BACHELOR OF SCIENCE (MICROBIOLOGY)

VISION

To produce intellectual mind and qualified professionals through innovative research and inventions for the enhancement of society.

MISSION

- To establish overall competence among the students by inculcating energetic thinking and positive spirit.
- To cultivate knowledge, skills, values and confidence for the student's excellence through research in their area of expertise or interest.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To build graduates professionally competent in Microbiology to solve problems in society.

PEO2: To demonstrate proficiency and practice biotechniques through lifelong learning.

PEO3: To perform as an individual or team with professional and ethical behavior.

PROGRAMME OUTCOMES (PO)

After completion of the programme, the graduates will be able to

PO1: Apply the knowledge of domain and fundamental science to solve problems relevant to the needs of the society.

PO2: Identify, formulate and review research literature for providing substantial conclusion for complex problems.

PO3: Function effectively as an individual and as a member or leader in diverse team and in multidisciplinary settings.

PO4: Demonstrate knowledge and understand the principles and apply these to once own work as a member in a team to manage projects and come with solutions for multidisciplinary environment.

PO5: Apply the ethical principles and commit to professional ethics and responsibilities in multidisciplinary practices.

PROGRAMME SPECIFIC OUTCOMES (PSO)

After completion of the programme, the graduates will be able to

PSO1: Design and execute industry oriented experiments in microbiology using standard techniques.

PSO2: Apply the domain knowledge and technology to develop research skill for commercialization of microbial products.

PSO3: Evaluate the need and impact of scientific solutions for sustainable development of society.

PSO4: Analyze the conceptual domain knowledge for innovative research and lifelong learning.

PSO5: Create and develop the employable, entrepreneur and socially responsible citizens.

BACHELOR OF SCIENCE (MICROBIOLOGY)

REGULATIONS

ELIGIBILITY

A candidate who has passed higher secondary examination in any one of the biological sciences (Botany/ Zoology, Biology) (Academic/ Vocational Stream- Agri, Home Science, Poultry) under higher secondary board examination, Tamil Nadu or as per norms set by the Government of Tamil Nadu or an examination accepted as equivalent there to by the syndicate, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **B.Sc., Microbiology** degree examination of this University after a course of study of three academic years.

DURATION OF THE PROGRAMME

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME

The maximum duration for completion of the UG Programme shall not exceed twelve semesters.

SCHEME OF EXAMINATION

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credits Points
				CA	CE	Total	
FIRST SEMESTER							
Part I							
24UTAL101/ 24UHIL101/ 24UFRL101	Tamil I/Hindi I/French I	5	3	25	75	100	3
Part II							
24UENLA101	English for Arts and Science - I	5	3	25	75	100	3
Part III							
24UMBM101	DSC I: Basics in Microbiology	6	3	25	75	100	5
24UCHMBA101	GEC I: Chemistry	4	3	25	75	100	2
24UMBMP101	DSC Practical I	6	6	40	60	100	4
24UCHMBAP101	GEC Practical I: Volumetric and Organic Analysis	3	3	40	60	100	2
Part IV							
24UVE101	VAC I: Yoga	1	3	25	75	100	1
	Total	**30**				**700**	**20**
SECOND SEMESTER							
Part I							
24UTAL201/ 24UHIL201/ 24UFRL201	Tamil II/Hindi II/French II	5	3	25	75	100	3
Part II							
24UENLA201	English for Arts and Science - II	5	3	25	75	100	3
Part III							
24UMBM201	DSC II: Microbial Taxonomy and Physiology	6	3	25	75	100	5
24UBCMBA201	GEC II : Basic and Clinical Biochemistry	4	3	25	75	100	2
24UMBMP201	DSC Practical II	6	6	40	60	100	4
24UBCMBAP201	GEC Practical II : Basic and Clinical Biochemistry	3	3	40	60	100	2
Part IV							
24UVE201	VAC II : Environmental Studies	1	3	25	75	100	1
	Total	**30**				**700**	**20**

THIRD SEMESTER							
Part I							
24UTAL301/ 24UHIL301/ 24UFRL301	Tamil III/ Hindi III/ French III	4	3	25	75	100	3
Part II							
24UENLA301	English for Arts and Science - III	4	3	25	75	100	3
Part III							
24UMBM301	DSC III: Molecular Biology and Microbial Genetics	4	3	25	75	100	4
24UMAMBA301	GEC III: Biostatistics	4	3	25	75	100	2
24UMBMP301	DSC Practical III	5	6	40	60	100	4
24UMAMBAP301	GEC Practical III: Biostatistics	2	3	40	60	100	2
Part IV							
24UMBNM301	MDC I	2	3	25	75	100	2
24UMBSB301	SEC I: Bioinstrumentation (100%Internal)	2	3	100	-	100	2
24UVE301	VAC III : Understanding India	1	3	25	75	100	1
24ULS301	AEC I : CCS -I	2	-	100	-	100	1
	Total	**30**				**1000**	**24**
FOURTH SEMESTER							
Part I							
24UTAL401/ 24UHIL401/ 24UFRL401	Tamil IV/ Hindi IV/ French IV	4	3	25	75	100	3
Part II							
24UENLA401	English for Arts and Science IV	4	3	25	75	100	3
Part III							
24UMBM401	DSC IV: Immunology	4	3	25	75	100	4
24UCSMBA401	GEC IV: Introduction to Python and Artificial Intelligence	4	3	25	75	100	2
24UMBMP401	DSC Practical IV	5	6	40	60	100	4
24UCSMBAP401	GEC Practical IV: Python and Office Automation Lab	2	3	40	60	100	2

Part IV							
24UMBNM401	MDC II	2	3	25	75	100	2
24UMBSB401	SEC II : Organic Farming and Bio-fertilizer Technology (100%Internal)	2	3	100	-	100	2
24UVE401	VAC IV: Digital and Technology Solutions	1	3	25	75	100	1
24ULS401	AEC II: CCS-II	2	-	100	-	100	1
	Total	**30**				**1000**	**24**
FIFTH SEMESTER							
Part III							
24UMBM501	DSC V: Medical Microbiology	6	3	25	75	100	5
24UMBM502	DSC VI: Fundamentals of Virology	6	3	25	75	100	5
24UMBM503	DSC VII: Soil and Agricultural Microbiology	5	3	25	75	100	5
24UMBEL501/ 24UMBEL502/ 24UMBEL503	DSE: Elective I	4	3	25	75	100	4
24UMBMP501	DSC Practical V	6	6	40	60	100	3
24UMBI501	Summer Internship (100% Internal Evaluation)	-	-	100	-	100	2
Part IV							
24UMBSB501	SEC III: Calculation for Biology (100% Internal)	2	3	100	-	100	2
24ULS501	AEC III: CCS - III	1	-	100	-	100	1
Part V							
24UMBE501	Extension Activity	-	-	-	-	-	2
	Total	30				**800**	**29**
SIXTH SEMESTER							
Part III							
24UMBM601	DSC VIII: Fermentation Technology	4	3	25	75	100	4
24UMBM602	DSC IX: Genetic Engineering	5	3	25	75	100	5
24UMBM603	DSC X: Food and Dairy Microbiology	4	3	25	75	100	4

24UMBEL601/ 24UMBEL602/ 24UMBEL603	DSE: Elective II	4	3	25	75	100	4
24UMBMP601	DSC Practical VI	5	3	40	60	100	3
24UMBPR601	Project & Viva -Voce	5	-	40	60	100	4
Part IV							
24UMBSB601	SEC IV : Microbial Technology (100% Internal)	2	3	100	-	100	2
24ULS601	AEC IV: CCS-IV	1	-	100	-	100	1
	Total	**30**				**800**	**27**
Grand Total						**5000**	**144**

SKILL ENHANCEMENT COURSE

The department offers the following subjects as Skill Enhancement Courses from third semester to sixth semester.

S.No.	Course Code	Semester	Corse Name
1.	24UMBSB301	III	SEC I: Bioinstrumentation
2.	24UMBSB401	IV	SEC II : Organic Farming and Bio-fertilizer Technology
3.	24UMBSB501	V	SEC III: Calculation for Biology
4.	24UMBSB601	VI	SEC IV : Microbial Technology

Internal Credit Transfer Scheme: The Equivalent credits earned by the completion of proctored MOOC courses can be transferred to the equivalent SEC course.

ADDITIONAL CREDIT COURSES

The department offers the following courses as Additional Credit Courses for the fourth and fifth semesters for Advanced Learners courses or students may choose as ACC course offered in MOOC/SWAYAM/NPTEL/CEC/COURSERA, etc. Additional 2 credits as per course will be given on completion with a certificate.

S.No	Course Code	Semester	Course
1.	24UMBAL401	IV	Biofertilizer Technology
2.	24UMBAL501	V	Marine Microbiology

DISCIPLINE SPECIFIC ELECTIVE COURSES

Students shall choose any one course as a Discipline Specific Elective Course from the following subjects in the Fifth and sixth semester.

S.No.	Course Code	Semester	Course Name
1.	24UMBEL501	V	DSE I: Environmental Microbiology
2.	24UMBEL502	V	DSE I: Cell Biology
3.	24UMBEL503	V	DSE I: Medical Mycology and Parasitology
4.	24UMBEL601	VI	DSE II: Pharmaceutical Microbiology
5.	24UMBEL602	VI	DSE II: Microbiology for Social Welfare
6.	24UMBEL603	VI	DSE II: Nano Microbiology

MULTIDISCIPLINARY COURSES (SEC)

The department offers the following two subjects as Multi-Disciplinary Courses for other than Microbiology students in third and fourth semesters.

S.No.	Course Code	Semester	Course Name
1.	24UMBNM301	III	MDC I : Personal Hygiene
2.	24UMBNM401	IV	MDC II: Nutrition and Hygiene

Internal Credit Transfer Scheme: The Equivalent credits earned by the completion of proctored MOOC courses can be transferred to the equivalent MDC course

INTERNAL CREDIT TRANSFER SCHEME

The equivalent credits earned by completion of MOOC (NPTEL/SWAYAM) courses can be used to SEC Courses provided by the department. However, the equivalent MOOC Course must be completed during the earlier semester of the offered SEC Course.

S.No.	Course Code	Sem	Course Name	Course equivalent in NPTEL/SWAYAM	Duration	Institute
1.	24UMBSB601	VI	SEC IV : Microbial Technology	Environmental Biotechnology	12 Week	IIT Kharagpur
				Industrial biotechnology	12 Week	IIT Kharagpur
				Microbial Biotechnology	12 Week	IIT Guwhati

FOR COURSE COMPLETION

Students shall complete

- Language subjects (Tamil / Hindi / French) in semesters I, II, III and IV.
- Language subject English offered in semesters I, II, III and IV.
- Value Education offered in semesters I, II, III and IV.
- GEC subjects offered in semester s I, II, III and IV.
- Skill Enhancement Courses offered in semesters III, IV, V and VI.
- Multidisciplinary courses offered in semesters III and IV.
- Ability Enhance courses offered in semesters III, IV, V and VI.
- Discipline Specific Elective Courses offered in fifth and sixth semesters. Students can choose any one out of two courses.
- Extension activity offered in semester V.
- The summer internship was offered in the V semester (100% Internal Evaluation).
- Project and Viva – Voce in VI semester.

ABBREVATION

DSC - Discipline Specific Course

GEC - Generic Elective Course

DSE - Discipline Specific Elective

AEC - Ability Enhancement Course

MDC - Multi Disciplinary Course

ACC - Additional Credit Course

VAC - Value Added Course

SEC - Skill Enhancement Course

PACE - Personality Advancement and Career Enhancement Course

TOTAL MARKS AND CREDIT DISTRIBUTION

S.No.	COMPONENTS	MARKS	CREDITS	CUMULATIVE CREDITS
1.	**PART I:**			
	Tamil/Hindi/French	4 × 100 = 400	4×3=12	12
2.	**PART II:**			12
	English	4 × 100 = 400	4×3=12	
3.	**PART III:**			98
	DSC Theory	10×100=1000	6×5 =30 4×4=16	
	DSE	2×100=200	2×4=08	
	DSC Practical	6×100=600	4×4=16 2×3=06	
	GEC Theory	4×100=400	4×2=08	
	GEC Practical	4×100=400	4×2=08	
	Summer Internship	1 ×100=100	1×2=02	
	Project & Viva Voce	1 ×100=100	1×4=04	
4.	**PART IV:**			20
	MDC	2×100=200	2×2=04	
	AEC	4×100=400	4×1=04	
	SEC	4×100=400	4×2=08	
	VAC	4×100=400	4×1=04	
5.	**PART V:**			02
	Extension Activity	-	1×2=2	
	Total (50 Courses)	**5000**	**-**	**144**

24UTAL101	**பொதுத்தமிழ் - I**	**பருவம் - I**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன

- தற்கால இலக்கியவகைகளைமாணவர்களுக்குக் கற்பித்தல்
- காலந்தோறும் தமிழ் கவிதைவளர்சிசி நிலைகள் மற்றும் சிறுகதைகளை அறிமுகப்படுத்துதல்.
- நாட்டுப்புற இலக்கியங்களின் வழி வாழ்க்கை கூறுகளையும், இலக்கியம், இலக்கணத்தில் சிறப்புகளையும் உணர்த்துதல்.

