.	6	Ev
CO – 2	Adapt easily into the workplace context, having become communicatively competent.	8	Cr
CO – 3	Apply to the Research & Development organisations/ sections in companies and offices with winning proposals.	8	Ap
CO – 4	Know digital competence	6, 1	Kn
CO – 5	Get an idea about academic writing	1, 6	Un
CO - 6	Get communicative competence	6, 8	Un
CO - 7	Get work place communication	8	Un
CO - 8	Develop creativity and imagination	2	Un

SEMESTER II			
Skill Enhancement Course – II Professional English for Microbiology – II			
Course Code -21UMIPE2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

Unit 1- Communicative Competence

Listening – Listening to two talks/lectures by specialists on Microbial growth- (TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions on microbial metabolism- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises on Buffer and it's preparation

Writing: Summary writing based on the reading passages on Buffer and it's preparation

Unit 2 - Persuasive Communication

Listening: listening to sample preparation for TEM and SEM

Speaking: debate on pros and cons of Micro organisms.

Reading: reading texts on advertisements and answering inferential questions on Butter

Writing: dialogue writing- writing an argumentative /persuasive essay on ice cream making.

Unit 3- Digital Competence

Listening: Listening to interviews of renowned alumnae.

Speaking: Interviews with subject specialists (using video conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging to nurture interests – subject related)

Reading: Selected sample of Web Page of a life science virtual lab.

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

Unit 4 - Creativity and Imagination

Listening: Listening to short (2 to 5 minutes) academic videos (prepared byEMRC/ other MOOC videos on Indian academic sites – E.g.https://www.youtube.com/watch?v=tpvicScuDy0)

Speaking: Making oral presentations through short films on impact of COVID 19.

Reading: Essay on Creativity and Imagination about impact of COVID 19

Writing – Basic Script Writing for short films Awareness about COVID 19

- Creating blogs, flyers and brochures on safety precaution for COVID 19
- Poster making – writing slogans/captions Symptoms of COVID 19

Unit 5- Work place Communication & Basics of Academic Writing

Speaking: Short academic presentation using PowerPoint opportunities in microbiology

Reading &Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing
Punctuation (period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)
Capitalization (use of upper case)

Text Books:

1. Tamil Nadu State Council for Higher Education (TANSCHE), Professional English for LifeScience- I
2. Rajan S., Selvi Christy R., *Essentials of Microbiology*. CBS Publishers and Distributers. 2015

Books for References:

1. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology* (7th edition) New York: McGraw- Hill Inc,. 2008.
2. Dubey R.C., and Maheswari, S. *A Text Book of Microbiology*, New Delhi: S.Chand& Co, 2003.
3. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology*- New York: McGraw- Hill Inc,. 1993.
4. Pelczar, *Microbiology*, Tata McGraw-Hill Education. 1998

Semester – II			
Environmental Studies			
Course Code : 21UAEV21	**Hrs/ Week : 2**	**Hrs/Sem:30**	**Credits : 2**

Course Outcomes:

Upon completion of this course, the students will be able to

1 Recognize the biotic and abiotic components of ecosystem and how they function.
2 Use natural resources more efficiently and know more sustainable ways of living.
3. Acquire an attitude of concern for the environment.
4. Participate in improvement and protection of environment.
5. Manage unpredictable disasters.
6 Create awareness about environmental issues to the public.

Unit I Environment and Ecosystem

Aim and need for Environmental Awareness - Components of Environment Ecosystem - Components of Ecosystem: Abiotic and biotic factors (Producer, Consumer and Decomposer) – Food Chain, Tropic Levels - Food Web, Energy flow and Ecological pyramids

Unit II Natural Resources:

Renewable and non-renewable resources – Water Resources: Uses and Conservation of Water – Rain Water Harvesting – Forest Resources: Importance of Forests - Major and Minor forest produces - Conservation of Forest Energy Resources: Solar Fossil Fuel – Wind – Role of individuals in the conservation of natural resources

Unit III Environmental Pollution

Pollutants – Types of pollution: Air, Water, Noise and Plastic Pollution – Causes, effects and Control measures – Global warming and Climate Change

Unit IV **Human Population and Environment**

Effect of human population on environment – Population Explosion problems related to population explosion – Involvement of population in conservation of environment – Measures adopted by the Government to control population growth – Environment and human health

Unit V **Disaster Management**

Floods–Drought–Earthquakes– Cyclones – Landslide–Tsunami–Control measures

SEMESTER – III			
Part-I பொதுத்தமிழ் - தாள் 3 காப்பிய இலக்கியங்களும் சிற்றிலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, புதினம்,)			
Course Code: 21ULTA31	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

Objectives:

- மாணவியர் இறை நம்பிக்கையிலும், நற்பண்புகளிலும் வளர்ந்து, இலக்கிய அறிவிலும் மொழித்திறனிலும் சிறந்து விளங்க வழிகாட்டல்.
- காப்பிய மாந்தரின் வாழ்க்கையின் மூலமாக கடவுள் நம்பிக்கை, நல்ல உறவுகள், இயற்கையை நேசித்தல், மொழிஅறிவு போன்றவற்றை வளரச் செய்தல்.

Course Outcome:

CO.No.	இப்பாடத்திட்டம் மாணவியருக்கு	அறிவுசார் மதிப்பீடு
CO-1	பெண்களின் சட்டங்கள் உரிமைகள், வேலைவாய்ப்பு பற்றிய விபரங்களை அறிந்து கொள்ள உதவுகிறது.	நடைமுறைப்படுத்தல்
CO-2	அரசியல் சூழ்ச்சி, இனம், சாதி குறித்த பாகுபாடு இவற்றிலிருந்து விடுதலை பெறும் வழிவகைகளைக் கற்றுக்கொடுக்கிறது.	நடைமுறைப்படுத்தல்
CO-3	இலக்கிய அறிவினை வளர்க்க, காப்பியச் சுவை உணர்ந்து சுவைக்க வாய்ப்பளிக்கிறது.	நடைமுறைப்படுத்தல்
CO-4	சமய நல்லிணக்கம், இறைநம்பிக்கை இவற்றை உருவாக்குகிறது.	உருவாக்கம்
CO-5	மொழியைப் பிழையின்றிப் பேசவும் எழுதவும் உதவுகின்றது. படைப்பாற்றல் திறனை வளர்க்க உதவுகிறது.	புரிந்துகொள்ளுதல், திறன் மேம்பாடு
CO-6	தனிமனித வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது	நடைமுறைப்படுத்தல்
CO-7	இப்பகுதியில் வாழும் அடித்தட்டு மக்களின் வாழ்வு நிலையை அறிந்து கொள்ள உதவுகிறது. பெண்கள் நீதிக்குப் போராடும் உணர்வை வளர்க்கிறது.	நடைமுறைப்படுத்தல், திறன் மேம்பாடு
CO-8	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல்,திறன் மேம்பாடு

SEMESTER – III			
Part-I பொதுத்தமிழ் - தாள் 3 காப்பிய இலக்கியங்களும் சிற்றிலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, புதினம்,)			
Course Code: 21ULTA31	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

அலகு - 1 செய்யுள் - 2 மணி

காப்பியங்கள்

1. சிலப்பதிகாரம் - அடைக்கலக் காதை : 11 – 94 பாடலடிகள்
2. மணிமேகலை – ஆபுத்திரன் திறன் அறிவித்த காதை : 1 முதல் 56 பாடலடிகள்
3. பெரியபுராணம் - கண்ணப்ப நாயனார் புராணம். (பாடல்கள்: 757 - 762, 67, 74, 81, 84,85, 804, 05, 06, 12, 14, 18, 19, 825 – 832, 834.
4. கம்பராமாயணம் - நட்புக்கோட் படலம்.
5. சீறாப்புராணம் - கள்வரை நதி மறித்த படலம்.
6. தேம்பாவணி - வளன் சனித்த படலம்.- 9 முதல் 31 பாடல்கள்.

சிற்றிலக்கியம்

1. திருக்குற்றாலக் குறவஞ்சி. IV குறவஞ்சி நாடகம். 8. எங்கள் மலையே.

அலகு - 2 இலக்கணம் - 1 மணி

பொருள் இலக்கணம்

1. அகப்பொருள் : எழுதிணை விளக்கம் - முதல், கரு, உரிப்பொருள்
2. புறப்பொருள் : வெட்சித்திணை முதல் பாடாண்திணை வரை விளக்கம் மட்டும்

யாப்பு இலக்கணம்

1. யாப்பு உறுப்புகள். (எழுத்து, அசை, சீர், தளை, அடி, தொடை)

அலகு - 3 இலக்கிய வரலாறு - 1 மணி

1. ஐம்பெருங்காப்பிங்கள்
2. ஐஞ்சிறுகாப்பியங்கள்
3. சிற்றிலக்கியத்தின் தோற்றமும் வளர்ச்சியும், பிள்ளைத்தமிழ், கலம்பகம், குறவஞ்சி, பரணி.
4. புதினம் தோற்றமும் வளர்ச்சியும்..

அலகு - 4 உரைநடை - 1மணி

இப்பொழுது இவள் - ப. திருமலை.

அலகு - 5 புதினம் - 1 மணி

தேரியாயணம் (சமூக நாவல்) - கண்ணகுமார விஸ்வரூபன்.

II B.A., / B.Sc Part I FRENCH

SEMESTER – III			
Course Title : PART – I French Paper – IIIAdvanced French Language			
Course Code : 21ULFA31	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 4**

Objectives

To enhance the acquisition of all the four competencies of language learning.
To create the independent capability of the learner to respond and tackle the various situations of communication when the learner is in the native country of the target language

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	give an explanation	Ap
2.	ask and say height and weight	Ap
3.	understand student exchange programme and professional world	Kn, Un, Ap
4.	express a goal and a skill	Ap
5.	understand a comic	Un
6.	describe a lifestyle	Kn, Ap
7.	talk about plans and difficulties	Ap
8.	enjoy, appreciate and understand the lyrics of the French songs	An
9.	write a CV	Cr
10.	comprehend French literature	Kn

Unit 1 – Pas de chance !

1.1 –Se plaindre / plaindre quelqu'un
1.2 – Donner une explication
1.3 – Exprimer une émotion négative
1.4 – Demander et dire le poids et la taille
1.5 – Chance et malchance

Unit 2 – Beau travail ?

2.1 – Comprendre un programme d'échange universitaire
2.2 – Exprimer le but, le souhait et un projet professionnel
2.3 – Exprimer une capacite, une compétence
2.4 – Comprendre des taches professionnelles
2.5 – Universités 2.0

Unit 3 – Au grand air

3.1 – Comprendre une BD sur un changement de vie
3.2 – Exprimer son insatisfaction
3.3 – Exprimer un choix de vie
3.4 – Décrire son mode de vie
3.5 – Je cultive mon jardin

Unit 4 – C'était bien ?

4.1 – Parler de ses difficultés
4.2 – Encourager, rassurer
4.3 – Parler d'un projet
4.4 – Exprimer son accord, son désaccord et intérêt
4.5 – Les Français en chanson

Unit 5 – Le texte littéraire

5.1 – Demain dès l'aube - Victor Hugo
5.2 – La Laitière Et Le Pot Au Lait - Jean De La Fontaine

PrescribedTextbook :

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1Méthode de français*. Paris : Didier, 2016.
Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1 Cahier d'exercises*. Paris : Didier, 2016.

Books, Journals and Learning Resources

- J.Girardet&J.Pécheur avec la collaboration de C.Gibble.*Echo A1*. Paris : CLE International, 2012.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I.* Paris : CLEInternational, 2003.
- Cocton Marie-Noëlle.*Génération 1 Niveau A1, Méthode de français et cahier d'exercices*.Paris : Didier, 2016.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, DupleixDorothée, Cocton Marie-Noëlle.*Saison 1 Niveau 1, Méthode de français et cahier d'exercices*. Paris : Didier, 2015
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.frenchtoday.com/french-poetry-reading/

SEMESTER – III			
Part II English Poetry, Prose, Extensive Reading and Communicative English - III			
Course Code: 21UGEN31	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Objectives:

- To acquaint students with literary art and writings of universal appeal.
- To strengthen the proficiency of communicative English through literary based study.

Course Outcome:

CO.No.	**Upon completion of this course, students will be able to**	**PSO Addressed**	**CL**
CO-1	understand the language and literary components of texts	2,8	Un
CO-2	gain insight into literary experience and expressions of writers	8	Un, Ev
CO-3	comprehend aspects of grammar and its application	4	Un
CO-4	enrich vocabulary and its regular usage	9	Un, Ap
CO-5	analyse functional English in literary texts	1,8	An
CO-6	evaluate perspectives and human values for life	2,10	Ev
CO-7	adopt appropriate technique to enhance communication and writing	1,7	Ap, Cr
CO-8	develop skills of formal writing and speech	4,7	Cr

SEMESTER – III			
Part II English Poetry, Prose, Extensive Reading and Communicative English - III			
Course Code: 21UGEN31	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Unit I –Poetry

William Shakespeare – All the World's a Stage
Dylan Thomas – Do not go gentle into that good night
Sri Aurobindo Ghosh – The Divine Worker

Unit II – Prose

Bertrand Russell – How to Avoid Foolish Opinions
Virginia Woolf – Men and Women
M.K. Gandhi – At School

Unit III – Fiction

Charlotte Bronte -*Jane Eyre* (Abridged Version)

Unit IV – Grammar

Active and Passive Voice, Direct and Indirect Speech

Unit V –Communication Skills

Listening Comprehension, Close Reading, Conversational English, Formal Writing

Text Books:

Units I – III – Compiled by the Research Department of English.

Units IV – Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Unit V – CLIL (Content & Language Integrated Learning) – Module IV by TANSCHE.

SEMESTER – III			
Core– III - Microbial Physiology and Metabolism			
Course Code: 21UMIC31	**Hrs/ Week:4**	**Hrs/ Sem: 60**	**Credits: 4**

Objectives

1. To understand the basic concepts of aerobic and anaerobic metabolic pathway
2. To analyse the role of individual components in overall cell function
3. To provide information on sources of energy and its utilization by microorganisms
4. To study about many different types of metabolic strategies

Course outcome

CO No	Upon completion of this course, students willbe able to	PSO addressed	CL
CO-1	Know the basic knowledge about microbial metabolism	2	Kn
CO-2	Know the applications of the various culture and their pathways	4	Kn
CO-3	Know the process of reporting the reportableDisease	5	Kn
CO-4	Interpret the techniques used in clinical microbiology	2	Co
CO-5	Determine the mechanism of nitrogen fixation by microbes	4	An
CO-6	Demonstrate the mechanism involved in bio-luminescence	1	Co
CO-7	Demonstrate the growth and sporulation process of microbes	4	Co
CO-8	Compare the mechanism of photosystem I & II	2	An

SEMESTER –III			
Core– III-Microbial Physiology and Metabolism			
Course Code :21UMIC31	**Hrs / Week:4**	**Hrs / Sem:60**	**Credits:4**

Unit-I: Introduction to Metabolism

Basic concept of metabolism – Membrane transport system – Passive and Active transport system – Facilitated diffusion, group Translocation – Iron transport – Requirements of growth- Micro & Macro nutrient elements. Role of osmo regulatory proteins

Unit-II: Metabolic pathway

Assimilatory and dissimilatory pathways – Respiratory pathways – Glycolysis, Krebs cycle – ETS – ATP generation – Fermentation pathways- Homo and Hetero lactate fermentation- Ethanol- Fermentation by bacteria and yeast – Mixed acid fermentation- Butanediol, acetate and propionate. Metabolism of protein

Unit-III: Respiration and photosynthesis

Anaerobic respiration: Nitrate, Sulphur, carbonate and methane – Bioluminescence components. Phototrophic metabolism- Historical account of photosynthesis.

