

BACHELOR OF SCIENCE IN MICROBIOLOGY REGULATIONS

ELIGIBILITY:

A pass in Higher Secondary Examination with any Academic stream or Vocational stream with Biology / Zoology / Botany / Biotechnology/Microbiology/Life Science as one of the subject and as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Bachelor of Science (Microbiology)** Degree Examination of this College after a course study of three academic years.

OBJECTIVE OF THE COURSE:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To inculcate practical knowledge in correlation with the theoretical knowledge.
2. To equip the students to meet the requirements of the current technology in Microbiology.
3. To motivate and train the students in various clinical and industrial sectors.
4. To encourage students to involve in research to explore microorganisms for the betterment of mankind.

SCHEME OF EXAMINATIONS

Subject Code	Subject	Hrs of Instru- ction	Exam Durat- ion (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
Part - I							
15UTL11U 15UHL11H 15UML11M 15UFL11F	Tamil-I Hindi-I Malayalam-I French - I	6	3	25	75	100	4
Part - II							
15UEG12E	English - I	6	3	25	75	100	4
Part - III							
15UMB13A	Core-I: Fundamentals of Microbiology	6	3	20	55	75	3
15UMB13P	Core Practical- I	5	3	40	60	100	4
15UBC1AC	Allied- I: Biochemistry I	5	3	20	55	75	3
Part - IV							
15UFC1FA	Environmental Studies	2	3	-	50	50	2
		30				500	20
Second Semester							
Part - I							
15UTL21U 15UHL21H 15UML21M 15UFL21F	Tamil-II Hindi-II Malayalam-II French - II	6	3	25	75	100	4
Part - II							
15UEG22E	English - II	6	3	25	75	100	4
Part - III							
15UMB23A	Core -II: Cell Biology	5	3	20	55	75	3
15UMB23P	Core Practical- II	5	3	40	60	100	4
15UBC2AA	Allied- II: Biochemistry II	4	3	20	55	75	3
15UBC2AP	Allied Practical- I	2	3	20	30	50	2

[Signature] 29/7/2015
 BOS Chairman/HOD
 Department of Microbiology
 Dr. N. G. P. Arts and Science College
 Coimbatore - 641 048

[Signature]
 Dr. P. R. MUTHUSWAMY
 PRINCIPAL
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Part – IV							
15UFC2FA	Value Education : Human Rights	2	3	-	50	50	2
		30				550	22
Third semester							
Part – I							
15UTL31U 15UHL31H 15UML31M 15UFL31F	Tamil-III Hindi-III Malayalam-III French – III	5	3	25	75	100	4
Part – II							
15UEG32E	English-III	5	3	25	75	100	4
Part – III							
15UMB33A	Core-III: Microbial Physiology	4	3	20	55	75	3
15UMB33P	Core Practical- III	4	6	40	60	100	4
15UCY3AA	Allied-III: Chemistry	3	3	20	55	75	3
15UCY3AP	Allied Practical- II	2	3	20	30	50	2
Part – IV							
15UMB3SA	Skill based Subject- 1: Clinical Biochemistry	3	3	20	55	75	3
	NMEC -I	2	-	-	50	50	2
15UFC3FA 15UFC3FB 15UFC3FC 15UFC3FD 15UFC3FE	Tamil / Advanced Tamil (OR) Yoga for Human Excellence / Women's Rights/ Constitution of India	2	3	-	50	50	2
		30				675	27
Fourth Semester							
Part – I							
15UTL41U 15UHL41H 15UML41M 15UFL41F	Tamil-IV Hindi-IV Malayalam-IV French – IV	5	3	25	75	100	4
Part – II							
15UEG42E	English-IV	5	3	25	75	100	4
Part – III							
15UMB43A	Core-IV: Food Microbiology	5	3	20	55	75	3

B.Sc-Microbiology (Students admitted from 2015-2016 onwards)

15UMB43P	Core Practical- IV	4	3	40	60	100	4
15UMA4AB	Allied- IV: Mathematics and Biostatistics	4	3	20	55	75	3
Part - IV							
15UMB4SA	Skill based Subject- 2: Food Processing and Preservation	3	3	20	55	75	3
	NMEC - II	2	2	-	50	50	2
15UFC4FA 15UFC4FB 15UFC4FC	Tamil Advanced Tamil (OR) General Awareness	2	3	-	50	50	2
		30				625	25
Fifth Semester							
Part - III							
15UMB53A	Core-V: Microbial Genetics	5	3	20	55	75	3
15UMB53B	Core-VI: Basic Immunology	5	3	20	55	75	3
15UMB53C	Core-VII: Medical Microbiology	5	3	20	55	75	3
15UMB53P	Core Practical- V	6	9	40	60	100	4
15UMB5EA/ 15UMB5EB/ 15UMB5EC	Elective- I	5	3	25	75	100	4
Part - IV							
15UMB5SA	Skill based Subject- 3: Processing of Clinical specimens	4	3	20	55	75	3
		30				500	20
Sixth Semester							
Part - III							
15UMB63A	Core-VIII: Mycology and Parasitology	4	3	20	55	75	3
15UMB63B	Core-IX:	4	3	20	55	75	3

B.Sc-Microbiology (Students admitted from 2015-2016 onwards)

	Industrial Microbiology						
15UMB63C	Core- X: Environmental Microbiology	4	3	20	55	75	3
15UMB63P	Core Practical VI	6	9	40	60	100	4
15UMB6EA/ 15UMB6EB / 15UMB6EC	Elective-II	4	3	25	75	100	4
15UMB6ED/ 15UMB6EE/ 15UMB6EF	Elective- III	4	3	25	75	100	4
Part - IV							
15UMB6SA	Skill based Lab- 1	4	9	20	55	75	3
Part - V							
15UEX65A	Extension Activity	-	-	-	50	50	2
		30				650	26
Grand Total						3500	140

ELECTIVE - I

(Student shall select any one of the following subject as Elective in fifth semester)

S.No	Subject Code	Name of the Subject
1.	15UMB5EA	Molecular Biology and Recombinant DNA technology
2.	15UMB5EB	General Biology
3.	15UMB5EC	Dairy Microbiology

ELECTIVE - II

(Student shall select any one of the following subject as Elective in sixth semester)

S.No	Subject Code	Name of the Subject
1.	15UMB6EA	Biotechnology
2.	15UMB6EB	Hematology
3.	15UMB6EC	Microbial inoculants and Composting

ELECTIVE - III

(Student shall select any one of the following subject as Elective in sixth semester)

S.No	Subject Code	Name of the Subject
1	15UMB6ED	Plant Tissue culture
2	15UMB6EE	Virology
3	15UMB6EF	Entrepreneurial Technology

NON MAJOR ELECTIVE COURSES

- The Department offers the following two papers as Non Major Elective Courses for other than the Microbiology students.
- Student shall select any one of the following subject as Non Major Elective Courses during their III and IV semester

S. No.	Semester	Subject Code	Course Title
1.	III	15UED34F	Microbiology and Public Health
2.	IV	15UED44F	Microbes in disease and Human welfare

FOR COURSE COMPLETION

Students have to complete the following Subjects:

- Language papers (Tamil/Malayalam/French/Hindi, English) in I, II, III and IV semester.
- Environmental Studies in I semester.
- Value Education in II and III semester respectively.
- General Awareness in IV semester.
- Allied papers in I, II, III and IV semesters.
- Two Non Major Elective courses in the third and fourth semester.
- Extension activity in VI semester.
- Elective papers in the fifth and sixth semesters.

Total Credit Distribution

Subjects	Credits	Total		Credits	Cumulative Total
Part I: Tamil	4	04 x 100 =	400	16	32
Part II: English	4	04 x 100 =	400	16	
Part III:					
Core	3	10 x 75=	750	30	94
Core Practical	4	06 x 100 =	600	24	
Allied Theory	3	04 x 75 =	300	12	
Allied Practical	2	02 x 50 =	100	04	
Elective	4	03 x 100 =	300	12	
Skill based subject theory	3	03 x 75 =	225	09	
Skill based subject practical's	3	01 x 75 =	75	03	
Part IV:					
Value Education	2	02 x 50 =	100	04	12
Environmental Studies	2	01 x 50 =	50	02	
Foundation Course	2	01 x 50 =	50	02	
NMEC	2	02 X 50 =	100	04	
Part V:					
Extension Activity	2	01 X 50 =	50	02	02
Total			3500	140	140

15UTL11U	பகுதி - 1 : தமிழ் தாள் -1	முதல் பருவம்
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Total Credit: 4
Hours per week: 6

(இரண்டு ஆண்டுகள் தமிழ் பயிலும் மாணவர்களுக்குரியது)

(கவிதை, சிறுகதை, இதழியல், இலக்கணம், இலக்கிய வரலாறு)

அலகு -1 கவிதைகள்

1. பாரதியார் - செந்தமிழ்நாடு
2. பாரதிதாசன் - புத்தகச் சாலை, நீங்களே சொல்லுங்கள்
3. கவிமணி - ஒற்றுமையே உயிர்நிலை
4. சிற்பி - பெல்ஜியம் கண்ணாடி
5. மு.மேத்தா - மரங்கள்
6. ஆ.வெண்ணிலா - நீரில் அலையும் முகம்

அலகு - 2 சிறுகதைகள்

1. புதுமைப்பித்தன் - கடவுளும் கந்தசாமிப் பிள்ளையும்
2. ஜெயகாந்தன் - யுக சந்தி
3. தி.ஜானகிராமன் - சிலிர்ப்பு
4. நாஞ்சில் நாடன் - சூடிய பூ சூடற்க
5. பட்சி - பெத்த வயிறு

அலகு - 3 நீதி இலக்கியம்

1. திருக்குறள் - அறன் வலியுறுத்தல்
2. ஏலாதி - (பா.எண் : 15,16,26,39,47)
- 3.கார்நாற்புது - (முதல் 10 பாடல்கள்)

அலகு - 4 இதழியல் கலை

1. இதழியல் விளக்கம் (இதழியல் விளக்கமும் இலக்கணமும், இதழ்களின் பணிகளும் பொறுப்புகளும், இதழ்களின் வகைகள்)
2. தமிழ் இதழ்கள் (நாளிதழ்கள், வார இதழ்கள், மாத இதழ்கள்)
3. தமிழ் ஊடகங்கள் (வானொலி, தொலைக்காட்சி, இணையம்)

அலகு – 5 இலக்கிய வரலாறும் இலக்கணமும்

1. தமிழ்க் கவிதையின் தோற்றமும் வளர்ச்சியும்
(மரபுக்கவிதை, புதுக்கவிதை)
2. தமிழ்ச் சிறுகதையின் தோற்றமும் வளர்ச்சியும்
3. பதினெண் கீழ்க்கணக்கு நூல்கள்
4. இலக்கணம் :
அ)ஒற்றுமிகும் இடங்கள்,
ஆ) ஒற்று மிகா இடங்கள்

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. இலக்கிய வரலாறு – பேராசிரியர் முனைவர் பாக்யமேரி
3. இதழியல் கலை - மா.பா.குருசாமி

15UHL11H	PART-I: HINDI-I	SEMESTER- I
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Total Credit: 4
Hours per week: 6

Prose, Non-detailed Text, Grammar & Translation Books Prescribed:

1. PROSE : **Nuthan Gadya Sangrah**

EDITOR: Jayaprakash (Prescribed Lessons – only 4)

Lesson 1 - Razia
Lesson 2 – Makreal
Lesson3- Bahtha Pani Nirmala
Lesson 4 – Rashtrapitha Mahathma Gandhi

PUBLISHER: Sumitra Prakashan Sumitravas,
16/4 Hastings Road,
Allahabad – 211 001.

2. NON DETAILED TEXT: Kahani Kunj.

EDITOR: Dr.V.P.Amithab. (Stories 1 -4 only)
Publisher : Govind Prakashan Sadhar Bagaar,
Mathura, Uttar Pradesh – 281 001.

3. GRAMMAR : Shabdha Vichar (Sangya, Sarvanam, Karak,
Visheshan) ONLY
(Noun, Pronoun, Adjective, Case Endings)
Theoretical & Applied. Book for

REFERENCE : Vyakaran Pradeep by Ramdev.
Publisher : Hindi Bhavan,
36,Tagore Town
Allahabad – 211 002. 4.

4. TRANSLATION: English- Hindi only. Anuvadh Abhyas – III (1-10 lessons Only)

PUBLISHER: Dakshin Bharath Hindi Prachar Sabha
Chennai -17.

- 5. COMPREHENSION :** 1 Passage from ANUVADH ABHYAS – III
(16- 30) Dakshin bharath hindi
prachar sabha
Chennai- 17.

15UML11M	PART-I: MALAYALAM-I	SEMESTER-I
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Total Credit: 4
Hours per week: 6

Paper I Prose, Composition & Translation

This paper will have the following five units:

- UNIT I & II - Novel
- UNIT III & IV - Short story
- UNIT V - Composition & Translation

TEXT BOOKS:

UNIT I & II -

Naalukettu - M.T. Vasudevan Nair (D.C. Books, Kottayam, Kerala)

UNIT III & IV

Manikkianum Mattu Prathana Kathakalum - Lalithampika Antharjanam (D.C.Books, Kottayam, Kerala)

UNIT V

Expansion of ideas, General Essay and Translation of a simple passage from English about **100** words) to Malayalam

REFERENCE BOOKS:

1. Kavitha Sahithya Charitram -Dr. M.Leelavathi (Kerala Sahithya Academy, Trichur)
2. Malayala Novel sahithya Charitram -K.M.Tharakan(N.B.S. Kottayam)
3. Malayala Nataka Sahithya Charitram-G.Sankarapillai(D.C.Books, Kottayam)
4. Cherukatha Innale Innu -M.Achuyuthan(D.C. Books, Kottayam)
5. Sahithya Charitram Prasthanangalilude-Dr. K.M. George,(Chief Editor) (D.C. Books, Kottayam).