Credits: 3 **Total hours:50**

UNIT	CONTENTS	Hrs	CO
I	கவிதைகள் அ) பொண் கண்ணகி–காலம்மாறிப்போச்சு ஆ) அறிவுமதி–(தேர்ந்தெடுக்கப்பட்ட 30 கவிதை–புல்லின் நுனியில் பனித்துளிஹைக்கூகவிதைகள்) இ) வைரமுத்து–மரங்களைப்பாடுவோம் ஈ) சிற்பி–அங்கீகரிக்கபடாத காதல்	10	CO1
II	சிறுகதைகள் அ) புதுமைப்பித்தன் - கடவுளும் கந்தசாமிபிள்ளையும் ஆ) ஆண்டாள் பிரியதர்ஷினி–மாத்திரை இ) புலிக்கலைஞன் - அசோகமித்திரன் ஈ) ராஜா வந்திருக்கிறார் - கு.அழகிரிசாமி	10	CO2
III	நாட்டுப்புறவியல் - பாடல்கள், விளையாட்டுகள் அ) தாலாட்டுப்பாடல்கள் - தாயின் கனவுகள் ஆ) காதல் பாடல்கள் - கிளியம்மா,கருத்தபுள்ள. இ) தொழில் பாடல்கள் - களையெடுப்பு ஈ) ஒப்பாரிபாடல்கள் உ) சிறுவர்,சிறுமியர் விளையாட்டு–ஆடவர்,மகளிர் விளையாட்டுகள்	10	CO3
IV	இலக்கிய வரலாறு அ) மரபுக்கவிதை தோற்றம் வளர்ச்சி ஆ) புதுக்கவிதை தோற்றம் வளர்ச்சி இ) சிறுகதை தோற்றம் வளர்ச்சி ஈ) நாட்டுப்புறவியல், பாடல்கள், விளையாட்டுகள் அறிமுகம்	10	CO4

V	இலக்கணம் - பொருள் இலக்கணம் அ) பகுபத உறுப்பிலக்கணம் ஆ) பிறமொழிச் சொற்களை தமிழ் சொற்களாக மாற்றுதல் இ) அகத்திணை, புறத்திணை	10	CO5
பாடநூல்			
1.தமிழ்த்துறை வெளியீடு			
பார்வை நூல்கள்			
தமிழண்ணல், புதியநோக்கில் தமிழ் இலக்கியவரலாறு, மீனாட்சிபுத்தகநிலையம், மதுரை– 2017. வைரமுத்துகவிதைகள், வைரமுத்துபதிப்பகம் திருமகள் நிலையம்.			

இடைக்கால இலக்கியங்கள்

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன

CO1	கவிதைகளின் சிறப்புகளை கூறுதல்
CO2	சிறுகதைகளின் தன்மைகளை கூறுதல்
CO3	நாட்டுப்புற இலக்கியங்களின் வழி வாழ்க்கை கூறுகளை அறிதல்
CO4	இலக்கிய வரலாற்றின் தோற்ற வளர்ச்சினை அறிதல்
CO5	அடிப்படை இலக்கணத்தை அறிதல்.

MAPPING

PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	H	H	H	H	M	M	M
CO2	H	H	H	H	H	H	H	M	M	M
CO3	H	H	H	H	H	H	H	M	M	M
CO4	H	L	L	L	L	L	H	M	M	M
CO5	H	H	H	H	H	H	H	M	M	M
H – High; M- Medium; L - Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UENLA101	ENGLISH FOR ARTS AND SCIENCE - I	SEMESTER – I

Course Objectives:

The course aims,

- To develop strategies and skills to enhance the ability to read and comprehend technical texts.
- To foster ability to write convincing job applications and effective reports.
- To develop speaking skills to make technical presentations, participate in impromptu speeches.
- To strengthen listening skill which will help them comprehend lectures and talks in their areas of specialization.

Credits:3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**1. Listening** a. Listening- short texts- short formal and informal conversations **2.Speaking** a. Pair work and small group work **3.Reading** a. Reading Newspaper Article **4.Writing** a. Purpose statements b. Checklists c. Instructions **5.Grammar**: Sentence and Noun a. Sentences- Kinds of Sentences b. Sentence Patterns c. Classification of Noun **6. Vocabulary in Context** a. Synonyms & Antonyms b. Compound words.	**10**	**CO1**
II	**1. Listening** Listening to science invention talks and completing exercises based on them **2. Speaking** Asking for and giving directions **3. Reading** Reading longer technical texts- identifying the various transitions in a text	**10**	**CO2**

	4. Writing a. Developing a story with pictures b. Paragraph writing **5. Grammar** : Pronouns and Adjectives **a**. Pronouns: Types of Pronouns b. Types of Adjectives, Correct use of Adjectives, Position of Adjectives **6. Vocabulary in Context** a. Single word substitute b. Phrasal verbs		
III	**1. Listening** Listening to documentaries and making notes **2. Speaking** Mechanics of presentations **3. Reading** Longer texts both general and technical practice in speed reading **4. Writing** a. Job application – Cover Letter –Resume preparation b. Note – Making **5. Grammar** : Verb and Adverb **a**. Types of Verbs: Finite and Non-Finite Verbs b. Strong and Weak Verbs **c.** Primary and Modal Auxiliary Verbs d. Adverb- Kinds of adverbs **6. Vocabulary in Context** a. Different forms and use of words b. Cause and Effect words	**10**	**CO3**
IV	**1.Listening** Listening to broadcast and telecast from Radio and TV **2.Speaking** Giving impromptu talks **3.Reading** Reading – Critical reading **4.Writing** Creative writing, Poster making **5. Grammar** : Prepositions, Conjunction and Interjection **6. Vocabulary in Context** a. Use of abbreviations and acronyms b. Misspelt words	**10**	**CO 4**

V	**1. Listening** Listening to different accents. **2. Speaking** a. Role-play b. Simulation **3. Reading** Making inference from the reading passage **4. Writing** Precise Writing **5. Grammar** : Voice **6. Vocabulary in Context** Lexical items (fixed / semi fixed expressions)	**10**	**CO5**

Reference Books	
1.	Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2.	A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd
Web sources	
1	https://www.cambridgeenglish.org/why-choose-us/
2	https://ieeexplore.ieee.org/Xplore/home.jsp
3	https://www.acronymfinder.com/

COURSE OUTCOMES (CO)

On completion of this course, the students should be able to

CO1	Develop the ability to listen to a conversation in English
CO2	Demonstrate confidence and proficiency in communication.
CO3	Analyse and restate the meaning of a text in English
CO4	Deliver impactful presentations.
CO5	Ability to speak clearly in standard academic English

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UMBM101	**DSC I: BASICS IN MICROBIOLOGY**	**SEMESTER I**

Course Objectives:

The course aims

- To learn the early developments of Microbiology.
- To understand the basic concepts of microscopy, staining, sterilization and chemotherapeutic techniques.

Credits: 05 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction to Microbiology:** Scope of Microbiology–Historical developments- Spontaneous generation– Germ theory of diseases. Contributions of Leeuwenhoek –Louis Pasteur-Joseph Lister- Edward Jenner– Robert Koch–Alexander Fleming. General properties of microorganisms (Bacteria, Fungi, Algae, Virus and Protozoan)	**10**	**CO1**
II	**Microscopy:** Principles, components and applications- Light microscopy, Dark field, Phase Contrast and Fluorescent microscopy. Electron microscopy- Scanning and Transmission electron microscopy. Confocal microscopy. **Staining techniques:** Staining types - Simple, Differential (Gram staining and Acid fast staining) and Special staining (Spore and Capsule staining).	**10**	**CO2**
III	**Culture techniques:** Media preparation– culture media- types of media. Pure culture techniques– preservation of culture. **Microbial cell:** Ultra structure of bacteria, sub- cellular structures and cell envelope–capsule, cell wall, pili and flagella.	**10**	**CO3**
IV	**Sterilization Principles:** Physical agents- dry heat, moist heat, radiation and filtration. Chemical agents– alcohols, phenol, aldehydes and gaseous agents.	**10**	**CO4**
V	**Antimicrobial Chemotherapy:** Antibiotics– classification and mode of action- cell wall synthesis inhibitors, protein synthesis	**10**	**CO5**

	inhibitors and nucleic acid synthesis inhibitors. Mechanism of drug resistance. Tests for antimicrobial susceptibility– Kirby Bauer method and Stokes method.		

Text Book:

1.	*Lansing M Prescott, John P Harley and Donald A Klein*. 2022. **Microbiology**. [12 th Edition]. Mc Graw Hill, NewYork.

Reference Books:

1.	*Atlas, R.M.* 1997. **Principles of Microbiology.** [Seventh Edition]. WCK. Mc Graw–Hill.
2.	*Black, J. G.* 2017 **Microbiology- Principles and Exploration.** [Tenth Edition]. Prentice Hall International Inc.
3.	*Madigan, M.T., Martinko, J.M.* and *Parker, J.* 2000. **Brock Biology of Microorganisms.** [Ninth Edition]. Prentice Hall International, Inc.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Recall the origin of Microbiology.
CO2	Understand the principles of Microscopy and staining techniques.
CO3	Assess growth parameters for the cultivation and preservation of microbes in the laboratory.
CO4	Apply aseptic condition for maintenance of pure culture and control of contaminants.
CO5	Assess the use of antibiotics to control pathogens and treatment of microbial diseases.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	H	M	M	M	M	H	M	M
CO2	H	H	H	H	M	H	H	H	H	M
CO3	H	H	H	H	M	H	H	H	H	M
CO4	M	H	M	H	H	M	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H	H
H – High; M- Medium; L - Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UCHMBA101	GEC I: CHEMISTRY (For B.Sc., Microbiology)	SEMESTER- I

COURSE OBJECTIVES:

The course aims

- To understand the bonding in molecules and compounds.
- To provide information about the basics of organic molecules.
- To know about preparation, properties of biomolecules.
- To learn hardness of water and preparation of de-ionized water.
- To understand the principle of volumetric analysis and preparation of standard solutions

Credits: 02 **Total Hours: 30**

UNIT	CONTENTS	Hrs	CO
I	**Chemical Bonding:** Ionic bond- Nature of Ionic bond-structure of NaCl & KCl - Factors influencing the formation of ionic bond. Covalent bond-nature of covalent bond- VSEPR theory - shapes of CH_4, NH_3 & H_2O. Coordinate Bond-Nature of coordinatebond, Werner's theory and structure of some complexes - $Ni(CO)_4$, $K_4[Fe(CN)_6]$. Hydrogen bonding-Theory of Hydrogen bonding-Inter and Intra molecular hydrogen bonding-consequences of hydrogen bonding.	06	CO1
II	**Basics of Organic Chemistry:** Classification of organic compound- types of reagents-electrophiles, nucleophiles and free-radicals, Electronic displacement effects: inductive effect, resonance, hyper-conjugation, steric effect. Hybridization and geometry of organic molecules- CH_4, C_2H_4, C_2H_2, C_6H_6	06	CO2
III	**Chemistry of Biomolecules:** Classification of carbohydrates, glucose & fructose-preparation, properties, muta-rotation, Inter-conversion of glucose and fructose; Aminoacids: preparation and properties of glycine and alanine –	06	CO3

	proteins: classification based on physical properties and biological functions- structure of proteins- primary and secondary structure.		
IV	**Chemistry of Water:** Water as a universal solvent– hardness of water- permanent and temporary hardness, disadvantages of hard water DO, BOD and COD- definition, Winkler's method for determination of BOD and COD. Water softening methods - Zeolite process, Reverse osmosis; Preparation of de-ionized water- Distilled water– Double distilled water– packaged drinking water.	**06**	**CO4**
V	**Analytical Chemistry:** Roles and importance of analytical chemistry-Accuracy, precision, determinate and indeterminate errors, relative error, absolute error. Principle of volumetric analysis-calibration of glasswares, standardization- experimental requirements- concentration units (normality and molarity)- types and preparation of standard solutions (primary and secondary standards). Types of titrations - indicators for acid-base titrations. Theories of indicators.	**06**	**CO5**

Text Book:

1	*Madan. R. L. and Tuli G. D.* 2005. **Simplified course in Physical chemistry,** [Sixth Edition], S. Chand and company Ltd., New Delhi.
2	*Bahl B.S.* and *Arun Bahl*, 2016. **Advanced Organic Chemistry,** [Twenty Second Edition], Sultan Chand & Co., New Delhi.
3	*Puri B. R., Sharma L. R.* and *Kalia K. K.,* 2017. **Principles of Inorganic Chemistry**, [Thirty third Edition], Shoban Lal Nagin Chand & Co, New Delhi.
4	Tiwari K. S., Melhotra S. N.,Vishnoi N.K, **A Text book of Organic Chemistry**,Vikas Publishing House Pvt. Ltd., New Delhi, 2017. (Unit - I, V).
5	R. Gopalan, P. S. Subramanian and K. Rengarajan, **Elements of Analytical Chemistry**, Sultan Chand and Sons, New Delhi, 1997. (Unit-IV)
6	Puri B. R., SharmaL.R., Kalia K. K, **Principles of physical Chemistry**, 23rd

	Edition, New Delhi, Shoban Lal Nagin Chand & Co, 2017. (Unit-II).
Reference Books:	
1	*LeeJ .D*. 2008. **A New Concise Inorganic Chemistry**, [Fifth Edition], Chapmann and Hall, London.
2	*Morrison R.T. and Boyd. R. N*. 2010. **Organic Chemistry**, [Seventh Edition], Prentice-Hall of India (P) Ltd,NewDelhi.
3	R. L. Madanand G. D. Tuli, **Inorganic Chemistry**, S. Chand Co., Ltd., New Delhi, 2010.
4	Gurdeep Raj, **Advanced Physical Chemistry**, Goel Publishing House, Meerut, 2016.
Web Links:	
1	Chemical-bonding https://alison.com/topic/learn/128224/chemical-bonding-learning-outcomes
2	Chemical reactions https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_OrganicChemistry_(Wade)/04%3A_The_Study_of_Chemical_Reactions/5.01%3A_Introduction
3	Biomolecules: http://med.fau.edu/students/md_m1_orientation/Overview.pdf
4	Water Chemistry: https://dnr.mo.gov/env/wpp/vmqmp/docs/chpt-07-intro-water chemistry-1-09.pdf
5	Analytical chemistry: http:// www.uvm.edu/ ~gpetrucc/ courses/ chem 196/ Textbooks/ Manahan. Fundamentals of Environmental Chemistry /1491Ch25.pdf

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Predict the bond formation inorganic molecules.
CO2	Understand the mechanism of the chemical reactions.
CO3	Compute the chemistry of carbohydrates, glucose & fructose and aminoacids.
CO4	Predict the chemistry behind water**.**
CO5	Understand the roles and importance of analytical chemistry

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	H	H	M	H	M	H	H	L
CO2	L	H	L	M	M	L	H	M	M	M
CO3	H	M	L	L	L	M	L	H	H	M
CO4	M	L	M	M	L	M	M	L	L	H
CO5	H	M	L	H	M	L	L	L	M	H
H – High; M- Medium; L - Low										

Prepared By

(Course Coordinator)

Approved By

(BoS Chairman)

24UMBMP101	**DSC PRACTICAL I**	**SEMESTER I**

Course Objectives:

The course aims

- To learn the basic techniques of Microbiology.
- To understand the morphological structures of bacteria.
- To cultivate and maintain the microorganisms.