Unit-IV: Growth and sporulation

Growth – Batch, continuous– Growth curve – Factors affecting growth – Physical, chemical and biological factors. Endospore – structure and mechanism of sporulation. Regulation of nitrogen assimilation and fixation by bacteria

Unit-V: Nutrition and Phosynthetic pigments

Characteristics and metabolism of autotrophs. – Chemolithotroph – Brief account on Sulphur, Hydrogen and Iron oxidation. Phosynthetic and accessary Pigments –Bacterio chlorophyll, rhodopsin and carotenoids. Energy rich compounds in cell metabolism

Text Book:

1. Meena Kumari S. *Microbial Physiology*.Chennai:1st edition MJP Publishers. 2006.

Books for Reference:

1. Rajapandian K. *Microbial physiology.*Chennai: PBS Book Enterprises India, 2010.
2. Lansing M. Prescott John.P. Harley and Donald A, Klein. *Microbiology.* Newyork: (5thedition). McGraw –Hill Company, 2003.
3. Tortora, Funke Case Addison. Introduction to Microbiology, Newyork: (7thedition)Wesley Longman Inc. 2001.
4. Dubey R.C. and Maheswari, S. *A. Text Book of Microbiology*. New Delhi: S.Chand &Co, 2003.
5. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology.* NewYork : McGraw- HillInc,

SEMESTER –III			
Core Practical-III- Laboratory in Microbial Physiology and Metabolism			
Course Code :21UMICR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Objectives:

1. To demonstrate various techniques employed in the cultivation of microorganisms.
2. To discuss on the different phases of microbial growth.
3. To explain the basic concepts of microbial identification based on biochemical tests
4. To demonstrate the basic principle of microbial metabolism

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Perform IMViC test and identify bacteria of entero bacteriaceae.	1	Sy
CO-2	Perform various biochemical test.	1	Sy
CO-3	Know the effect of various environmental factors.	1	Kn
CO-4	Prepare buffer and determine the pH.	1	Sy
CO-5	Various hydrolysis for the production of extra-cellular enzymes.	1	Sy
CO-6	Explain the concept of microbial growth, its measurement and growth curve	1	Co
CO-7	know the working principle of spectrophotometer and be able to handle	1	Kn
CO-8	Demonstrate the working principle of SDS-PAGE and Agarose gel electrophoresis.	1	Kn

SEMESTER –III			
Core Practical-III- Laboratory in Microbial Physiology and Metabolism			
Course Code: 21UMICR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Practicals:

1. IMVIC test
2. Carbohydrate fermentation-Glucose.
3. TSI test
4. Production of extracellular enzyme
   a) Starch hydrolysis
   b) Casein hydrolysis
   c) Lipid hydrolysis
   d) Gelatin hydrolysis
5. Urease test
6. Nitrate reduction test
7. Catalase test
8. Construction of growth curve - Demonstration
9. Effect of pH and Temperature on bacterial growth
10. Bacterial population count by turbidity method - Demonstration
11. Isolation of photosynthetic microorganism from environment
12. Estimation of calcium ions present in sporulating bacteria by EDTA method.

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. Kannan,N. *Laboratory Manual in General Microbiology*. Paramount Publication, 1996.
3. MurrayP.R; BaronE.J;Jorgerson J.H;Pfaller M.A.and Yolker R.H. *Manual of Clinical microbiology*. Washington D.C: 8th edition.Vol.1&2ASM .2003.
4. Sundararaj.T. *Laboratory manual.* Chennai. (1st edition) publn Sundararaj.A. 2005.
5. Jayaraman,J. *Laboratory Manual in Biochemistry*. New Delhi: Wiley Eastern Ltd.,. 1985.
6. Plummer,D.T. *An Introduction to Practical Biochemistry.* New Delhi: Tata McGraw-Hill. 1998.
7. Palanivelu.P. *Analytical Biochemistry and Separation techniques*. Chennai: 21st Century Publications. 1998.

SEMESTER–III			
Allied–III–Genetic Engineering			
Course Code:21UMIA31	**Hrs/Week:4**	**Hrs/Sem:60**	**Credit:3**

Objectives:

1. To understand the steps of gene cloning
2. To understand significance of GMOs
3. To know ethical values related to genetic modification
4. To screen out various techniques involved in molecular cloning

Course Outcome:

CONO	Upon completion of this course, students will be able to	PSO Addressed	CL
CO-1	Infer basic knowledge about cloning	2	Un
CO-2	Identify the applications of genetic engineering in Various fields	4	Ap
CO-3	Explain cloning vectors	2	Un
CO-4	Interpret the techniques used in genetic engineering	2	Un
CO-5	Compare different types of vectors	4	An
CO-6	Explain Genetically modified food	2	Un
CO-7	Demonstrate the hazardous and potential risk in Releasing transgenic into environment	6	Un
CO-8	Make use of DNA Libraries	4	Ap

SEMESTER–III			
Allied–III–Genetic Engineering			
Course code:21UMIA31	**Hrs/Week: 4**	**Hrs/Sem:60**	**Credit:3**

Unit–I: Methods of gene cloning

Genetic engineering–History–Tools of Genetic Engineering-Gene cloning-Steps in cloning- Gene transfer methods-Screening of chimeric DNA. Cloning using linkers and adapters

Unit–II: Gene cloning vectors

Cloning vectors for rDNA (Plasmids, Phages, Cosmids, Transposons)-Binary and Shuttle vectors. Strategies for selecting and designing cloning vectors

Unit–III: Gene libraries and blotting methods

Techniques in Genetic Engineering - Southern, Western, Northern blotting - PCR and its modification-DNA finger printing-DNA libraries .BAC library – YAC library

Unit–IV: Advantages of gene cloning

Applications of genetic engineering- Transgenic plants – Development of crops for disease resistance (Bt cotton) - herbicide tolerance- Medicine (Insulin) – Environment - role of superbug in bio degradation. Markers and Reporter genes and their applications

Unit-V: Role of Genetically modified organisms and regulations

Genetically modified organisms–Advantages and disadvantages-Ecological impact of transgenic plant–Release of GMO in to environment. Indian and international agencies involved in patenting, patenting biological materials

Textbooks:

1. Dr.Verma P.S and Dr.Agarwal.V.K. *Genetic Engineering*. NewDelhi: Chand and Company Ltd. 2009.
2. DubeyR.C. *A Text Book of Biotechnology*. NewDelhi: Fifth revised Edition. S Chand &Co. 2014.
3. Dr.Prakash.S Lohar. *Text Book of Biotechnology.* Chennai: MJP Publishers, 2005

Books for Reference:

1. Glick.B.R.and Pasternak,J.J. *Molecular Biotechnology–Principles and Applications of Recombinant DNA.* Washington D.C: ASM Press, 2017.
2. Brown,T.A. *Gene Cloning.* USA: Third Edition. -Chapman and Hall Publications, 2016.
3. Satyanarayana.U. *Biotechnology*. Kolkata: Books and Allied(P) Ltd. 2013.
4. Rastogi S.C. *Biotechnology Principles and applications.* New Delhi: Narosa Publishing HousePvt.Ltd . 2007.
5. Mohan P. Arora.*Biotechnology.* Mumbai :Himalaya Publishing House Pvt Ltd, 2005
6. Jogdh and.S.N.*Gene Biotechnology* Mumbai: Himalaya Publishing House Pvt. Ltd. 2009

SEMESTER-III			
Allied practical III–Laboratory in Genetic Engineering			
Course Code:21UMIAR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:1**

Objectives:

1. To illustrate creative use of modern tolls and techniques in genetic engineering
2. To familiarize with molecular research-based enzymes
3. To develop different ends of restricted fragmented used in gene cloning
4. To understand the concept of gene multiplication

Course Outcome:

CONO	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Illustrate the principle behind any genetic engineering practical	2	Un
CO-2	Develop basic handling skill in genetic engineering practical	2	Ap
CO-3	Experiment with isolation of Nucleic acids from Different sources	4	Ap
CO-4	Interpret Transformation	1	Un
CO-5	Test for the quantification of nucleic acids	2	An
CO-6	Distinguish the quantification of DNA and RNA	2	An
CO-7	Distinguish the isolation of DNA and RNA	4	An
CO-8	Compare the theory with the protocol of PCR	2	An

SEMESTER-III			
Allied practical III–Laboratory in Genetic Engineering			
Course code:21UMIAR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:1**

1. Isolation of genomic DNA from bacteria.
2. Isolation of genomic DNA from plant source.
3. Isolation of DNA from animal source.
4. Isolation of RNA from bacteria.
5. Isolation of RNA from plant source.
6. Isolation of RNA from animal source.
7. Polymerase Chain Reaction (Demonstration).
8. Quantification of DNA.
9. Quantification of RNA.
10. Restriction – Digestion of E.CoR1 enzyme

11 Ligation of Restricted fragment using Ligase enzyme

12. Determination of unknown fragment using marker DNA – Demonstration

Books for Reference:

1. Janarthanan. S. and Vincent.S. *Practical Biotechnology*: *Methods and Protocols.* Hyderabad : Universities Press (India) private limited. 2007.
2. Jyoti Saxena, Mamta aunthiyal, InduRavi. *Laboratory manual for Microbiology, Bio-chemistry and Molecular Biology*. India : Scientific Publishers, 2012.
3. Sambrook and Russell. *Molecular Cloning laboratory manual.* New York: Vol 1,2,3.Third edition. ColdSpring Harbor Laboratory Press, Cold Spring Harbor. 2016.

SEMESTER –III			
Skill Based Elective – Bioinstrumentation			
Course code-21UMIS31	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Objectives

1. To know the fundamental principles and applications of basic instruments in biology
2. To learn the types of electrophoresis and spectroscopy
3. To understand, design and evaluate systems and devices that can measure, test and/or acquire biological information
4. To apply advanced control theory to practical research problems.

Course Outcome:

CO No	Upon completion of this course, Students will be able to	PSO Addressed	CL
CO-1	Understand the concept about the basic instrumentation.	2	Un
CO-2	Know about pH measurements and important Of buffer.	2,3	Un
CO-3	Develop basic principles and application of centrifuge.	2,3	Co
CO-4	Develop basic principles and application of spectrophotometer.	2	Un
CO-5	Demonstrate an understanding of Electrophoresis.	2	Sy
CO-6	Develop basic principles and application of colorimetry	2,4	Co
CO-7	Grasp the principles and applications of Various instruments	2	Un
CO-8	Grasp the knowledge about advanced instrumentation.	2	Un

SEMESTER –III			
Skill Based Elective – Bioinstrumentation			
Course code-21UMIS31	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Unit-I: Basics of instrumentation

Balance, pH meter, Reagent preparations. Buffers – Preparation of buffers-Standard buffers -Basic principle of centrifugation, and its types - Ultra Centrifugation (Preparative and analytical), Density gradient Centrifugation, Rate zonal centrifugation, Differential centrifugation.

Unit–II: Photometry

Colorimetry: Instruments of Colorimetry, components and their functions – Beer Lambert's Law. Spectrophotometer, UV-Visible Spectrophotometer, Types of Spectrophotometer instrumentation and application. Flame Photometry.

Unit–III: Chromatographic techniques

Chromatography - Principle, instrumentation and application of Paper Chromatography, Adsorption chromatography, Ion exchange Chromatography, Thin layer Chromatography, Affinity chromatography, HPLC and GC.

Unit-IV: Electrophoresis

Electrophoretic techniques –principle, Agarose Gel Electrophoresis, SDS-PAGE, Native Gel, 2D gel and gradient Gel Electrophoresis, Pulsed field Gel Electrophoresis (PFGE).

Unit–V: Advanced instrumentation

Spectroscopy – Raman effect, UV-Visible, Mass spectroscopy, Atomic Absorption spectroscopy, NMR –Experimental techniques and instrumentation.

Textbooks

1. Upadhyay, Upadhyay and Nath, *Biophysical chemistry – principles and techniques*, Himalaya publishing home, 3 rd edition , 2002
2. J.Jayaram *Laboratory manual in biochemistry*, Wiley publisher. 1981
3. L.Veerakumari *Bioinstrumentation*, MJP publishers, 1st edition. 2011**.**

BooksforReference:

1. Jayaraman.J. *Laboratory Manual in Bio chemistry*. NewDelhi Wiley Eastern Ltd. 1985.
2. Plummer.D.T. *An Introduction to Practical Biochemistry,* NewDelhi TataMcGrawHill. 1998.
3. P.Palanivelu *Analytical biochemistry and separation techniques-A laboratory manual*, tulsi books centre2nd edition 2001.

4. Keith Wilson and John walker *Principles and techniques of practical biochemistry*, Cambridge University press., 5th edition 2000.
5. Gurumani.N. *Research Methodology for Biological sciences*, Chennai. MJP publishers.2006.
6. D. Holme and H. Peck *Analytical biochemistry*, longman, 3rd edition 1998.
7. Freifelder, *Physical biochemistry- application to biochemistry and molecular biology*, San Fransisco. W.H. Freeman and company, 2nd edition, 1982.

SEMESTER–III			
Skill Based Elective - Vermitechnology			
Course Code:21UMIS32	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Objectives

1. To get the thorough knowledge on making Vermicomposting and vermiculture.
2. To learn about species used in Vermicomposting and Culture techniques of earthworms
3. To study the Vermicomposting production
4. To encourage the self-employment practice and save the human being by the way of minimizing the use of chemical fertilizers.
5. To understand the interaction of earthworms with other organisms

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Select from, use and interpret results of descriptive Vermitechnology methods	6	Ev
CO-2	Demonstrate an understanding the scientific and technological benefits to the rural sector by equipping them with the latest technology and to create the model for the nation	6	Ev
CO-3	gain knowledge earthworms about the various morphology	1	An
CO-4	Communicate the awareness of field sampling using Vermicomposting	5	Un
CO-5	Make appropriate awareness of parasites and predators	5	Un
CO-6	Understand the awareness among the present status and importance of composting methods and Vermicomposting	4	An
CO-7	Understand the waste reduction in Vermicomposting	4	Un
CO-8	Explain the nutrient availability in the Vermicomposting	6	Ev

SEMESTER–III			
Skill Based Elective –Vermitechnology			
Course Code:21UMIS32	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Unit-I: **Earthworm classification**

Morphology and Anatomy. Biology of *Lumbricus terrestris*. – Digestive system–Excretion – Reproduction and Life cycle – Earthworm as farmer's friend.

Unit-II: Vermicomposting materials and their classification

Vermicomposting materials and their classification. Physical, chemical and biological and environmental changes brought by earth worm in soil structure-carbon, nitrogen and phosphorous transformations.

Unit-III: Vermicomposting production

Requirements – Different methods of Vermicomposting – Heap method – Pot method and Tray method – changes during Vermicomposting. Collection and Preservation of earthworms.

Unit-IV: Vermicomposting in Homes

Vermicomposting in Homes, Maintenance of Vermicomposting beds. Earthworm predators, Parasites and pathogens. - Economics of Vermicomposting and vermiwash production. Vermiculture for waste reduction.

Unit-V: Vermicomposting advantages

Role of in plant growth and other applications, Earthworms as animal feed – Medicinal value of earthworm meal– Role of Earthworms in Solid Waste, and Sewage waste management. Earthworms as bioreactors.

Text Book:

Mary Violet Christy. A. *Vermitechnology*– Chennai: MJP Publishers, 2014.

Books forReference:

1. Edwards,C.A .and Bohlen, P.J., *Ecology of earthworms*. Chapman and hall. 3rdEdition, 1996.
2. Ismail,S.A. *Vermicology. The Biology of Earthworms.* London. Orient Longman, 1970.
3. Lee, K.E. *Earthworms-Their ecology and relationship with soil and land use*, Sydney. Academic Press, 1985.
4. Ranganathan L.S. *Vermibiotechnology from soil health to human health*. India: Agrobios, 2006.
5. GuptaP.K. *Vermicomposting for sustainable Agriculture.* India. Agrobios.2008.