15UFL11F	PAPER-I FRENCH-I	SEMESTER- I
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Total Credit: 4**Hours per week: 6****French Language for Under-graduate Degree Programmes**

Compétence Culturelle	Compétence De communication	Compétence grammaticale
UNITÉ 1 - Ici, en France		
• Moi et les Autres • La France Express	• INTERACTION: s'identifier • RÉCEPTION ECRITE: Comprendre une annonce d'aéroport • RÉCEPTION ORALE: comprendre l'écrit de la rue (Panneaux, plaques, rues...) • PRODUCTION ÉCRITE: écrire un SMS	• Le présent des verbes: Je suis, je reste, J'arrive • Le lieu: (je suis) à... (je suis) ici • L'infinif
UNITÉ 2 - Ici, en classe		
• Moi et le français • Le français dans le monde	• INTERACTION: Se présenter • RÉCEPTION ORALE: Comprendre des consignes Orales • RÉCEPTION ÉCRITE: Comprendre une fiche D'inscription • PRODUCTION ÉCRITE: écrire un texte à l'impératif	• Tu/vous • Le présent des Verbes en-er et de être: je, tu, vous • La forme Impérative (tu, vous) Des verbes en-er
UNITÉ 3 - Samedi		
• Le fil du temps	• INTERACTION: S'informer • RÉCEPTION ORALE: Comprendre une annonce • RÉCEPTION ÉCRITE:	• Les articles Définies: le, la, les • A, de + le, la, les: Au, aux, du, des, à l', de l' • Être (présent) l'heure

	Comprendre un article (titres et illustrations) • PRODUCTION ÉCRITE: écrire des slogans	• LI faut+nom - LI faut+infinitive • Phrases verbe+complément, Complément+verbe
UNITÉ 4 - Dimanche		
• Les activités Culturelles des Français	• INTERACTION: Acheter,demander des Informations • RECEPTION ORALE: Comprendre les Titres du journal à la radio • RÉCEPTION ÉCRITE: Comprendre les Informations • PRODUCTION ÉCRITE: Inventer des noms de journaux	• Faire, present • Avior, present • LI y a • Le présent des verbes en-er: Regarder • Combien? • Quand? • Complément de nom: Tremblement de terre, les noms de pays.... • Du,des,de la(reprise U2) • Les adjectifs possessifs: Mon,ta,son, Ma,ta,sa Mes,tes,ses
UNITÉ 5 - Dommage!		
• Un baby-boom en 2000 et 2001 • L'amour, toujours	• INTERACTION: exprimer la tristesse, la peur, conseiller,encourager • RÉCEPTION ORALE: Comprendre une émission De radio • RÉCEPTION ÉCRITE: Comprendre un sondage • PRODUCTION ÉCRITE: écrire des blogs	• Est-ce que • Le present des verbes pouvoir,Vouloir • Le conditionnel des Verbs pouvoir, Vouloir • Ne...pas

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco*, **Alors I.** Goyal Publishers Pvt Ltd 86, University Block Jawahar Nagar (Kamla Nagar) New Delhi - 110007.

15UEG12E	PART- II: ENGLISH-I	SEMESTER- I
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Total Credit: 4
Hours per week: 6

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

CONTENTS

UNIT - I

PROSE

1. My Financial Career – Stephen Leacock
2. At School – Gandhi
3. Ecology – Barry Commoner

UNIT - II

SHORT STORIES

1. The Gateman's Gift – R.K. Narayan
2. The Open Window – H.H. Munro
3. The Face of Judas Iscariot – Bonnie Chamberlain

UNIT - III

ONE ACT PLAY

1. The Discovery – Herman Ould

UNIT - IV

FUNCTIONAL GRAMMAR

1. Vocabulary Exercises
2. Synonyms, Compound Words, etc
3. Communication Skills – Tasks
4. Different types of sentences
5. The Structure of Sentences
6. Transformation of Sentences

UNIT - V

COMPOSITION TASKS

1. Greeting, Introducing, Requesting, Inviting
2. Congratulating, Thanking, Apologising, Advice
3. Suggestions, Opinions, Permissions.
4. Comprehension

TEXT BOOKS:

1. *Seshasayee. N.* 2001. **Honeycomb.** Anu Chitra Publications, Chennai.
2. *Syamala, V.* 2002. **Effective English Communication for You.** Emerald Publisher, Chennai.

REFERENCE BOOKS:

1. *Rajamanickam. A.* 2001. **Everyman's English Grammar.** Macmillan.
2. *Krishna Mohan and Meera Banerji.* 2005. **Developing Communication Skills.** Macmillan, Chennai.
3. *Wren, P.C. and H. Martin.* 1998. **High School English Grammar and Composition.** Macmillan.

15UMB13A	CORE- I: FUNDAMENTALS OF MICROBIOLOGY	SEMESTER - I
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Total Credits: 3
Hours per Week: 6

OBJECTIVES:

This course has been designed to provide the students with

1. Characteristics of Microorganisms
2. Different classes of microbes
3. Factors that influence their activity.

CONTENTS

UNIT - I

History and Scope of Microbiology – Spontaneous generation theory and its disproof – Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister and John Tyndall. Sterilization and Disinfection- Principles- Methods of Sterilization – Physical methods: Dry Heat, Moist heat, Filtration and Radiation. Chemical methods – Formaldehyde, Alcohol, Phenol and Gaseous sterilizing agents.

UNIT - II

Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEM . Stains - Staining reactions – Types of staining – Simple, Differential (Gram's, Spore, AFB), Capsule staining, fungal staining.

UNIT - III

Culture Media - Types of Media – Enriched, Selective, Differential and Special Purpose Media (one e.g. for each type). Maintenance and Preservation of microbial culture.

UNIT - IV

Morphology, Classification, General Characteristics and economic importance of Fungi (Aspergillus, Saccharomyces) Algae (Anabena, Chlamydomonas, Volvox, Spirogyra).

UNIT - V

Morphology, Classification and General Characteristics of Rickettsiae, Mycoplasma - Reproduction - Chlamydiae.

TEXT BOOK:

1. *Prescott, L.M J.P. Harley and C.A. Klein.* 1995. **Microbiology** 2nd edition. Wm, C. Brown Publishers.

REFERENCE BOOK:

1. *Salle A.J.* 2014. **Fundamental Principles of Bacteriology** 7th edition, Tata Mc Hill Publishing Company Ltd.,

15UBC1AC	ALLIED - I: BIOCHEMISTRY- I	SEMESTER - I
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Total Credits: 3
Hours per Week: 5

OBJECTIVES:

This course has been designed to study the

1. Nature of biological macromolecules namely carbohydrate, lipids, and proteins.
2. Importance of DNA and RNA
3. Role of Vitamins, Minerals and Hormones in the functioning of cell.

CONTENTS

UNIT - I

Carbohydrate classification structure, properties & chemical reactions of monosaccharide. Structure, Properties of disaccharides – Maltose, Lactose and Sucrose. Polysaccharides – structure & biological functions of Homo & Hetero polysaccharides. Biological importance of sugar derivatives – glycosaminoglycan, proteoglycan & glycoprotein – Blood group & Bacterial cell wall polysaccharides.

UNIT - II

Lipids: Definition classification of lipids, physiochemical properties. Storage lipids – fatty acids – types. Structural lipids – phospholipids, glycolipids & sphingolipids. Structure & Biological role of cholesterol, prostaglandins, Thromboxanes, Leukotrienes.

UNIT - III

Classification of amino acids, general properties, Non protein amino acids. Peptide bond – structure & conformation, Protein classification, Physiochemical properties of proteins. Organization of protein Structure – Primary, Secondary (Keratin, Collagen) Tertiary (Myoglobin), Quaternary structure (Hemoglobin).

UNIT - IV

Structures of Purines, pyrimidines, Nucleoside & Nucleotides. Properties of nucleic acids. DNA Double helical structure – Isoform. RNA – Types – mRNA, tRNA, rRNA - structure & function.

UNIT - V

Minerals in biological system & their importance – Iron, Calcium, Phosphorous, Iodine, Copper, Zinc. Vitamins – Definition, classification: Fat soluble (Vitamin A,D,E,K) and Water Soluble vitamins (Vitamin B)- Sources, functions and deficiencies. Role of vitamins as antioxidants & cofactors. Hormones involved in regulatory metabolism: Insulin, Glucagon and thyroid.

TEXT BOOKS:

1. *J.L.Jain.* 2007. **Fundamentals of Biochemistry**, 1st edition. S. Chand and company Ltd.
2. *Sathyannarayana U.* 2008. **Biochemistry** 3rd Edition. Books and Allied (P) Ltd.
3. *Stryer L.* 1995. **Biochemistry** 4th Edition. W. H. Freeman and Company, New york.

REFERENCE BOOKS:

1. *Zubay,* 1999. **Biochemistry** 4th edition. William.C.Brain publishers.
2. Donald J. *Voet* and Judith G. *Voet.* 2004. **Biochemistry** 3rd edition. John Wiley & Sons (Asia) pvt ltd.

15UMB13P	CORE PRACTICAL- I	SEMESTER I
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Total Credits: 4
Hours per Week: 5

CONTENTS

1. Laboratory precautions
2. Preparation of cleaning solutions - Chromic acid
3. Culture media preparation – Nutrient Broth and Nutrient Agar (Plate, Deep, Slant)
4. Differential and Selective medium.
5. Sterility testing of Autoclave and Hot air Oven
6. Decimal Dilution Technique
7. Pure culture techniques – Streak plate method, Pour plate method, Spread plate method
8. Isolation and Enumeration of bacteria from soil
9. Isolation of fungi from soil
10. Isolation of Actinomycetes from soil
11. Bacterial staining - Simple Staining
12. Gram Staining
13. Acid Fast Staining
14. Capsular staining – Negative staining
15. Spore Staining
16. Motility test - Hanging drop and SIM agar
17. Fungal staining – Lacto phenol Cotton Blue Mount
18. Slide culture Technique

TEXT BOOKS:

1. *James.C.Cappuccino*. 2013. **Microbiology A laboratory manual**. 1st edition, Pearson education publishers.
2. *Kannan, N*. 1996. **Laboratory manual of General Microbiology**, 2nd edition, Panima publishing house.

REFERENCE BOOKS:

1. *Aneja, K.R.* 2012. **Experiments in Microbiology, plant pathology and biotechnology**, 4th Edition. New age publishers.
2. *Kannan, N.* 2003. **Hand book of Laboratory culture media** 1st edition, Panima publishing house.

15UTL21U	பகுதி - 1: தமிழ் தாள் - 2	இரண்டாம் பருவம்
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Total Credit: 4
Hours per week: 6

(இரண்டு ஆண்டுகள் தமிழ் பயிலும் மாணவர்களுக்கு உரியது)

சமய இலக்கியங்கள்

அலகு -1 சைவ வைணவ இலக்கியங்கள்

1. திருஞானசம்பந்தர் - தோடுடைய செவியன் (11 பாடல்கள்)
2. குலசேகர ஆழ்வார் - திருவேங்கட மலைத்தொடர்பு வேண்டல்

அலகு -2 கிறித்துவ இசுலாமிய இலக்கியங்கள்

1. கண்ணதாசன் - இயேசு காவியம் - மலைப்பொழிவு
2. உமறுப்புலவர் - சீறாப்புராணம் - மானுக்குப் பிணை நின்ற படலம்

அலகு -3 சமயச் சான்றோர் வரலாறு

1. சைவ சமயச் சான்றோர்

திருநாவுக்கரசர், மாணிக்கவாசகர்

2. வைணவ சமயச் சான்றோர்

பெரியாழ்வார், ஆண்டாள்

3. கிறித்துவ சமயச் சான்றோர்

கால்டுவெல், ஜி.யூ.போப்

4. இசுலாமிய சமயச் சான்றோர்

குணங்குடி மஸ்தான், சவ்வாதுப் புலவர்

அலகு - 4 சமய இலக்கிய வரலாறு

1. சைவம் 2. வைணவம்

அலகு - 5 இலக்கணம்

1. பெயர்ச்சொல், 2. வினைச்சொல், 3. இடைச்சொல்,
4. உரிச்சொல் – பொது இலக்கணம்

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. தமிழ் இலக்கிய வரலாறு – பேராசிரியர் முனைவர் பாக்யமேரி

15UHL21H	PART-I: HINDI-II	SEMESTER- II
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Total Credit: 4
Hours per week: 6

(Modern Poetry, Novel, Translation & Letter Writing)

1. Modern Poetry: Shabari – By Naresh Mehtha

Publishers: Lokbharathi Prakashan I Floor, Duebari Building
Mahatma Gandhi Marg,
Allahabad -1.

2. Novel: Seva Sadhan – By Prem Chand

Publisher:

3. Translation: Hindi – English Only,
(anuvadh abhyas – iii) lessons.1 – 10 only publisher: dakshin bharath hindi
prachar sabha chennai – 600 017.