Credits: 04 **Total Hours: 42**

Experiment	**CONTENTS**	**Hrs**	**CO**
1.	Handling, maintenance and care of bright field Microscope	**3**	**CO1**
2.	Cleaning of glassware	**3**	**CO1**
3.	Staining techniques– Simple staining	**3**	**CO1**
4.	Gram's staining.	**3**	**CO1**
5.	Acid Fast (Ziehl- Neelson) staining	**3**	**CO1**
6.	Spore staining	**3**	**CO1**
7.	Capsular staining	**3**	**CO1**
8.	Media preparation- Liquid media– Nutrient broth, Solid media– Nutrient agar	**3**	**CO2**
9.	Preparation of agar slants and agar deeps.	**3**	**CO2**
10.	Pure culture techniques– Serial dilution method and pour plate method	**3**	**CO3**
11.	Streak plate method	**3**	**CO3**
12.	Spread plate method	**3**	**CO3**
13.	Stab culture method	**3**	**CO4**
14.	Antibiotic sensitivity test– Kirby-Bauer disc diffusion method	**3**	**CO5**

Reference Books:	
1.	*Cappucino, J. Gand Sherman, N.* 2012. **Microbiology – A laboratory manual.** [Seventh Edition]. Pearson Education Inc.
2.	Harley and Presscott. 2002. **Laboratory Exercises in Microbiology,** [Fifth Edition]. Mc Graw Hill Companies.
3.	*Kannan, N.* **Laboratory manual in General Microbiology.** [Second Edition]. Panima publishing corporation, New Delhi.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Identify microbes through staining with microscopy.
CO2	Design different media for cultivation of microorganisms.
CO3	Evaluate the isolation and purification of microorganisms.
CO4	Demonstrate the maintenance of bacterial cultures.
CO5	Evaluate control measures of microorganisms using chemotherapy.

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UCHMBAP101	GEC PRACTICAL I: Volumetric and Organic analysis (For B.Sc., Microbiology)	SEMESTER I

COURSE OBJECTIVES:

The course aims

- To enable the students to acquire the quantitative skills in volumetric analysis.
- To know the organic compounds by analysis.

Credits: 2 **Total Hours: 30**

EXPT NO.	CONTENTS	CO
Volumetric Analysis		
1	Estimation of HCl using Sodium hydroxide.	**CO1**
2	Estimation of Ferrous sulphate using Potassium permanganate.	
Qualitative Analysis of Organic compounds		
1	Carboxylic acid	**CO2**
2	Amine	
3	Amide	
4	Carbohydrate	
5	Phenol	

Text books:

1	*Kamboj, P. C.* 2013. **University Practical Chemistry.** [First Edition (reprint)], Vishal publications, Jalandhar, Punjab.
2	*Venkateshwaran,V.,Veerasamy. R. Kulandaivelu.R.,* 2012. **Basic Principles of Practical Chemistry,** [Second Edition], S. Chand & sons, New Delhi.

Reference books:

1	*Thomas. A. O.*2000. **Practical Chemistry**,[Sixth Edition]. Sharada Press, New Delhi.
2	*Bajpai D. N. , Pandey O. P.* and *GiriS.* 2012. **B.Sc., Practical Chemistry**, Revised Edition, S. Chand & company, NewDelhi.

3	Vogel, **Text Book of Quantitative Chemical Analysis**, Sixth edition, Pearson Education, 2009.
Web link:	
1	http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis
2	https://www.csub.edu/chemistry/organic/manual/Lab14_QualitativeAnalysis.pdf

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Analyse quantitatively by titration techniques.
CO2	Analyse systematically an organic compound by laboratory techniques.

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UVE101	**VAC I: YOGA**	**SEMESTER - I**

Course Objectives:

The course aims

- To understand physical body and Health concepts
- To have the basic Knowledge on Simplified Physical Exercises, Asanas and Meditation
- To Introspect and improve the behaviors
- To inculcate cultural behavioral patterns

Credits: 1 **Total Hours: 15**

UNIT	CONTENTS	Hrs	CO
I	**Yoga and Physical Health:** Health - Meaning and Definition - Physical Structure - Three bodies - Five limitations - Simplified Physical Exercises - Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana 1, 2 , Massage, Acu pressure, Relaxation exercises - Yogasanas – Surya namaskar.	3	CO1
II	**Greatness of Life Force and Mind:** Maintaining youthfulness - Postponing the ageing process - Sex and spirituality - Significance of sexual vital fluid - Married life - Chastity - Development of mind in stages - Mental Frequencies - Methods for Concentration.	3	CO2
III	**Personality Development – Sublimation:** Purpose and Philosophy of Life - Introspection - Analysis of Thought - Moralization of Desire - Analysis and practice - Neutralization of Anger.	3	CO3
IV	**Human Resources Development:** Eradication of Worries - Analysis and Eradication practice - Benefits of Blessings – Effect of good vibrations - Guidance for good Friendship – Individual Peace and world peace.	3	CO4
V	**Law of Nature:** Unified force - Cause and effect system - Purity of thought deed and Genetic Centre – Love and Compassion - Gratitude - Cultural Education - Fivefold culture.	3	CO5

Text Book:	
1.	Value Education - World Community Service centre, Vethathiri Publications, Erode.
Reference Books:	
1	*Vethathiri Maharishi*, 2011, Journey of Consciousness, Erode, Vethathiri Publications.
2	*Vethathiri Maharishi*, 2022, Simplified Physical Exercises, Erode, Vethathiri Publications.
3	*Vethathiri Maharishi*, 2004, Unified force, Erode, Vethathiri Publications
4	Yoga for Modern age - ThathuvagnaniVethathiri Maharishi
5	Sound Health through yoga – Dr. K. Chandrasekaran, November 1999 PremKalyan Publications, Madurai
6	Light on yoga - BKS.Lyenger
7	ThathuvagnaniVethathiri Maharishi – Kayakalpa yoga – First Edition 2009 Vethathiri Publications, Erode.
8	Environmental Studies - Bharathidasan University Publication Division

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO1	Understand the physical structure and simplified physical exercises.
CO2	Nurture the life force and mind
CO3	Introspect and improve the moral values
CO4	Realize the importance of human resources development
CO5	Enhance purity of thought and deed

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UTAL201	**பொதுத்தமிழ் - II**	**பருவம் - II**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன

- ஐம்பெருங்காப்பியங்களின் மூலம் பழங்காப்பியநிகழ்வுகள் மற்றும் அமைப்பு முறைகளை எடுத்துரைத்தல்.
- பிறகாப்பியங்கள் மூலம் வரலாற்று நிகழ்வுகளை மாணவர்களுக்கு அறிமுகம் செய்தல்
- சிற்றிலக்கியங்களில் வழி வாழ்வியல் முறையை உணர்த்துதல்

Credits: 3 **Total Hours: 50**

UNIT	*CONTENTS*	Hrs	CO
I	சிலப்பதிகாரம் - வழக்குரைகாதை மணிமேகலை–மலர்வனம் புக்ககாதை	10	**CO1**
II	**பிறகாப்பியங்கள்** அ) கம்பராமாயணம் - வாலிவதைபடலம் ஆ) பெரியபுராணம் - இளையான்குடிமாறநாயனர் புராணம்	10	**CO2**
III	**சிற்றிலக்கியங்கள்** அ) கலிங்கத்துப்பரணி–போர் படியாது ஆ) குற்றாலக் குறவஞ்சி–மலைவளம்	10	**CO3**
IV	அ) காப்பியத்தின் தோற்றம் வளர்ச்சி– ஐம்பெரும்காப்பியங்கள்,ஐஞ்சிறுகாப்பியங்கள் - அறிமுகம் ஆ) சிற்றிலக்கியம் தோற்றம் வளர்ச்சி	10	**CO4**
V	**இலக்கணம்** அ) ஆகுப்பெயர் ஆ) மயங்கொலிச்சொற்கள் - 8 (ர,ற வேறுபாடுகள்) இ) அலுவலகம் சார்ந்தகடிதங்கள்,மனுக்கல் எழுதுதல்	10	**CO5**

பாடநூல்

1.தமிழ்த்துறைவெளியீடு

பார்வைநூல்கள்

தமிழண்ணல், புதியநோக்கில் தமிழ் இலக்கியவரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை– 2017.
சிலப்பதிகாரம் –புலியூர்கேசிகன், பாரிநிலையம், சென்னை– 2015.
கலிங்கத்துப்பரணி– சாரதாபதிப்பகம், சென்னை- 2021.

COURSE OUTCOMES(CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன

CO1	காப்பியங்களின் சிறப்புகளை அறிதல்
CO2	பிறகாப்பியங்களின் தன்மைகளை அறிதல்
CO3	சிற்றிலக்கியங்கள் பற்றி அறிதல்
CO4	காப்பியங்கள்,சிற்றிலக்கியங்களின் தோற்றம்,வளர்ச்சியினை அறிதல்
CO5	கடிதம் எழுதுதல், இலக்கணம் பற்றி அறிதல்

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	H	H	H	H	M	M	M
CO2	H	H	H	H	H	H	H	M	M	M
CO3	H	H	H	H	H	H	H	M	M	M
CO4	H	H	H	H	H	L	H	M	M	M
CO5	H	L	L	L	L	H	H	M	M	M
H – High; M- Medium; L - Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UENLA201	**ENGLISH FOR ARTS AND SCIENCE - II**	**SEMESTER– II**

Course Objectives:

The course aims,

- To develop strategies and skills to enhance ability to read and comprehend technical texts.
- To foster ability to write convincing job applications and effective reports.
- To develop speaking skills to make technical presentations, participate in group discussions.
- To strengthen listening skill this will help them to comprehend lectures and talks in their areas of specialization.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**1. Listening** Listening-Listening to talks of a scientific/technical nature and completing information **2. Speaking** Role – play on Scientific invention **3. Reading** Reading short technical texts from journals **4. Writing**-Purpose statements- Dialogue writing Scientific inventions/Technology **5.Grammar & Vocabulary in Context:** a. Present Tense (simple and progressive) / Past Tense (Simple and progressive) b. Question types: Who/Yes or No/and Tags. c. Synonyms & Antonyms, One word substitution.	**10**	**CO1**
II	**1.Listening** a. Listening to two talks/lectures by specialists on selected subject specific topics - (TED Talks) and answering comprehension exercises (inferential questions) **2.Speaking:** a. Small group discussions (the discussions can be based on the listening and reading passages- open ended questions. **3.Reading** Reading biographies, travelogues, **4.Writing** a. General Essay on Scientific/technical topics	**10**	**CO2**

	b. Short Report on an event (field trip etc.) **Grammar & Vocabulary in Context** a . Present tense and past tense (Perfect) b. Subject-Verb Agreement; c. Word forms (prefixes & suffixes) d. Phrasal verbs.		
III	**1.Listening** a. Listening for Product description b. Process description **2.Speaking** a. Describing process b. Continuing discussions with connecting ideas **3.Reading** Reading advertisements, gadget review user Manuals. **4.Writing** Writing emails / Report writing **Grammar& Vocabulary in Context:** a. Present Tense &Past Tense(Perfect continuous) b. Synonyms & Antonyms ,One word substitution	**10**	**CO3**
IV	**1.Listening** Giving and responding to opinions **2.Speaking** Opinions and facts. **3.Reading** Newspaper articles; Journal reports **4.Writing** a. Hints Development b. Recommendations c. Extracting information from info graphics (charts and graph) **Grammar & Vocabulary in Context:** a.Voice (showing the relationship between Tenses and Voices) b. Collocations; Fixed/ Semi fixed expressions.	**10**	**CO4**

V	**1.Listening** Listening to factual and abstract information. **2.Speaking** Group Discussion **3.Reading** Reading Editorials; and Opinion Blogs **4.Writing** Drafting advertisement **Grammar & Vocabulary in Context:** a. Punctuation b. Negation (Statements & Questions) c. Cause & Effect Expressions –Content vs Function words.	**10**	**CO5**

Reference Books	
1	Technical Communication–Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2.	A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd
Web Sources	
1	https://www.linkedin.com/learning/
2	https://www.ego4u.com/
3	https://www.grammarly.com/

COURSE OUTCOMES (CO)

On completion of this course, the students should be able to

CO1	Develop the ability to listen to a conversation in English
CO2	Demonstrate confidence and proficiency in communication.
CO3	Analyse and restate the meaning of a text in English
CO4	Deliver impactful presentations.
CO5	Ability to speak clearly in standard academic English

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UMBM201	**DSC II: MICROBIAL TAXONOMY AND PHYSIOLOGY**	**SEMESTER II**

Course Objectives:

The course aims

- To learn the classification and taxonomic groups of microbes.
- To understand the basic nutritional requirements of microorganism.
- To learn the general metabolic activities of bacteria.

Credits: 05 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Microbial Evolution**: Classification–Haeckel's three kingdom concepts–Whittaker's five kingdom concepts. Taxonomy hierarchy. Binomial Nomenclature. Classical systems of classification– Chemotaxonomy, Numerical taxonomy.	**10**	**CO1**
II	**Molecular Based Classification:** DNA- DNA Hybridization - Protein sequencing – rRNA sequencing. Classification and Salient features of bacteria according to the Bergey's manual of determinative bacteriology.	**10**	**CO2**
III	**Microbial Growth:** Growth and mode of cell division in bacteria– growth curve– measurement of growth- batch, continuous and synchronous culture. Factors affecting microbial growth- Physical and Chemical - temperature, pH, osmotic pressure, moisture, radiations and salinity. Endospore formation.	**10**	**CO3**
IV	**Microbial Nutrition:** Nutritional requirements and types of bacteria. Transport of nutrients by bacteria– active transport, passive diffusion, facilitated diffusion and group translocation.	**10**	**CO4**
V	**Metabolic Pathways:** Glycolysis, Entner Duodroff pathway, Citric acid cycle, Electron transport chain – ATP generation, Photosynthesis –oxygenic and anoxygenic and Fermentation.	**10**	**CO5**

Text Books:	
1.	*Atlas, R. M.* 1997. **Principles of Microbiology.** [Second Edition]. WCK. Mc Graw–Hill.
2.	*Lansing M Prescott, John P Harley and Donald A Klein.* 2022. **Microbiology**. [12th Edition]. Mc GrawHill, NewYork.