SEMESTER-III			
NME I - Food Microbiology			
Course Code:21UMIN31	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Objectives

To highlight student that microorganisms are importance of food, food hygiene, sanitation and food safety

Course Outcome:

CO. No	Upon completion of this course, students Will be able to	PSO addressed	CL
CO-1	To provide knowledge on the importance of Food microbiology	1,4	Un,An
CO-2	Acquire brief knowledge on food microbes And their importance.	1	Un
CO-3	Acquire knowledge on various types of preservation.	6	Co
CO-4	Provide information about the principles of preservation.	1,6	Un
CO-5	Acquire knowledge on contamination and Spoilage problems	1,6	Un
CO-6	Provide interpretation of laboratory tests in the Diagnosis of infectious diseases.	2	Co
CO-7	To understand the mode of transmission of food Poisoning and food infections	6	Co
CO-8	Provide information about the quality control Principles and importance.	1,2	Un

SEMESTER-III			
NME I-Food Microbiology			
Course Code: 21UMIN31	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Unit-I : Food as a substrate for microorganisms

Food as a substrate for microorganisms - factors affecting the growth of microorganism in food. Mold, yeast and bacteria- general characteristics & importance.

Unit-II: Principles of food preservation

Principles of food preservation – Methods of food preservation – asepsis, removal of microorganism anaerobic conditions, high temperature- low temperature, drying and food additives – Canning.

Unit–III: Contamination and spoilage

Contamination and spoilage of milk and milk products, meat and meat products, fish

and fish products, vegetables and fruits and canned food.

Unit-IV: Food Borne diseases

Food Borne diseases: Mode of Transmission –Food Poisoning –Food infection-Bacterial (*Staphylococcal*), Fungal (*Aspergillus*) and Viral infection (*Hepatitis*)

Unit-V: Quality Control

Food Laws and Regulations. Export Act- AGMARK -FPO, FAO-WHO-HACCP- Principles and Importance. intellectual property rights, Introduction to patents

Text Book:

1. Frazier, W.C and Westhoff, D.C *Food microbiology*, 4th edition, New Delhi. Tata Mac Graw Hill, 2008.
2. Adams, M.R and Moss M.O *Food Microbiology* New Age International (p) Limited Publishers. 1995

Books for Reference:

1. Banwart, G.J., Basic *Food Microbiology*, New Delhi. CBS Publishers and Distributors, 2nd Edition 1989.
2. Robinson R.K *Dairy Microbiology*, London. Elsevier Applied science, 1990.
3. Edward Arnold, Hobbs BC Roberts D *Food Poisoning and Food Hygiene*, London., 1993.

Semester – III			
Women's Synergy			
Code : 21UAWS31	**Hrs/ Week : 2**	**Hrs/Sem:30**	**Credits : 2**

Unit I - Physical Health

Woman's Structural Organisation – Levels of organisation – Body image - Reproductive health – Hormonal Cycle and its Psycho-somatic implications – Child birth – lactation – Nutritional status of women.

Unit II – Psychological Health

Examining factors determining psychological conditions of women – Depression, anxiety, stress, hysteria – Socio – cultural and familial conditioning of women's minds – Self Image, Discrimination against women.

Unit III – Women and Legal Awareness

Women specific – centered legislations – legal issues – laws to prevent gender based violence National / State Pro-women schemes – educational and Employment schemes. Laws for protection of Women – Women's rights to property – Women's Rights in the Indian Constitution – Maternity benefit act.

Unit IV – Women and Finance

Manager of domestic finance – Budgeting basics – Create a family budget - Set financial goals – Plan for financial emergencies – Budget for travel – Saving strategies – Investment options

Unit V – Women's Empowerment in Various Domain

Introduction - Women created history in sports and music – P. T. Usha, M. S. Subbulakshmi - Women who crossed hurdles in Social Service – Mother Theresa, Muthulakshmi Reddy, Medha Patkar - Role of Women in Indian independence movement and Politics – Indira Gandhi, Aruna Asaf Ali.

SEMESTER-III	
Self-Study (Optional) - Food Packaging Technology	
Course Code: 21UMISS1	**Credits: +2**

Objectives:

To provide the learners with the best learning experience in packing by self-study education andenabling the students to become entrepreneurs and socially responsible.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	To provide understanding on the consequence of Food microbiology	1,4	Un, An
CO -2	Acquire a brief knowledge on food packing	1	Un
CO-3	Acquire knowledge on various types of food packing	6	Co
CO-4	Provide information about the principle of Packing	1,6	Un
CO-5	Acquire knowledge on special packing techniques	1,6	Un
CO-6	Acquire knowledge on packing techniques and their types	1	Un
CO-7	To provide understanding on the consequence of Labelling and packing rules	1	Un
CO-8	Acquire knowledge on bar coding	1	Un

SEMESTER-III	
Self-Study (Compulsory) - Food Packaging Technology	
Course Code: 21UMISS1	**Credits: +2**

Unit I: Introduction

Introduction – packaging strategies for various environments – functions of package

Unit II: Packaging materials

Packaging materials – cushioning materials – bio degradable packaging materials – shrink and stretch packaging materials.

Unit III: Special Packaging Techniques

Special Packaging Techniques- Vacuum and gas packaging – aseptic packaging

Unit IV: Types of Packaging

Retort pouching –edible film packaging – tetra packaging – antimicrobial packaging – shrinks and stretches packaging.

Unit V: Packaging Rules

Packaging Rules- Labeling- Packaging Techniques - Bar coding.

Text Books:

1. Robertson, G.L. *Food Packaging: Principles and Practice*. 2nd Edition. Taylor and Francis, 2006.
2. Han, Jung H. *Innovations in Food Packaging*. Elsevier, 2005.
3. Ahvenainen, Raija. *Novel Food Packaging Techniques*. Wood Head Publishing, 2003.
4. Mathlouthi, M. *Food packaging and Preservation*. Aspen Publications, 1999.

Books for Reference:

1. Mahadevia, M., Gowramma, R.V. *Food Packaging Materials*. Tata McGraw Hill 2007.
2. Robertson, G. L. *Food Packaging and Shelf life*: A Practical Guide. Narendra Publishing House. 2001.
3. 3. John, P.J. *A Handbook on Food Packaging* Narendra Publishing House 2008.

SEMESTER – IV			
Part-1 பொதுத்தமிழ் - தாள் 4 சங்க இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, நாடகம்)			
Course Code: 21ULTA41	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

Objectives:

- மாணவியருக்கு நல்ல மதிப்பீடுகளைக் கற்பித்து, வாழ்வில் அவற்றைப் பின்பற்ற வழிவகுத்தல்.
- இலக்கியமாந்தரின் மூலம் நல்ல வாழ்க்கை அனுபவங்களைப் பெறச்செய்து தன்னம்பிக்கை, ஆளுமைத் திறம், மொழி அறிவு இவற்றை உருவாக்குதல்.

Course Outcome:

CO.No.	இப்பாடத்திட்டம் மாணவியருக்கு	அறிவுசார் மதிப்பீடு
CO-1	அனுபவ அறிவை வளர்க்கிறது.	நடைமுறைப்படுத்தல்
CO-2	பழந்தமிழர் வாழ்வியல் முறைகளை கற்று பயனடைய உதவுகிறது.	நடைமுறைப்படுத்தல்
CO-3	ஆய்வு நோக்கினை வளர்க்கவும் வாழ்வின் வளர்ச்சி நிலையை மேம்படுத்திக் கொள்ளவும் உதவுகிறது.	நடைமுறைப்படுத்தல், உருவாக்கம்
CO-4	மனிதநேயம், இறைநம்பிக்கை இவற்றை உருவாக்குகிறது.	உருவாக்கம்
CO-5	மொழியைப் பிழையின்றி பேசவும் எழுதவும் உதவுகின்றது.	திறன் மேம்பாடு
CO-6	தனிமனித வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது	நடைமுறைப்படுத்தல், உருவாக்கம்
CO-7	சமுதாய பிரச்சினைகளை எதிர்கொள்ளும் திறம் கிடைக்கிறது.	நடைமுறைப்படுத்தல், திறன் மேம்பாடு
CO-8	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல், திறன் மேம்பாடு

SEMESTER – IV			
Part-1 பொதுத்தமிழ் - தாள் 4 சங்க இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, நாடகம்)			
Course Code: 21ULTA41	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

அலகு - 1 செய்யுள் - 2 மணி

எட்டுத்தொகை

1. நற்றிணை - பாடல்கள் : 64, 318
2. குறுந்தொகை - பாடல்கள் : 3, 20, 75
3. ஐங்குநுறூறு - செலவு அழுங்குவித்தப் பத்து - பாடல்கள் : 304, 307, 308, 309
4. பதிற்றுப்பத்து - பாடல் : 25
5. பரிபாடல் - பாடல் 6 (1-10 அடிகள்)
5. கலித்தொகை - பாடல் : 51
6. அகநானூறு - பாடல்கள் : 20, 194
7. புறநானூறு - பாடல்கள் : 191, 204

பத்துப்பாட்டு

மதுரைக்காஞ்சி - 63 வரிகள்

அலகு -2 இலக்கணம் - 1 மணி

1. **பாவகைகள்** - வெண்பா, ஆசிரியப்பா பொது இலக்கணம்
2. **அணி இலக்கணம்** -
   உவமை, உருவகம், வேற்றுமை, வஞ்சப்புகழ்ச்சி, சிலேடை, தற்குறிப்பேற்றம்
3. வாக்கிய வகைகள்
4. பிறமொழிச் சொற்களை நீக்கி எழுதுதல்
   அ. ஆங்கிலச் சொற்கள்
   ஆ. வடமொழிச் சொற்கள்
   இ. தெலுங்குச் சொற்கள்

அலகு 3 இலக்கியவரலாறு - 1 மணி

1. எட்டுத்தொகை நூல்கள்
2. பத்துப்பாட்டு நூல்கள்
3. சங்க இலக்கியத்தின் தனிச்சிறப்புகள்
4. நாடகம் - தோற்றமும் வளர்ச்சியும்

அலகு - 4 உரைநடை - 1மணி

இலக்கியத் தென்றல் - தமிழ்த்துறை - கட்டுரைத் தொகுப்பு,
தூய மரியன்னைகல்லூரி (தன்னாட்சி), தூத்துக்குடி

அலகு -5 நாடகம் - 1 மணி

ஆயிரம் பூக்கள் மலரட்டும் - கீழ்க்குளம் வில்லவன்

II B.A., / B.Sc Part I FRENCH

SEMESTER – IV			
Course Title : PART – I French Paper – IVFrench Course and Literature			
Course Code : 21ULFA41	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 4**

Objectives

To create and develop the taste for literary readings in the target language.
To motivate students to appreciate the French literature.

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	comprehend the French literary background	Un, An
2.	imbibe the basic grammatical structures of the language	Un, An
3.	inculcate the values imparted through the literary texts	Un, An
4.	appreciate simple literary texts	An, Ap
5.	acquire literary knowledge and enhance aesthetic perception	An, Ap
6.	explore a literary text, with the perspective of analyzing the content and manner of writing	An, Ap
7.	reflect upon the author's ideas and transform her own personality	Ap, Cr
8.	discover, interrogate and reflect on the humanistic value	Cr
9.	understand the history of France	Un

Unit 1 – XVII^{e}siècle

1.1 – Le Corbeau et le Renard - Jean de la Fontaine
1.2 – Le Petit Chaperon Rouge - Charles Perrault
1.3 – Le Passe Composé

Unit 2 – XVIII^{e}siècle

2.1 – Zadig : La danse - Voltaire
2.2 – La Révolution française
2.3 – L'imparfait

Unit 3 – IX^{e}siècle

3.1 – Chansons d'automne - Paul Verlaine
3.2 – Le Père Goriot *(extrait)* - Honoré de Balzac
3.3 – Les Pronoms relatifs

Unit 4 – XX^{e}siècle

4.1 – Le Pont Mirabeau - Guillaume Apollinaire
4.2 – L'Etranger *(extrait)* - Albert Camus
4.3 – Les Indicateurs temporels

Unit 5 – La littérature francophone

5.1 – Le Grand Cahier*(extrait)* - Agota Kristof
5.2 – Le fils à la recherche de sa mère- Pape Faye
5.3 – Le Futur proche et le futur simple

Books, Journals and Learning Resources

- K. Madanagobalane, N.C.Mirakamal.*Le Francais par les Textes*. Chennai :Samhita Publications, 2019.
- Blondeau Nicole, Allouache Ferroud jà, Ne Marie-Françoise.*Littérature Progressive du Français*.Paris : CLE International,2004.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I*. Paris : CLE International, 2003.
- Akyuz Anne,Bazelle-Shahmaei Bernadette, Bonenfant Joelle, GliemannMarie-Francoise.*Les 500 exercices de grammaire*. Paris : Hachette livre,2005
- Grégoire Maria.*Grammaire Progressive du français*. Paris :CLE International,2002.
- Sirejols Evelyne, TempestaGiovanna,Grammaire. *Le Nouvel Entrainez-vous avec 450 Nouveaux Exercices.* Paris : CLE International, 2002
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.conte-moi.net/node/120

SEMESTER – IV			
Part II English Poetry, Prose, Extensive Reading and Communicative English - IV			
Course Code 21UGEN41	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Objectives:

- To advance students' understanding of literary art and writings of universal appeal.
- To further the proficiency of communicative English through literary studies.

Course Outcome:

CO.No.	**Upon completion of this course, students will be able to**	**PSO Addressed**	**CL**
CO-1	understand better the language and literary components of texts	2,8	Un
CO-2	gain deeper insight into literary experience and expressions of writers	8	Un
CO-3	comprehend sentence types and its application	5	Un
CO-4	be competent in conversational and functional English	1	Ap
CO-5	rightly employ verbal and non-verbal communication skills	2,4,10	Ap
CO-6	adopt right perspectives of human values for life	10	Ap
CO-7	develop skills of creative/ formal writing and speech	3,7	Cr
CO-8	face interviews and competitive exams with confidence	6,10	Ap

SEMESTER - IV			
Part II English Poetry, Prose, Extensive Reading and Communicative English - IV			
Course Code :21UGEN41	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Unit I –Poetry

John Keats – Bright star, would I were steadfast
E.E. Cummings – I carry your heart with me
Jayanta Mahapatra – Relationship

Unit II – Prose

Helen Keller – Three Days to See
Jerzy Kosinski – TV as a Baby Sitter
Bhabani Bhattacharya – Names are not Labels

Unit III – Fiction

Thomas Hardy – *Tess of the d' Urbervilles* (Abridged Version)

Unit IV – Grammar

Types of Sentences, Transformation of Sentences

Unit V – Communication Skills

Verbal and Non-Verbal Communication, Interview, CV- Resume, Presentation Skills

Text Books:

Units I – III – Compiled by the Research Department of English.

Units IV – Joseph, K.V. *A Textbookof English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Unit V – CLIL (Content& Language Integrated Learning) – Module IV by TANSCHE.

SEMESTER – IV			
Core – IV– Molecular Biology and Microbial Genetics			
Course Code: 21UMIC41	**Hrs/Week- 4**	**Hrs/Sem: 60**	**Credit: 4**

Objectives:

1. To provoke excellence about various aspects of microbial genetics and molecular biology of microorganisms.
2. To enhance knowledge about genetic material of microbes and their mutations.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	explain the basic knowledge about the microbial genetic material and its functions.	6	U n
CO-2	compare various types of bacterial plasmids, their types, and its functions.	5	U n
CO-3	interpret the role and properties of transposons and IS elements.	7	U n
CO-4	illustrate various mechanisms involved in bacteriophage cycle.	5	U n
CO-5	improve the knowledge about structure and classification of bacteriophage and their mode of replication.	6	Cr
CO-6	classify various mutations takes place in microbial genetics.	8	Un
CO-7	compare various gene transfer mechanisms	7	Un
CO- 8	recall transformation and transduction and their classification	5	Re

SEMESTER – IV			
Core – IV– Molecular Biology and Microbial Genetics			
Course Code: 21UMIC41	**Hrs/Week- 4**	**Hrs/Sem: 60**	**Credit: 4**

Unit –I: Basics of Genetics

Genetics- Historical Introduction- experiments of Griffith, Avery, Hershey and Chase - DNA structure - RNA – types, structure. RNA as the genetic material - Genetic code. Replication of DNA and enzymology of DNA replication.