4. Letter Writing: (Leave letter, Job Application, Ordering books, Letter
to Publisher, Personal letter)

15UML21M	PART-I: MALAYALAM-II	SEMESTER- II
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Total Credit: 4
Hours per week: 6

PAPER II PROSE: NON-FICTION

This Paper will have the following five units:

UNIT I & II

Biography

UNIT III, IV & V

Travelogue

TEXT BOOKS PRESCRIBED:

Unit I & II *Changampuzha Krishna Pillai: Nakshatrangalude Snehabhajanam*
-M.K. Sanu (D.C. Books, Kottayam)

Unit III, IV & V *Kappirikalude Nattil - S.K. Pottakkadu* (D.C. Books, Kottayam)

REFERENCE BOOKS:

1. Jeevacharitrasahithyam -Dr. K.M. George(N.B.S. Kottayam)
2. Jeevacharitrasahithyam malayalathil- Dr. Naduvattom Gopalakrishnan (Kerala Bhasha Institute, Trivandrum)
3. Athmakathasahithyam malayalathil -Dr. Vijayalam Jayakumar(N.B.S. Kottayam)
4. Sancharasahithyam Malayalathil-Prof.Ramesh Chandran. V,(Kerala Bhasha Institute, Trivandrum).

15UFL21F	PART-I: FRENCH-II	SEMESTER- II
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Total Credit: 4

Hours per week: 6

French Language for Under-graduate Degree Programmes

Compétence Culturelle	Compétence De communication	Compétence grammaticale
UNITÉ 6 – Super!		
• L'égalité homme/femme	• INTERACTION: Exprimer des sentiments, exprimer la joie, le plaisir, le bonheur • RÉCEPTION ORALE: Comprendre un jeu radiophonique • RÉCEPTION ÉCRITE: Comprendre des annonces • PRODUCTION ÉCRITE: Écrire des cartes postales	• Les noms de professions masculine/feminine • Le verb finir et less Verbes du groupe en-ir • Le present de l'impératif • Savoir(present) • Le participe passé: Fini, aimé, arrive, dit,écrit • Quel(s), quelle(s)...: Interrogatif et Exclamatif • À + infinitive • Les articles: n,une,des
UNITÉ 7 – Quoi?		
• Le 20 siècle: Petits progrès Grand progrès	• INTERACTION: Decrire quelque chose, une personne • RECEPTION ORALE: Comprendre un message publicitaire • RÉCEPTION ÉCRITE: Comprendre un dépliant touristique • PRODUCTION ÉCRITE: Écrire des petites annonces	• On • Plus, moins • Le verbe aller: • Present, impératif • Aller + infinitive • Le pluriel en -x
UNITÉ 8 – Et après		
• Nouvelles du jour	• INTERACTION: Raconteur,situer un récit dans le temps • RÉCEPTION ORALE:	• L'imparfait:: quel-Ques forms pour introduire le récit:Il faisait, il y avait, il Était

	Comprendre une description • RÉCEPTION ÉCRITE: Comprendre un test • PRODUCTION ÉCRITE: écrire des cartes postales	• Un peu, beaucoup, trop, Assez • Très • Le verbe venir: Présent, impératif • En Suisse, au Maroc, aux Etats-Unis
UNITÉ 9 – Mais oui!		
• La génération des 20-30 ans	• INTERACTION: Donner son opinion, Expliquer pourquoi • RÉCEPTION ORALE: Comprendre des informations à la radio • RÉCEPTION ÉCRITE: Comprendre un texte informatif • PRODUCTION ÉCRITE: écrire un mél de protestation	• Répondre, prendre: Présent, impératif, part Passé • Parce que pourquoi • Tout/tous, toute/s Tous/toutes les... (répétition action)
UNITÉ 10 – Mais non!		
• De la ville à la campagne	• INTERACTION: Débat:: exprimer l'accord, exprimer le Désaccord • RECEPTION ORALE: Comprendre un message sur un répondeur téléphonique • RÉCEPTION ÉCRITE: Comprendre un témoignage • PRODUCTION ECRITE: Rédiger des petites Announces immobilières	• Le verbe devoir: Present et participe passé • Le verbe vivre, present • Aller + infinitive • Venir+ infinitive • Etre pour/contre

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco, Alors I.* Goyal Publishers Pvt Ltd 86, University Block Jawahar Nagar (Kamla Nagar) New Delhi – 110007

15UEG22E	PART-II: ENGLISH-II	SEMESTER II
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Total Credit: 4
Hours per week: 6

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

CONTENTS

UNIT - I

PROSE

1. Words of Wisdom – Chetan Bhagat
2. Forgetting – Robert Lynd
3. My Early Days – Dr. Abdul Kalam

UNIT - II

SHORT STORIES

1. Am I Blue? – Alice Walker
2. Last Leaf – O Henry
3. Selfish Giant – Oscar Wilde

UNIT - III

ONE ACT PLAY

1. Soul Gone Home - Langston Hughes

UNIT - IV

FUNCTIONAL GRAMMAR

1. Lexical Skills and Question Forms
2. Idioms and Phrases – Subject-Verb Agreement
3. Spelling, Antonyms and Synonyms, Infinitives
4. Vocabulary, Report Writing
5. Plurals, Particles in Adjectives
6. Apostrophe, Archaic Words, Art of Persuasion
7. Syllables, Changing Adjectives to Nouns
8. Homonyms, Prepositions
9. Compound Words, Acronyms, Collective Nouns, Degrees of Comparison

UNIT - V

COMPOSITION TASKS

1. Letter Writing - Structure
2. Business Correspondence – Memos, reports, proposals
3. Resume & C.V.
4. Advertisements
5. Notices, Agenda, Minutes
6. Circulars
7. Essay Writing
8. Précis Writing
9. Dialogue Writing
10. Soft Skills, Business English

TEXT BOOKS:

1. *Board of Editors.* 2012. **Radiance – English for Communication**, Emerald Publishers.
2. *Syamala, V.* 2002. **Effective English Communication for You**. Emerald Publisher, Chennai.

REFERENCE BOOKS:

1. *Rajamanickam. A.* 2001. **Everyman's English Grammar**. Macmillan.
2. *Krishna Mohan and Meera Banerji.* 2005. **Developing Communications Skills**. Macmillan, New Delhi.
3. *Wren, P.C. and H. Martin.* 1998. **High School English Grammar and Composition**. Macmillan

15UMB23A	CORE- II: CELL BIOLOGY	SEMESTER - II
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Total Credits: 3
Hours per Week: 5

OBJECTIVES:

To develop basic knowledge and skills in aware of

1. The complexity and harmony of the cell and molecular biology
2. The mode of cell divisions and
3. Mechanism of nutrient transportation inside the cell.

CONTENTS

UNIT - I

Structure of Prokaryotes - Cell wall - Cell membrane- Extra mural layer - Slime - Capsule - Cytoplasmic inclusions - Mesosomes - Nuclear material - Reserve materials - Pigment - Cell appendages - Flagella - Pili.

UNIT - II

Structure of Eukaryotes - Cell wall - Cell membrane - Mitochondria - Chloroplast - Endoplasmic reticulum - Golgi complex - Nucleus - Ribosomes - Inclusions Bodies - Flagella.

UNIT III

Cell division in Bacteria - Binary fission - Cell division of Eukaryotes - Mitosis and Meiosis. Cell cycle. Basics of linkage and crossing over.

UNIT IV

Transport mechanisms - Diffusion - Facilitated diffusion - Active transport - Group translocation - Phagocytosis - Pinocytosis.

UNIT V

Archaeobacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidophiles.

TEXT BOOK:

1. *Lansing M. Prescott, John P. Harley, Donald A. Klein. 2001. **Microbiology**, 5th Edition. McGraw – Hill Higher Education.*

REFERENCE BOOKS:

1. *Stanier, Y. Ingraham J.L. Wheolis H.H and Painter P.R. 1986. **The Microbial world**, 5th edition. Eagle Works Cliffs N.J. Prentica Hall.*
2. *Tortora, Funke and Case. 2008. **Microbiology**, 8th edition. Mc Graw Hill Company.*
3. *Verma P S, 2004. **Cell biology, Genetics, Evolution and Ecology**, 14th Edition, S Chand Publishers.*

15UBC2AA	ALLIED - II: BIOCHEMISTRY - II	SEMESTER - II
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Definition, classification and types of carbohydrates.
2. Amino acid, protein and lipid classifications and structural characteristics.
3. Nucleic acid content and enzymes activities.

CONTENTS

UNIT - I

Enzymes Classification & nomenclature. Specificity of Enzymes. Active site- Overview of Coenzymes and cofactors in enzyme catalyzed reaction.- - Enzyme Kinetics - factors affecting enzyme activity, Michaelis-Menten plot, Lineweaver-Burk plot.

UNIT - II

Enzyme regulation - Enzyme inhibition - Reversible - competitive, noncompetitive, uncompetitive and mixed inhibition- irreversible inhibition.

UNIT - III

Carbohydrate metabolism: Glycolysis- The citric acid cycle and regulation. The pentose phosphate pathway & its importance. Lipid metabolism: α , β , γ , Oxidation of fatty acids- biosynthesis of Lipids

UNIT - IV

pH meter, Principle and applications of colorimeter and Spectrophotometer - UV & visible- flame photometer. Centrifugation - methods and types: Basic principles of centrifugation - types of rotors - Analytical and preparative centrifugation - density gradient centrifugation, Types of centrifuges: Small, bench, large capacity refrigerated, high speed refrigerated centrifuges and Ultracentrifuge.

UNIT - V

Chromatography – Principles and applications of Paper, Thin Layer Chromatography, Column Chromatography, Adsorption Chromatography, Ion exchange Chromatography. Electrophoresis- Principles and applications. SDS- PAGE, Agarose gel electrophoresis.

TEXT BOOKS:

1. *Rodney Boyer*, 2001. **Modern Experimental Biochemistry**. Prentice Hall Publisher.
2. *Albert L. Lehninger, David L. Nelson, Michael M. Cox*, 2004. **Biochemistry**, 1st Edition. Palgrave Macmillan Limited.

REFERENCE BOOKS:

1. *Jayaraman J* 1981. **Laboratory Manual in Biochemistry**, 5th Edi. New Age Int. Publishers, New Delhi.
2. *Plummer DT* 1977 **An Introduction to Practical Biochemistry**, 3rd Edi. Tata McGraw Hill, Bombay.
3. *Sawhney S K*, 2000. **Introductory Practical Biochemistry**, Narosa Publishing House.

15UMB23P	CORE PRACTICAL -II	SEMESTER II
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Total Credits: 4
Hours per Week: 5

CONTENTS

1. Observation of Plant cell
2. Observation of animal cell
3. Observation of onion root tip
4. Observation of giant chromosomes.
5. Observation of salivary gland chromosomes.
6. Measurement of Microbial cell size by Micrometry
7. Cell count- Microscope
8. Screening of PHB production
9. Preparation of permanent slides
10. Observation of permanent slides of Algae, Fungi and Protozoa
11. Preparation and observation of Blood smear
12. Observation of permanent slide for stages of mitosis
13. Observation of permanent slide for stages of meiosis
14. Quantification of Total cell protein
15. Extraction of chlorophyll pigments.

TEXT BOOKS:

1. *J Jayaraman*, 2005. **Laboratory manual in Biochemistry**. 1st Edition. New Age International.
2. *James.C.Cappuccino*. 2013. **Microbiology A laboratory manual**. 1st edition, Pearson education publishers.

REFERENCE BOOKS:

1. *Aneja. K.R.* 2012. **Experiments In Microbiology, Plant Pathology and Biotechnology**, 4th edition. New age publishers.
2. *Kannan, N.* 2003. **Hand Book of Laboratory Culture Media** 1st edition, Panima publishing house.

15UBC2AP	ALLIED PRACTICAL-I : BIOCHEMISTRY	SEMESTER- II
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Total Credits: 2
Hours per Week: 2

1. Analysis of Carbohydrates:

- a. Monosaccharide - Pentose- Arabinose. Hexoses- Glucose, Fructose,
- b. Disaccharides - Sucrose, Maltose and Lactose
- c. Polysaccharide - Starch.

2. Analysis of Amino acids:

- a. Histidine
- b. Tyrosine.
- c. Tryptophan
- d. Arginine

3. Characterization of lipids

1. Determination of acid number.
2. Determination of iodine number.

4. Separation techniques

1. Separation of amino acids by paper chromatography
2. Separation of sugars by thin layer chromatography
3. Separation of serum proteins by electrophoresis.

5. Quantification technique

1. Quantification of Protein by Lowry *et al* method
2. Quantification of Carbohydrate by DNSA method

REFERENCE BOOKS:

1. David T. Plummer 1978. **An introduction to practical biochemistry** 2nd Edition. McGraw Hill Higher Education.
2. Pattabiraman T. N and Sitarama Acharya U. 1994. **Laboratory Manual in biochemistry** 2nd Edition. All India Traveller Book Seller.
3. J Jayaraman, 2005. **Laboratory manual in Biochemistry**. 1st Edition. New Age International.

15UTL31U	பகுதி -1: தமிழ் தாள் -3	மூன்றாம் பருவம்
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Total Credits: 4

Hours/week: 5

2015-2016 ஆம் கல்வியாண்டு முதல் பயில்வோருக்குரிய பாடத்திட்டம்

காப்பியம் – சிற்றிலக்கியம் – நாடகத்தமிழ்

அலகு -1 காப்பியங்கள்

1. சிலப்பதிகாரம் – மங்கல வாழ்த்துப் பாடல்
2. மணிமேகலை – மலர்வனம் புக்க காதை
3. சீவக சிந்தாமணி – பதுமையார் இலம்பகம் (முதல் 20 பாடல்கள்)

அலகு – 2 சிற்றிலக்கியங்கள்

1. கலிங்கத்துப்பரணி – களம் பாடியது
2. மீனாட்சியம்மை பிள்ளைத்தமிழ் – வருகைப் பருவம்

அலகு – 3 நாடகத்தமிழ்

1. சேர தாண்டவம் – பாரதிதாசன்

அலகு - 4 காப்பியம், சிற்றிலக்கியம் – வரலாறு

1. காப்பியங்களின் தோற்றமும் வளர்ச்சியும்
2. சிற்றிலக்கியத்தின் தோற்றமும் வளர்ச்சியும்
3. நாடகத்தின் தோற்றமும் வளர்ச்சியும்

அலகு- 5 இலக்கணம்

1. எழுத்து ,அசை, சீர், தளை, அடி, தொடை – விளக்கம்
2. அணி – உவமையணி, தற்குறிப்பேற்றஅணி
3. அலுவலகம் சார்ந்த கடிதம் – விண்ணப்பங்கள் , வேண்டுகோள் ,முறையீடு.