Reference Books:	
1.	*Madigan, M.T., Martinko, J.M. and Parker, J.* 2000. **Brock Biology of Microorganisms.** [Ninth Edition]. Prentice Hall International, Inc.
2.	*Balows, A. Truper, H.G. Devorkin, M. Harder and Schleife, K.H.* 1992. **The Prokaryotes.** Springer link. NewYork.
3.	*Black, J.G.* 2017. **Microbiology- Principles and Exploration.** [Tenth Edition]. Prentice Hall International Inc.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Identify the group of microorganisms based on taxonomical character.
CO2	Analyze microorganisms based on their molecular features.
CO3	Assess the growth factors for cultivation of microorganisms in the laboratory.
CO4	Formulate suitable media for microbial growth.
CO5	Outline metabolic pathways and standardize culture conditions for industrially important microorganisms.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	H	M	M	M	H	H
CO2	H	H	H	H	H	H	H	H	H	H
CO3	H	M	H	M	M	H	M	H	M	M
CO4	H	H	H	H	H	H	H	H	H	H
CO5	M	H	M	H	H	M	H	M	H	H
H – High; M- Medium; L – Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UBCMBA201	GEC II : BASIC AND CLINICAL BIOCHEMISTRY	SEMESTER – II

Course Objectives:

The Course aims

- To facilitate the students to learn the basic structures of biomolecules.
- To understand the biological importance of complex macromolecules such as polysaccharides, lipids, proteins and nucleic acids.
- To understand about the disorders of various metabolism and their function tests.

Credits: 2 **Total Hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Carbohydrate** - General properties, function, structure, classification– monosaccharides (Glucose, Fructose, Galactose), Dissaccharides (Sucrose, Maltose, Lactose) and polysaccharides (Starch, Glycogen), and biological significance.	8	CO1
II	**Lipids** –Definition, Lipoproteins and their functions – Triglycerides, Cholesterol, LDL, HDL. **Amino acids** –Definition, classification and biological significance. **Proteins:** Definition, classification and biological significance.	8	CO2
III	**Enzymes** – Definition, IUB classification with examples. Active site - Definition, Mechanism of enzyme action - Lock & key model and induced fit hypothesis. Enzyme units - IU, katal. Factors affecting enzyme activity (pH, Temperature and substrate concentration). **Nucleic acids:** Nucleosides and nucleotides. Nucleic acids - DNA - Double helical structure - Watson and Crick model. Properties of DNA – density, absorption maxima, Tm, denaturation and renaturation. RNA – Types - rRNA, mRNA, tRNA - Structure and functions.	8	CO3

IV	**Clinical Manifestations : Carbohydrate metabolism**: Sugar levels in blood and Homeostasis, Diabetes mellitus- Classification, Complications and Diagnosis. **Lipid metabolism :** Hypo and Hyperlipidemia, Atheroscerosis, Fatty liver, Obesity.	8	CO4
V	**Clinical Assessment :** Haemoglobin levels in blood Renal- Urea, creatinine, ALP, GFR, Urinary calculai, Dialysis. Liver markers- Bilirubin, serum Transaminase (GOT, GPT), Jaundice. Cardiac Markers- CK, Troponin	8	CO5

Text Books

1. *Jain, J. L.* 2005. **Fundamentals of Biochemistry.** [Sixth Edition]. S. Chand & Company Ltd., New Delhi
2. *Conn Erice, E.* and *Stumpf Paul, K.* 2007. **Outlines of Biga**

Biochemistry. [Fifth Edition]. John Wiley & Sons, New Delhi.

Reference Books

1. *Nelson David, L.* and *Cox, M.M.* 2011. **Lehninger Principles of Biochemistry**. [Fifth Edition]. Macmillan/ Worth, New York.
2. *Lubert Stryer*, *Jermy M. Berg* and *John L. Tymoczko.* 2007. **Biochemistry.** [Sixth Edition].W. H Freeman and Co, New York.
3. *Reginald H. Garrett* and *Charles M. Grisham.* 2005. **Principles of Biochemistry**. Thomson Brooks/Cole, Australia.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Illustrate the structure, properties and chemical reactions of Carbohydrates.
CO2	Describe the nature of Nature of amino acids, functions and structural organization of proteins and Characterize the structure and properties of lipids.
CO3	Interpret the classification, characteristics and basic concepts of enzyme action and about nucleic acids.
CO4	Explain the disorders of carbohydrate metabolism and to interpret the disorders of lipid metabolism
CO5	To understand the clinical assessment of Blood, Hepatic and Liver.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	H	H	M	H	L	M	H	M
CO2	M	H	H	H	M	H	L	M	H	M
CO3	M	H	H	H	M	H	L	M	H	M
CO4	M	H	H	H	M	H	L	M	H	M
CO5	M	H	H	H	M	H	L	M	H	M
H – High; M- Medium; L – Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UMBMP201	**DSC PRACTICAL II**	**SEMESTER II**

Course Objectives:

The course aims

- To learn about the morphological diversity of microorganisms.
- To understand the biochemical characterization of microorganisms.

Credits: 04 **Total Hours: 48**

Experiment	**CONTENTS**	**Hrs**	**CO**
1.	Measurement of cell size and motility of bacteria – Micrometry and Hanging drop method.	**3**	**CO1**
2.	Microscopic examination of cyanobacteria – *Oscillatoria* sp.,*Spirulina* sp., *Nostoc* sp. and *Anabaena* sp.	**3**	**CO2**
3.	Microscopic examination of fungi – *Mucor* sp., *Aspergillus* sp., *Penicillium* sp. and *Alternaria* sp.	**3**	**CO2**
4.	Growth curve –Turbidity method	**6**	**CO3**
5.	IMViC tests	**3**	**CO4**
6.	Sugar fermentation tests	**3**	**CO4**
7.	Triple sugar iron agar (TSI) test	**3**	**CO4**
8.	Nitrate reduction test	**3**	**CO4**
9.	Starch hydrolysis	**3**	**CO4**
10.	Catalase and Oxidase tests	**3**	**CO4**
11.	Urease test	**3**	**CO4**
12.	Gelatin hydrolysis test	**3**	**CO4**
13.	Effect of various factors on growth of bacteria i. Temperature ii. pH iii. Nutrients – carbon source	**3**	**CO5**
14.	Thermal Death Point and Thermal Death Time	**6**	**CO5**

Reference Books	
1.	*Harley Prescott.* **Laboratory Exercises in Microbiology.** [Fifth Edition]. The McGraw-Hill companies.
2.	*Kannan, N.* **Laboratory Manual in General Microbiology.** [Second Edition]. Panima publishing corporation, New Delhi.
3.	*Benson.* 2001. **Microbiological Applications Laboratory Manual in General Microbiology.** [Eighth Edition]. The McGraw-Hill Companies.

EXPERIMENT OUTCOMES (EO) After completion of the course, the students will be able to	
CO1	Identify the motility of bacteria and determine the size of bacteria.
CO2	Discriminate the structures of Algae and Fungi.
CO3	Analyze the different phases of bacterial growth.
CO4	Outline the characterization of bacteria based on biochemical activities.
CO5	Assess the bacterial growth based on environmental factors.

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UBCMBAP201	GEC PRACTICAL II: BASIC AND CLINICAL BIOCHEMISTRY	SEMESTER – II

Course Objectives:

The Course aims

- To enable the students to identify the biomolecules with the basics of the chemical reactions by qualitative and quantitative analysis.
- To learn the simple biochemical separation methods.

Credits: 2 **Total Hours: 30**

S.No	EXPERIMENT	Hrs	CO
I. Qualitative Analysis			
1.	Carbohydrates: Glucose, fructose, lactose and starch.	6	CO1
2.	Amino acids: Tyrosine, tryptophan, methionine.	3	CO1
3.	Proteins: Solubility test, coagulation test, ninhydrin test, biuret test, folin's phenol test, precipitation by metals. Lipids: Solubility, grease spot, Oil spot, emulsification, halogenations, colour reactions.	3	CO1
II. Biochemical Preparation			
4.	Separation of serum and plasma from blood. Estimation of glucose - Nelson -Somogyi method.	3	CO2
5.	Estimation of Urea – DAM- TSC method in Blood and urine	3	CO2
6.	Estimation of Creatinine-Jaffe's method in Blood and urine.	3	CO2
7.	Estimation of Total protein – Lowry's method.	3	CO2
8.	Qualitative analysis of urine- Analysis of normal and abnormal constituents in urine.	6	CO2

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Illustrate the structure and chemical reactions of Carbohydrates, Amino acids, Lipid, Proteins.
CO2	Handle the blood and urine samples

Prepared By

(Course Coordinator)

Approved By

(BoS Chairman)

24UVE201	**VAC II: ENVIRONMENTAL STUDIES**	**SEMESTER – II**

Course Objectives:

The course aims

- To enable the students acquire knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.
- To implicate awareness among young minds for safeguarding environment from manmade disasters.

Credits: 1 **Total Hours: 15**

UNIT	CONTENTS	Hrs	CO
I	**Environment** – Definition – Scope – Structure and function of ecosystems - producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession– food chain, food webs.	03	CO1
II	**Natural resources:** Renewable - air, water, soil, land and wildlife resources. Non–renewable – Mineral coal, oil and gas.	03	CO2
III	**Biodiversity** – Definition – Values – Consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of bio diversity – conservation of bio- diversity:	03	CO3
IV	**Environmental Pollution:** Definition – causes, effects and mitigation measures – Air pollution, Water pollution, Soil pollution, Noise pollution. Acid rain – Climate change and global warming	03	CO4
V	**Population and environment** – Population explosion –Women and Child welfare – Disaster Management - Role of information technology in environmental health.	03	CO5

Text Book

1. Department of Biochemistry. Environmental Studies (Study Material). Published by K. S. Rangasamy College of Arts & Science (Autonomous). Tiruchengode.

Reference Book

1. *Erach Bharucha*. 2005. **Textbook of Environmental studies**. Universities press. PVT. Ltd.

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO1	Describe the types of ecosystem and concepts in sustainable development.
CO2	Explain the importance of natural resources and environmental problems.
CO3	Recite about the biodiversity, hot spots of biodiversity and its conservation.
CO4	Be conscious on the effects of pollution and population explosion.
CO5	Implement the preventive measures for environmental issues.

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UTAL301	**பொதுத்தமிழ் III**	**பருவம் - III**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன

- சமயங்கள் பற்றி அறிமுகம் செய்தல்.
- சமய இலக்கியங்கள் பற்றி மாணவர் அறியுமாறு செய்தல்.
- பிற நீதி இலக்கியங்கள் மூலம் மாணவர்களுக்கு அறத்தினை வலியுறுத்துதல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**சைவம், வைணம்** அ) திருஞானசம்பந்தர் - கோளறு பதிகம் ஆ) பெரியாழ்வார் - திருப்பல்லாண்டு (முதல் 5 பாடல்கள்) இ) ஆண்டாள் - திருமணக் கனவு	10	CO 1
II	**கிருத்துவ இஸ்லாமிய இலக்கியங்கள்** அ) கண்ணதாசன் - இயேசு காவியம் - சிலுவைப்பாடு (முதல் 10 பாடல்கள்) ஆ) நாயகம் ஒரு காவியம் - பாம்பின் நேசமும் தோழரின் பாசமும் (முதல் 10 பாடலகள்)	10	CO 2
III	**பிறநீதி இலக்கியங்கள்** அ) கொன்றை வேந்தர் - முதல் 20 பாடல்கள் ஆ) வெற்றி வேற்கை - முதல் 20 பாடல்கள் இ) நீதிநெறி விளக்கம் - முதல் 5 பாடல்கள் ஈ) உலகநீதி - முதல் 5 பாடல்கள் உ) மூதுரை - முதல் 5 பாடல்கள்	10	CO 3
IV	**சமய இலக்கிய வரலாறு** அ) சைவம் தோற்றம் வளர்ச்சி ஆ) வைணவம் தோற்றம் வளர்ச்சி இ) கிறித்துவ தோற்றம் வளர்ச்சி ஈ) இஸ்லாம் தோற்றம் வளர்ச்சி உ) பிற்கால நீதி இலக்கியங்கள் அறிமுகம்	10	CO 4
V	**இலக்கணம்** அ) அணியிலக்கணம் 1. தற்குறிப்பேற்ற அணி 2. உவமையணி 3. பின்வருநிலையணி 4. உருவக அணி 5. வஞ்சபுகழ்ச்சியணி ஆ) ஆகுபெயர்கள் இ) வல்லினம் மிகும், மிகா இடங்கள்	10	CO 5

பாடநூல்

1. செய்யுள்திரட்டு - தமிழ்த்துறை வெளியீடு, கே.எஸ்.ரங்கசாமி கலை மற்றும் அறிவியல் கல்லூரி (தன்னாட்சி)

பார்வை நூல்கள்

1. *வேந்தன், த. கோ.* 2017. **நாலாயிரதிவ்ய பிரபந்தம்**, சாரதா பதிப்பகம், சென்னை.
2. கண்ணதாசன், 2006. **இயேசு காவியம்**. கலைக்காவிரி வெளியீடு, சென்னை.
3. மேத்தா, மு. 2012. **நாயகம் ஒரு காவியம்.** ரஹ்மத் பதிப்பகம், சென்னை.
4. *தமிழண்ணல்,* 2017. **புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு**, மீனாட்சி புத்தக நிலையம், மதுரை.
5. தண்டியலங்காரம், கதிர் பதிப்பகம், திருவையாறு. 2020.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO 1	பக்தி இலக்கியங்கள், மொழி வளர்ச்சிக்கு உதவியதைக் கூறுதல்.
CO 2	சமய இலக்கியங்கள் பற்றி அறிதல்
CO 3	நீதி இலக்கியங்கள் வழி அறத்தை வலியுறுத்துதல்
CO 4	சமய இலக்கியங்கள் தோற்றம் வளர்ச்சியை அறிதல்.
CO 5	மொழியின் அடிப்படை இலக்கணத்தை அறிதல்.