Unit –II: Bacterial plasmids

Bacterial plasmids (F-plasmid, R plasmid, col plasmid, degradative plasmid, virulence plasmid, Ti Plasmid) - Structure, types and properties of plasmids- Plasmid replication- Transposons and IS elements- Structure, types and properties.

Unit- III: Central Dogma and Bacteriophages

Transcription – Reverse transcription, Reverse transcriptase -Translation – Bacteriophages - Classification based on structure and genetic material - Lytic cycle and lysogenic cycle (T4 and Lambda phage only).

Unit- IV: Mutations

Mutations- Spontaneous (Substitution, Spontaneous Deamination of 5-Methyl cytosine, Frameshift Mutation) induced (Chemical mutagens-Base Analogues, Chemicals changing the specificity of hydrogen bonding, Alkylating agents, intercalating agents) Rations as mutagens (UV and X-rays) Genotypic and phenotypic mutants- Reversion and suppression- Ames test.

Unit –V: Gene transfer mechanisms

Gene transfer mechanisms- Conjugation (Cell transmissible plasmids, F factor and Hfr strains- Transformation (Natural transformation, competence, DNA uptake, role of natural transformation, artificially induced competence and electroporation) - Generalized and specialized transduction.

Text Books:

1) Dubey R.C., and Maheshwari, S. *A Text Book of Microbiology,* NewDelhi: S.Chand & Co, 2003.
2) Jayanthi G.P. *Molecular biology,* Chennai: MJP publishers, 2008.
3) Freifelder D., *Molecular Biology*, New Delhi: Narosa publishing house, 1991.

Books for Reference:

1. Watson, J.D., Hopkins N.H., Roberts JW.,Steitz J.A and Weiner A.A.M. *Molecular Biology of the gene.* The Benjamin cummings publishing company. 1987.
2. Lewin B. *Genes IX*. UK: Oxford University press, 2007.
3. Talaro, K.P., Andtalaro. A. *Foundations in Microbiology.* New York: WCP McGraw- Hill,1999.
4. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology*. New York: McGraw-Hill Inc,1993.
5. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology.* New York: McGraw-Hill Inc, 7th edition. 2008.

SEMESTER IV			
Core Practical IV - Laboratory in Molecular Biology and Microbial Genetics			
Course Code:21UMICR4	**Hrs/Week: 2**	**Hrs/Sem : 30**	**Credit : 2**

Objectives:

1. To impart basic level laboratory training in the subject of Microbial genetics.
2. To extend the fundamental knowledge of molecular biology and to provide the highest of genetical studies towards research field.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO Addressed	CL
CO-1	examine spontaneous mutants.	4	An
CO-2	examine induced mutant by UV	5	An
CO-3	analyze antibiotic resistant mutant by gradient plate technique.	6	An
CO-4	examine UV induced auxotrophic mutants by replica plate technique.	4,5	An
CO-5	demonstrate plasmid DNA from *E.coli*	8	Un
CO-6	demonstrate AGE	7	Un
CO-7	demonstrate conjugation in bacteria by genetic recombination.	8	Un
CO-8	demonstrate PCR.	7,8	Un

SEMESTER IV			
Core Practical IV - Laboratory in Molecular Biology and Microbial Genetics			
Course Code: 21UMICR4	**Hrs/Week : 2**	**Hrs/Sem: 30**	**Credit : 2**

1. Plasmid DNA isolation from *E.coli*
2. Isolation of spontaneous mutants.
3. Isolation of induced mutant by UV
4. Isolation of antibiotic resistant mutants by gradient plate technique
5. UV induced auxotrophic mutants production and isolation of mutants by replica plating technique
6. Screening and isolation of phage from sewage.
7. Agarose Gel Electrophoresis
8. Genetic recombination in Bacteria by conjugation (Demonstration)
9. Preparation of competent cell
10. Bacterial Transformation (Demonstration).

Books for Reference:

1. Cappuccino., and Sherman. N. *Microbiology – A Laboratory Manual.* New York: Benjamin Cummins. 1996.
2. Gunasekaran. *Laboratory Manual in Microbiology*. New Delhi: New Age International Ltd.,Publishers, 1996.
3. Jayaraman, J., *Laboratory Manual in Biochemistry.* New Delhi: Wiley Eastern Ltd., 1985.
4. Kannan. N. *Laboratory Manual in General Microbiology*. Palani: Palani Paramount Publication, 1996.
5. Sunderaraj., *Microbiology – Laboratory Manual.* Chennai: Publn. Sunderaraj. T, 1st Edition.2005.

SEMESTER – IV			
Allied – IV – Mushroom Technology			
Course Code: 21UMIA41	**Hrs/Week : 4**	**Hrs/Sem : 60**	**Credit : 3**

Objectives

1. To facilitate the students with wide knowledge about the mushroom technology.
2. To inculcate the deep knowledge on mushroom technology.

Course Outcome:

CO N0	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO-1	explain about the detailed information of edible and non – edible mushroom.	4	Un
CO-2	compare the cultivation of various types of mushrooms.	5	Un
CO-3	construct the mushroom house.	6	Cr
CO-4	compare different types of mushroom cultivation techniques and pure culture preparation.	7	An
CO-5	explain about economics of mushroom cultivation and their precaution.	6	Un
CO-6	interpret about the different modes of storage of mushroom.	5	Un
CO-7	illustrate about the various nutrition content present in mushroom.	4	Un
CO-8	make use of various types of foods prepared from mushroom.	6	Ap

SEMESTER – IV			
Allied – IV – Mushroom Technology			
Course Code: 21UMIA41	**Hrs/Week : 4**	**Hrs/Sem: 60**	**Credit : 3**

Unit – I : Mushroom morphology

Different parts of a typical mushroom & variations in mushroom morphology. Key to differentiate edible from poisonous mushrooms. Button, Oyster and King mushroom (*Ganoderma)*- General morphology, distinguishing characteristics, spore germination and life cycle. Historical account on mushroom cultivation.

Unit - II: Cultivation Technology

Infrastructure, spawn lab, equipments and substrates in mush- room cultivation: Casing; raw material used for casing, preparation of casing material; important sanitation during various stages of mushroom cultivation. Precautions in mushroom cultivation – area selection, spawn preparation, spawn run, harvesting, pest management.

Unit – III: Cultivation of mushrooms

Steps involved in cultivation - Button Mushroom, Oyster mushroom and King mushroom (*Ganoderma)*

Unit –IV: Storage and nutrition

Short time storage, Long term storage, Drying , Storage in salt solutions. Nutrition – Proteins, Amino acids , Mineral elements; Carbohydrate , Vitamins , Crudefibre content.

Unit – V: Health benefits of Mushroom & Value added products

Health benefits of Mushroom: Antiviral value, antibacterial effect, antifungal effect, anti-tumour effect, hematological value cardiovascular & renal effect, in therapeutic diets, adolescence, for aged persons & diabetes mellitus.

Value added products - Mushroom - Soup, Pickles, Powders, Jams ,Cutlet, Omelette , Samosa , Curry, mushroom biscuits, mushroom ketchup, mushroom chips, mushroom candy.

Text Books:

1) Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R, *Oyster Mushrooms, Department of Plant Pathology,* Coimbatore: Tamil Nadu Agricultural University, 1991.
2) Nita Bahl, *Hand book of Mushrooms,* II Edition, Vol. I & Vol. II: 1988.

Books for Reference:

1. Biswas S., Datta M. and Ngachan S.V. *Mushrooms: A Manual for Cultivation,* PHI. 2012.
2. Zadrazil F. and Grabbe K. *Edible Mushroom, Biotechnology* Vol. 3, Berlin: Wein- heim: Verlag Chemie, 1983.
3. Changs T. and Hayanes W.A. (Ed.) *Biology and Cultivation of Edible Mushrooms.* New York: Academic Press. 1978.
4. Tewari, Pankaj Kapoor, S.C., *Mushroom cultivation*, Delhi: Mittal Publications, 1988.

SEMESTER – IV			
Allied Practical – IV –Laboratory in Mushroom Technology			
Course Code : 21UMIAR4	**Hrs/Week : 2**	**Hrs/Sem : 30**	**Credit : 1**

Objectives

1. To provoke excellence for training and practicing in the field of mushroom cultivation technology.
2. To promote and encourage the entrepreneurship quality of every students for developing and providing them with a sustainable and profitable environment.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Give outline about the field of mushroom technology	1	Un
CO -2	explain the cultural characteristics of mushroom	1	Un
CO-3	develop the basic requirements for the high production of mushroom	4	Cr
CO-4	interpret the laboratorial concept of mushroom technology	2	Un
CO-5	to develop the mushroom cultivation skill	2	Cr
CO-6	analyze the nutritional significance of mushroom in our day to day life	2,3,4	An
CO-7	explain the purpose of mushroom of cultivation	1	Un
CO-8	organize students to develop mushroom cultivation farms to encourage their entrepreneurship.	2,3,4	Ap

SEMESTER – IV			
Allied Practical – IV –Laboratory In Mushroom Technology			
Course Code: 21UMIAR4	**Hrs/Week- 2**	**Hrs/Sem – 30**	**Credit – 1**

1. Isolation and purification – Tissue culture technique
2. Preparation of mother spawn
3 Preparation of first and second generation spawn
4 Preparation of mushroom bed using paddy straw / sugar cane wastes
5. Qualitative analysis of protein in the mushrooms
6. Qualitative analysis of sugar in the mushrooms
7. Qualitative analysis of lipid in the mushrooms
8. Preparation of value added products mushroom pickles
9. Preparation of value added products mushroom soup
10. Visit to mushroom industry

Books for Reference:

1 Biswas S., Datta M. and Ngachan S.V. *Mushrooms: A Manual for Cultivation*, PHI. 2012.

2 Zadrazil F. and Grabbe K. *Edible Mushroom, Biotechnology* Vol. 3, Berlin: Weinheim: Verlag Chemie,1983.

3 Changs T. and Hayanes W.A. *Biology and Cultivation of Edible mushrooms.* New York: AcademicPress. 1978.

4 Tewari, Pankaj Kapoor, S.C., *Mushroom cultivation*, New Delhi: Mittal Publications, 1988.

5 Marimuthu, T. Krishnamoorthy, A.S. Siva prakasam, K. and Jayarajan. R , *Oyster Mushrooms*, Department of Plant Pathology, Coimbatore: Tamil Nadu Agricultural University, 1991.

6 Swaminathan, M. *Food and Nutrition*. Bappco, No.88, Mysore Road, Bangalore – 560018 : The Bangalore Printing and Publishing Co. Ltd.,. 1990.

7. Nita Bahl ,. *Hand book of Mushrooms,* II Edition, Vol. I & Vol. II. 1984-1988.

SEMESTER – IV			
Skill Based Elective - Practical in Medical Laboratory Technology			
Course Code:21UMIS41	**Hrs/week : 2**	**Hrs/Sem : 30**	**Credit: 2**

Objectives:

The Medical Laboratory Technology graduates excel as innovative practitioners committed to excellence and a collaborative and healthy work environment. These graduates play a vital role in the provision of quality health care and in scholarship for the advancement of self, the profession and society.

Course Outcome:

CO NO.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the laboratory practices and know how to maintain the laboratory instruments	1,2	Un
CO-2	analyze and distinguish various types of blood groups	2,3,4	An
CO-3	evaluate the culture tests and understand the pathological diseases of humans	2,4	An
CO-4	analyze the physical, chemical and microscopic analysis of culture samples	2,3	An
CO-5	perform various techniques on isolation of microorganisms for various sources	2	Ap
CO-6	understand the ESR and CRP tests for analysis	1,2	Un
CO-7	perform the qualitative tests for carbohydrates and proteins	2	Ap
CO-8	analyze and isolate the microbes from blood	3,4	An

SEMESTER – IV			
Skill Based Elective - Practical in Medical Laboratory Technology			
Course Code:21UMIS41	**Hrs/week : 2**	**Hrs/Sem : 30**	**Credit: 2**

1. Separation of blood and serum
2. Collection and preservation of blood sample.
3. Estimation of glucose
4. Estimation of cholesterol
5. Identification of carbohydrates (Qualitative test)
6. Identification of proteins (Qualitative test)
7. Staining of blood smear
8. Examination of urine- physical, chemical, & microscopic
9. Urine analysis: Glucose, protein, urea, creatinine and billirubin.
10. Culture tests- urine, nasal, throat swab, stool & pus
11. Antimicrobial susceptibility testing
12. Pregnancy test
13. ESR
14. CRP- Demonstration.
15. Testing of malarial parasite.
16. Testing of stool samples for parasites (ova & cysts)
17. Isolation & identification of Mycobacteria- Demonstration
18. Cultivation & identification of protozoa
19. Identification of *Escherichia coli* from urine sample
20. Isolation of bacteria from blood.

Books for Reference:

1. Cappucino.J.G., and Sherman. N. *Microbiology – a laboratory manual.* New York: BenjaminCummins. 1996.
2. Kannan.N. *A laboratory manual in general Microbiology*. Palani: Palani paramount publication, 1996.
3. Gunasekaran. P. *Laboratory manual in Microbiology.* New Delhi: A new age International Ltd.,publishers, 1996.
4. Sundaraj. T. *Microbiology – A laboratory manual.* Chennai: Sundaraj.1st Edition Publication. 2005.
5. Jayaraman. J. *Laboratory manual in Biochemistry*. New Delhi: Wiley Eastern Ltd., 1985.
6. Plummer. D.T. *An introduction to Practical Biochemistry*. New Delhi: Tata McGraw Hill, 1998.
7. Benson. *Microbiological applications – A Laboratory Manual in General Microbiology.* Mc.Graw Hill Higher Education. International Edition, 2002.
8. Renganathan. S., Gkul Shankar S., Ranjit.M.S, Pankajalakshmi.V.,Sivramakrishnan.M., Selvakumar.B.N., and mohhamedaejaz. *Fungal Diseases and Diagnosis*. (Vol I): 2001.
9. Kanai Mukerjee L., *Medical Laboratory Technology – A procedure manual for routine diagnosis tests*- Tata mc Graw Hill Publishing Co. Ltd., New Delhi: Vol III.2005
10. Rajan S., Selvi Christy R., *Experimental procedures in Life Sciences.* Chennai: Anjanaa Publishers, 2010.

SEMESTER – IV			
Skill Based Elective- Practical in Parasitology			
Course Code:21UMIS42	**Hrs/week : 2**	**Hrs/Sem : 30**	**Credit:2**

Objectives:

Parasitology focuses on medical parasites and includes their morphology, lifecycle, and the relationship with host and environment. These graduates play a vital role in the provision of quality health care and in scholarship for the advancement of self, the profession and society.