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. இலக்கிய வரலாறு – பேராசிரியர் முனைவர் பாக்யமேரி
3. இதழியல் கலை - மா.பா.குருசாமி

15UHL31H	PART-I: HINDI-III	SEMESTER -III
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Total Credits: 4

Hours/week: 5

(Poetry, History of Hindi Literature, Alankar)

1. **Poetry:** Kavya Prasar – By
Dr.Balanath Puplicher: Jawahar Pusthakalay Sadar
Bazaar, Mathura – U.P. 281 001. (Pracheen – Kabir,
Tulsi, Sur & Meera, Aadhunic – Gupt, Prasad, Panth,
Nirala, Dinakar, Agneya

Short Notes On Poets -Only the above mentioned.

2. History of Hindi Literature:

(Only Aadi Kaal and Bhakthi Kaal. Only a general
knowledge.) ALANKAR: Anupras, Yamak, Slesh,
Vakrokthi, Upama, Rupak,

REFERENCE BOOKS:

1. **Hindi Sahithya Ka Saral Ithihass** By *Rajnath Sharma*, Vinod
Pustak Mandir, Agra – 282 002.
2. Kavya Pradeep Rambadri Shukla, Hindi Bhavan, 36, Tagore
Town, Allahabad – 211 002.
3. **Alankar:** Anupras, Yamak, Slesh, Vakrokthi, Upama, Rupak,

15UML31M	PART-I: MALAYALAM-III	SEMESTER III
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Total Credits: 4

Hours/week: 5

PAPER III- POETRY

This Paper will have the following five units:

UNIT I, II & III

A part of Ezuthachan's Work

UNIT IV & V

A Khandakavya of Vallathol

Text Books prescribed:

UNIT I, II & III

Karnnaparvam – Ezuthachan
(Poorna Publications, Calicut)

UNIT IV & V

Achanum Makalum – Vallathol (D.C. Books, Kottayam)

15ULG31F	PART -I FRENCH-III	SEMESTER -III
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Total Credits: 4**Hours/week: 5****French Language for Under-graduate Degree Programmes**

Compétence Culturelle	Compétence de Communication	Compétence Grammatical
UNITÉ 1- Excuses et vœux		
Convivialité (lieux et société, l'apéritif)	- INTERACTION ORALE: Accueillir quelqu'un, s'excuser, remercier - RÉCEPTION ORALE: Comprendre des annonces enregistrées - RÉCEPTION ÉCRITE: Comprendre une affiche - PRODUCTION ÉCRITE: Écrire des cartes de vœux	- Pronoms personnels toniques <i>moi, je...; toi... tu</i> - Pronoms personnels objets <i>Me, te, le...</i> - Les verbes en -er comme appeler, acheter - Les adjectifs possessifs <i>nos, vos, leurs</i>
UNITÉ 2 – Bravo et merci		
Communication et technologies (le portable, internet)	- INTERACTION ORALE: Interagir au téléphone, féliciter - RÉCEPTION ORALE: Comprendre une émission à la radio - RÉCEPTION ORALE: Comprendre une définition - PRODUCTION ÉCRITE: Écrire des plaques commémoratives	- Oui, que - Le passé composé - Le participe passé <i>J'ai eu, elle a été</i> - Longtemps, pendant ..., de... à
UNITÉ 3 – Faire et dire		
Jeunes : enquête	- INTERACTION ORALE: Demander de l'aide, donner des instructions - RÉCEPTION ORALE: Comprendre un message enregistré - RÉCEPTION ÉCRITE :	- Ce / cet, cette, ces - Le verbe voir - Envoyer, appuyer - Les articles partitifs <i>du, de la (de l)', des, de</i>

	Comprendre un article d'un magazine de consommateurs • PRODUCTION ÉCRITE : Écrire un règlement	
UNITÉ 4 – Faire ci ou faire ça		
• Les vacances des Français	• INTERACTION ORALE : Proposer quelque chose, accepter, refuser • RÉCEPTION ORALE : Comprendre une émission de cuisine • RECEPTION ÉCRITE : Comprendre une brochure d'informations • PRODUCTION ÉCRITE : Ecrire un texte de promotion touristique	• <i>S'il y a du soleil : L'hypothèse (supposition, Condition) la préposition Si + indicatif</i> • <i>Sinon... ou + indicatif</i> • <i>Sortir, partir</i> • <i>Quelques, plusieurs</i> • <i>Le long de</i> • <i>Au milieu de...</i> • <i>Au sommet de...</i>
UNITÉ 5 – Cœur et santé		
• Author du Couple	• INTERACTION ORALE: Exprimer son intérêt pour quelqu'un, exprimer l'affection • RECEPTION ORALE: Comprendre une chanson • RECEPTION ÉCRITE: Lire un horoscope • PRODUCTION ÉCRITE: Écrire une lettre au courrier du cœur	• J'étais...L'imparfait(1) • Aussi brillant que... • Le plus beau, le moins cher • Le verbe connaître

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco, Alors II* . Goyal Publishers Pvt Ltd 86, University Block ,Jawahar Nagar (Kamla Nagar), New Delhi – 110007.

15UEG32E	PART-II: ENGLISH-III	SEMESTER III
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Total Credits: 4

Hours/week: 5

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

CONTENTS

UNIT -I

PROSE

1. On Habits – A. G. Gardiner
2. Men and Women – Virginia Woolf
3. Sweets for Angels – R. K. Narayan

UNIT -II

SHORT STORIES

1. The Ant and the Grasshopper – Somerset Maugham
2. A Day's Wait – Ernest Hemingway
3. The Doll's House – Catherine Mansfield

UNIT III

ONE ACT PLAY

1. The Bishop's Candlesticks
2. A Kind of Justice

UNIT -IV

FUNCTIONAL GRAMMAR

1. The Noun
2. The Adjective
3. The Adverb
4. Sentence Structure
5. Sentence Pattern

UNIT -V

COMPOSITION TASKS

1. Human relationships in academic and professional life
2. Deciding on a career
3. Finding a Job
4. Going for an Interview
5. Writing Projects
6. Account of a task completed
7. Recommendation for promotion
8. Writing recording of achievement
9. Story Writing

TEXT BOOKS

1. *Daniel, James. P.C. Focus: A Course in Language and Communication Skills*, Harrows Publications, Bangalore, 560068.
2. *Daniel, James.P.C. 1989. English for Career Development, a Course in Functional English*, Orient Longman Private Limited Publications.

REFERENCE BOOKS

1. *Rajamanickam. A. 2001. Everyman's English Grammar*. Macmillan.
2. *Krishna Mohan and Meera Banerji. 2005. Developing Communications Skills*. Macmillan, New Delhi.
3. *Wren, P.C. and H. Martin. 1998. High School English Grammar and Composition*. Macmillan

15UMB33A	CORE- III: MICROBIAL PHYSIOLOGY	SEMESTER - III
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

This course illustrates

1. The major features of growth and metabolism of microorganisms.
2. Determination of growth curve
3. Environmental influence on the microbial growth and metabolism
4. Antibiotic production resistance and microbial relationships.

CONTENTS

UNIT - I

Nutrition: Nutritional requirements of micro organisms - Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT - II

Different phases of growth - growth curve - generation time - factors influencing microbial growth - temperature, pH, pressure, salt concentration, nutrients - synchronous growth and continuous cultivation. Diauxic growth- Estimation of Microbial growth - Direct Microscopic count, Turbidometric assay, TVC- Indirect Method- CO₂ liberation -Protein estimation

UNIT -III

Metabolism - EMP - HMP - ED pathways - TCA cycle-Completely phosphorylated, non phosphorylated and reverse TCA cycle. Oxidation-Reduction. Oxidative and Substrate level phosphorylation. Glyoxylate cycle- β oxidation of fatty acids.

UNIT- IV

Photosynthesis. Anaerobic respiration – Sulphur and nitrogen metabolism. Fermentation – alcoholic, propionic and mixed acid fermentation. Methanogens.

UNIT- V

Biosynthesis of bacterial cell wall. Biosynthesis of amino acids (Glutamic acid family). Synthesis of fatty acids. Bioluminescence.

TEXT BOOKS:

1. *Gerhard Gottschalk*, 2006. **Bacterial Metabolism**. Springer-Verlag New York.
2. *David White and George D. Hageman*. 2000. **Microbial Physiology and Biochemistry Laboratory**. Oxford University Press.

REFERENCE BOOKS:

1. *Doelle. H.W.*1975.**Bacterial Metabolism**. 2nd edition. Academic Press.
2. *Moat. A.G. and Foster. J. W.* 1988. **Microbial Physiology**. 4th edition. John Wiley & sons.

15UCY3AA	ALLIED PAPER III - CHEMISTRY I	SEMESTER III
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Total Credits: 3

Hours/Week: 3

OBJECTIVE:

1. On successful completion of this course the students shall gain knowledge in the basics of chemistry which helps bioscience students to understand chemical bonding in the biomolecules and the techniques involved in the biochemistry.

CONTENTS

UNIT - I

Chemical bonding:

1. Molecular Orbital Theory, bonding, antibonding, and nonbonding orbitals. MO configuration of H_2 , N_2 , O_2 , F_2 - bond order - diamagnetism and paramagnetism.
2. Ionic Bond: Nature of ionic bond, structure of NaCl and CsCl, factors influencing the formation of ionic bond.
3. Covalent Bond: Nature of covalent bond, structure of CH_4 , NH_3 , H_2O , shapes of $BeCl_2$, BF_3 , based on VSEPR theory and hybridization.

UNIT - II

Solutions:

1. Normality, molarity, molality, molefraction, moleconcept.
2. Primary and secondary standards - preparation of standard solutions.
3. Principle of Volumetric analysis (with simple problems).
4. Strong and weak acids and bases - Ionic product of water- pH, pKa, pKb, Buffer solution and pH and pOH simple calculations.

UNIT-III

Basic Organic Chemistry:

1. Electron displacement effect in organic compounds - Inductive effect - Electromeric effect - Resonance effect, Hyperconjugation, Steric effect, acidity of organic acids and bases.
2. Isomerism, Symmetry of elements (Plane, Centre and Axis of symmetry), Molecules with one chiral carbon and two adjacent

chiral carbons –Optical isomerism of tartaric acid, Enantiomers – Diastereomers – Separation of racemic mixture - Geometrical isomerism (maleic & fumaric acid).

UNIT – IV

1. Surface Chemistry:

Adsorption – Chemisorption - Physisorption. Difference between chemisorption and physisorption - Applications of adsorption - Factors influencing adsorption. Isobar, Isostere.

2. Chromatography - Principle & applications of Column, Paper and Thin Layer Chromatography.

UNIT – V

Dyes:

1. Terms used – Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, Hyperchromic shift, Hypochromic shift. Classification of dyes based on chemical structure & application- Preparation of azo (Methyl orange) and triphenyl methane (Malachite green) dyes.

TEXT BOOKS:

1. R. D. Madan. 2001. **Modern Inorganic Chemistry**. S. Chand & Company, New Delhi,.
2. Puri , Sharma, Pathania. 2004. **Principles of Physical Chemistry**, Vishal Publishing Company, Jalandhar.
3. M. K. Jain, S. C. Sharma. 2001. **Organic Chemistry**, Shoban Lal Nayin Chand, Jalandhar.
4. Gopalan R. 1991. **Elements of Analytical Chemistry**, Sultan Chand & Sons, New Delhi.

15UMB33P	CORE PRACTICAL - III	SEMESTER III
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Total Credits: 4
Hours per Week: 4

CONTENTS

1. Measurement of microbial growth – plate count
2. Measurement of microbial growth - turbidity method
3. Measurement of microbial growth - Microscopy count
4. Calculation of generation time.
5. Utilization of amino acid as Carbon source
6. Mixed acid Fermentation test
7. Non-acid end product test
8. Amino acid translocation test
9. Carbohydrate fermentation tests - Durham's tube
10. Preferential sugar utilization test - TSI.
11. H₂S production
12. Starch hydrolysis
13. Catalase test
14. Oxidase test
15. Urease test
16. Nitrate Utilization test
17. Nitrite test
18. Gelatin liquefaction
19. Casein hydrolysis test

TEXT BOOKS:

1. *Aneja. K.R., 2012. Experiments in Microbiology, Plant Pathology and Biotechnology, 2nd edition. New age publishers.*
2. *James.C.Cappuccino. 2013. Microbiology A laboratory manual. 1st edition, Pearson education publishers.*

REFERENCE BOOKS:

1. *Kannan, N. 1997. Laboratory Manual of General Microbiology, 1st edition, Panima Publishing house.*
2. *Kannan, N. 2003. Hand book of Laboratory Culture media 1st edition, Panima Publishing house.*

15UCY3AP	ALLIED PRACTICALII:CHEMISTRY-I	SEMESTER III
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Total Credits: 2

Hours/ Week: 2

I. Volumetric analysis

1. Estimation of Sodium Hydroxide using standard Sodium Carbonate.
2. Estimation of Hydrochloric acid using standard Oxalic acid.
3. Estimation of Oxalic acid using standard Sulphuric acid.
4. Estimation of Ferrous sulphate using standard Mohr salt solution.