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UENLA301	**ENGLISH FOR ARTS AND SCIENCE - III**	**SEMESTER – III**

Course Objectives

The course aims to

- Use English to communicate effectively in familiar and routine academic, professional and social contexts.
- Demonstrate effective listening skills to interpret academic and real-life situations.
- Apply grammatical rules and sentence structures accurately in speaking and writing.
- Select technical terms and general vocabulary to express ideas clearly.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	1. Listening : Listening to conversations and instructions. 2. Speaking : Role Play-Seeking and sharing information 3. Reading : Critical reading 4. Writing : Extended Definitions, Dialogue writing, Film/Book review 5. Grammar : Modals 6. Vocabulary : Business Jargon (Synonyms & Antonyms)	10	CO 1
II	1. Listening : Listening to advertisements and Short Documentary films 2. Speaking : Brainstorming (mind mapping) Small group discussions (subject- specific) 3. Reading : Reading visual texts – Advertisements 4. Writing : Hints development, Advertisement Writing. 5. Grammar : Concord 6. Vocabulary : Homophones, Homonyms	10	CO 2
III	1. Listening : Listening to interviews 2. Speaking : Small Talks, Non-Technical presentation 3. Reading : Short passage. 4. Writing : Process description, Blog Writing. 5. Grammar : Conditional Clause 6. Vocabulary : Portmanteau Words	10	CO 3
IV	1. Listening : Listening to TED talks. 2. Speaking : Giving ideas and opinions on launching a	10	CO 4

	gadget/instrument 3. Reading : Reading biography (eminent speakers and writers) 4. Writing : Creative writing, Check list. 5. Grammar : Reported speech 6. Vocabulary : Idioms and Phrasal Verbs		
V	1. Listening : Listening to gadget presentation. Listening to lectures on scientific inventions. 2. Speaking : Technical presentation (PPT) 3. Reading : Reading to interviews. 4. Writing : Narrative writing – writing narrative essays 5. Grammar : Simple, Compound and Complex sentences 6. Vocabulary : Discourse Markers	10	CO 5

Text Books

1. Thimmesha, L., Victor, R. 2022. **A Textbook of English Language Communication Skills,** [Revised Edition], Infinite Learning Solutions.
2. *Gajendra Singh Chauhan.* 2018. **Technical Communication,** [Latest Revised Edition]**,** Cengage learning India Pvt Limited.

Reference Books

1. *Sanjay Kumar, Pushp Lata.* 2019. **Communication Skills**, Oxford University Press.
2. *Shoba, K.N., Praveen. Sam, D.* 2020. **A Course in Technical English**, Cambridge University Press.
3. *Sudharshana, N.P., Savitha, C.* 2018. English for Engineers, Cambridge University Press.
4. *Nick Bell.* 2015. **Reading Skills: How to Read Better and Faster- Speed Reading, Reading Comprehension & Accelerated Learning**. [2nd Edition], CreateSpace Independent Publishing Platform.
5. *Michael McCarthy, Felicity O'Dell,* 2017. **English Vocabulary in Use Upper-Intermediate Book with Answers Vocabulary Reference and Practice.** Cambridge University Press.

Web Reference

1. https://learnenglish.britishcouncil.org/skills/listening/a2-listening/four-conversations
2. https://www.csuohio.edu/writing-center/critical-reading-what-critical-reading-andwhy-do-ineed-do-.
3. https://learnenglish.britishcouncil.org/grammar/b1-b2-grammar/reported-speech-statements

4. https://www.youtube.com/watch?v=TdWcUi4RjtA
5. https://hbr.org/2013/06/how-to-give-a-killer-presentation

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO 1	Recall key vocabulary words, grammar rules, and language structures.
CO 2	Interpret the meaning of texts, including implicit and explicit information.
CO 3	Apply grammar rules and vocabulary knowledge to create sentences and express ideas accurately.
CO 4	Analyze the structure and organization of texts, identifying elements such as main ideas, supporting details, and transitions.
CO 5	Evaluate the effectiveness of communication strategies in different contexts.

Course Prepared by
Ms. P. JANANI
Assistant Professor

Course Approved by
Dr. V. V. MALINEE
BOS Chairman

24UMBM301	DSC III: MOLECULAR BIOLOGY AND MICROBIAL GENETICS	SEMESTER III

Course Objectives:

The course aims

- To provide knowledge on structure and replication of DNA.
- To understand the significance and functions of RNA in protein synthesis.
- To provide information about the mechanisms of gene transfer and recombination.

Credits: 04 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**DNA Structure and Replication:** DNA Structure – Different forms of DNA(A- DNA, B- DNA, Z-DNA) DNA as a genetic material – Griffith's Avery and Harshey- Chase experiment. Prokaryotic DNA replication – Replication fork formation – Continuous as Discontinuous strand synthesis – Meselson and Stahl Experiment– Enzymes involved– DNA replication. Mechanism of DNA replication - DNA replication modes - rolling circle and Bidirectional DNA replication.	10	CO1
II	**Transcription and Translation in Prokaryotes:** Concept of transcription. RNA Polymerases - prokaryotes. Translation in prokaryotes - Translational machinery - ribosome structure in prokaryotes, tRNA structure and processing. Inhibitors of protein synthesis in Prokaryotes. Overview of regulation of gene expression - *lac, trp* operons as examples. Regulation of gene expression by DNA methylation.	10	CO2
III	**Mutation:** - Definition and types - base substitutions, frame shifts, deletions, insertions, duplications, inversions. Silent, conditional, and lethal mutations. Physical and chemical mutagens. Uses of mutations. Reversion and Supression, Mutator gene. Inter and Intragenic suppression. Repair Mechanisms - Photoreactivation, Nucleotide Repair, Base Excision Repair, Methyl Directed Mismatch Repair and SOS Repair.	10	CO3
IV	**Gene Transfer Mechanisms**: Transformation - Natural Competence and Transformation. Conjugation and its mechanism. Transduction - Generalized and Specialized.	10	CO4
V	**Transposition and Types of Transposition Reactions:** Mechanism of transposition: Replicative and non- replicative transposition. Transposable elements - Prokaryotic transposable elements –	10	CO5

	insertion sequences, composite, and non-composite transposons. Uses of transposons. Eukaryotic transposable elements – Yeast – Ty retrotransposors.		

Text Book:

1.	Malacinski G.M. (2008). Freifelder's Essentials of Molecular Biology. 4th Edition. Narosa Publishing House, New Delhi.
2.	Gardner E. J. Simmons M. J. and SnustedD.P.(2006). Principles of Genetics. 8th Edition. Wiley India Pvt. Ltd.
3.	Trun N. and Trempy J. (2009). Fundamental Bacterial Genetics. 1st Edition. Blackwell Science Ltd.
4.	Brown T. A. (2016). Gene Cloning and DNA Analysis- An Introduction. (7th Edition). John Wiley and Sons, Ltd.
5.	Dale J. W., Schantz M.V. and Plant N. (2012). From Gene to Genomes – Concepts and Applications of DNA Technology. (3rd Edition). John Wileys and Sons Ltd.

Reference Books:

1.	Glick B. R. and Patten C.L. (2018). Molecular Biotechnology – Principles and Applications of Recombinant DNA. 5th Edition. ASM Press.
2.	Russell P.J. (2010). iGenetics - A Molecular Approach, 3rd Edition., Pearson New International edn.
3.	Nelson, D.L. and Cox, M.M. Lehninger(2017). Principles of Biochemistry. 7th Edition, W.H. Freeman.
4.	Synder L., Peters J. E., Henkin T.M. and Champness W. (2013). Molecular Genetics of Bacteria, 4th Edition, ASM Press Washington-D.C. ASM Press.
5.	Primrose S.B. and Twyman R. M. (2006). Principles of Gene Manipulation and Genomics. (7th Edition). Blackwell Publishing

Web Resources

1.	[PDF] Lehninger Principles of Biochemistry (8th Edition) By David L. Nelson and Michael M. Cox Book Free Download – Study Materialz.in
2.	https://microbenotes.com/gene-cloning-requirements-principle-steps-applications/
3.	https://courses.lumenlearning.com/boundless-biology/chapter/dna-replication/
4.	Molecular Biology Notes - Microbe Notes
5.	Molecular Biology Lecture Notes & Study Materials | Easy Biology Class

COURSE OUTCOMES (CO)

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

CO1	Analyze the significance of DNA and elucidate the replication mechanism.
CO2	Illustrate the types of RNA and protein synthesis machinery.
CO3	Infer the causes and types of DNA mutation and summarize the DNA repair mechanisms.
CO4	Evaluate the importance of plasmids and phages in genetics.
CO5	Analyze gene transfer and recombination methods.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	M	M	M	M	M	M
CO2	H	H	M	H	M	H	M	M	H	M
CO3	H	H	M	H	M	H	M	M	H	M
CO4	M	H	M	H	H	M	M	M	H	H
CO5	H	H	M	H	H	H	M	M	H	H
H – High; M- Medium; L - Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UMAMBA301	GEC III: BIOSTATISTICS	SEMESTER–III

COURSE OBJECTIVE:

The Course aims

- To learn the strategies of research field and also to provide knowledge to understand the role of statistics in research.

Credits: 2 **Total Hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Introduction:** Definition – Function of Statistics – Limitations of Statistics – Collection of data – Classification and Tabulation. **(Chapter 1 Sections: 1.3, 1.7, 1.8) (Chapter 2 Sections: 2.1, 2.3)**	**08**	**CO1**
II	**Measures of Central Tendency:** Arithmetic Mean – Median – Mode – Geometric mean – Harmonic mean. **(Chapter 3 Sections: 3.1.1, 3.2 - 3.5)**	**08**	**CO2**
III	**Measures of Dispersion and Variability:** Range – Inter Quartile Range and Quartile Deviation – Mean Deviation – Standard deviation – Coefficient of variation. **(Chapter 4 Sections: 4.1 – 4.4)**	**08**	**CO3**
IV	**Correlation Analysis:** Types of correlation – Methods of studying Correlation (Excluding Correlation of grouped data). **Regression Analysis:** Regression line – Regression equation (Excluding Method of Least Square). **(Chapter 6 Sections: 6.1 – 6.2) (Chapter 7 Sections: 7.1 – 7.2)**	**08**	**CO4**
V	**Sampling and Tests of Significance:** Steps in test of hypothesis –Test of significance of small samples (t and F) – Chi-square test and Goodness of Fit. (Problems only). **(Chapter 10 Sections:10.1, 10.6) (Chapter 11)**	**08**	**CO5**

Text Book:

1. *Palanichamy. S and Manoharan. M,* 2003**Statistical methods for Biologists.** [Third Edition]. Palani Paramount Publications, Palani.

Reference Books:

1. *Daniel W.W.* 2013. **Biostatistics.** John Wiley and Sons, Newyork.

2.	*Arora, P.N. and Malhan, P.K.* 2010**Biostatistics.** Himalaya Publishing House, Mumbai.

COURSE OUTCOMES (CO)

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

CO1	Learn the importance of statistics
CO2	Understand the concepts of measures of central tendency
CO3	Know the concepts of measures of dispersion
CO4	Gain knowledge on correlation and regression analyses
CO5	Test the samples using testing of hypothesis

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	H	H	H	L	H	L	H	H
CO2	H	M	H	H	H	L	H	L	H	H
CO3	H	L	H	H	H	L	H	L	H	H
CO4	H	M	H	H	H	L	H	L	H	H
CO5	H	M	H	H	H	L	H	L	H	H
H – High; M- Medium; L - Low										

Prepared By **Approved By**

(Course Coordinator) **(BoS Chairman)**

24UMBMP301	**DSC PRACTICAL III**	**SEMESTER III**

Course Objectives:

The course aims

- To learn about the methods of genomic and plasmid DNA isolation.
- To understand the methods of protein separation.

Credits: 04 **Total Hours: 45**

Experiment	**CONTENTS**	**Hrs**	**CO**
1.	Isolation of genomic DNA from *E.coli*	**5**	**CO1**
2.	Isolation of plasmid DNA from *E.coli*	**5**	**CO1**
3.	Estimation of DNA using diphenylamine method	**5**	**CO2**
4.	Separation of bacterial protein using SDS –PAGE	**5**	**CO2**
5.	Spontaneous mutation – isolation of auxotrophic mutant by gradient plate method.	**5**	**CO3**
6.	Induced mutation – isolation of auxotrophic mutant by replica plate method	**5**	**CO3**
7.	Estimation of RNA by orcinol method.	**5**	**CO4**
8.	Bacterial conjugation.	**5**	**CO5**
9.	Estimation of protein by Lowry *et al* method.	**5**	**CO5**

Reference Books

1. Sambrook J. and Russell D.W. (2001). Molecular Cloning - A Laboratory Manual –7th Edition. Cold Spring Harbor, N.Y: Cold Spring Harbor Laboratory Press.
2. James G Cappucino. and Natalie Sherman. (2016). Microbiology – A laboratory manual. (5th Edition). The Benjamin publishing company. New York.
3. Gunasekaran P. (2007). Laboratory Manual in Microbiology. New Age International.

EXPERIMENT OUTCOMES (EO) After the completion of this course, the students will be able to	
CO1	Illustrate different types of DNA and RNA.
CO2	Utilize hands-on training in isolation of genomic and plasmid DNA.
CO3	Analyze importance of experimental microbial genetics.
CO4	Apply the knowledge of molecular techniques in various fields.
CO5	Investigate the significance of various estimation methods.

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UMAMBAP301	**GEC PRACTICAL III : STATISTICAL METHODS USING MS-EXCEL**	**SEMESTER–III**

COURSE OBJECTIVE:

The Course aims

- To give a good grip on concepts in analyzing the data using statistical software

Credits: 2 **Total Hours: 21**

PROGRAM	**CONTENTS**	**Hrs.**	**CO**
1	Diagrams and graphs	**03**	**CO1**
2	Measures of Locations	**03**	**CO2**
3	Measures of Dispersion	**03**	**CO2**
4	Correlation coefficient (Karl Pearson and Rank method)	**03**	**CO3**
5	Regression lines	**03**	**CO3**
6	Small sample test (t and F)	**03**	**CO4**
7	Chi-square test for independence of attributes.	**03**	**CO4**
REFERENCE BOOKS			
1.	*Bhattacharjee Dibyojyoti.* **Practical Statistics Using Microsoft Excel.** Asian Books Private Ltd.		
2.	*Apte D.P.*2008. **Statistical Tools for Mangers using MS EXCEL.** Excel Books.		

COURSE OUTCOMES (CO)

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

CO1	Demonstrate the data in diagrammatic and graphical representation
CO2	Find the averages and measures of dispersion
CO3	Calculate correlation and regression for huge amount of data
CO4	Gain knowledge about test of significance

24UMBSB301	SEC I: BIOINSTRUMENTATION	SEMESTER III

Course Objectives:

The course aims

- To learn the working mechanism and applications of biological instruments.
- To study various analytical techniques in the field of Microbiology.