Course Outcome:

CO NO.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the laboratory practices and know how to maintain the laboratory instruments	1,2	Un
CO-2	analyze and distinguish various types of stool samples	2,3,4	An
CO-3	evaluate the culture tests and understand the patho-logical diseases of humans	2,4	An
CO-4	analyze the detection of Ascaris, *E. histolytica* in from sputum sample.	2,3	An
CO-5	perform various techniques on isolation of micro-organisms for various sources	2	Ap
CO-6	understand the blood smear by field's stain.	1,2	Un
CO-7	perform the examination of *Leishmania* spp. from blood parasites	2	Ap
CO-8	analyze and isolate the microbes from blood	3,4	An

SEMESTER – IV			
Skill Based Elective- Practical in Parasitology			
Course Code: 21UMIS42	**Hrs/week : 2**	**Hrs/Sem : 30**	**Credit:2**

1. Laboratory safety guidelines.
2. Collection and Preservation of stool specimen.
3. Identification of intestinal parasites- microscopic method
4. Examination of stool sample by saline wet mount method.
5. Iodine wet preparation of the fresh stools.
6. Formalin-Ether concentration method for stool sample.
7. Concentration of stool parasites.
8. Sedimentation method of stool sample.
9. Floatation method of stool sample.
10. Agar plate test for strongloides.(Demonstration)
11. Detection of *Schistosoma haematobium* in urine sample.
12. Detection of *Trichomonas vaginalis* from vaginal swabs.
13. Detection of Ascaris, *E. histolytica*in from sputum sample.
14. Preparation and staining of thick and thin smear for *plasmodium* spp.
15. Examination of blood smear by field's stain.
16. Examination of blood smear by Giemsa stain.
17. Examination of *Leishmania* spp. from blood parasites by Leishman's staining
18. Hematoxylin stain for microfilaria. (Demonstration)

REFERENCES

1. LTLP Broad sheet 11 . *Methodology update.* Section 4.3.oct 11,1990.
2. Garcia LS, Bruckner DA. *Diagnostic Medical Parasitology.* Washington DC: ASM press. 3rd edition. 1997.
3. Neva FA, Brown HW. *Basic clinical parasitology.* Appleton and Norwalk Connecticut. 6th edition. 1994.
4. Ash LR Oreil TC. *Atlas of human parasitology.* Chicago: ASCP press. 4th edition. 1997.
5. Honigberg, B.M. *Trichomonads parasitic in human* . New York: springer-verlag, 1989.

6. Wilcox .A. *Manual for the microscopical diagnosis of malaria in man.* Washington, D.C: U. S department of health,Education and welfare. 1960.
7. Basic malarial microscopy World health organization, Geneva, Switzerland.1991.
8. National committee for Clinical Laboratory Standards. Use of film examination for parasites tentative guideline M15-T National committee for Clinical laboratory standards ,Villanova, PA, 1992.

SEMESTER-IV			
NME II-Clinical Microbiology			
Course Code: 21UMIN41	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Objectives

1. To gain knowledge on the relevant clinical examples of bacterial, viral, fungal, and parasitic pathogens and the diseases they cause. To understand pathogenic microorganisms and the mechanisms by which they cause disease in thehuman body.
2. To develop informatics and diagnostic skills, including the use and interpretation of laboratory test in the diagnosis of infectious diseases

Course Outcome:

CO No	Upon completion of this course students will be able to	PSO addressed	CL
CO-1	Provide knowledge on the importance of Clinical microbiology	1,4	Un,An
CO-2	Acquire knowledge on normal flora on human body.	1	Un
CO-3	Acquire knowledge on various types of diseases.	6	Co
CO-4	Provide information about the mechanisms of Infectious disease transmission	1,6	Un
CO-5	Acquire knowledge on causative agent, treatment, prevention and control measures.	1,6	Un
CO-6	Provide interpretation of laboratory tests in the Diagnosis of infectious diseases.	2	Co
CO-7	understand the importance of pathogenic bacteria in human disease with respect to in-fections of the respiratory tract, gastrointes-tinal tract, urinary tract, skin and soft tissue.	6	Co
CO-8	Develop basic skills necessary to work in the Microbiology laboratory.	1,2	Un

SEMESTER-IV			
NME II-Clinical Microbiology			
Course Code:21UMIN41	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Unit-I: Basics of Clinical Microbiology

Sources of infection- Routes of transmission-control measures-Testing by Koch's postulates – Antibiotic sensitivity testing

Unit-II: Bacterial pathogens

Bacterial pathogens- *Streptococcal,Staphylococci, E. coli Pseudomonas,and Vibrio cholerae.*

Unit–III: Fungal pathogens

Fungal pathogens- Mycosis, *Candida, Aspergillus-Dermatophytes*

Unit-IV: Viral pathogens

Viral pathogens- Polio, Rabies virus, Dengue, AIDS and CoronaVirus.

Unit-V: Protozoan pathogens

Protozoan pathogens - *E.histolytica*, Plasmodium, Giardia, Taenia solium, Ascaris

Text Books:

1. Ananthanaryanan R and Panikar J, *Textbook of Microbiology*, Orient Longmans. 2000.
2. Rajan.S. *Medical Microbiology*, Chennai, MJP Publisher, 2007.

Books for Reference:

1. Kanai L Mukherjee, *Medical Laboratory Technology,* India, McGraw Hill Education; 2nd edition. 24 June 2010.
2. Salle, A.J. *Fundamental Principles of Bacteriology*. New Delhi, TataMcGraw-Hill Publishing Company Ltd.(7thedition), 1996.
3. PelczarJr.,M.J,.Chan.E.C.S. and Kreig, N.R.*Microbiology,* New York: McGrawHillInc.,

SEMESTER- IV			
Ability Enhancement Course: Yoga and Meditation			
Code: 21UAYM41	**Hrs/Week : 2**	**Hrs/Semester : 30**	**Credits: 2**

Course Outcome:

- To learn and practice various meditation, yoga methods to transform the ordinary life into a healthy, harmonious life leading to holistic wellbeing,
- To create an eco-friendly, loving and compassionate world.
- Acquire knowledge and skill in yoga for youth empowerment.
- Increase their power of concentration
- Learn the causes and ways to overcome fear and sadness.
- Create a ecofriendly, loving and compassionate world.

Unit I: Meditation (6 Hrs)

Meditation – Purposes of meditation– Major types of meditations: Zazen, Mindfulness, Vipasana, Yoga, Self-inquiry, Listening, Qi Gong, Taoist, Tantra– Health benefits of meditation: physical, psychological, spiritual–Meditation and Silence:Silence of the body, mind, heart,and beyond – General methodology of meditation – Tips for better meditation

Exercises: Practicing Zazen meditation – Self-enquiry meditation exercises

Unit II: Self-Awareness (6 Hrs)

Awareness – Self-awareness – Importance of self-awareness – Shades of self-awareness – Difference between Awareness and Concentration – Power of concentration – Levels of concentration – How to increase concentration? – Beauty of living here and now – Ways to develop your presence – Self-awareness and Ecology: interconnectedness

Exercises: Body Scan exercise – Self-Witnessing exercise – Eating Raisin with full awareness

Unit III: Yoga (6 Hrs)

Meaning and importance of yoga – Yoga and human physical system – Principles of Yoga – Different types of yoga – Yoga and balanced diet – Yoga and energy balance – Pranayama – Surya namaskaram– Basic asanas for healthy life – Therapeutic benefits of simple yogasanas – Naturopathy for common ailments.

Exercises:Practicing basic Asanas – Doing Sun Salutation

Unit IV: Mindfulness (6 Hrs)

Definition of mindfulness – Three components of mindfulness– Benefits of mindfulness – Mindfulness and Brainwave patterns – Myths about mindfulness – Scientific Facts about mindfulness – Formal method to practice mindfulness – Qualities of Mindfulness – Obstacles for mindfulness – informal ways of practicing mindfulness – Mindfulness to get rid of addictions

Exercises: Practice Mindful Walking –Practice Mindful Talking

Unit V: Heartfulness (6 Hrs)

Attitude to life – Power of positive attitude – Techniques to develop positive attitude – Positive vs negative people – Forms of negative attitude – Heartfulness – Managing fear: Basic 5 fears, Ways to overcome fear–Handling anger: Anger styles, Tips to tame anger – Coping with sadness: Causes and ways to overcome sadness, dealing with depression – Ultimacy of compassion: Compassion to oneself, towards others: Forgiveness, to nature: Seeing God in all

Exercises: Practice Loving-Kindness meditation– Doing compassionate actions

Text Book:

1) Thamburaj Francis. *Meditation and Yoga for Holistic Wellbeing.* Trichy:Grace Publication. 2019.

Books References:

1) Osho. *Meditation the Only Way.* New Delhi: Full Circle Publication, 2009.
2) Thamburaj Francis. *Journey from Excellence to Godliness: Zen Meditation for Transformation.* Grace Publication, Trichy, 2017.
3) Osho. *Awareness: The Key to Living in Balance.* New York: St.Martin's Griffin Publication, 2001.
4) Tolle Eckart.*The Power of Now: A Guide to Spiritual enlightenment.* New World Library, 2004.
5) Swami Gnaneswarananda. *Yoga for Beginners.* Calcutta: Sri Ramakrishna Math, 2010.
6) HanhThichNhat. *The Miracle of Mindfulness: An Introduction to the Practice of Meditation.* Beacon Press, 2016.
7) Kamlesh D. Patel and Joshua Pollock. *The Heartfulness Way: Heart-Based Meditations for Spiritual Transformation.* Westland Publications, 2018.

SEMESTER- IV	
Self-Study (Optional) -Probiotics	
Course Code: 21UMISS2	**Credits: +2**

Objectives:

To provide the learners with the best learning experience in Probiotics by self-study education and enabling the students to become entrepreneurs and socially responsible.

Course Outcome

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recall the basic knowledge on probiotics	3	Re
CO -2	acquaint with characteristics of probiotics	1,2	Kn
CO-3	analyse the aware the probiotics organisms.	2	Ev
CO-4	interpret the knowledge on the roles of probiotics.	1,2	Ap
CO-5	differentiate the probiotics and prebiotics	1,2	Co
CO-6	explain the concept of mechanisms of probiotics	2	Un, Ap
CO-7	grasp the knowledge about prebiotics.	2,3	An
CO-8	know the wealth of the probiotics and prebioticsm	2	Kn

SEMESTER-IV	
Self-Study (Optional) -Probiotics	
Course Code: 21UMISS2	**Credits: +2**

Unit I: Probiotics

Probiotics: Introduction and history of Probiotics, Probiotic microorganisms.

Unit II: Characteristics of Probiotics

Characteristics of Probiotics for selection: Tolerance to additives, stability during storage, stability maintenance of probiotic microorganisms.

Unit III: Role of Probiotics

Role of Probiotics in health and disease: prevention and treatment of gastero-intestinal bacterial infection treatment of chronic urinary tract infection, antitumor and cholesterol level

Unit IV: Mechanism of probiotics

Mechanism of probiotics: production of antimicrobial substances, modulation of immune system, alteration of intestinal bacterial metabolite action

Unit V: Prebiotics concepts

. Prebiotics: concept, definition, criteria, types and sources of prebiotics, prebiotics and gut microflora - Prebiotics and health benefits: mineral absorption, immune response, cancer prevention, elderly health and infant health, prebiotics in foods.

Books for References:

1. Salminen. S and Wright , A. V. *Lactic Acid Bacteria*, Marcel Dekker.1998.
2. Glenn R. G. Marcel R. *Handbook of Prebiotics* CRC press. 2008.
3. LeeY K, Salminen S . *Handbook of Probiotics and Prebiotics* . AJohn Willeyand Sons Inc. Publication 2009.
4. SandholmT. M. Saarela M. *Functional Dairy Products* CRC Wood-head Publishing Limited 2003.

.

SEMESTER-V			
Core V- Psychology and Microbiology for Healthcare			
Course Code: 21UBCC51	**Hrs/Week:6**	**Hrs/Sem:90**	**Credit:3**

Objectives

1. To familiarize the concepts of psychological aspects in health.
2. To understand the complex interactions of biological, psychological, social factors of humanhealth and disease.

Course Outcome:

CO. No	Upon completion of this course, students Will be able to	PSO addressed	CL
CO-1	Learn the nature of psychology and microbiology	1	Re
CO-2	Understand the importance of human system	1	Re
CO-3	Gain knowledge about the acute stressors.	2	Un
CO-4	Analyze the various problems in menstrual cycle	5	An
CO-5	Develop proper lifestyle	3	Cr
CO-6	Understand about sleep related disorders	6	Un
CO-7	Create depth knowledge about the warning and health Risk	2	Un
CO-8	Evaluate the concept of healthcare.	4	Ev

SEMESTER-V			
Core V- Psychology and Microbiology for Healthcare			
Course code:21UBCC51	**Hrs/Week:6**	**Hrs/Sem:90**	**Credit:3**

Unit I: Introduction

Introduction to Microbiology - The History and Contributions of Microbiology (Antony Van Leeuwenhoek, Joseph Lister, Pasteur, Robert Koch,) Classification of microorganisms (Bacteria, fungi, virus), Applied fields of Microbiology.

Psychology as a science -Schools of Psychology, Various fields in psychology, Nature and Scope of Psychology.

Unit II: Psycho neuro immunology

Introduction and historical overview of Immune system, Basic Immunology- Specific immune mechanisms and functions – Immunomediators: [Immune-specific (e.g., cytokines); Non-immune-specific (e.g., aging, sleep)], Neuroimmunology- Lymphocyte neurohormonal receptors. Human stressor - Laboratory acute stressor effects on immunity.

Unit III: Psycho physiological disorders

Personality disposition. CHD, Asthmatics, Allergy, Eczema, Hiding, Rheumatoid Arthritis, Peptic Ulcer, Diabetes and menstrual disorders.

Unit IV: Life -style factors

Keeping the motor running -Neurobiological process that govern exercise, related psychological effects. Nutrition, eating -related process, overweight and obesity -making changes -Healthy foods-public health-Sleep, Sleep Disorders, accidents at work and at home.

Unit V: Dealing with illness and COVID

Recognizing illness symptoms and what needs to be done- recognizing warning and health risks COVID - Disease, Testing, Symptoms, Treatment. Spread of COVID and its Prevention. COVID - Physical health issues and Mental health issues. COVID Vaccine in India.

Textbooks:

1. Cacioppo,J.T., Tassinary, L.G.,& Berntson, G.G Hand book of Psychophysiology..Cambridge, UK: Cambridge University Press. III edition 2007.
2. Marks,D.F., Murray, M.,Evans,B.,& Estacio,E.V. Health Psychology India; , SagePublication.2006.
3. ThomasJ. Kindt, RichardA. Goldsby, BarbaraA. Osborne. Kuby Immunology. NewYork W.H. Freeman and Company.VI edition. 2007.
4. Wiley,Sherwood,Woolverton. *Prescott'sMicrobiol gy*. McGraw Hill International XIX Edition. 2014.

Books for Reference:

1. Sarafino, E.P .*Health Psychology*. NewYork, John Wiley & Sons Inc. 1999.
2. Hymie Anisman, *Health Psychology*. India, Sage publication Ltd. 2016.
3. Taylor,S.E. *Health Psychology*. India, McGraw-Hill Education. 2014.
4. Vaman Rao.C. *Immunology*. New Delhi: Narosa Publishing House,. 2nd Edition, 2007.