II. Organic Analysis

1. To distinguish between aliphatic & aromatic.
 2. To distinguish between saturated & unsaturated.
 3. Detection of Elements (N, S, Halogens).
 4. Functional group tests for phenols, acids (mono & di), aromatic primary amine, monoamide, diamide, carbohydrate.
- Functional group characterized by Confirmatory test.

TEXT BOOK:

1. V. Venkateswaran, R. Veeraswamy & A. R. Kulandaivelu. 2004. **Basic Principles of practical chemistry**, Sultan Chand & Co.

15UMB3SA	SKILL BASED SUBJECT-1: CLINICAL BIOCHEMISTRY	SEMESTER - III
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Total Credits: 3
Hours per Week: 3

OBJECTIVES:

1. Enable the students to realize the diagnostic importance of various metabolic disorders.
2. Enable the students to know the clinical aspects of various metabolic disorders.
3. To understand the significance of diagnostic bio chemistry.

CONTENTS

UNIT-I

Basic concepts of Clinical Biochemistry - A brief review of units and abbreviations used in expressing concentrations and standard solutions. specimen collection and processing (Blood, urine, faeces). Anti-coagulant preservatives for blood and urine.

UNIT-II

Diseases related to carbohydrate metabolism Regulation of blood sugar, Glycosuria -types of glycosuria. Oral glucose tolerance test in normal and diabetic condition. Diabetes mellitus and Diabetic insipidus - hypoglycemia, hyperglycemia. Ketonuria, ketosis.

UNIT-III

Inborn errors of metabolism Introduction -clinical importance, phenyl ketonuria, cystinuria, alkaptonuria, Fanconi's syndrome, galactosemia, albinism, tyrosinemia, and hemophilia.

UNIT-IV

Organ function test Lipid and lipoproteins: Classifications, composition, mode of action - Cholesterol. Factors affecting blood cholesterol level. Dyslipoproteinemias, IHD, atherosclerosis, risk factor and fatty liver. Liver function test: Metabolism of bilirubin, jaundice - types, differential diagnosis. Liver function test -Icteric index, Vandenberg test, plasma protein changes, PT.

UNIT-V

Clinical enzymology Functional and non-Functional plasma enzymes. Isoenzymes with examples. Enzyme patterns in acute pancreatitis, liver damage, bone disorder, myocardial infarction and muscle wasting.

TEXT BOOKS:

1. *Chatterjee M N and Rana Shinde.* 2007. **Text book of Medical Biochemistry.** 7th Edition. Jaypee Brothers Medical Publishers.
2. *Harold Varley.* 2005. **Practical clinical biochemistry,** 4th Edition. CBS Publishers and Distributors. New Delhi.

REFERENCE BOOKS:

1. *Abdul Khader.* 2003. **Medical Laboratory Techniques,** 1st edition. Frontline Publications, Hyderabad.
2. *Monica Chess Brough.* 1985. **Direct Laboratory practice in Tropical countries. Microbiology,** 1st Edi. Cambridge University Press. New York.
3. *Bailey and Scott's.* 1990. **Diagnostic Microbiology,** 8th edition. The C.V. Mosby Company.

15UED34F	NMEC I: MICROBIOLOGY AND PUBLIC HEALTH	SEMESTER - III
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Total Credits: 2
Hours per Week:2

OBJECTIVES:

The course is designed

1. To meet a national demand, which has reached critical proportions, for a trained workforce in biodefense and emerging infections.
2. It also addresses an international demand for training in diseases that affect developing countries.

CONTENTS

UNIT -I

Communicable Diseases: Introduction, Terminology. Modes of disease transmission, general measures for prevention & control of communicable diseases.

UNIT-II

Disinfection & Sterilization: Effective disinfection by liquid chemical agents like Halogen, Potassium permanganate solution etc. Solid chemical agent – Bleaching powder, Lime.

UNIT-III

Non-Communicable Diseases: Diagnosis & prevention of Cancer, Cardiovascular Diseases and Diabetes.

UNIT-IV

Food borne infection – Salmonellosis, Shigellosis and Hemorrhagic colitis.
Food intoxication – *Staphylococcus aureus*, *Bacillus cereus* and Mycotoxins.

UNIT-V

Personal Hygiene: Factors influencing health & hygiene. Health habits & practice. Maintenance of normal circulation, respiration, digestion etc. Skin care cleanliness. Dental care. Care of hands, hand washing. Exercises-importance. Food values. Nutrition.

TEXT BOOKS:

1. *Frazier, W.C. and Westhoff, D.C.* 2008. **Food microbiology**. 4th Edition. McGraw Hill NY.
2. *Park K.* 2013. **Preventive and Social Medicine 22nd Edition**, Banarsidas Bhanot **Publishers**.

REFERENCE BOOK:

1. *Adams, M.R.and Moss. M.O.* 1996. **Food Microbiology**. 2nd edition. Panima Publishers.

15UTL41U	பகுதி - 1: தமிழ் தாள் - 4	நான்காம் பருவம்
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Total Credits: 4

Hours/week: 5

(இரண்டு ஆண்டுகள் தமிழ் பயிலும் மாணவர்களுக்கு உரியது)

சங்க இலக்கியமும் நாட்டுப்புற இலக்கியமும்

அலகு - 1 எட்டுத்தொகை

1. குறுந்தொகை - (நெய்தல், பாடல் எண் : 57 - சிறைக்குடி ஆந்தையார்)

(மருதம், பாடல் எண்: 61 - தும்பிசேர்கீரன்)

(முல்லை, பாடல் எண்: 167 - கூடலூர்கிழார்)

2. கலித்தொகை - (குறிஞ்சிக்கலி, பாடல் எண் :16 - கபிலர்)

3. அகநானூறு - (பாலை, பாடல் எண் : 43 - நல்லந்துவனார்)

4. புறநானூறு - (பா.எண் : 279 - ஒக்கூர் மாசாத்தியார்,
பா.எண்: 312 - பொன்முடியார்)

அலகு - 2 பத்துப்பாட்டு

1. முல்லைப்பாட்டு - நப்பூதனார்

அலகு - 3 நாட்டுப்புறவியல்

1. நாட்டுப்புறப்பாடல்கள் - அறிமுகம்

2. தாலாட்டுப் பாடல்கள்

3. தொழிற்களப் பாடல்கள்

அலகு - 4 இலக்கிய வரலாறு

1. பத்துப்பாட்டு

2. எட்டுத்தொகை

அலகு - 5 இலக்கணம்

1. அகத்திணை - விளக்கம்

2. புறத்திணை - விளக்கம்

பார்வை நூல்கள்

1 . தமிழ்த்துறை வெளியீடு

2. இலக்கிய வரலாறு - பேராசிரியர் முனைவர் பாக்யமேரி

3. நாட்டுப்புற இயல் ஆய்வு - சு. சக்திவேல்

15UHL41H	PART-I :HINDI-IV	SEMESTER-IV
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Total Credits: 4

Hours/week: 5

(Drama, One Act Play, General Essay)

1. **Ladai** Sarveshwar Dayal Saksena Publisher : Vani Prakashan
New Delhi – 110 002.

2. **One act play :** Ekanki Panchamruth (Excluding Bohr Ka Thara)
Publisher: Govind Prakashan Mathura

3. **General essay**

Book for reference : Aadarsh Nibandh Vinodh Pustak Mandir
Hospital Road, Agra – 28

15UML41M	PART-I: MALAYALAM-IV	SEMESTER IV
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Total Credits: 4

Hours / Week: 5

Drama & Folklore Paper IV. Drama & Folklore

Unit I, II & III A Drama

Unit IV & V Folklore

TEXT BOOKS:

1. Unit I, II & III **Lankalakshmi** – C. N. Sreekantan Nair (D.C. Books, Kottayam).
2. Unit IV & V **Oru Vadakkanveeragatha** – M.T. Vasudevan Nair (Puthariyamkam, Sahithya Kairali Publications, Bhagavathinada P.O).

REFERENCE BOOKS:

1. **Natyasasthram**, K.P. Narayana Pisharodi, Trans. (Kerala Sahithya Akademi, Thrissur).
2. **Malayala Nataka Sahithya Charithram**, G. Sankara Pillai (Kerala Sahithya Akademi, Thrissur).
3. **Malayala Nataka Sahithya Charithram**, Vayala Vasudevan Pillai (Kerala Sahithya Akademi Thrissur).
4. **Natakam – Oru Patanam** (C. J. Smaraka Prasanga Samithi, Koothattukulam).
5. **Natakaroopacharcha**, Kattumadam Narayanan (NBS, Kottayam)
6. **Folklore** – Raghavan Payyanadu (Kerala Bhasha Institute, Trivandrum)

15UFL41F	PART-I: FRENCH-IV	SEMESTER-IV
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Total Credits: 4**Hours/week: 5****French Language for Under-graduate Degree Programmes**

Compétence Culturelle	Compétence de Communication	Compétence Grammatical
UNITÉ 6 – Problèmes problems		
Le bénévolat	- INTERACTION ORALE: Interroger sur la tristesse, l'abattement, exprimer sa sympathie, rassurer - RÉCEPTION ORALE: Comprendre une interview à la radio - RECEPTION ÉCRITE: Comprendre un test de magazine - PRODUCTION ÉCRITE: Écrire une lettre à un(e) amie	- Les pronoms indéfinis rien, quelque chose - Le verbe crier - Du pluriel: eau, eu, al - Se soigner, s'excuser, se renseigner, s'appeler - La phrase négative: ne... plus, ne... jamais, ne... rien, ne... personne
UNITÉ 7 – C'est qui? C'est comment?		
Les classes sociales	INTERACTION ORALE: Décrire quelqu'un RECEPTION ORALE: Comprendre un bulletin météo RECEPTION ÉCRITE: Comprendre une courte interview PRODUCTION ÉCRITE: Écrire des notices biographiques	- Les adjectifs qualificatifs: Formes au masculin et au féminin - Il fait beau, il neige, il pleut... - Le verbe décrire - Les verbes en -indre - Les adjectifs possessifs féminins mon, ton, son devant voyelle ou h
UNITÉ 8 – Et après? Et après		
La mémoire et l'histoire	- INTERACTION ORALE: Raconter une anecdote, une histoire, attirer l'attention - RÉCEPTION ORALE: Comprendre une	- L'imparfait(2) - Les verbes en -oir - Les pronoms démonstratifs ça et cela - Prés de... Loin de...

	interview à la radio • RÉCEPTION ÉCRITE: Comprendre des faits divers • PRODUCTION ÉCRITE: Écrire une brève	• La forme passive
UNITÉ 9 – Sûr et certain		
• L'université en France	• INTERACTION ORALE : Exprimer un point de vue, exprimer une certitude • RÉCEPTION ORALE : Comprendre et apprécier un poème • RÉCEPTION ÉCRITE : Comprendre un appel à participer à la vie collective • PRODUCTION ÉCRITE : • Ecrire une lettre de motivation	• Le futur des verbes <i>parler, Avoir,être,voir</i> • Le verbe <i>valoir</i> • Par • Les pronoms démonstratifs <i>celui-ci, celle -là</i>
UNITÉ 10 – Peut -être...peut-être		
• Le système de santé en France	• INTERACTION ORALE : Exprimer une incertitude, exprimer l'évidence • RÉCEPTION ORALE : Comprendre et apprécier une chanson • RECEPTION ÉCRITE : Comprendre un débat d'idées • PRODUCTION ÉCRITE : Écrire au courrier des lecteurs	• Les pronoms personnels objets,indirect <i>lui, leur</i> • L'impératif affirmative + COD et COL • Les verbes <i>en – ayer</i> • L'interrogation à inversion

TEXT BOOK:

1. Marcella Di Giura Jean-Claude Beacco, **Alors II** . Goyal Publishers Pvt Ltd 86, University Block ,Jawahar Nagar (Kamla Nagar), New Delhi – 110007.

15UEG42E	PART-II: ENGLISH-IV	SEMESTER IV
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Total Credits: 4
Hours/week: 5

OBJECTIVE:

To develop the language competence of the students.

1. To be enriched with functional English.

CONTENTS

UNIT -I

1. Mobile and Mixed-up – Anil Darker
2. My Vision for India – Dr. Abdul Kalam
3. Common Sense – Sedgwick, Woodworth

UNIT -II

SHORT STORIES

1. A Room 10 x 8 –K.S. Duggal
2. A Face on the Wall – E.V. Lucas

UNIT -III

SHORT PLAY

1. The Death Trap – H. H. Munro
2. The Never Never Nest – Cedric Mount

UNIT- IV

FUNCTIONAL ENGLISH

1. Communication Skills – Listening, Telephone, Resume & E-Mail
2. Interview & Group Discussion, Parts of the Exercises in each chapter.

UNIT -V

COMPOSITION TASKS

1. Public Speaking – speaking on an official occasion
2. Participating in a meeting

3. Airing grievances
4. Interview Skills
5. Conducting an Interview
6. Interviewing the expert
7. Net equittte
8. Negotiation Skills

TEXT BOOKS

1. *Nandini Nayar.2014* **Treasure Hunt**. Board of Editors, Foundation Books.
2. *Daniel, James.P.C. 1989*. **English for Career Development, a Course in Functional English**, Orient Longman Pvt Ltd., Publications.