Credits: 02 **Total Hours: 30**

UNIT	CONTENTS	Hrs	CO
I	**Buffer, pH and Spectrometry:** Good Laboratory practices. Buffer preparation– Phosphate buffer. Working principle, operation and maintenance of pH meter, Colorimeter, UV-Vis Spectrophotometer and Infrared Spectrometer.	06	CO1
II	**Centrifugation:** Principles of centrifugation. Rotor types– Fixed angle, vertical tube and swinging bucket. Instrumentation and application of centrifugation –Preparative and analytical techniques. Ultracentrifuge.	06	CO2
III	**Electrophoresis:** Principles and applications–Paper electrophoresis, Agarose Gel Electrophoresis. SDS-PAGE, Two-dimensional electrophoresis and Isoelectric focusing.	06	CO3
IV	**Chromatography:** Principle and applications- Paper, TLC, Column, Ion exchange, Affinity chromatography, HPLC, Gas chromatography, GCMS and LCMS.	06	CO4
V	**Radioactivity and Imaging techniques:** Half-life, Radioactive decay, Excitation, Ionization. Isotopes used in biological studies. Measurement of Radioactivity-Geiger- Muller counter, Scintillation counter.	06	CO5

Text Book:

1. *Rodney F. Boyer.* **2007. Modern Experimental Biochemistry**. 3rd Edition. Pearson Education ltd.
2. Veerakumari, L (2009). Bioinstrumentation- 5th Edition -. MJP publishers.

Reference Books:

1. *Wilson, K., and Walker, J.* 2003. **Practical Biochemistry, Principles and Techniques**. Cambridge University Press, Cambridge.
2. Skoog A., West M (2014). Principles of Instrumental analysis – 14th Edition W. B. Saunders Co., Philadephia.

Web Resources:

1.	http://www.biologydiscussion.com/biochemistry/centrifugation/centrifuge introduction-types-uses-and-other-details-with-diagram/12489
2.	http://www.rsc.org/learn-chemistry/collections/spectroscopy/introduction
3.	https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html

COURSE OUTCOMES (CO)

After completion of the course, the students' will be able to

CO1	Discuss the importance of bioinstruments in science field.
CO2	Separate biomolecules based on sedimentation using centrifuges.
CO3	Isolate biomolecules based on electrophorectic mobility.
CO4	Assess the separation and characterization of biomolecules.
CO5	Evaluate the respective biomolecules through radio isotopes.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	H	H	H	H	H	H	H
CO2	M	M	M	H	H	M	M	M	H	H
CO3	H	H	H	H	M	H	H	H	H	M
CO4	M	H	H	H	M	M	H	H	H	M
CO5	M	M	M	M	M	M	M	M	M	M
H – High; M- Medium; L – Low										

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UVE301	VAC III : UNDERSTANDING INDIA	SEMESTER – III

Course Objectives

The course aims

- Identify India's geographical location, neighboring countries and major geographical features.
- Recognize the components of the Indian social structure, including caste, community, class and gender.
- Analyze the evolution of social hierarchies in India over different periods.

Credits: 1 **Total Hours: 15**

UNIT	CONTENTS	Hrs.	CO
I	**Geography & Cultures of India:** Physical Features of India – Landscape – Mountains – Rivers - Population, its growth, distribution - Migration People - Culture of India - Major Festivals, Culinary traditions – Costumes.	3	CO 1
II	**Architecture of India:** Ancient Architecture - Indus Valley Civilization, Mauryan, Gupta – Architecture - An introduction to Indian knowledge systems.	3	CO 2
III	**Freedom Struggle:** Revolt of 1857 - Formation of Indian National Congress – Swadeshi Movement - Gandhian Movements - Subhas Chandra Bose and INA - Independence and Partition of India.	3	CO 3
IV	**Communicating Culture:** Oral narratives – Myths - Tales and Folklore - Introduction to the Tribal Cultures of India	3	CO 4
V	**Indian Economy:** Economic Liberalization - Mixed Economy - Planning Commission	3	CO 5

Text Books

1. *Chauhan, Abha.* 2021. **Understanding Culture and Society in India: A Study of Sufis, Saints and Deities in Jammu Region**. Springer Nature.

Reference Books

1. *Hussain, Majid.* 2022. **Geography of India**. Edited by Tasawwur Husain Zaidi. Noida: McGraw Hill.
2. *Ramesh Dutta Dikshit,* 2020. **Political Geography: Politics of Place and Spatiality of Politics**, Macmillan Education.
3. *Thapar, Romila.* 2021. **Indian Cultures as Heritage: Contemporary Pasts.** London, Seagull Books.

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO 1	Identify India's geographical location, neighboring countries, and major geographical features.
CO 2	Interpret the significance of different types of architectural structures and Indian Knowledge Systems in shaping philosophical thought.
CO 3	Illustrate the role of different freedom fighters and their contributions to India’s independence.
CO 4	Demonstrate how oral narratives contribute to the preservation of tribal cultures.
CO 5	Assess the impact of economic liberalization on India's development.

Course Prepared by
Mr. J. SIBI CHAKARAVARTY
Assistant Professor

Course Approved by
Dr. V. V. MALINEE
BOS Chairman

24ULS301	AEC I: CAREER COMPETENCY SKILLS I	SEMESTER – III

Course Objectives

The course aim

- To develop and improve the problem solving skill.

Credits: 1 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	Pipes and Cisterns – Time and Work **Chapter 16, 17**	5	CO 1
II	Time and Distance – Boat and Streams **Chapter 18, 19**	5	CO 2
III	Problem on Trains – Alligation and Mixture **Chapter 20, 21**	5	CO 3
IV	Simple Interest - compound interest **Chapter 22, 23**	5	CO 4
V	Calendar – Clock – Permutation and combination **Chapter 27, 28, 30**	5	CO 5

Text Books

1. *Aggarwal R.S.* 2025. **Quantitative Aptitude.** [Revised Edition]. S. Chand& Co., New Delhi.

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO 1	Solve problems involving the concepts of Simplification and average.
CO 2	Solve problems involving the concepts of Surds and Indices
CO 3	Solve problems involving the concepts of Ratio and Proportion
CO 4	Solve problems involving the concepts of Profit and loss, Partnership.
CO 5	Solve problems involving the concepts of Age and Percentage.

Course Prepared by
Ms.A. ISWARYA
Assistant Professor

Course Approved by
Mr. T. RAJENDRAKUMAR
(BOS Chairman)

24UTAL401	**பொதுத்தமிழ் IV**	**பருவம் - IV**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன

- சங்க இலக்கியங்களை அறிமுகம் செய்தல்.
- அற இலக்கியங்கள் பற்றி மாணவர்கள் அறிய செய்தல்.
- இலக்கிய வரலாறுகளை அறிய வைத்தல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**சங்க இலக்கியம் (எட்டுத்தொகை)** அ) குறுந்தொகை - பாடல் 2,3,4,40,167 ஆ) கலித்தொகை - பாடல் 1-5 இ) புறநானூறு - பாடல் 3,112 ஈ) ஐங்குறுநூறு - அம்ம வாழிப்பத்து	10	CO 1
II	**சங்க இலக்கியம் (பத்துப்பாட்டு)** அ) குறிஞ்சிப்பாட்டு (106 வரிகள் மட்டும்)	10	CO 2
III	**அற இலக்கியம்** அ) திருக்குறள் - மருந்து ஆ) நாலடியார் - குடிப்பிறப்பு (முதல் 5 பாடல்கள்) இ) இன்னா நாற்பது - முதல் 5 பாடல்கள் ஈ) முதுமொழிக்காஞ்சி - தண்டாப்பத்து	10	CO 3
IV	**இலக்கிய வரலாறு** அ) முச்சங்க வரலாறு அறிமுகம் ஆ) எட்டுத்தொகை நூல்கள் இ) பத்துப்பாட்டு நூல்கள் ஈ) பதினெண்கீழ்க்கணக்கு நூல்கள்	10	CO 4
V	**இலக்கணம்** அ) அகத்திணைகள் ஆ) புறத்திணைகள் இ) தன்வினை, பிறவினை, செய்வினை, செய்பாட்டுவினை வாக்கியங்கள	10	CO 5

பாடநூல்

1. பொதுத்தமிழ், தமிழ்த்துறை வெளியீடு, கே.எஸ். ரங்கசாமி கலை மற்றும் அறிவியல் கல்லூரி (தன்னாட்சி)

பார்வை நூல்கள்

1. *சுப்பிரமணியம், ச.வே.* 2012. **பதினெண்கீழ்க்கணக்கு நூல்கள்,** மணிவாசகர் பதிப்பகம், சென்னை.
2. *சுப்பிரமணியம், ச. வே.* 2008. **சங்க இலக்கியம் மூலம் முழுவதும்**, மணிவாசகர் பதிப்பகம், சென்னை.
3. மறைமலையடிகள், 2005. **குறிஞ்சிப்பாட்டு ஆராய்ச்சியுரை**. இராமையா பதிப்பகம், சென்னை.
4. *முனைவர் பாக்யமேரி*, 2008. **வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு.** பாரி நிலையம், சென்னை.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO 1	எட்டுத்தொகை நூல்கள் பற்றி அறிதல்.
CO 2	பத்துப்பாட்டு நூல்கள் பற்றி அறிதல்.
CO 3	அற இலக்கியங்கள் வழி வாழ்க்கை கூறுகளை உணர்த்துதல்
CO 4	இலக்கிய வரலாற்றின் தோற்றம் வளர்ச்சியை அறிதல்
CO 5	அடிப்படை இலக்கணத்தை அறிதல்.

Course Prepared by
Dr. R. PUVITHA
Assistant Professor

Course Approved by
Dr. R. PALANIVEL
BOS Chairman

24UENLA401	**ENGLISH FOR ARTS AND SCIENCE - IV**	**SEMESTER – IV**

Course Objectives

The course aims to

- Integrate language skills effectively in professional and academic contexts.
- Analyze and apply domain-specific registers to communicate with clarity and precision in subject-related discussions.
- Enhance proficiency by expanding vocabulary and evaluating its formal usage.
- Construct context-appropriate responses using advanced grammar, vocabulary, and technical terms in academic and professional settings.

Credits: 3 **Total Hours: 50**

UNIT	**CONTENTS**	**Hrs.**	**CO**
I	1. Listening : Listening to technical Style of communication, ABC of technical communication 2. Speaking : Public speaking and Extempore. 3. Reading : Reading scientific and technical texts 4. Writing : Proposals 5. Grammar : Determiners 6. Vocabulary : Fixed Expressions	10	CO 1
II	1. Listening : Listening and Note taking 2. Speaking : Techniques for neutralization of Mother Tongue Influence (MTI) 3. Reading : News magazines, Pamphlets, Reading words with accuracy. 4. Writing : Summary writing 5. Grammar : Common errors. 6. Vocabulary : Compare and Contrast expressions.	10	CO 2
III	1. Listening : Listening to accent of English – British & American 2. Speaking : Debate 3. Reading : Short narratives and descriptions excerpts interview. 4. Writing : Essay Writing. 5. Grammar : Mood, Modifiers. 6. Vocabulary : Changing words from one form to another.	10	CO 3

IV	1. Listening : Radio News / TV –News telecast 2. Speaking : Watch or Listen to documentaries 3. Reading : Reading Motivational Stories (Success stories in subject areas) 4. Writing : Report writing (Investigative and Progress report) 5. Grammar : Negation (Statements & Questions) 6. Vocabulary : Sequence of words	10	CO 4
V	1. Listening : Listening to health problems and advice, Stress in responses, Listening to restaurant Orders 2. Speaking and : Expressing Likes and dislikes, Agreeing disagreeing, Table manners. 3. Reading : Reading about the new hobby of geo coaching 4. Writing : Meeting Minutes 5. Grammar : Relative clause 6. Vocabulary in Context : Subject-Specific Vocabulary – Science / Arts	10	CO 5

Text Books

1. Thimmesha, L., Victor, R. 2022. **A Textbook of English Language Communication Skills,** [Revised Edition], Infinite Learning Solutions.

Reference Books

1. *Jack C. Richards., Jonathan Hull.,* 2015. **Interchange**. Cambridge University Press.
2. *Lakshminarayanan*., **A Course Book On Technical English**, Scitech Publications (India) Pvt. Ltd.

Web Reference

1. https://www.fluentu.com/blog/educator-english/esl-listening-websites/
2. https://americanenglish.state.gov/resources/teachers-corner-listening

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO 1	Understand and share information and ideas clearly in writing and speaking across different situations.
CO 2	Speak clearly and confidently in real-life situations using suitable communication methods.
CO 3	Analyze different texts to understand both their meaning and language use.
CO 4	Evaluate their own English language skills to identify strengths and areas for improvement.
CO 5	Create effective conversations and written pieces for different communication situations.

Course Prepared by

Mr. R. PACHAGOUNDAN

Assistant Professor

Course Approved by

Dr. V. V. MALINEE

BOS Chairman

24UMBM401	**DSC IV: IMMUNOLOGY**	**SEMESTER IV**

Course Objectives:

The course aims

- To understand the working of immune system and immune molecules.
- To know the mechanism of immune response and immunodiagnosis.
- To impact knowledge on immunological disorders.

Credits: 04 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Introduction and Immunity**: Basics in Immunology- Contributions-Early theories and clonal selection theory. Immunity types and response- Innate and Acquired immunity, Humoral and Cell mediated immunity.	**10**	**CO1**
II	**Cells and Organs of Immune System and Antigen:** Hematopoiesis and its regulations, Role of stromal cells, Programmed Cell Death. Cells, Organs and tissues of the immune system– Primary lymphoid organs– Secondary lymphoid tissues. Antigens: Types– Epitopes, haptens, adjuvants and properties. Super Antigens.	**10**	**CO2**
III	**Antigen– Antibody Reactions:** Antibody: Structure, types and properties. Monoclonal antibody production. Primary and secondary reactions, Chemical interactions, Agglutination, Agglutination inhibition, Precipitation, Immunofluorescence, ELISA, RIA, Complement fixation test, Immunohaematology– ABO and Rh incompatibility.	**10**	**CO3**
IV	**Complement System**: Properties, Classical and alternative pathway, Cytokines - Role of Cytokines, structure and functions. MHC and its role. Autoimmunity– Grave's disease, Myasthenia Gravis. Vaccinology – Immunization – Active and Passive- Attenuated vaccine, Toxoid -Recombinant vaccine – purified macromolecules as vaccines. COVID Vaccine.	**10**	**CO4**
V	**Effector Mechanisms:** Transplantation- HLA Typing-Types of grafting, graft acceptance and rejection. Hypersensitive reactions– Classification–IgE mediated (type–I)– Antibody mediated cytotoxic (Type–II)– Immune complex mediated (Type-III)- TDTH -Mediated(Type-IV). Cancer immunology– Origin and terminology, Immune responses to tumour, Cancer	**10**	**CO5**

	Immunotherapy.		