SEMESTER–V			
Core–VI-Immunology			
Course code:21UMIC51	**Hrs/Week-4**	**Hrs/Sem–60**	**Credit–4**

Objectives:

1. To discuss the role of immune system in maintaining health
2. To identify cellular and molecular mechanism of immune response
3. To understand the basis of self and non-self-immune reaction
4. To study about various kinds of immune cells and organs

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Explain the structural features of the components of the immune System and functions.	4	Un
CO-2	Compare humora land cellular immunity and their relative significance.	4	Un
CO-3	interpret the characteristics of antigen and antibody reactions.	4	Ev
CO-4	Influence of the roles of the immune system in both maintaining health and contributing disease.	4	Ev
CO-5	Influence the immunological response and how it is triggered and regulated.	4	Ev
CO-6	analyze about the pathogenesis of disease ,effect, treatment and maintenance to prevent disease.	4	An
CO-7	Compare types of lymphoid organs	5	Un
CO-8	Compare various types of hypersensitivity	5	Un

SEMESTER–V			
Core–VI-Immunology			
Course Code:21UMIC51	**Hrs/Week-4**	**Hrs/Sem–60**	**Credits–4**

Unit–I: Introduction to Immunology

History of immunology (Joseph Lister, Louis Pasteur and Elie Metchnikoff)–Innate And acquired-Structure, functions of the cells in immune system detailed aspects of T and B cells. Memory specificity

Unit–II: Organs of Immune systems

Organs of Immune systems–primary lymphoid organs (thymus, bone marrow)–secondary lymphoid tissues(lymph nodes, spleen and MALT). Hematopoiesis and hemopoiesis

Unit-III: Antigens and immunoglobulins

Antigens – types – properties – Haptens – adjuvant – immunoglobulins – structure, types, properties and functions – Complements: components and pathways. Major Histo compatibility Complex (MHC)- Human leukocyte antigen (HLA) - Humoral immune response - cell mediated immune response. T – dependent and T- independent Antigens

Unit–IV: Antigen–antibody reactions

Antigen–antibody reactions –In vivo methods (Precipitation reactions, agglutination and complement fixation)– Immuno-fluorescence– ELISA–RIA– Transplantation immunology.Immuno diagnostic test (Liver disease)

Unit–V: Hypersensitivity reactions

Hypersensitivity reactions–Antibody mediated– TypeI: Anaphylaxis–Type II:Antibody – dependent cell cytotoxicity – Type:III: immune complex reactions –Type IV hypersensitivity-reaction – Auto immune disease (Rheumatoid arthritis). Immuno suppression.

TextBooks:

1. Rajan,S. *Medical microbiology*. Chennai : MJP Publisher,. 2007.
2. Fathimunisa Begum. *Monoclonal antibodies: Thehopefu ldrugs*. Chennai : MJP Publisher,2008.
3. Kannan. *Immunology*. Chennai: MJP Publisher, 2007.
4. Vaman Rao.C. *Immunology*. NewDelhi : Second Edition. Narosa Publishing House, 2007.

Books for Reference:

1. Donald.M.Weirand john Steward. *Immunology.* London:(7th Education).ELBS, 1993.
2. Ivan M.Roit. *Essential Immunology.* Oxford: Blackwell Scientific Publications. 1998.
3. Paul.*Essential Immunology*. NewYork:(2ndEducation), Raver Press, 1998.
4. PeterJ. Delves and Ivan M.Roit (Eds) *Encyclopedia of Immunology*. London:(2ndEducation)Academic Press. 1998.
5. Stewart Sell. *Immunology, Immunopathology and Immunity.* USA: (6thEducation),ASM Press, 2001.
6. Ananthanrayanan,R. ,and Panicker.J. *TextBook of Microbiology*.NewDelhi: Orientlongmans. 2000.
7. Wiley,Sherwood,Woolverton. *Prescott'sMicrobiology*.USA:NinthEdition. McGraw Hill International Edition. 2014.
8. ThomasJ.Kindt, RichardA. Goldsby, Barbara A.Osborne. *Kuby Immunology*. NewYork: Sixth Edition.W.H.Freeman and Company, 2007.

SEMESTER- V			
Core VII - Clinical Microbiology			
Course Code : 21UMIC52	**Hrs/week: 4**	**Hrs/sem: 60**	**Credit:4**

Objectives

To impart the knowledge of medically important human diseases with respect to their causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment.

Course Outcome:

CO No	Upon completion of this course, students will able to	PSO addressed	CL
CO-1	understand the laboratory practices and know how to maintain the laboratory instruments	4	An
CO-2	analyze and distinguish various types of blood cells	2	Un
CO-3	understand the pathological diseases and explain the test for hepatitis, aids, and intestinal parasites.	6	Ev
CO-4	evaluate critical thinking of biochemical test	5	Un
CO-5	demonstrate the proficiency in basic methods of instrumentation and quantitative analytical skills used to-conduct biological research.	4	An
CO-6	determines the applied microbiology aspects of clinical-technique	1	An
CO-7	interpret different classes of microbes.	3	Cr
CO-8	analyze the level information in the subject of medical microbiology.	6	Ev

SEMESTER- V			
Core VII - Clinical Microbiology			
Course code : 21UMIC52	**Hrs/week: 4**	**Hrs/sem: 60**	**Credit:4**

Unit-I: Basics of Clinical Microbiology

Normal microbial flora of the human body- Sources of infection: Food, water, vector and air –Modes of transmission – Koch's postulates– pandemic diseases and epidemiology – putative virulence factors of human pathogens – infectious disease cycle.

Unit-II: Diagnostic microbiology

Diagnostic microbiology – Collection and transport of specimen for microbiological Examination-General methods for isolation and identification of bacteria–skin, LRT, URT and urinary tract infections- Typing of bacterial isolates – Sero diagnosis

Unit-III: Clinical symptoms - Bacteria

Clinical symptoms- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following bacterial (a) Tuberculosis (b) Meningitis, (c) Gastro intestinal disorders-Typhoid, cholera (d) Sexually transmitted diseases- Syphilis and gonorrhea. (e) Anaerobic wound infection-Tetanus.

Unit-IV: Clinical symptoms - Virus

Clinical symptoms- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following viral infections (a) Respiratory infections: common cold, influenza, measles, and mumps (b) Liver diseases: Hepatitis A & B (c) Immunodeficiency diseases-AIDS and Cytomegalovirus.(d) Neurological diseases: Dengue, Rabies (e) Emerging disease – corona virus

Unit-V: Clinical symptoms – Fungi & Protozoa

Clinical symptoms- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following fungal and protozoan infections (a) Fungal – Superficial (Tinea nigra), subcutaneous mycoses (sporotrichosis) and systemic mycoses (Candidiasis), (b) Protozoan: Amoebiasis. Leishmaniasis and malaria, (c) Helminthes – ascariasis zoonotic diseases – Plague.

Text books:

1. Anathanarayanan, R., and Panicker, J. *Text book of microbiology.* Hyderabad: Orient Longmans. 2000.
2. S., Rajan.*Medical microbiology.* Chennai: MJP publisher, 2007.

Books for reference:

1. L.M.,Prescott J.P., Harley and D.A., Klein. *Microbiology.* New York: 7th edition McGraw-Hill Inc, 2008.
2. J.R Pelczar ., M.J. Chan E.C.S., and Kreig N.R. *Microbiology.* New York: McGraw- HillInc, 1993.
3. Tortora, Funke Case Addison. *Microbiology – An Introduction.London:*7th edition WesleyLongman Inc. 2001,
4. R.C.Dubey and S.,Maheswari. *A Text Book of Microbiology.* New Delhi: S.Chand & Co, 2003.

SEMESTER–V			
Core- VIII –Biostatistics and Bioinformatics			
Course code:21UMIC53	**Hrs/Week–4**	**Hrs/Sem-60**	**Credit:4**

Objectives

1. To understand the collection of data
2. To learn measures of central tendency.
3. To understand symmetry, correlation and regression.
4. To realise tests of significance
5. To learn basic tools on bioinformatics and biological databases
6. To understand the construction phylogenetic trees for evolutionary analysis and apply theoretical skill to practical application

Course Outcome:

CO No	Upon completion of this course, students Will be able to	PSO addressed	CL
CO-1	Develop an understanding of the basic concepts of biostatistics	2	Cr
CO-2	Explain the statistical methods	4	Un
CO-3	Recall the collection, processing and Presentation of data	2	Re
CO-4	Explain measures of central tendency	4	Un
CO-5	acquire knowledge on the application of bioinfor-matics in life sciences.	2	An
CO-6	realise the importance and application of biologicaldatabase.	2	Ev
CO-7	understand and determine the sequence of un-known sample through various e resources.	4	Re
CO-8	understand the importance of data banks and visu-alization tools	4	Ev

SEMESTER–V			
Core- VIII –Biostatistics and Bioinformatics			
Course code:21UMIC53	**Hrs/Week–4**	**Hrs/Sem-60**	**Credit:4**

Unit-I: Introduction to Biostatistics

Biostatistics - Definition - Statistical methods - Basic principles. Variables - Measurements, Functions, Limitations and Uses of statistics.

Unit-II: Collection of data

Collection of data primary and secondary - Types and Methods of data collection procedures - merits and demerits. Classification - Tabulation and Presentation of data - sampling methods.

Unit-III: Central tendency

Mean, Median, Mode, Geometric mean - merits & demerits. Measures of dispersion - Range, Standard deviation, Mean deviation, Quartile deviation - merits and demerits

Unit IV: Introduction to bioinformatics

Introduction to bioinformatics: Bioinformatics - Definition, application and significance of bio informatics in life sciences. Database- introduction, types and classification, internet, World Wide Web. Biological Database: Nucleic acid sequence database - genbank, EMBL, DDBJ - Protein sequence database - PIR, SWISS PROT

Unit V: Sequence analysis and Alignment tools

Sequence analysis and Alignment tools: Sequence analysis – need and importance – pairwise alignment – dynamic programming – Global (Needleman – Wunsch) and Local (Smith Waterman) Alignment concepts – Database searching tools – Entrez, BLAST, FASTA – multiple alignment – Clustal – Construction of Phylogenetic trees.

Text Book

1. A. Fielding. *Computing forbiologists*.New Jersey, Benjamin/ Cuming Publ.Co, 1985.

Books for reference:

1. S. Balamurugan, Anand Krishnan, Dinesh Goyal, Balakumar Chandrasekaran, Boomi Pandi.*Computation in Bioinformatics: Multidisciplinary Applications* Scrivener Publishing LLC, 2021.
2. G.VonHeijne. *Sequence Analysis in molecular Biology.* Academic Press, 978-0-12-725130-1, 1987
3. Apioneer, Devereux and Gtribskov. *Sequence analysis primer.* 978-1-349-21355-9, 1991.
4. Attwood T and Parry D. *Introduction of Bioinformatics*. Pearson Education Asia; 2009.

SEMESTER - V			
Core Practical V- Laboratory in Immunology and Clinical Microbiology			
Course Code:21UMICR5	**Hrs/Week:6**	**Hrs/Sem:90**	**Credit:3**

Objectives

1. To perform agglutination and precipitative reaction
2. To demonstrate the difference between serum and whole blood diagnostic tests
3. To screen and understand about various types of blood cells using smear techniques
4. To study with human body fluids for diagnostic approach

Course Outcome:

CO No	Upon completion of this course students will be able to	PSO addressed	CL
CO-1	Demonstrate various immunodiffusion test.	1,2	Re
CO-2	Develop their ability to perform qualitative and Quantitative assay of Widal test.	2	Un
CO-3	Improve their ability to perform test for syphilis	3	Un
CO-4	Analyze how to perform latex agglutination and Blood grouping techniques.	3	An
CO-5	Examine various types of bacterial pathogens	5	Un
CO-6	Demonstrate antibiotic susceptibility test	6	An
CO-7	Test urine samples	6	An
CO-8	Examine stool sample	4,6	An

SEMESTER V			
Core Practical V-Laboratory in Immunology and Clinical Microbiology			
Course Code:21UMICR5	**Hrs/Week:6**	**Hrs/Sem:90**	**Credit:3**

1.WIDAL test–qualitative assay

2.Latex agglutination test(ASO)

3.Agglutination reaction with reference to blood grouping

4.Agglutination reaction with reference to RH typing.

5. Demonstration of Antigen–Antibody reaction–Ouchterlony technique-ODD

6. Identification of various immune cells by morphology – Leishman staining, Giemsa staining.

7. Biochemical identification of bacterial pathogens.

TSI, Indole, MR, VP, Citrate, Urease, Catalase test for

a. Staphylococcus aureus b. *Escherichia coli*

8.Antibiotic susceptibility testing by Disc diffusion method (*Escherichia coli* and *Staphylococcus aureus*).

9. Isolation of normal flora of the skin and throat Urine culture and its microbiological analysis (*E.coli)*

10 Urine culture and its Microbiological analysis (*E.coli*)

11. Stool examination by Zinc-sulphate floatation method

12. ELISA HIV/HBSAg - (Demonstration)

Books for Reference:

1. J Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.

2. Murray P.R; BaronE.J; Jorgerson J.H;P faller M.A.and Yolker R.H. *Manual of Clinical microbiology*, ASM Poem Washington D.C: 8th edition.Vol. 1 &2.2003.

3.Gunasekaran,P. *Laboratory Manual in Microbiology*. NewDelhi: New Age International Ltd.,Publishers, 1996.

4 Dubey,R.C.and Maheswari,D.K. *PracticalMicrobiology*.Chenai:1st EditionChand and Company Ltd.,India. 2002.

5 Harley Precott .*Laboratory Exercises in Microbiology*. London: V edition.TheMacGraw–Hillcompanies. 2002.

6 Myer's and Koshi's. *Manual of Diagnostic Procedures in Medical Microbiology and Immu-*

nology/Serology.Vellore: Published by Department of Clinical Microbiology, CMC and Hospital, Vellore,TamilNadu.2006

7 Kanika L Mukherjee,*Medical Laboratory Technology, A procedure manual for routine diagnosis tests.* New Delhi: Tata McGraw–Hill Publishing Co.,Ltd., Vol.I-III.2007.

8 Kannan, N. Laboratory *Manual in General Microbiology*. Palani: Paramount Publication, Palani. 1996.

9 Aneja KR. *Experiments Microbiology, Plant pathology and Biotechnology,* Chennai: 4th Edition. New age International publishers, 2005.

SEMESTER–V			
Core Elective- Microbial Nanotechnology			
Course Code:21UMIC51	**Hrs/Week:4**	**Hrs/Sem:60**	**Credit:4**

Objectives

1. To impart knowledge on characterize the nanoparticles using standard methods
2. To introduce advanced ideas and techniques required in emergent area of nanotechnology.
3. To develop human resource with specialization in theoretical and experimental techniques.
4. To apply the scientific knowledge of Physics, Mathematics, Chemistry, and Engineering for deeper understanding of the matter at nanoscale.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Acquire basic knowledge on nanotechnology	4	Un
CO-2	Explain the basics of microbial applications Of nanotechnology.	4	Un
CO-3	appreciate the structural and functional principles of nano materials.	4	An
CO-4	Grasp the fundamental knowledge about Synthesis of nano materials.	4	Un
CO-5	Acquire basic knowledge about biosensors and types.	2	Ap
CO-6	Get knowledge about analysis of bio molecular nanostructures.	4,2	Un
CO-7	Acquire knowledge on cancer diagnosis and treatment.	2,4	Ap
CO-8	get knowledge about drug designing and delivery	2,4	Ap

SEMESTER–V			
Core Elective- Microbial Nanotechnology			
Course Code:21UMIC51	**Hrs/Week:4**	**Hrs/Sem:60**	**Credit:4**

Unit I: Types of nano particles and application

Introduction to nanotechnology- Structural and functional principles of nanotechnology - Applications of nanotechnology. Bio Nanoparticles – Carbon nano tubes, Carbon nano cones. Nano glasses – Nano ceramics

Unit II: Synthesis and analysis of nanoparticles

Nanotechnology: Nanoparticles synthesis by plants, bacteria and yeast. Methods of Nanobiotechnology-Analysis of bimolecular Nano structures by Atomic Force Microscopy, Scanning Probe Electron Microcopy and XRD.SNOM and ESCA

Unit III: Sensor system and probe

Biosensors–optical nanosensors, multi-functional biochip (MFB) and Detection of *Mycobacteriumby MFB.* Nano clays - functionalization and applications

Unit IV: Nano technology in medical field

Application of Nano biotechnology in medicine – Cancer diagnosis and treatment, Drug designing and delivery. Bioimaging – Micro Electro Mechanical Systems (MEMS)

Unit V: Nano technology in agriculture

Nanotechnology and Food safety–Food Packaging and Processing. Nanotechnology in agriculture–crop improvement and Pest management. Biosecurity. nano crystalline silver for bacterial inhibition

Text Books:

1. David.S.Goodsell.Jhonwiley.*Bionanotechnology*. NewDelhi: Lessons from Nature. 2006.
2. R.K.Rathi. *Nanotechnology* . NewDehli:1st Edition.S.Chand&CompanyLtd, 2009,

Books for Reference:

1. Bernd Rehm, *Microbial Bio nano technology*: *Biological Self-assembly Systems and Biopolymer-based Nano structures*. London: Horizon Scientific Press. 2006.
2. Fulekar M.H., *Nanotechnology: Importance and Applications*. New Delhi: IK international Pvt Ltd, 2010.
3. Jain K.K., TailorL. *Nano biotechnology: Molecular Diagnosis*. Francis Group. London: Horizon scientific press .2009

SEMESTER –V			
Core Elective – Marine Microbiology			
Course Code : 21UMIC52	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Objectives

1. To impart advanced level information in the subject of Marine Microbiology.
2. To make students aware of the marine ecosystems.
3. To ensure employability in marine related industries.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	get an idea about marine micro-biology.	1	Un
CO -2	Understand the diversity inmarine ecosystem.	1	Un
CO-3	know the scope of marine micro-biology	4	An
CO-4	know the Role of marine microbes in oil degradation	1, 2	An
CO-5	get the knowledge of Bio fouling and prevention	2	Un
CO-6	distinguish the marine ecosystem	2	Ev
CO-7	analyse Microbial indicator organism and pollution	2	An
CO-8	understand Methods of studying marine microorganisms	2	Un

SEMESTER –V			
Core Elective – Marine Microbiology			
Course code : 21UMIC52	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

UNIT-I: Marine environment

The world's oceans and seas, properties of seawater, physico-chemical factors in the marine environment such as temperature, density, nutrients, salinity, dissolved gases, waves, tides, oceanic currents

UNIT-II: Ecology and methods to study marine microbes

Ecology of estuaries, salt marshes, mangroves, hydrothermal vents, swamps, coral reefs and deep sea. Methods of studying marine microorganisms Collection, enumeration, isolation and identification based on morphological, physiological and biochemical characteristics.