REFERENCE BOOKS:

1. *Rajamanickam. A. 2001*. **Everyman's English Grammar**, Macmillan.
2. *Krishna Mohan and Meera Banerji. 2005*. **Developing Communication Skills**.Macmillan.
3. *Wren.P.C and Martin.1998*. **High School Basic Grammar and Composition**. Macmillan.

15UMB43A	CORE -IV: FOOD MICROBIOLOGY	SEMESTER IV
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Total Credits: 3
Hours per Week: 5

OBJECTIVES:

The course is used to study

1. The nature of foods and the causes of deterioration,
2. The principles underlying food processing and the improvement of foods for the consuming public.

CONTENTS

UNIT - I

Food and Microorganisms - Important microorganisms in food (Bacteria, Mold and yeasts); Factors affecting the growth of microorganisms in food - pH, moisture, oxidation - Reduction potential, Nutrient content and Inhibitory substances and biological structure.

.UNIT - II

Microbiology in Food Sanitation - Bacteriology of Water - Sewage and waste treatment Disposal - Microbiology of Food Product - Good Manufacturing Practices - Hazard Analysis - Critical Control Points - Health of Employees.

UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk - canned foods.

UNIT - IV

Fermented food - Bread, fermented fish and meat products - Fermented dairy products - Yoghurt and cheese. Fermented beverages: Wine and beer

UNIT- V

Food borne diseases – Food poisoning and Food borne infections –
Bacterial and Mycotoxins- Investigation of food poisoning outbreaks

TEXT BOOKS:

1. *Frazier. W.C and D.C Westhoff.* 1978. **Food Microbiology.** 3rd ed.
Tata Macgraw Hill publishing Co., New Delhi.
2. *Adams M.R. and Moss M. O.,* 2000. **Food Microbiology** 2nd
edition. Panima Publishers.

REFERENCE BOOKS:

1. *Roger.Y.Stainer.* 2003. **Basic Food Microbiology.** 2nd edition, CBS
Publishers.
2. *Jay,J.M .* 1991. **Modern Food Microbiology** 4th edition. Van
Nostra and Rainhokdd Co.

15UMA4AB	ALLIED -IV: MATHEMATICS AND BIOSTATISTICS	SEMESTER- IV
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

1. On successful completion of this course the students shall enrich to solve various problems in bioscience
2. It helps the students to do research problems

CONTENTS

UNIT - I

Set theory-Introduction-Set and its Elements-Set Description-Types of sets-Venn-Euler diagrams-Set operations.

UNIT - II

Matrices – Determinant of a matrix – Transpose of a matrix - Inverse of a matrix –Solutions of simultaneous linear equations in three variables using matrices.

UNIT - III

Solving simultaneous linear equations in two variables and three variables – Solving quadratic equations – nature of roots of quadratic equations.

UNIT - IV

Measures of central tendency – Mean, Median, Mode – Measures of dispersion – Quartile deviation - Mean deviation - Standard deviation

UNIT - V

Correlation – Karl Pearson's Coefficient of correlation – Rank correlation.

TEXT BOOK:

1. *Navaneetham, P.* 2007. **Business Mathematics and Statistics.**

REFERENCE BOOKS:

1. *Pillai R.S.N. and Bagavathi. V.* 2007. **Statistics**
2. *Sancheti, D.C. and Kapoor, V.K.* **Statistics-Theory, Methods & Application.**
3. *Gupta.S.P.* 2004. **Statistical Methods.**

15UMB43P	CORE PRACTICAL- IV	SEMESTER IV
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Total Credits: 4
Hours per Week: 4

CONTENTS

1. Microbiological Examination of Food
2. Detection of number of bacteria in Milk by SPC
3. Isolation of Lipolytic Microorganism from Butter
4. Observation of Bacteria from Curd
5. Isolation and Identification of Microorganisms from spoiled Bread
6. Isolation and Identification of Microorganisms from spoiled Milk
7. Isolation and Identification of Microorganisms from spoiled Fruit
8. Isolation and Identification of Microorganisms from spoiled Vegetable
9. Determination of Milk Quality by Methylene Blue Reduction test
10. Determination of Thermal Death time
11. Determination of Thermal Death point

TEXT BOOKS:

1. *Aneja, K.R.* 2012. **Experiments in Microbiology, plant pathology and biotechnology**, 4th Edition. New age publishers.
2. *James.C.Cappuccino.* 2013. **Microbiology A laboratory manual**. 1st edition, Pearson education publishers.

REFERENCE BOOKS:

1. *Kannan,N.* 1997. **Laboratory Manual of General Microbiology**, 1st edition, Panima Publishing House.
2. *Kannan,N.* 2003. **Hand Book of Laboratory Culture Media** 1st edition, Panima Publishing House.

15UMB4SA	SKILL BASED SUBJECT- 2 : FOOD PROCESSING AND PRESERVATION	SEMESTER- IV
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Total Credits: 3
Hours per Week: 3

OBJECTIVES:

1. Knowledge about food processing methods.
2. Understand the principles of food preservation.
3. Acquire skills in methods of food preservation

CONTENTS

UNIT-I

Rice Technology -Production, processing, milling of rice, parboiling, processes, by products of rice milling and their utilization. Nutrient loss during processing.

UNIT -II

Mushroom -Production, processing, utilization. Meat -Production, processing, Poultry -Production, preparing poultry for consumption, packaging. Fish -Production, effect of handling practices, storage, manufacturing and packaging.

UNIT -III

Vegetable processing -Drying techniques -drum drying, vacuum puffing, foam mat drying, freeze drying, accelerated freeze drying. Fruits-Sun drying of banana and grapes; Mechanical dehydration -use of kiln drier and tunnel drier.

UNIT -IV

Principles of food preservation – General principles and application methods – Asepsis - Techniques of removal – use of temperature (low & high). Drying, radiation and chemical preservatives.

UNIT -V

Advances in food preservation–principles, advantages and disadvantages only -non-thermal processes, ultrasound method, nanotechnology, oscillating magnetic field, electric field pulses, high pressure processing.

TEXT BOOKS:

1. *Frazier. W.C and D.C Westhoff.* 1978. **Food Microbiology.** 3rd ed. Tata Macgraw Hill Publishing Co., New Delhi.
2. *Adams. M. R and M. D Moss.* 1995. **Food Microbiology.** 5th Edition. New Age International limited.

REFERENCE BOOKS:

1. *Shakuntala Manay, N and Shadak Cheraswamy, M.,* 1987. **Food Facts and Principles,** Wiley Eastern Ltd.
2. *Jay,J.M .*1991. **Modern Food Microbiology** 4th edition , Van Nostra and Rainhokdd Co.

15UED44F	NMEC- II: MICROBES IN DISEASE AND HUMAN WELFARE	SEMESTER- IV
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Total Credits: 2
Hours per Week: 2

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Role of microbes in industries and enzymes.
2. Food intoxication
3. Types of infection and role of microbes.

CONTENTS

UNIT - I

Infection: Mode and spread of infection, Epidemic, endemic and pandemic diseases- Definition. Contagious and infectious diseases. Prevention of infection.

UNIT - II

Normal flora of human body, carriers, types of carriers. Sterilization and disinfection: principles, pasteurization, chlorination, UV treatment, disinfection of floors and hand sanitation.

UNIT - III

Defense mechanism of human system: First line, second line and third line defense mechanisms (outline only), Allergy and hypersensitivity – An introduction to type I, II, III and IV.

UNIT - IV

Antibiotics: Introduction, Mode of action with example of each class, Antibiotic resistance and prevention of antibiotic resistance.

UNIT - V

Vaccines: Introduction, types: Killed, Live attenuated recombinant vaccines and toxoids. Universal immunization programme.

TEXT BOOKS:

1. *Lansing M. Prescott, John P. Harley, Donald A. Klein.* **2001.**
Microbiology, 5th Edition. McGraw – Hill Higher Education.
2. *Satynarayana. U.* 2008. **Biotechnology**, 1st edition. Books and Allied Ltd.
3. *Jeffrey C. Pommerville.* 2004. **Alcamo's Fundamentals of Microbiology**. 7th Edition. Jones and Barlett Publishers.

REFERENCE BOOKS:

1. *Mims, Playfair, Roitt Wakelin and Williams.* 1998. **Medical Microbiology**, 2nd Edition. Mosby Publishers Limited.
2. *Rajan. S.* 2009. **Medical Microbiology**, 1st edition. MJP publishers.

15UMB53A	CORE- V: MICROBIAL GENETICS	SEMESTER V
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Total Credits: 3
Hours per Week: 5

OBJECTIVES:

The course aims to build the concepts regarding

1. Characteristics of microbial genetics
2. Bacterial genetic recombination
3. Genetic material exchange and mutations.

CONTENTS

UNIT-I

Prokaryotic Genomes - Physical organization of bacterial genomes (Structure of the bacterial nucleoid, Replication and partitioning of the bacterial genome).

UNIT-II

Mechanism of genetic exchange: Plasmid and bacterial sex, Types of plasmids (F Plasmid: a Conjugate plasmid', Mobilization of Non-conjugative plasmid, R plasmid, Col plasmid Copy number and incompatibility), Episomes. Transposable elements.

UNIT-III

Bacterial Genetics (Mutant phenotype, DNA mediated Transformation; Conjugation (Cointegrate Formation and Hfr Cells, Time-of-Entry Mapping, F' Plasmid); Transduction (Generalized transduction, Specialized Transduction) - gene mapping

UNIT-IV

Bacteriophages-Introduction-T₂&T₄ Phages - Lytic and Lysogenic Cycle. Lambda Phages- Eukaryotic phages.

UNIT-V

Molecular Mechanism of gene regulation in prokaryotes - lac, trp, Ara operons. Eukaryotic gene regulation.

TEXT BOOKS:

1. *Gardner, E. J, Simmons, M J & D P Snustard* . 1991, **Principles of Genetics**, 8th edition. John Wiley & Sons. NY.
2. *Freifelder .S.* 1987. **Microbial Genetics**, 1st Edi. Jones & Bartlett, Boston.
3. *Robert H. Tamarin.* 1992. **Principles of Genetics**, 7th edition, Cm Brown Publishers.

REFERENCE BOOKS:

1. *Lewin.B,* 1990. **Genes**, 1st edition, Oxford University Press.
2. *Klug .W.S. & Cummings, MR.* 1996, **Essentials of Genetics**, Mentics Hail. New Jersey.

15UMB53B	CORE- VI: BASIC IMMUNOLOGY	SEMESTER- V
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Total Credits: 3
Hours per Week: 5

OBJECTIVES:

The objectives of this course are to continue

1. To introduce the students to the field of immunology.
2. History of immunology and antigen -antibody types.
3. Hypersensitivity and immune response.
4. Blood grouping and transplantation.

CONTENTS

UNIT- I

History and Scope of Immunology - The basis of defense mechanisms - Cells and Organs involved in immune system.

UNIT- II

Types of immunity - Antigen - Antibody - types - Complement pathways - Classical , alternate and lectin pathway - Immunoglobulin - structure, Isotypes, and functions.

UNIT- III

Allergy and Hypersensitivity - Classification types and Mechanisms - Autoimmunity mechanisms and autoimmune response diseases: cell specific: Systemic Lupus Erythmatosis and Organ Specific: Myasthenia Gravis.

UNIT -IV

Antigen - Antibody reactions -Agglutination: Direct, indirect, RPR and Hemaagglutination Precipitation: Double Immuno Diffusion, ELISA, Radio immune assay (RIA) - Monoclonal antibodies and its applications.

UNIT -V

Immuno hematology - Blood transfusion - ABO grouping - Rh factor - Tissue transplantation- HLA typing - Mechanism of acceptance and rejection. Immunodeficiency: AIDS.

TEXT BOOKS:

1. *Nandhini Shetti*, 2009. **Immunology, an Introductory Text Book**.
1st edition. New Age International Limited.
2. *Tizard, I R.* 1998. **Immunology an Introduction**, 4th edition.
Thomson publishers, Australia.

REFERENCE BOOKS:

1. *Roitt, IM.* 2011. **Immunology** 1st edition. Mosby Publishers.
2. *Kuby, J.* 2002. **Immunology** 5th edition. W.H. Freeman, NY.

15UMB53C	CORE- VII: MEDICAL MICROBIOLOGY	SEMESTER -V
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Total Credits: 3
Hours per Week: 5

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Gram positive organisms
2. Gram negative organisms and Spirochaetes
3. Rickettsiae and Mycoplasma

CONTENTS

UNIT- I

Infections- sources of infections- Types of infections- methods of infections - Definitions- Epidemic, Pandemic, Endemic diseases- Epidemiology of Infectious diseases, Infectious diseases cycle- Investigation of epidemics- control of epidemics.

UNIT-II

Morphology, Pathogenicity and laboratory diagnosis- Gram positive & negative coccus - *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pneumococcus* and *Neisseria* sp.

UNIT- III

Morphology, Pathogenicity and laboratory diagnosis- Gram positive organisms- *Bacillus anthracis*, *Corynebacterium diphtheriae*, *Clostridium botulinum*, *Clostridium tetani*.

UNIT -IV

Morphology, Pathogenicity and laboratory diagnosis- Gram negative Organisms - *Escherichia coli*, *Klebsiella*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Vibrio cholerae*.

UNIT-V

Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium tuberculosis*, *Mycobacterium leprae*, *Treponema pallidum*, *Leptospira*.

TEXT BOOKS:

1. *Ananthanarayanan R and CK Jayaram Panicker*, 1994, **Textbook of Microbiology**. Orient Longman.
2. *Chakraborty P* 1995, **A Text book of Microbiology**, New Central Book Agency Pvt Ltd. Calcutta.