Text Book:

1.	*Nandhini Shetty.* 2021. **Immunology: Introductory Text Book**. 2 nd edition. New Age International Pvt. Ltd., New Delhi.

Reference Books:

1.	*Roitt.* 2017. **Essential Immunology. 13th Edition.** Wiley - Blackwell Scientific Publishers, London.
2.	*Janeway, C. A., P. Travers, M. Walport and M. J. Shlomchik* (2008). **Immunobiology**: 7th Edition. The Immune System in Health and Disease. Garland Publishing, USA.
3.	*Kuby.* 2022. **Immunology**. eighth Edition. W.H. Freemna and Company, New York.

Web Sources:

1.	https://www.ncbi.nlm.nih.gov/books/NBK279395/
2.	https://med.stanford.edu/immunol/phd-program/ebook.html
3.	https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes/

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Understand the importance of immunity.
CO2	Discuss the cells and organs of immune system.
CO3	Analyze the importance of immunity and to develop new monoclonal antibodies.
CO4	Demonstrate the nature of antigens and antibodies and to develop vaccines.
CO5	Analyze merits and demerits of transplantation.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M	M	M	M	M	M
CO2	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H
CO4	M	M	M	M	M	M	M	M	M	M
CO5	H	H	H	H	H	H	H	H	H	H
H – High; M- Medium; L – Low										

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UCSMBA401	GEC IV: INTRODUCTION TO PYTHON AND ARTIFICIAL INTELLIGENCE (For the students of B.Sc. Microbiology)	SEMESTER–IV

COURSE OBJECTIVES:

The course aims

- To make students understand the concepts of Python programming
- To have an introduction about Artificial Intelligence.
- To elaborate on future trends of Artificial Intelligence

Credit Points: 2 **Total Hours: 30**

UNIT	CONTENTS	Hrs	CO
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions.	6	CO1
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements.	6	CO2
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments:** Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion.	6	CO3
IV	**Introduction:** Definitions of Artificial Intelligence – Artificial Intelligence problems – Topics of Artificial Intelligence – Timelines of Artificial Intelligence - Branches of Artificial Intelligence – Applications of Artificial Intelligence.	6	CO4
V	**Future of Artificial Intelligence :** Autonomous Cars – United States Vs China – Technological Unemployment – Weaponization of AI – Drug Discovery – Artificial General Intelligence	6	CO5

Text Book:

1.	*Reema Thareja*, *First Edition*, *2017*. **Python Programming using problem solving approach.** Oxford University Press.(UNIT I,II,III)
2.	*Vinod Chandra S.S and Haseendran.S* , 2014. **Artificial Intelligence and Machine Learning**, Prentice Hall of India Pvt Ltd, Delhi.(UNIT IV)

3.	*Tom Taulli*, 2019. **Artificial Intelligence Basics – A Non-Technical Introduction**, A Press. Edition Ltd, New Delhi. (UNIT V)
Reference Books:	
1.	*John Paul Mueller*, *Luca Massaron*, **Artificial Intelligence For Dummies** [Second Edition].**2007**. DreamtechPress,New Delhi.
WEB REFERENCES:	
1.	https://medium.com/@manutej/a-non-technical-introduction-to-ai-part-1-a53471fae2fe
2.	https://www.netguru.com/blog/crash-course-introduction-to-ai-fundamentals

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Understand the basics concepts of python.
CO2	Working with Looping and jump statements.
CO3	Learn the Concept of function and function arguments
CO4	Understand the basics of Artificial Intelligence.
CO5	Discuss about the Future of Artificial Intelligence.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	H	H	M	H	M	H	H
CO2	M	H	M	H	H	M	H	M	H	H
CO3	M	H	M	H	H	M	H	M	H	H
CO4	M	H	M	H	H	M	H	M	H	H
CO5	M	H	M	H	H	M	H	M	H	H
H – High; M- Medium; L – Low										

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UMBMP401	**DSC PRACTICAL IV**	**SEMESTER IV**

Course Objectives:

The course aims

- To study the serological diagnostic techniques.
- To study the qualitative analysis of various antigen against antibody.

Credits: 04 **Total Hours: 45**

Experiment	**CONTENTS**	**Hrs**	**CO**
1.	ABO blood grouping and cross matching	**5**	**CO1**
2.	C - Reactive Protein	**2**	**CO2**
3.	Rheumatoid Arthritis	**3**	**CO2**
4.	Anti Streptolysin O	**2**	**CO3**
5.	Rapid Plasma Reagin	**3**	**CO2**
6.	WIDAL test (Slide and tube methods)	**5**	**CO3**
7.	Haemagglutination	**5**	**CO4**
8.	Tridot ELISA	**5**	**CO4**
9.	Counter Immunoelectrophoresis	**5**	**CO5**
10.	Double Immunodiffusion (Ouchterlony)	**5**	**CO5**
11.	COVID Test kit method	**5**	**CO5**

Reference Books:

1. *Rajan, Sand Selva Christy, R.*2010. **Experimental Procedures in Life Sciences.** [First Edition]. Anjanaa Book House, Chennai.
2. *Kannan, N.* **Laboratory Manual in General Microbiology.** [Second Edition]. Panima publishing corporation, New Delhi.
3. *Aneja*, K. R. 2003. **Experiments in Microbiology, Plant pathology and Biotechnology.** [Fourth Edition]. New age International.

COURSE OUTCOMES (CO)

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

CO1	Identify viral infections by serological method diagnosis.
CO2	Analyze the blood group of individuals and also analyze the enteric fever and their causative agent.
CO3	Utilize immunotechniques for qualitative analysis of antigens.
CO4	Evaluate Streptococcal infections by serological methods and determine the infection status based on CRP level.
CO5	Identify the presence of rheumatoid factor among suspected patients and diagnose HIV, hepatitis viral infection among risky populations.

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UCSMBAP401	GEC PRACTICAL IV: PYTHON AND OFFICE AUTOMATION LAB (For the students of B.Sc., Microbiology)	SEMESTER - IV

COURSE OBJECTIVES:

The subject aims

- To make students understand the concepts of Python programming
- To acquire basic concepts of MS Word, MS Excel, MS PowerPoint and its applications.

Credit Points: 2 **Total Hours: 20**

S.NO	PROGRAMS	Hrs	CO
1.	Program using variables, constants, I/O statements in Python.	**2**	**CO1**
2.	Program using Operators in Python.	**2**	**CO1**
3.	Program using Conditional Statements.	**2**	**CO2**
4.	Program using Loops.	**2**	**CO2**
5.	Program using Jump Statements.	**2**	**CO2**
MS – Word			
6.	Designing a Personal Profile using following options • Font styles. • Page layout, Page Setup (Setting Margins, Changing Page Size, Changing Page Orientation and Applying Page Background). • Table.	**2**	**CO3**
7.	Creating a Document for topic presentation with following options • Single and Double Column. • Page numbers. • Headers and Footers. • Date and time, Pictures and Shapes.	**2**	**CO3**
MS - Excel			
8.	Entering Data for Stock Analysis using the following options • Formatting the Cells. • Sorting and Filtering.	**2**	**CO4**
9.	Creating a Chart for Lab Stock Maintenance with sample data.	**2**	**CO4**

MS - PowerPoint			
10.	Creating a Presentation with Animation effects.	**2**	**CO5**
WEB REFERENCES:			
1.	https://www.tutorialspoint.com		
2.	https://www.free - computer - tutorials.net		
3	https://www.edu.getglobal.org		
4	https://www.w3schools.com		

COURSE OUTCOMES (CO):

After the completion of this course, the student will be able to

CO1	Understand the basics concepts of python.
CO2	Working with Looping and jump statements.
CO3	Create professional and academic documents by applying different formats and styles.
CO4	Create, edit and enhance basic Excel spreadsheet using formula and charts.
CO5	Understand basic power point using templates, animations and slide transitions.

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UMBSB401	SEC II: ORGANIC FARMING AND BIOFERTILIZER TECHNOLOGY	SEMESTER IV

Course Objectives:

The course aims

- To encourage organic farming in urban areas.
- To understand the significance and implementation of biofertilizers.

Credits: 02 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Organic Farming:** Definition, Benefits, Concept of different cropping systems in relation to organic farming, Crop rotation. Organic farming process. Organic fertilizers, Crop nutrients and effective microorganisms in organic farming.	05	CO1
II	**Organic farming for urban space:** Create a sustainable organic garden (Backyard- Square Foot Gardening, Small Space Gardening, Mini Farming) Composting, Vermicomposting.	05	CO2
III	**Bacterial Biofertilizers:** Introduction, advantages and future perspective. Structure and Characteristic features production and field application of Biofertilizers – *Azospirillum, Azotobacter* and *Rhizobium.*	05	CO3
IV	**Algal and Fungal Biofertilizers:** Structure and Characteristic features of Cyanobacterial biofertilizers – *Anabaena, Nostoc;* Structure and Characteristic features of fungal biofertilizers – AM , Mycorrhiza.	05	CO4
V	**SCP:** Cultivation, Mass production and packaging of Spirulina, Oyster and *Agaricus* Mushroom.	05	CO5

Text Book:

1. *E.Somasundaram., D Udhyanandhini, M Meyyappan. (2021).* **Principles of Organic farming.**
2. *A M Pirttila (2021).* **Biofertilizer and Biocontrol agents for agriculture**.
3. *N S Subbarao (2017).* **Biofertilizers in Agriculture and Forestry(Fourth edition)**

Reference Books:

1. *Sujit Chakrabarthy (2018).* **Organic Home Gardening Made Easy, 1st edition.**

2.	*Bansal M (2019).* **Basics of Organic farming CBS Publisher.**

Web Sources:

1.	https://agritech.tnau.ac.in/org_farm/orgfarm_intoduction.html
2.	https://www.fao.org/organicag/oa-faq/oa-faq6/en/
3.	https:// www.india.gov.in/topics/agriculture/organic-farming

COURSE OUTCOMES (CO)

After completion of the course, the students' will be able to

CO1	Become an entrepreneur with wide knowledge about farming and sustainable resources.
CO2	Implement organic farming in urban areas with knowledge on compost.
CO3	Gain Knowledge about the bacterial biofertilizer and its advantages.
CO4	Understand the significance about cyanobacterial and fungal biofertilizers.
CO5	Understand and implement the use of biofertilizers.

MAPPING										
PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	M	M	M	H	H
CO3	H	H	H	H	M	H	H	H	H	M
CO4	H	H	H	H	M	M	H	H	H	M
CO5	H	H	H	H	H	M	M	M	M	M
H – High; M- Medium; L – Low										

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UVE401	VAC IV: DIGITAL AND TECHNOLOGICAL SOLUTIONS	SEMESTER – IV

Course Objectives

The course aims

- To build familiarity with key digital paradigms.
- To create awareness about the importance and impact of digital technology.
- To impart knowledge of communication and network systems.
- To promote awareness and understanding of e-Governance and Digital India initiatives

Credits: 1 **Total Hours: 15**

UNIT	CONTENTS	Hrs.	CO
I	**Evolution of Digital Systems:** Introduction and Evolution of Digital Systems - Role and Significance of Digital Technology - Information and Communication Technology – Tools.	3	CO 1
II	**Computer System:** Computer System - Software and its types - Operating systems: Types and Functions. **Problem Solving:** Algorithms and Flowcharts.	3	CO 2
III	**Communication System:** Principles, Model & Transmission Media. **Internet:** Concepts - Application - WWW - Web Browsers and Search Engines – Messaging - Email and Social Networking.	3	CO 3
IV	**E-commerce & Digital Marketing:** Basic Concepts – Benefits of E-commerce – Challenges in Digital Marketing. **Computer Based Information System:** Significance and Types.	3	CO 4
V	**Digital India and e-Governance:** Initiatives, Infrastructure, Services and Empowerment. **Digital Financial Tools:** Unified Payment Interface - Aadhar Enabled Payment System – USSD - Credit / Debit Cards - e-Wallets - Internet Banking - NEFT/RTGS and IMPS - Online Bill Payments and PoS.	3	CO 5

Text Books

1. *Rajaraman, V.* 2018. **Introduction to Information Technology**, [3rd Edition], PHI Learning private Limited.
2. *Behrouz A. Forouzan,* 2022. **Data Communications and Networking**, [4th Edition], McGrawHill.
3. *Balagurusamy, E.* 2009. **Fundamentals of Computers**, Tata McGraw Hill.

Reference Books

1. *Pramod Kumar, Anuradha Tomar, Sharmila, R.* 2021. **Emerging Technologies in Computing Theory, Practice, and Advances**, [1st Edition], Chapman and Hall/CRC Imprint.
2. *Stuart Jonathan Russell, Peter Norvig*. 2014. **Artificial Intelligence - A Modern Approach**, Pearson Education
3. *Samuel Greengard,* 2021. **Internet of Things**, [Revised and Updated Edition], MIT Press.
4. *Murthy, C.S.V*. 2002. **E-Commerce (Concepts, Models, Strategies),** Himalaya Publishing House.
5. *Judith S. Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman*, 2013. **Big Data for Dummies**, Wiley & Sons-Wiley.

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO 1	Understand digital systems, technology and the effective use of ICT tools.
CO 2	Gain knowledge of computer systems, software, operating systems, and problem-solving techniques.
CO 3	Learn about communication systems, computer networks, the internet, and various online platforms.
CO 4	Know about computer-based information systems, e-commerce, and digital marketing concepts.
CO 5	Gain awareness of Digital India initiatives, e-governance services and digital financial tools.