UNIT-III: Growth and Physiology of marine microbes

Modes of microbial growth: viable but non- culturable (VBNC) microorganisms, biofilms, microbial mats, epibiosis - Physiology of marine microbes: metabolic diversity and energyyielding processes: microbial loop; marine snow; phototrophy and primary productivity, fermentation, aerobic respiration, anaerobic respiration (denitrification, sulphate reduction, methanogenesis); nitrification, annamox, sulphur oxidation, methanotrophy; carbon dioxide fixation in autotrophs; the role of microorganisms in biogeochemical cyling: carbon, nitrogen, phosphorous, sulphur, iron, manganese

UNIT-IV: Sampling equipment and analysis

Sampling equipment: water samplers such as Niskin sampler, HydroBios sampler, Rosette samplers; sediment samplers such as van Veen grabs and corers - Analysis of primary productivity: the radiocarbon method - Analysis of bacterial productivity: the thymidine uptake method - Measurement of respiration rates: light-dark bottle method

UNIT-V: Techniques used in marine microbiology

Flow cytometry (bacteria, picoplankton, picoeukaryotes, viruses); molecular approaches such as metagenomics, community fingerprinting and Fluorescence in situ hybridization (FISH).

Text books:

1. Vijaya Ramesh, K. *Environmental Microbiology.* Chennai: Environmental Microbiology. 2006.

2. Atlas, R.M and Bartha, M. *Microbial Ecology – Fundamentals and applications*. California:

Benjamin Cummings. 2003.

Books for Reference:

1. Hunter-Cevera, J, Karl, D and Buckley, M. *Marine Microbial Diversity: the key to Earth's habitability*. Washington: American Academy of Microbiology. 2005.

2. Mitchell, R. and Kirchman, D. L. *Microbial Ecology of the Oceans*, US: Wiley Blackwell Publishers. 3rd edition 2018.

4. Miller, C. B. and Wheeler, P. A., *Biological Oceanography*, US: Wiley-Blackwell Publishers. 2nd edition. 2012.

5. Munn, C. *Marine Microbiology: Ecology and Applications*. New York: Garland Science, Taylor and Francis group. 2nd edition. 2011.

Semester - V			
Common Skill Based Core	**Computer for Digital Era and Soft Skills**		
Code : 21UCSB51	**Hrs / Week : 2**	**Hrs / Sem : 30**	**Credits : 2**

Course Outcome

- Identify different types of computer systems.
- Classify various types of software being used.
- Compare various digital payments and use them in day to day life.
- Recognise the innovative technologies IoT and integrate it in various fields.
- Analyze various social networking platforms and use them efficiently.
- Distinguish various cyber attacks and apply preventive measures.
- Understand the various soft skills needed to become successful.
- Analyze self and adapt oneself to work in a team.

Unit I: Fundamentals of Computers:
Introduction to computers- Components of computers-Working principle-Types of computers-Tablet-Notebook-Smart phone-PDA-Impact of computers on society-Types of software.

Unit II: Recent Trends in Computer Science and e-Governance:
IoT - applications- Mobile applications - E-Learning- E-Commerce - digital payments

Unit III: Social Media:
Face book-Twitter-Linked In-Instagram-Advantages of Social Networking-Issues/Risks of Social Networking-Protecting ourselves from social Networking problems-Cybercrimes-Hacking-Phishing- Cyber Security

Unit IV: Introduction to Soft Skills:
Learning objectives – What are soft skills?-Categories of Soft Skills-Integral Parts of Soft Skills.

Unit V: Understanding Self and Team Building:
Transactional Analysis (TA) - Structural analysis of Ego states- The functional model of Ego states - Egogram-Storkes - Life Position - Egogram and Life Positions Questionnaire-Team and Team Building- Features of effective creative teams

Books for Reference:

1. Peter Norton, Introduction to Computers 6th Edition
2. Charles P Pfleeger, Shari Lawrence Pfleeger, Security in Computing, I Edition, Pearson Education, 2003.
3. E.Balagurusamy, Fundamentals of Computers, McGraw Hill
4. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang , E-Commerce fundamentals and applications, Wiley Student edition
5. Benita Bhatia Dua, DeepaJeyaraman, Profit with Social Media, CNBC
6. Dr.K.Alex, Soft Skills, S.Chand & Co
7. http://www.digitalindia.gov.in/content/social-media-analytics
8. https://www.researchgate.net/publication/307878962_Introduction_to_E-Governance
9. http://www.ijqr.net/journal/v10
10. https://www.researchgate.net/publication/258339295_FUNDAMENTALS_OF__COMPUTER _ STUDIES

SEMESTER –V	
Self-Study (Optional) – Sea Food Processing	
Course Code: 21UMISS3	**Credits:2**

Objectives:

To understand the different food sources from the sea environment and to gain knowledge in the concept of sea food processing.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO- 1	build an idea about the sea environmental science.	3,4	Ap
CO -2	elaborate the nutritional benefits of marine resources	3	Cr
CO -3	importance of food processing.	3	Ev
CO- 4	explain the preservation methods- canning, smoking, drying, chilling and freezing.	1	Un
CO -5	demonstrate to handle and store the fish products	3	Un
CO -6	design the fish products	4	Cr
CO- 7	explain packaging and labelling techniques.	3	Un
CO -8	evaluate the methods to extend shelf life.	4	Ev

SEMESTER –V	
Self-Study (Optional) – Sea Food Processing	
Course Code: 21UMISS3	**Credits:2**

Unit– I: Sea environmental science

Sea environmental science: Marine eco system - Nutritional benefits of marine resources – fish, fish oil, seaweeds.

Unit- II: Scope and importance of food processing

Scope and importance of food processing - principles and methods of food preservation - Sun drying, Smoking, Salt curing, Chilling, Pickling,

Unit- III: Preservation methods

Preservation methods: Canning and Frying, irradiation process, value addition**.**

Unit– IV: Fish products

Microbiology of fish products - storage and handling, preservation – freezing techniques and, preparation of fish products (Fermented fish, Fish products, Fish soups, Fish powder, Prawn powder and Cutlets)

Unit– V: Introduction to packaging and labelling

Introduction to packaging and labelling - packaging principles and operation - packaging materials - deteriorative changes in foodstuff and packaging methods for prevention - shelf life of packaged foodstuffs - methods to extend shelf life, requisites of good packages.

Text book:

1. Bonnell A. D. - *Quality Assurance in Sea Food Processing:* A practical guide – Chap-man and Hall, Inc. 1993.

Books for Reference:

1. Linda Ankenman Granata, George J. Flick, Jr, Roy E. Martin. *The sea food industry – Spices, products, processing and safety*– Wiley Blackwell Publication. – 2nd edition .2012
2. Hall G. M. -*Fish Processing Technology* . Blackie academic andProfessional publication. 2nd Edition. 1997.
3. Ioannis S. Boziaris. *Sea food processing – Technology, Quality and safety* – Wiley Blackwell publication. 2013.

SEMESTER- VI			
Core IX - Food Microbiology			
Course Code: 21UMIC61	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits:4**

Objectives:

To highlight the basic concepts and principles about the techniques in food microbiology and advanced level information about food microbiology and to enhance the students with the basic knowledge on various techniques involved in food production and preservation.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	explain food microbiology	1	Un
CO-2	classify food.	1	Un
CO-3	explain food as a substrate for microorganisms.	3	Ev
CO-4	determines microbial contamination of food	3	Ev
CO-5	explain food preservation- physical and chemical methods.	1	Ev
CO-6	evaluate the causes of food spoilage-fruits, vegetables, dairy products, meat and fish.	3	An
CO-7	determine food borne disease and food spoilage.	4	Ev
CO-8	importance of food laws and regulations.	3, 4 ,5	Ev

SEMESTER- VI			
Core IX - Food Microbiology			
Course Code: 21UMIC61	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Unit – I: Basics of Food Microbiology

Food as a substrate for microorganisms- Microorganisms important in food microbiology- Bacteria, Molds and Yeasts- Brief account of each group – General characteristics and importance – Microbiological examination of food - Microscopic techniques. Direct microscopic examination, total colony counts and differential enumeration and Most probable number

Unit- II: Food contamination

Microbial contamination of foods - spoilage of food by microbes in cereals and cereal products- Eggs and poultry – meat – fish, fruits, vegetables and its dried products- pickles- bread – canned foods.

Unit- III: Food preservation

Methods of food preservation: Aseptic handling, removal of microorganisms, anaerobic conditions, heat processing, refrigeration and freezing, drying, osmotic pressure- Chemical preservatives - Radiation- UV light, irradiation – Canning.

Unit- IV: Food borne diseases

Food poisoning- Food borne diseases- Food intoxication and Food infection- Bacterial toxins (*Staphylococcus*, *Clostridium*, *Escherichia* and *Salmonella*) – Fungal (Mycotoxins) – Viral (Hepatitis A-E) – Protozoan (*Entamoeba Histolytica*)- Algal (Ciguatoxin).

Unit-V: Quality and safety assurance in food industry

Microbial standards in food – *fssai* – Hazard Analysis Critical Control point (HACCP) - Food laws and Regulations- FAO, FDA, WHO, AGMARK, ISI, ISO. - BIS Laboratory Services, BIS product certification and licensing quality systems. Food Hygiene and sanitation.

Text Book:

1. Frazier, W.C. and Westhoff, D.C. *Food Microbiology*. 4th Edition. New Delhi: Tata McGrawHill publishing Co Ltd., 2008.

Books for Reference:

1. Adams, M.R. and Moss, M.O. *Food Microbiology*. New York: McGraw Hill,. 4th edition. 1995.
2. Jay, J.M. *Modern Food Microbiology*. ,New Delhi: CBS Publishers and Distributors. 2006.
3. Hobbs, B.C. and Roberts, D. *Food Poisoining and Food Hygiene*, London: Edward Aarnold (A division of Hodder and Sloughton), 1993.

SEMESTER-VI			
Core X- Industrial Microbiology			
Course Code:21UMIC62	**Hrs/Week:5**	**Hrs/Sem:75**	**Credits:4**

Objectives:

1. To cover the principles of various processes associated with the production and recovery of different bio-products derived from microorganisms.
2. To provide theoretical and practical skills in industrial microbiology
3. To identify and explore industrially important microbes
4. To describe the environmental and nutritional factors affecting the production of various metabolites

Course Outcome

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Revise the idea about the usage of microorganisms in the field of industrial microbiology	3	Ap
CO-2	Analyse the knowledge of various industrial products and its impacts on the society.	4	Un
CO-3	Acquire knowledge in industrial fermentation	3	An
CO-4	Have an insight on industrial microbiological techniques	2	Cr
CO-5	Understands the in the field of industrial microbiology	1	Un
CO-6	Acquire knowledge of basics and applied microbiological aspects of food industries.	1	Un
CO-7	Have knowledge on antibiotic production	2,4	Cr
CO-8	Get knowledge about analysis of industrial waste and sew-age treatment and disposal	2,4	Cr

SEMESTER-VI			
Core X- Industrial Microbiology			
Course Code:21UMIC62	**Hrs/Week:5**	**Hrs/Sem:60**	**Credits:4**

Unit-I: Introduction to fermentation

History of industrial Microbiology, Isolation, screening, preservation and improvement of Industrially important microorganisms; Raw materials and media design for fermentation processes; Development of inoculums for industrial fermentations; Factors affecting fermentation process

Unit-II: Types of fermentation and human high value products

Types of fermentation- Batch, continuous, Surface, Submerged, Aerobic and Anaerobic fermentor -Design and types, Instrumentation and control-aeration and agitation and sterilization Enzymes and cell immobilization, Production of recombinant proteins having therapeutic and di agnostic applications: Insulin, Interferon, Somatotropin, Exploitation of microorganism and their products

Unit-III: Sources of industrial products

Biology of industrial microorganisms. *Streptomyces*, Yeasts (*Saccharomyces* cerevisiae) *Spirulina* and *Penicillium*. Single cell protein (Spirulina) Biofuels from microbial sources. Recovery and purification of fermentation products. (Down stream processing) Method for cell lysis .

Unit-IV: Industrial products

Alcohols (Ethanol and Butanol); Beverages (Beer and Wine); Amino acids (Glutamic acid and Lysine); Organic acids (Citric acid and acetic acid); Production of enzymes (Protease, Amylase and Lipase); Biopolymers (Xanthan gum and PHB); Bio preservatives (Nisin)

Unit-V: Pharmaceutical products

Antibiotics (Penicillin, Cephalosporin and Streptomycin); Vitamins (Riboflavin and Cyanocobalamin); Production of Hormones (Testosterone); Vaccines (Plant–Agrobacterium tumefaciens, Animal–Lepto spirosis, Microbes-DPT).

Text Books:

1. Wulf Crueger A. *A Text Book of Industrial Microbiology.* New Delhi :2nd edition. Panima Publishing Corporation, 2000.
2. Peter F. Stanbury.,Whittaker, A. and Hali.S.J. *Principles of Fermentation-Technology*.NewDelhi:2nd edition. Pergamon Press. 1997.
3. Patel A.H. *Industrial Microbiology*. Kolkata: Macmillan India Limited.1996.

Reference books:

1. Prescott & Dunn. *Industrial Microbiology*. NewYork: CBS publishers and Distributors.1986.
2. Casida, L.E. *Industrial Microbiology*. Mysore: Eastern Limited, 1997.
3. Michael J.,Waites, Neil L., Morgan, John S.Rockey and Gray Higton . *Industrial Microbiology.* NewDelhi: An Introduction, Replika press Pvt. 2001.
4. Purohit, S.S., Kakrani, H.N., Saluja, A.K. *Pharmaceutical Biotechnology*. Jodhpur: Student edition, 2006
5. Satyanarayana.U. *Biotechnology*. Kolkata: Books and Allied (P) Ltd, 2013.