REFERENCE BOOKS:

1. *Bailey and Scotts*, 1994, **Diagnostic Microbiology**, 9th edition, Baron and Finegold CV Mosby Publications.
2. *Jawetz E Melnic JL and Adel berg EA* 1998, **Review of Medical Microbiology**. Lange Medical Publications, USA.
3. *Mackie and Mc Catney*, 1994, **Medical Microbiology No I and II**. Churchill Livingston, 14th edition.

15UMB5EA	ELECTIVE- I: MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY	SEMESTER- V
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Total Credits: 4
Hours per Week: 5

OBJECTIVES:

1. The techniques of Molecular cloning through a set of experimental methods in molecular biology
2. To construct recombinant DNA molecules and to direct their replication within host organisms

CONTENTS

UNIT - I

DNA: - DNA as genetic material, Structure of DNA, DNA Replication- Semiconservative-enzymology-mechanism.

UNIT - II

Transcription (General)-Genetic Code-Translation- enzymology and mechanism.

UNIT -III

Mutation-types-silent-missense-non-sense-insertion-deletion- substitution-spontaneous and induced. Repair-light-dark-SOS-Recombinant

UNIT-IV

Restriction Enzymes-Mode of Action, Ligases and Methylases, Isolation - Purification of DNA and RNA, PCR, Genomic and C-DNA library, Blotting-Southern and Northern- RFLP, RAPD

UNIT- V

Vectors – Plasmid based Vectors, pBR322 & pUC, Phage based Vectors- λ (Lamda)Hybrid Vectors- Phagemid and Cosmid. Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method.

TEXT BOOKS:

1. *Old. RW and Primrose*, 1995. **Principle of Gene Manipulation**, 5th edition. Blackwell Scientific Publication ,Boston.
2. *T.A Brown* 1st edition, 2002. **Genomes**, John- Wiley & Son.

REFERENCE BOOKS:

1. *Winnecker, E.D*, 1987. **From Gene to Clones**, Introduction to Gene Technology, 1 st edition. Panima educational book agency.
2. *Glick B .R and Pasternak J .J* .1994. **Molecular Biotechnology. Principles and Application of recombinant DNA**, 2 nd edition. ASM Press, Washington.

15UMB5EB	ELECTIVE-I: GENERAL BIOLOGY	SEMESTER- V
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Total Credits: 4
Hours per Week: 5

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Cellular Organization
2. Different systems in human beings
3. Interdisciplinary studies in life sciences

CONTENTS

UNIT - I

Introduction: Study on Life- - Cellular Organization-Chemistry of Cell-membrane structure and diversity- osmosis and diffusion- mitosis and cell cycle- prokaryotes and eukaryotes- water and life.

UNIT - II

Digestive system- Respiratory system- Excretory system in human beings - Homeostasis- Circulation- -Nervous System

UNIT - III

Plant Photosynthesis- pigments- light reaction and dark reaction- C3 and C4 Photosynthesis-plant hormones.

UNIT - IV

Genetics: Heredity- Patterns of Inheritance- Dominant/Recessive - Sex-linked
Incomplete Dominance- Co-dominance- Polygenic Inheritance- Multiple Alleles

UNIT - V:

Ecology: Ecosystem Structure: Abiotic Factors, Biotic Factors, The Flow of Energy in Ecosystems- Food Chains, Food Webs, Energy Pyramids.

TEXT BOOKS:

1. *Taylor D J, Green, N P O, Stout G W.* 1997. **Biological Science**, 3rd edition, Cambridge University Publishers,
2. *Verma P S,* 2004. **Cell biology, Genetics, Evolution and Ecology**, 14th Edition, S Chand Publishers.
3. Chandi Charan Chatterjee, 1958. Human Physiology, 4th Edition. Central Book Agency.

REFERENCE BOOK:

1. *Gerald Karp,* 2010. **Cell Biology**, 6th Edition, John Wiley & sons Publishers.

15UMB5EC	ELECTIVE- I: DAIRY MICROBIOLOGY	SEMESTER- V
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Total Credits: 4
Hours per Week: 5

OBJECTIVES:

1. The hygienic properties of commercially available dairy foods.
2. The products survey

CONTENTS

UNIT - I

History and Development – Role of Microbes - Starter cultures and its importance in dairy industry. Classification of Lactic Acid Bacteria, production of antibacterial substances by lactic starter cultures. Mixed and define strain starter culture; propagation of starter cultures; factors affecting their propagation; starter concentrates - direct bulk and direct vat starter cultures; starter distillates.

UNIT - II

Preservation of starter cultures: freezing and freeze-drying; factors affecting the survival of cultures during preservation. Role of starter cultures in the preparation of various fermented milks; classification of fermented milks.

UNIT - III

Microbiology of dahi and yoghurt; different types of dahi and yoghurt; preparation; defects and their control. Microbiology of milk products; their nutritional and therapeutic significance. Microbiology of other fermented milks - cultured buttermilk their significance. Concept of probiotic starters and their application in probiotic dairy food.

UNIT - IV

Definition, standards and classification of cheese. Milk quality in relation to cheese making. Cheese additives and preservatives. Role of starter culture in relation to cheese quality. Manufacture of different varieties of cheese: Microbiological changes during preparation ripening in cheese. Accelerated ripening of cheese. Microbiological defects in cheese; their cause and prevention.

UNIT - V

Rapid assessment of dairy food for microbial and non-microbial contaminants; Enumeration Principles in detection of predominant spoilage organisms and pathogens like indicator organisms, *E.coli*, *Salmonella*, *Shigella*, *Staph aureus*, *Bacillus cereus*. Microbial quality of water and environmental hygiene in dairy plant; chlorination of dairy water supply, quality of air. Personnel hygiene, treatment and disposal of waste water and effluents.

TEXT BOOK:

1. *Adams M.R. and Moss M. O., 2000. Food Microbiology* 2nd edition. Panima Publishers.

REFERENCE BOOKS:

1. *William C Frazier and Dennis C Westhoff.* 2004. **Food Microbiology**, 4th Edition by TMH Publishers.
2. *George J. Banwart,* 1979. **Basic Food Microbiology**, 2nd Edition, CBS Publishers.

15UMB53P	CORE PRACTICAL -V	SEMESTER- V
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Total Credits: 4
Hours per Week: 5

CONTENTS

1. DNA Extraction from Bacteria
2. Plasmid Extraction
3. Separation of DNA
4. Effect of UV on bacterial culture
5. UV-Mutagenesis
6. Chemical-Mutagenesis
7. Slide agglutination -Blood grouping
8. Tube agglutination- WIDAL
9. Precipitation – RPR
10. Ouchterlony's Immunodiffusion
11. ELISA
12. SDS – PAGE
13. Silver staining
14. Preservation of gel.

TEXT BOOKS:

1. *Maniatis, T. Tritsch E F and Sambrook J, 2010. Molecular Cloning. A Laboratory Manual.* Cold Spring Harbor Laboratory, New York.
2. *Aneja. K.R. 2012. Experiments in Microbiology, Plant Pathology and Biotechnology, 2nd edition, New age publishers.*

REFERENCE BOOK:

1. *Jeffrey H. Miller, 1972. Experiments in Molecular genetics.* Cold Spring Harbor Laboratory, New York.

15UMB5SA	SKILL BASED SUBJECT-3: PROCESSING OF CLINICAL SPECIMENS	SEMESTER -V
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Collection and processing of clinical specimens.
2. Blood smear preparation and identification of blood cells.
3. Staining method and types of staining.

CONTENTS

UNIT - I

Sample collection –containers- urine, blood, sputum, stool - transportation. The techniques of preservation of samples. Separation of plasma and serum.

UNIT - II

Analysis of urine: microscopic examination- crystals, casts, sediments, pregnancy tests. Physical and chemical tests.

UNIT - III

Blood analysis: Peripheral blood smear examination - Staining - Total count - Differential WBC count - Morphological abnormalities - absolute eosinophil count - E.S.R, P.C.V, Blood indices - Platelet count: BT, CT.

UNIT -IV

Microbiological Examination of Stool - Microscopy, Culture and Biochemical identification of Pathogens.

UNIT - V

Microbiological Examinations of Sputum and Throat swab- Microscopy, Culture and Biochemical identification of Pathogens. Antibiotic sensitivity test.

TEXT BOOKS:

1. *Kanai.N.Mukherjee.* 2007. **Medical Laboratory Technology**.1st edition, TMH, New Delhi.
2. *Ramnik Sood.* 2009. **Text Book of Medical Laboratory Technology**. 5th edition, Jaypee brothers Medical publishers.

REFERENCE BOOK:

1. *Bailey and Scotts,* 1994, **Diagnostic Microbiology**, 9th edition, Baron and Finegold CV Mosby Publications.

15UMB63A	CORE- VIII: MYCOLOGY AND PRASITOLOGY	SEMESTER -VI
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Fungal infections
2. Parasitic infections
3. Antibiotics and chemotherapeutic agents

CONTENTS

UNIT-I

Classification of Fungal infection: skin mycology: Superficial Mycoses- Cutaneous Mycoses- Subcutaneous Mycoses. Infectious disease mycology: Dimorphic Systemic Mycoses- Opportunistic Systemic Mycoses

UNIT-II

Pityriasis versicolor- Dermatophytes and agents of superficial mycoses. Trichophyton, Epidermophyton and Microsporum. Subcutaneous mycoses - sporotrichosis- chromoblastomycosis- mycetoma. Dimorphic systemic mycoses -Histoplasmosis, Coccidioidomycosis

UNIT-III

Opportunistic mycoses -Candidiasis, Cryptococcosis, Aspergillosis. Mycotoxins, Antifungal agents, testing and methods.

UNIT-IV

Introduction to medical Parasitology - Classification, Protozoa - Entamoeba - Plasmodium- Leishmania - Trypanosoma -Giardia - Trichomonas.

UNIT-V

Life cycle and infection-Platyhelminthes - Taenia-Nematihelminthes - Ascaris - Enterobius - Trichuris - Wuchereria.

TEXT BOOKS:

1. *Prescott, L.M J.P. Harley and C.A. Klein.* 1995. **Microbiology** 2nd edition. Wm, C. Brown Publishers.
2. *Ananthanarayanan R and CK Jayaram Panicker,* 1994, **Textbook of microbiology.** Orient Longman.
3. *Chakraborty P* 1995, **A Text book of microbiology,** New Central Book Agency Pvt Ltd. Calcutta.
4. *CK Jayaram Paniker.* 2007. **Medical Parasitology,** 6th Edition. Jaypee Brothers Medical Publishers (p) Ltd. New Delhi.

REFERENCE BOOKS:

1. *Bailey and Scotts,* 1994, **Diagnostic Microbiology,** 9th edition, Baron and Finegold CV Mosby Publications.
2. *Jawetz E Melnic JL and Adel berg EA* 1998, **Review of Medical Microbiology.** Lange Medical Publications, USA.
3. *Jagdish Chander,* 2009. **Textbook of Medical Mycology,** 3rd edition. Mehta Publishers, New Delhi.

15UMB63B	CORE -IX: INDUSTRIAL MICROBIOLOGY	SEMESTER- VI
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Fermentation- Definition & types
2. Industrial scale Production of beverages, Single cell protein
3. Downstream process

CONTENTS

UNIT -I

Fermentation- Definition & types - Submerged and Solid state. Batch fermentation – Continuous fermentation. Fermentors – Components (Baffles, Agitator, Impellers and Antifoaming agents). Types of Fermentors - Tower, cylindroconical & airlift.

UNIT -II

Industrially important strains- Screening methods- Primary and Secondary screening. Strain development for improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -III

Industrial scale Production of beverages – beer and wine- vitamin B12 and Riboflavin – Antibiotics- penicillin and streptomycin - production of enzymes - Amylases and Proteases.

UNIT- IV

Single cell protein- Baker's yeast, Spirulina- Details of mushroom development- *Oyster Pleurotus*) and Button (*Agaricus*) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular - Breakage of cells - physical and chemical methods. Centrifugation, filtration, Flootation-solvent extraction, precipitation.

TEXT BOOKS:

1. *Patel A.H.* 2011. **Industrial Microbiology**. 2nd Edition. Mac Millan Publishers.
2. *Crueger W and Crueger A.* 1991. **Biotechnology. A textbook of Industrial Microbiology**. Sinauer Associates Inc.,U.S.
3. *Stanbury P T and Whitaker* 1984. **Principles of Fermentation Technology**, 1st Edition. Adithya Books pvt ltd.

REFERENCE BOOK:

1. *Prescott and Rehm* 1986. **Industrial Microbiology**. 1st edition. Agarbios.

15UMB63C	CORE- X: ENVIRONMENTAL MICROBIOLOGY	SEMESTER- VI
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Total Credits: 3
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Exploration and dissemination of microflora in environment
2. To understand the role of microbes to better ecological nich
3. Understand the significance of microbes in environmental cleaning

CONTENTS

UNIT - I

Soil Microbiology, Soil microbes (Types and Enumeration)-Weathering and Humus formation, Soil pollution-Sources. Biogeochemical cycling- Nitrogen, Carbon, Phosphorous, Sulphur, Iron cycles and its importance.

UNIT - II

Aerobiology-Microbial contamination of air-Sources of contamination- Enumeration of bacteria from air, Air sampling devices. Significance of air Microflora, Outline of Airborne diseases (Bacterial, Fungal and Viral).