Course Prepared by

Dr. S. NITHYA

Assistant Professor

Course Approved by

Dr. J. TAMILSELVAN

(BOS Chairman)

24ULS401	AEC II: CAREER COMPETENCY SKILLS II	SEMESTER – IV

Course Objectives

The course aim

- Analyze the structure and function of English grammar for effective communication in diverse contexts.
- Demonstrate appropriate linguistic expressions and soft skills required for formal and informal interactions.
- Use effective communication techniques for professional speaking, writing, and interactions at the workplace

Credits: 1 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Advanced Functional Grammar in Context** Tense usage in Professional Settings - Present perfect - Past perfect - Future forms – Conditionals - Reported Speech	5	CO 1
II	**Professional Communication & Writing** Resume and Cover Letter writing - Writing memos, Meeting minutes	5	CO 2
III	**Soft Skills** Goal setting: SMART goals, planning and prioritization - Conflict resolution and problem-solving approaches	5	CO 3
IV	**Speaking Skills for Workplace** Debates - Group discussions	5	CO 4
V	**Advanced Professional Communication** Business Reports - Proposals	5	CO 5

Text Books

1. *Biber, Douglas, et al.* 2020. **Longman Grammar of Spoken and Written English**. Pearson Education,
2. *Vickers, Rachel. 2021.* **The Art of Writing a CV: A Practical Guide to Writing a Winning CV and Cover Letter**. [2nd Edition]. Kogan Page.

Reference Book

1. *Eastwood, John*. 2022. **Oxford Practice Grammar: Basic.** [3rd Edition]. Oxford University Press.
2. *Bailey, Stephen.* 2022. **Academic Writing: A Handbook for International Students**. [5th Edition]. Routledge.

COURSE OUTCOMES (CO)

After completion of the course, the student will be able to

CO 1	Identify and apply basic rules of English grammar in everyday communication.
CO 2	Construct clear and well-organized short pieces of writing for different purposes.
CO 3	Demonstrate appropriate social and professional expressions in spoken interactions.
CO 4	Develop effective verbal and non-verbal communication skills for various contexts.
CO 5	Engage in everyday conversations and workplace communication by applying appropriate language and etiquette.

Course Prepared by

Mr. J. SIBI CHAKARAVARTY

Assistant Professor

Course Approved by

Dr. V. V. MALINEE

BOS Chairman

24UMBNM301	**MDC I : PERSONAL HYGIENE** **(Course offered to other department students)**	**SEMESTER III**

Course Objectives:

The course aims

- To equip the student with procedures of good basic hygiene and sanitation requirements.
- To learn the prevention of health hazard situation through unhygienic handling of food, equipment used in food production and food production work areas.

Credits: 02 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Hygiene and Health:** Introduction to hygiene. Factors influencing health and healthful living. Practices related to maintain normal circulation- normal respiration- normal digestion and elimination- normal sensory functions- normal skeletal alignment.	05	CO1
II	**Physical Health:** Skin care, cleanliness, clothing; care of the hair, prevention of pediculosis. Dental care and oral hygiene. Care of hands, hand washing, care of nails. Hygiene of elimination, menstrual hygiene. COVID Care.	05	CO2
III	**Health habits and practices**: Recognizing positive and negative practices in the community. Care of the face, foot wear, eyes, nose and throat, Food values- nutritious diet, selection, preparation and handling of food.	05	CO3
IV	**Periodic health examination**: The health examination; health record; infection- types; immunization; detection and correction of defects; prevention and early treatment of common ailments - common colds, indigestion, headache.	05	CO4
V	**Health in the home:** The home as a center for healthful living. Household measures for disposal of refuse, waste; latrines and sanitation; ventilation. Safety in the home; common home hazards. Sanitation in animal sheds; insects and pests.	05	CO5

Text Book:

1. *Nicholas Johns*. 2000. **Managing Food Hygiene.** Macmillan Publishers. Hong kong.

Reference Books:

1.	*Lansing M Prescott, John P Harley and Donald A Klein*. 2020. **Microbiology**. [Eleventh Edition]. Mc Graw Hill, NewYork.

COURSE OUTCOMES (CO)

After completion of the course, the students' will be able to

CO1	Create awareness of personal hygiene and healthy living.
CO2	Practice hygienic methods to protect the skin, hair, oral and nail.
CO3	Follow positive hygienic practice for healthy life.
CO4	Plan for periodic examination of body against common infection.
CO5	Explain proper disposal of waste and maintain hygiene at home.

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UMBNM401	MDC II: NUTRITION AND HYGIENE (Course offered to other department students)	SEMESTER IV

Course Objectives:

The course aims

- To learn about nutrition, nutritional facts and their importance
- To learn information to optimize our diet
- To impart knowledge on different health care programs taken up by India and types of hygiene methods

Credits: 02 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Nutrition –** Definition, importance, Good nutrition, and mal nutrition; Balanced Diet: Basics of Meal Planning. Importance of Carbohydrates, Lipids, Proteins and Vitamins in dietary sources, effects of deficiency. Food sources of Calcium, Potassium, and Sodium; food sources of Iron, Iodine, and Zinc. Importance of water–functions, sources, requirements and effects of deficiency.	**05**	**CO1**
II	**Nutrition for Life Cycle:** Balanced diet-Normal, Pregnant, lactating women, Infancy, young children Adolescents, Adults, and the Elderly; Diet Chart; Nutritive value of Indian foods.	**05**	**CO2**
III	**Improper diets:** Definition, Identification, Signs and Symptoms- malnutrition, under-nutrition, over-nutrition, Protein Energy Malnutrition, obesity; Nutritional Disease and Disorder- hypertension, diabetes, anemia, osteomalacia, cardiovascular disease.	**05**	**CO3**
IV	**Health**: Determinants of health, Key Health Indicators, Environment health & Public health; Health-Education: Principles and Strategies. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India; Functioning of various nutrition and health organizations in India.	**05**	**CO4**
V	**Hygiene –** Definition; Personal, Community, Medical and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme. Rural Community Health: Village health sanitation & Nutritional committee. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public	**05**	**CO5**

	places.		
Text Book:			
1.	Bamji, M. S., K. Krishnaswamy & G. N. V. Brahmam (2009) Text book of Human Nutrition (3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi		
2.	S K. Haldar (2022). Occupational Health and Hygiene in Industry. CBS Publishers.		
Reference Books:			
1.	Vijaya Khader (2000) Food, nutrition & health, Kalyan Publishers, New Delhi		
2.	Srilakshmi, B., (2010) Food Science, (5th Edition) New Age International Ltd., New Delhi		
3.	Revilla M .K. F., Titchenal A. and Draper J. (2020). Human Nutrition. University of Hawaii,Mānoa.		
Web Resources			
1	National Rural Health Scheme: https://nhm.gov.in/index1.php? ang=1& level=1 & sublinkid= 969 & lid=49		
2	National Urban Health Scheme: https://nhm.gov.in/index1.php? lang=1&level=1 & sublinkid =970 & lid=137		
3	Village health sanitation & Nutritional committee https://nhm.gov.in/index1.php?lang=1 & level= 1& sub linkid=149 & lid=225		
4	Health Impact Assessment - https://www.who.int/hia/about/faq/en/		
5	Healthy Living https://www.nhp.gov.in/healthylivingViewall		

COURSE OUTCOMES (CO)

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

CO1	Learn the importance of nutrition for a healthy life
CO2	Study the nutrition for life cycle
CO3	Know the health care programmes of India
CO4	Learn the importance of community and personal health & hygiene measures
CO5	Create awareness on community health and hygiene

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

24UMBAL401	ACC I: BIOFERTILIZER TECHNOLOGY	SEMESTER IV

Course Objectives:

The course aims

- To learn the scope and importance of biofertilizers.
- To study mass cultivation methods of various biofertilizers.

Credit: 2

UNIT	CONTENTS	CO
I	**Introduction to Biofertilizers:** Structure and characteristic features of the following biofertilizer organisms - *Azospirillum, Azotobacter, Rhizobium* and *Frankia.*	**CO1**
II	**Biofertilization Processes:** Decomposition of organic matter and soil fertility and vermicomposting. Mechanism of phosphate solubilization and phosphate mobilization. Free living and symbiotic nitrogen fixation.	**CO2**
III	**Cultivation Techniques:** Isolation, purification, mass multiplication, formulation and crop response of inoculants - *Rhizobium, Azotobacter* and *Azospirillum* and phosphate solubilizer (*Pseudomonas striata*).	**CO3**
IV	**Cyanobacteria:** Isolation, purification, mass multiplication and application of cyanobacterial bioinoculants. Azolla - mass cultivation and its application.	**CO4**
V	**Mycorrhizae**: Ecto and endomycorrhizae. Isolation of AM fungi - Wet sieving method and sucrose gradient method. Mass production of AM inoculants and field applications.	**CO5**

Text Books:

1. *Somani, L.L., S.C. Bhandari, K.K. Vyas and S.N. Saxena.* 1990**.Biofertilizers.** Scientific Publishers - Jodhpur.
2. *Tilak, K.V.B.* 1991. **Bacterial Biofertilizers.**ICAR Pub., New Delhi.

Reference Books:

1. P*urohit, S.S., P.R. Kothari and S.K. Mathur. 1993.***Basic and Agricultural Biotechnology.** Agro Botanical Pub. India.
2. *Subba Rao, N. S.* 1988. **Biological Nitrogen Fixation: Recent Developments.** Oxford and IBH Pub. Co. Pvt. Ltd., India.

Subba Rao, N.S., G.S. Venkataraman and Kannaiyan. S. 1993.**Biological Nitrogen**

3.	**Fixation.** ICAR Pub., New Delhi.

COURSE OUTCOMES (CO)

After completion of the course, the students' will be able to

CO1	Discuss the economic importance of biofertilizers.
CO2	Understand the nitrogen fixation process.
CO3	Apply the various formulation and cultivation methods for biofertilizer production.
CO4	Demonstrate the cyanobacterial biofertilizer production.
CO5	Outline the field application of mycorrhizal bioinoculants.

MAPPING

PO &PSO / CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H	H	H	H	M	H
CO2	H	H	H	H	H	H	H	H	H	H
CO3	H	M	H	H	H	H	M	H	H	H
CO4	H	M	H	H	H	H	M	H	H	H
CO5	H	H	H	H	H	H	H	H	H	H

H – High; M- Medium; L – Low

Prepared By
(Course Coordinator)

Approved By
(BoS Chairman)

GUIDELINES

1. SUBMISSION OF RECORD NOTE BOOKS:

Candidates appearing for Practical Examinations shall submit Bonafide Record Note Books prescribed for Practical Examinations, otherwise the candidates will not be permitted to appear for the Practical Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory, Practical and Internship)

I. (i) THEORY

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each theory paper with a passing minimum of 30 marks in External out of 75.

MARK DISTRIBUTION

Internal Marks Distribution [CA- Total Marks: 25]

Attendance	: 5 Marks
Assignment	: 5 Marks
Internal Examinations	: 15 Marks
Total	**: 25 Marks**

(ii) THEORY (If Internal Evaluation is for 100 Marks)

ASSESSMENT OF SEC: (Internal Evaluation only)

The candidate shall be declared to have passed the Examination, if the candidate secures not less than 40 marks out of 100 in the internal evaluation.

Marks Distribution [Total marks: 100]

Test (3)	: 60 Marks
Assignment (3)	: 30 Marks
Attendance	: 10 Marks
Total	**: 100 Marks**

II. PRACTICAL

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

Internal Marks Distribution [CA- Total Marks: 40]

Experiment	: 10 Marks
Attendance	: 5 Marks
Record	: 5 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

III. PROJECT WORK

The project work shall be carried out by students during the VI semester and has to complete the work at the end of that Semester.

- The Student has to attend 2 reviews before completing his/her Project and it will be evaluated by an internal examiner.
- The assessment of student performance in a semester is calculated by Continuous Internal Assessment (CA) for 40 marks and External Assessment for 60 marks.
- Upon completion of the project work the candidate shall be required to appear for a Viva- Voce conducted by an external examiner.
- The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in project with a passing minimum of 24 marks in External out of 60.

Mark Distribution Pattern

Internal Mark Distribution **Continuous Assessment (CA) Total Marks: 40**

1.	Attendance	:	10 Marks
2.	Review (2)	:	20 Marks
3.	Presentation	:	10 Marks
Total		**:**	**40 Marks**

External Mark Distribution **Comprehensive Examination (CE) Total Marks: 60**

1.	Research work done	:	20 Marks
2.	Project report	:	20 Marks
3.	Presentation	:	10 Marks
4.	Viva-Voce	:	10 Marks
Total		**:**	**60 Marks**

3. QUESTION PAPER PATTERN AND MARK DISTRIBUTION FOR THEORY

Question Paper Pattern and Mark Distribution **(For 75 marks)**

1. PART – A (10 x 1 = 10 Marks)

Answer ALL questions

Two questions from each UNIT

2. PART – B (5 x 7 = 35 Marks)

Answer ALL questions

One question from each UNIT with Internal Choice

3. PART – C (3 x 10 = 30 Marks)

Answer ANY THREE questions

One question from each UNIT

Open Choice – 3 out of 5 questions

Question Paper Pattern and Mark Distribution **(For 100 marks)**

1. PART – A (15 x 1 = 15 Marks)

Answer ALL questions

Two questions from each UNIT

2. PART – B (5 x 7 = 35 Marks)

Answer ALL questions

One question from each UNIT with Internal Choice

3. PART – C (5 x 10 = 50 Marks)

Answer ALL questions

One question from each UNIT with Internal Choice

QUESTION PAPER PATTERN FOR DSC PRACTICAL EXAMINATIONS

(MAXIMUM MARKS: 60) TIME: 6 HOURS

DSC Practical Examinations (Maximum marks: 60) Time: 6 Hours

Question paper pattern

Experiment–I (Major)	- 30 Marks
Experiment–II (Minor)	- 15 Marks
Spotters (5 x3)	- 15 Marks
Total	**- 60 Marks**

AEC: CCS (100 % Internal Evaluation)

CCS Internal Marks Distribution [CA – Total Marks: 100]

Attendance	:	10 marks
Assignment / Listening / Speaking	:	50 Marks (5 Assignments Compulsory)
Class Test	:	40 Marks (2 Test Compulsory)
Total	**:**	**100 Marks**

The candidate shall be declared to have passed the examination if he / she secured at least 40 marks for UG programme out of a total of 100 marks.