SEMESTER- VI			
Core XI - Environmental and Agricultural Microbiology			
Course Code : 21UMIC63	**Hrs/week: 4**	**Hrs/sem: 60**	**Credit:4**

Objective

This course will introduce students to the field of environmental and agricultural microbiology, which is the study of microbes in natural environments such as soil, water and air. To enhance knowledge of various microbial activities and its impact on the environment and study about various beneficial aspects of soil microbes. To study the control of pest using bio pesticide related to bacteria, fungi and viruses.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	analyze the soil microorganism and their properties.	1	An
CO- 2	determine the role of microbes on environment.	1	Ev
CO -3	distinguish positive and negative interactions	1	An
CO- 4	outline the interaction between microbes and soil.	4	Un
CO- 5	discuss about the types of waste and waste treatment	6	Cr
CO- 6	summarize the treatment methods.	6	Un
CO -7	determine the Biopesticide and Biofertilizer development	2	Ev
CO -8	evaluate the microbes used as Biopesticide and Biofertilizer	4	Ev

SEMESTER- VI			
Core XI - Environmental and Agricultural Microbiology			
Course Code : 21UMIC63	**Hrs/week: 4**	**Hrs/sem: 60**	**Credit:4**

Unit-I: Properties of soil

Physical and Chemical - Microbial flora of soil - Bacteria, Fungi,Algae, Actinomycetes and Nematodes) –Factors affecting microbial population – Bioleaching.

Unit-II: Biogeochemical cycle and Nitrogen fixation

Biogeochemical cycle- Carbon, Phosphorus, Nitrogen, Sulphur – Biological Nitrogen Fixation – Symbiotic (Rhizobium) and Asymbiotic (Azotobacter)– Root nodule formation - and Nitrogenase, Hydrogenase.

Unit-III: Microbial interactions between microbes

Microbial interactions between microbes - Mutualism, Commensalism, Competition, Amensalism, Parasitism and Predation. Interaction of microbes and plants – Rhizosphere and Phyllosphere.

Unit-IV: Types of wastes

Types of wastes – characterization of solid and liquid wastes. Solid waste treatment – saccharification – gasification – composting, Utilization of solid wastes for mushroom production. Liquid waste treatment - Treatment methods – primary and secondary (anaerobic – methanogenesis) aerobic: trickling, activated sludge, oxidation pond – tertiary treatment.

Unit-V: Bio fertilizer

Bio fertilizer - Rhizobium, Azotobacter, Cyanobacteria, Azolla – Massmultiplication and crop response Bio pesticides –. Bacterial (*Bacillus thuringiensis*) - Fungal (*Trichoderma viridae*) – Viral (NPV & CPV).

Text books:

1. Dubey R.C. *A Text Book of Biotechnology.* New Delhi: Fifth revised Edition. S Chand &Co. 2014.
2. Dubey R.C. and D.K. Maheshwari. *A Text Book of Microbiology.* New Delhi: S. Chand & Co. 2013.

Books for Reference:

1. Shiva Aithal. C. *Modern approaches in Soil, Agricultural and Environmental Microbiology*. New Delhi: Himalaya Publishers, 2010.

2. Atlas, R.M. and Bartha. M. Microbial *Ecology –Fundamentals and applications.*California: Fourth edition - Benjamin – Cummings, Mento Park, 2009.

3 Martin Alexander. *Introduction to Soil Microbiology*. New Delhi: Wiley eastern Ltd., 1983.

4. K. VIjaya Ramesh. *Environmental Microbiology.* Chennai: MJP Publishers, 2005.

5.Subbarao. N.S. *Soil Microorganisms and Plant growth.* New Delhi: Ed, Oxford and IBHPublishing Co, Pvt. Ltd, 1995.

6.Rangaswamy.G. and Bagyaraj.D.J. *Agricultural Microbiology.* New Delhi: Second Edition - Prentice- Hall of India Pvt Ltd., 1996.

SEMESTER–VI			
Core-XII-Microbial Biotechnology			
Course Code:21UMIC64	**Hrs/Week:4**	**Hrs/Sem:60**	**Credits:4**

Objectives

1. To understand the molecular cloning- tools and strategies and methods in molecular cloning
2. To learn the methods of DNA sequencing in prokaryotic and eukaryotic genomes
3. To learn the construction and screening of genomic libraries
4. To gain theoretical knowledge in rDNA technology tools

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Define the history &concepts of biotechnology.	2	Re
CO-2	Assess the intellectual propertyright&protection.	2	Ev
CO-3	Illustrate the knowledge on the production of Biotechnological products.	3	Un
CO-4	Interpret about the concepts and applications in enzyme biotechnology.	3	Un
CO-5	Assume the mechanisms involved in biodegradation of pollutants.	6	An
CO-6	Illustrate the cloning process	2	Un
CO-7	Analyse the production of biotechnological products	2,3	An
CO-8	Recall the concept of biogas,bioleaching,biodegradation of petroleum.	4	Re

SEMESTER–VI			
Core-XII-Microbial Biotechnology			
Course Code: 21UMIC64	**Hrs/Week:4**	**Hrs/Sem:60**	**Credits:4**

Unit-I: Introduction to Biotechnology

Introduction- Biotechnology – Definition – History – Scope. Microbial production of enzymes Protease- Pectinase- Lipase. Industrial application of microbial enzymes- Therapeutic- Manipulative Analytical uses. Immobilization of enzymes and its application. Ribozymes- Abzymes- Synzymes**.**

Unit-II: Transgenic plants and animals

Development of Transgenic plants and animals- resistant to herbicide- insects-bacteria- virus and fungus. Transgenic rice, edible vaccine, bioplastic. Transgenic animals (Dolly) - ethical implications on transgenic animals

Unit-III: Application in Biotechnology

Single cell protein (algae and yeast). Industrial cultivation methods of Spirulina – biotechnological potentials of Spirulina as: food and feed – fuel production from microalgae – pharmaceutically valuable compounds from microalgae. Commercial production of bio-ethanol and bio-diesel using lignocellulosic waste. Biogas production application. Bio Hydrogen production - application. Biosensors –Types- Application. Biochips– Types- Application.

Unit-IV: Microbes involved in biodegradation

Microbes involved in biodegradation - Microbial degradation of phenolics – metals – sewage nutrients (phosphate and nitrate) – hydrocarbons – xenobiotic compounds, bioaugmentation – bioaccumulation – biomagnification. Microbial leaching of ores – oil extraction. Microbial deterioration of materials – paper – leather – wood – paint – textiles – paint – metal corrosion.

Unit-V: Biosafety and Bio ethics

IPR-Tools of IPR (copy rights, patenting, trade mark & trade secret), patenting of biological materials, GATT, WTO, WIPO. Biosafety and Bio ethics – Definitions, principles, Bio safety guide lines for Microbiology Laboratory**.**

Text Books:

1. *Text book of Biotechnology*. R.C.Dubey Chand and company (P)Ltd. 2006.
2. Glick. B, R and Pasternak J. J *Molecular biotechnology*. ASM press,Washington. 2001.
3. Kumaresan . V *Biotechnology*. Saras Publication. 2009.
4. Singh B. D *Biotechnology*. Kalyani Publication. 2006.
5. Lansing M. Prescott, John P. Harley and Donald A. Klein. (*Microbiology*. (5th edition). New York.

McGraw-Hill company, 2003.

Books for Reference:

1. Singh, B. D. *Biotechnology*. Kalyani Publication. 2006.
2. Dubey, R.C. *Text book of Biotechnology*. Chand and company (P) Ltd. 2017.
3. Trevan, M.D, Boffey, S. Coulding K. H., Stanburry.P. *Biotechnology the basic principles*- India Tata McGraw Hill edition. 1990.
4. Sathyanarayana, U *Biotechnology*. Books and allied (P) Ltd. 2008.
5. Pradipta Kumar, Mohapatra *Text Book of Environmental Biotechnology*. I.K International 2006.
6. Das, H.K., *Text Book of Biotechnology*. 3rd Edition. Wiley India (P) Ltd 2007.
7. Ramwat, K.G.,Shaily Goyal *Comprehensive Biotechnology*. Chand and company (P) Ltd 2009.
8. WiliamJ,Thieman ,Michael, A., Palladino *Introduction to Biotechnology*. Dorling Kindersley (India) Private Limited 2009.
9. Philose, P.M. *A Text Book of Biotechnology*. Dominant Publishers and Distributors. 2006.
10. Ramdass, P., Meerarani, S *Text book of Animal Biotechnology*. Library of congres cataloguing in Publishing in Data. 2002.

SEMESTER –VI			
Core Practical – VI - Laboratory in Food Microbiology and Industrial Microbiology			
Course Code : 21UMICR6	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 2**

Objectives:

To highlight the techniques involved in food and industrial microbiology and to expose the students to different processes used in industries, food production and preservation and get information about the spoilage microorganisms.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	explain the importance of food and industrial microbiology	1	Un
CO-2	understand different food microbes and their role.	1	Un
CO-3	explain food as a substrate for microorganisms.	3	Ev
CO-4	exploit microbes in the production of food	3	Ev
CO-5	explain food preservation- physical and chemical methods.	1	Ev
CO-6	evaluate the causes of food spoilage-fruits, vegetables, dairy products, meat and fish.	3	An
CO-7	recall the techniques involved in industries.	1	Re
CO-8	explain the quality and safety assurance in food industry.	2, 4 ,5	Un

SEMESTER –VI			
Core Practical – VI - Laboratory in Food Microbiology and Industrial Microbiology			
Course Code : 21UMICR6	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 2**

1. Evaluation of Milk quality- Phosphatase method.
2. Swab test and air sampling - worker's hand, surface, working table .
3. Microbiological analysis of Curd- TVC
4. Microbial Examination of Fruits - Surface washing and internal tissues- TVC.
5. Microbial Examination of Vegetables - Surface washing and internal tissues- TVC.
6. Microbial examination of Meat- Surface washing and internal tissues- TVC.
7. Microbial examination of Fish- Surface washing and internal tissues- TVC.
8. Isolation of yeast from idly batter.
9. Testing of soft drinks by MPN method
10. Immobilization of bacterial cells (*Escherichia coli* and *Bacillus*).
11. Preparation of Single cell Protein (*Spirulina*) - Demonstration
12. Production of alcohol from sugarcane.
13. Wine production using yeast.
14. Antibiotic production by Bacteria or Actinomycetes- Demonstration.
15. Industrial visit.

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. David greenwood, Richard. B., Slack & John. F., Peutherer, *Medical microbiology.* 16th edition. 2002.
3. Murray P.R; Baron E.J; Jorgerson J.H; Pfaller M.A. and Yolker R.H. *Manual of Clinical microbiology,* Washington D.C: Vol. 1 & 2 ASM Poem. 8th edition. 2003.
4. Gunasekaran, P. *Laboratory Manual in Microbiology.* New Delhi: New Age International Ltd., Publishers, 1996.
5. Jayaraman, J., *Laboratory Manual in Biochemistry*. NewDelhi: Wiley EasternLtd., 1985.
6. Dubey, R.C.and Maheswari, D.K. *Practical Microbiology*, India: Chand and Company Ltd., 1st edition. 2002.

SEMESTER- VI			
Core Practical VII – Laboratory in Environmental, Agricultural Microbiology and Microbial Biotechnology			
Course Code : 21UMICR7	**Hrs/week: 4**	**Hrs/Sem: 60**	**Credit: 2**

Objectives

1. To impart skill on isolation of various microbes from soil and plant.
2. To enhance advanced level laboratory training in Agricultural Microbiology.

Course Outcome:

CO NO	Upon completion of this course, students will be able to	PSO addresed	CL
CO -1	test for isolation of various soil microbes	5	An
CO- 2	experiment with isolation of microbes from various agro samples.	5	Ap
CO -3	interpret the preparation of Bio fertilizer and its assay	4	Un
CO -4	infer quantitative assay of microbes from various agro samples	2	Un
CO- 5	interpret staining of VAM	5	Un
CO -6	analyse antagonism between microorganisms	2	An
CO -7	demonstrate the isolation of Phosphate solubilizing bacteria	5	Un
CO- 8	identify nitrogen fixing bacteria	5	Ap

SEMESTER- VI			
Core Practical VII – Laboratory in Environmental, Agricultural Microbiology and Microbial Biotechnology			
Course Code : 21UMICR7	**Hrs/week: 4**	**Hrs/Sem: 60**	**Credit: 2**

1. Determination of Soil pH.
2. Determination of Soil temperature.
3. Isolation and enumeration of soil microorganism.
4. Quantitative assay of microbes in Rhizosphere.
5. Quantitative assay of microbes in Phyllosphere.
6. Isolation of phosphate solubilizing micro organism
7. Water testing by Most propable number method.
8. Isolation of *Rhizobium* sp from root nodules of leguminous plants.
9. Isolation of *Azotobacter* sp from soil.
10. Isolation of *Azospirillum* sp from soil.
11. Identification of Cyanobacteria from soil. (Anabaena and Nostoc).
12. Staining of VAM.
13. Preparation of Biofertilizers - Azospirillum
14. Assay of biofertilizer (Seed treatment, Seedling treatment, Soil inoculation, Measurement of root and shoot system)
15. Study of antagonism between microorganisms.
16. Isolation of microbes from air sample technique- settle plate method
17. Southern blotting
18. Northern blotting

Books for Reference:

1. Jyoti Saxena, Mamta Baunthiyal, Indu Ravi. *Laboratory manual for Microbiology, Biochemistry and Molecular Biology*. India: Scientific Publishers, 2012.
2. Gunasekaran. P. *Laboratory Manual in Microbiology*. New Delhi: First edition. New AgeInternational Ltd., Publishers, 2005.
3. Dubey, R.C. and Maheswari, D.K. *Practical Microbiology*. India: Second edition. Chand and Company Ltd., 2002.
4. Aneja K.R.. *Experiments in Microbiology,Plant Pathology and Biotechnology.* India: Chand & Co.,Ltd.1993

SEMESTER –VI	
PROJECT	
Course Code: 21UMIP61	**CREDITS:3**

Objectives

1. To impart advanced level information for doing a Research Project Individually and to visit to Hi-Tech Industries /Institutes
2. To develop self-confidence through paper presentation and skill-based training at workshops and get acquainted to subject interviews.

RESEARCH PROJECT

To plan and design statistically, retrieve relevant literature, organize and process the data, photograph relevant observations, evaluate by statistical program, present the project in any State/ Regional / National conference/ Seminar during the second year of the course and submit during the final semester examinations. The work has to be conducted in the Department/Collaborative organization/Institute under the guidance of the Project Supervisor. Inter- disciplinary collaborations from External Departments /Institutions can also be organized for essential areas of the Project if necessary. Theme of valuation of the project report submitted bythe candidate is outlined under the course project and viva-voce.

The project report should be submitted to the Head of the Course Department "One week prior" to the commencement of the practical examination in the Fourth Semester. Each student has to submit 3copies of his/ her project report for revaluation.

INDUSTRIAL VISIT

An educational tour to leading industrial institutes should be conducted as an eye opener and to basically understand the advanced technological know-how which is a must. This exposure and orientation to Advanced Instruments / Gadgetries / On-line Process / By-product Recoveries / Involved Strategies and Implications would alleviate the level of scientific knowledge by all standards. A report pertaining to the visit of scientific learning shall be submitted for evaluation. On-Duty leave should be granted to the teachers accompanying the students. The industrial visit shall include Food, Dairy, Pharmaceutical, Biotechnological, Agricultural, Beverage and Fermentation , Enzyme Production, Solid and Liquid Waste Management, processing plants and research based organizations(Fundamental and Advanced Centers of Eminence)

PRESENTATION OF SCIENTIFIC FINDINGS

Each student will have to present their scientific finding so individual work(or)collaborative work in any State / Regional / National International Seminar or Symposia. Alternatively, they can attend any workshops conducted by the State / National Organizations of Scientific Recognition. Abstracts/Papers presented along with certificates will have to be produced during examination. Scientific papers published in Journals / Proceedings during his /her Master Program will be given special weightage.

GENERAL VIVA- VOCE

The examiners shall conduct a General Viva-Voce pertaining to the core course papers as an overall component.