UNIT - III

Aquatic Microbiology-Microbiology of water (Aquatic environment- Fresh and Marine)-Water Pollution and Waterborne Pathogens. Assessment of water quality –MPN Bacteriological examination of water- Indicator organisms. Microbiology of Sewage-Waste water treatment

UNIT - IV

Microbial interaction-among microbes, mutualism, commensalism, ammensalism, parasitism, predation. Microbial interaction with plants, Rhizosphere, Mycorrhizae. Symbiotic (*Rhizobium*, *Azolla*) ,free-living nitrogen fixers (*Azotobacter*, *Azospirillum*, BGA) and Phosphate solubilizers.

UNIT - V

Recycling of liquid and solid wastes-Composting-Biogas, Mushroom and SCP production from Waste. Biodegradation of Complex Polymers (Cellulose, Hemicellulose, Lignin, Chitin and Pectin).

TEXT BOOKS:

1. *Atlas R. M. and Bartha., 1998. Microbial Ecology. 1st edition.* Pearson education.
2. *Subharao. 2005. Soil Microbiology Soil Microorganisms and Plant Growth. 1st edition.* Oxford and IBH,
3. *Mark S Coyne, Soil Microbiology: An Exploratory Approach, Delmar Publishers.*

15UMB6EA	ELECTIVE -II: BIOTECHNOLOGY	SEMESTER -VI
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Total Credits: 4
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Microbial synthesis of commercial products
2. Vaccines and Gene therapy
3. Transgenic plants, transgenic animals and Bioremediation

CONTENTS

UNIT -I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals - Interferon's - Human growth hormone- Antibiotics -Biopolymers.

UNIT -II

Vaccines - subunit vaccines, Live attenuated -Monoclonal antibody. Gene therapy: *in vitro* and *in vivo* gene therapy.

UNIT -III

Transgenic plants-Ti plasmid - insect, virus, herbicide resistant plants - microbial insecticides - bacteria, fungi and viruses.

UNIT IV

Transgenic animals - mice - retroviral method - DNA Microinjection method - embryonic stem cell method- Application-Transgenic Animal - Methodology

UNIT -V

Microbial Degradation of Xenobiotics: Manipulation by Transfer of Plasmids. Manipulation by gene alteration. Utilisation of Starch and Sugars - Improving alcohol production, Improving fructose production, *Zymomonas mobilis* -Utilisation of cellulose - Isolation of prokaryotic and Eucaryotic cellulose gene. Manipulation of cellulose gene.

TEXT BOOKS:

1. *Brown T.A.*, 2002. **Genomes**, 1st edition, John- Wiley & Son.
2. *Glick B .R and Pasternak J .J* .1994. **Molecular Biotechnology. Principles and Application of recombinant DNA**, 2nd edition. ASM Press, Washington.

15UMB6EB	ELECTIVE -II: HAEMATOLOGY	SEMESTER- VI
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Total Credits: 4
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Blood and its nature
2. Blood Transfusion and blood transfusion reactions
3. Blood Analysis

CONTENTS

UNIT-I

Blood: Definition, Characters, Composition. Collection of Blood - Capillary Blood: from Adults, Infants. Venous blood: from Adults, Infants. Anticoagulants: Definition - Type: Wintrob's /EDTA /Heparin /Citrate.

UNIT-II

Counting of Blood Cells: Neubauer counting chamber - Total RBC count : diluting fluids , Macro dilution, Micro dilution technique. Normal values - Total WBC count : diluting fluids , Macro dilution, Micro dilution technique. Absolute Eosinophil count - Differential Leucocyte count: Granulocyte, Agranulocytes, Morphology, Function, Staining Technique - Platelet Count : Morphological characters, Functions. Haemoglobin: Composition, Normal Values:- Determinations:

UNIT-III

Coagulation Mechanism:- Factors: Bleeding time, Clotting time. Haematological indices:- Packed cell volume : Wintrob's , Micro HCT method - Erythrocyte sedimentation Rate - Principle - Determination.

UNIT-IV

Preparations of stains and staining techniques: - Wright stain - Leishman's stain -Giemsa's stain –Fields stain - Peroxidase stain: Examination of Blood smear:-Peripheral smear report: Size, colour, shapes, inclusions.

UNIT-V

Coombs test : Direct, Indirect - Donor screening - Cross matching : Major, Minor - Collection of blood, preservation, storage.

TEXT BOOKS:

1. *Mukerjee, K.L.* 1988. **Medical Laboratory Technologies Vol I - III** Tata McGraw Hill. Publishers, New Delhi.
2. *Mukerjee, K.L.* 1988. **Medical Laboratory Technology: A Procedures Manual for Routine Diagnostic Tests.** Tata McGraw Hill. Publishers, New Delhi.

REFERENCE BOOK:

1. *Gadkar, P.B and Gadakar, D.P.* 2014. **Textbook Medical Laboratory Technology** 2nd Edition. Bhalani Publishing House.

15UMB6EC	ELECTIVE-II: MICROBIAL INOCULANTS AND COMPOSTING	SEMESTER- VI
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Total Credits: 4
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Fertilizers - Cyanobacterial Biofertilizers and Fungal Biofertilizers
2. Biomanures and Mass production of biofertilizers

CONTENTS

UNIT - I

Introduction - History, importance and present status of different types of fertilizers and their application to crop plants. Importance of macro and micro nutrients.

UNIT - II

Bacterial Biofertilizers - Free living forms: *Azotobacter*- Symbiotic forms: Rhizobium - Legume Association, Phosphate solubilizer, Nonlegume association. Inoculum preparation - Application - Yield. Merits and Demerits.

UNIT - III

Cyanobacterial Biofertilizers - Symbiotic and Free living - Mass production of Algae - Field application and yield.

UNIT - IV

Fungal Biofertilizers - Types of fungal biofertilizers, Ectomycorrhizal association with pines; Vescicular arbuscular mycorrhizal association (VAM) - *Glomus* sp; Actinomycetes as Biofertilizers - Actinorhiza, Actinorhizal associations - *Frankia* sp.

UNIT - V

Vermi Compost; Microbial compost - pure culture techniques, consortium - types of compost pits. Mass production of biofertilizers - Rhizobium, mycorrhiza of micro and macro nutrients.

TEXT BOOKS:

1. *Totawat, K.L., Somani, L.L., Sharma, R.A. and Maloo, S.R., 2004. Biofertilizer Technology. Agrotech Publishing Academy. Udaipur, Rajasthan.*
2. *G S Venkataraman, 1972. Algal Biofertilizer and rice cultivation. Today & Tommorrow's Printers & Publishers.*
3. *Kannaiyan S. 2002. Biotechnology of Biofertilizer. Springer Science & Business Media.*

REFERENCE BOOK:

1. *Subha Rao, N.S., 2000. Soil Micro Organisms and Plant Growth. Oxford and IBH, 4th edition. New York.*

15UMB6ED	ELECTIVE- III : PLANT TISSUE CULTURE	SEMESTER VI
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Total Credits: 4
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Tissue Culture technique
2. Micro propagation
3. Cloning and Cryopreservation

CONTENTS

UNIT- I

History of Tissue Culture technique. Requirements for a Cell Tissue Culture lab like Laminar Air Flow device, sterilization scheme for culture chamber. Totipotency of plant cells- de differentiation and dedifferentiation.

UNIT - II

Nutrient media: Composition of commonly used nutrient culture media with respect to their contents like inorganic chemicals, organic constituents, vitamins, amino acids etc. Sterilization of the media and appliances by autoclaving.

UNIT - III

Culture of plant materials- explants selection and technique of culturing the same. Growth conditions. Methods of sub culturing and transfer of Regenerated plants to the field.

UNIT - IV

Micro propagation: Proliferation of auxiliary buds, induction of adventitious buds and bulbs, callus regeneration, somatic embryogenesis, continuous culture, immobilized cultures, estimation of growth and artificial seeds.

UNIT - V

Cloning: Isolation of single cells, culturing of single cell- different methods, culture cell viability test. Cryopreservation and slow growth cultures, freezing and storage, thawing, re-culture.

TEXT BOOK:

1. *Kalyan Kumar D.* 1997. **An Introduction to Plant Tissue Culture.** 1st Edition. New Age Publishers.

REFERENCE BOOKS:

1. *Razdan M K* 2005. **An Introduction to Plant Tissue Culture.** 1st Edition. Oxford.
2. *Guptha P K.* 2009. **Elements of Biotechnology.** 1st edition. Rastogi Publications.

15UMB6EE	ELECTIVE- III: VIROLOGY	SEMESTER- VI
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Total Credits: 4
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Development of virology and reproduction of DNA phages
2. Lysogeny and viruses of Eukaryotes
3. Human viral infections

CONTENTS

UNIT - I

Early development of virology - Virus- Morphology, General characteristics, Classification and Multiplication of viruses. The structure of viruses- virion size- General structure properties- helical capsids, icosohedral capsid- nucleic acids- Viral envelopes and enzymes. Cultivation of Viruses- virus purification and assays.

UNIT- II

Reproduction of DNA phages - ds DNA lytic phages- lytic cycle of T4 phage The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- ØX 174- circle replication.

UNIT-III

Lysogeny- Temperate bacteriophages- lambda phage- induction of lysogens- Generation of defective phages and their uses. Reproduction of RNA phages.

UNIT -IV:

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B, C). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Polio virus, Emerging viral diseases: Ebola, Dengue.

TEXT BOOKS:

1. *Dimmock*. 1998. **Introduction to Modern Virology**. 5th edition. Blackwell scientific publications.
2. *Rogger Hull*. 2001. **Mathews Plant Virology**. 4th edition. Academic press.

REFERENCE BOOKS:

1. *Luria S.E. Darnel, J.E Jr. Baltimore. D and Campbell A.* 1978. **General Virology**, 3rd edition, Wiley and sons.
2. *Ananthanarayanan R and CK Jayaram Panicker*, 2005. **Introduction to Medical Microbiology**, 2nd edition .Orient Longman.

15UMB6EF	ELECTIVE- III: ENTREPRENEURIAL TECHNOLOGY	SEMESTER- VI
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Total Credits: 4
Hours per Week: 4

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Entrepreneur development
2. Fermentation products, Mushroom cultivation and Composting
3. Patents and secret processes and brewing

CONTENTS

UNIT - I

Entrepreneur development, activity, Institutes involved, Government contributions to entrepreneurs, risk assessment. Industrial Microbiology, Definition, scope and historical development.

UNIT - II

Microbial cells as fermentation products- Baker's yeast, food and feed yeasts, Bacterial Insecticides, Legume Inoculants, Mushrooms, Algae. Enzymes as fermentation products- Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases, Invertases, and other enzymes.

UNIT - III

Mushroom cultivation and Composting- Cultivation of *Agaricus campestris*, *Agaricus bisporus*, and *Volvariella volvaciae*; Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting, storage.

UNIT - IV

Biofertilizers - Historical background, Chemical fertilizers versus biofertilizers, organic farming. *Rhizobium* sp, *Azospirillum* sp, *Azotobacter* sp, as Biofertilizers.

UNIT -V

Brewing- Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of Industrial alcohol.

TEXT BOOK:

1. *Aneja. K.R.* 2012. **Experiments in Microbiology, plant pathology and biotechnology**, 2nd edition, New age publishers.

REFERENCE BOOKS:

1. *Glick B .R and Pasternak J .J* .1994. **Molecular Biotechnology. Principles and Application of recombinant DNA**, 2nd edition. ASM Press, Washington.
2. *Stanbury P T and Whitaker* 1984. **Principles of Fermentation Technology**, 1st edition. Adithya Books pvt ltd.

15UMB63P	CORE PRACTICAL- VI	SEMESTER- VI
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Total Credits: 4
Hours per Week: 6

CONTENTS

1. Enzyme production and assay – protease
2. Enzyme production and assay - amylase
3. Alcohol production - wine
4. Immobilization using Sodium alginate
5. Isolation of free living nitrogen fixers –*Azotobacter*, *Azospirillum*
6. Phosphate solubilizers
7. Isolation of symbiotic nitrogen fixers - *Rhizobium* from nodule.
8. Water potability test-MPN Test
9. Study of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
10. Isolation of coli phages.
11. Study of Yeast
12. Study of fungi – *Penicillium* sp. and *Aspergillus* sp.,
13. Study of *Candida* sp.,

TEXT BOOK:

1. Aneja. K.R.2nd edition, **Experiments in Microbiology, Plant Pathology and Biotechnology**, New age publishers.

REFERENCE BOOKS:

1. James.C.Cappuccino. 2013. **Microbiology A laboratory manual**. 1st edition, Pearson education publishers.
2. Kannan N., **Laboratory Manual of General Microbiology**, 2nd edi. Panima Publishing House.

15UMB6SA	SKILL BASED LAB-1	SEMESTER -VI
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Total Credits: 3
Hours per Week: 4

CONTENTS

1. Urine Analysis
2. Blood sugar analysis
3. Separation of Plasma and Serum
4. Serum Urea and Creatinin
5. Serum bilirubin
6. Liver function test
7. Food preservation using Salt and Sugar
8. Food Preservation using Chemicals
9. Microbial analysis of processed food
10. Preparation of Vathal, vadagam,
11. Preparation of Pickles

TEXT BOOKS:

1. *Rajan S. and Selvi Christy. Experimental Procedures in Life Sciences.* Anjana book House.
2. *Aneja. K.R. 2012. Experiments in Microbiology, plant pathology and biotechnology, 4th Edition.* New age publishers.

REFERENCE BOOKS:

1. *James.C.Cappuccino. 2013. Microbiology A laboratory manual. 1st edition,* Pearson education publishers.
2. *Kannan N., 1997. Laboratory Manual of General Microbiology, 2nd edition,* Panima Publishing House.


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