

**PROGRAMME: B.Sc. MICROBIOLOGY
CURRICULUM**

SEMESTER I									
Sl. No	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1.	STA1101 SFR1101 SHN1101	Tamil - I French - I Hindi - I	3	0	0	3	50	50	1 3 5
2.	SHS1109	General English - I	3	0	0	3	50	50	5
3.	SMB1101	General Microbiology	3	1	0	4	50	50	7
4.	SMB1102	Basic Biochemistry	3	1	0	4	50	50	8
5.	SBT1001	Environmental Science	3	0	0	3	50	50	9
6.	SMB4101	General Microbiology Lab	0	0	3	2	50	50	11
7.	SMB4102	Basic Biochemistry Lab	0	0	3	2	50	50	11
Total Credits for Semester 1 – 21									
Total Marks for Semester 1 – 700									

SEMESTER II									
Sl. No	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1.	STA 1102 SFR 1102 SHN1102	Tamil – II French – II Hindi – II	3	0	0	3	50	50	12 14 15
2	SHS 110	General English – II	3	0	0	3	50	50	16
3.	SBB1101	Cell Biology	3	1	0	4	50	50	17
4.	SBB1201	Immunology	3	1	0	4	50	50	18
5.	SBB1202	Intermediary Metabolism	3	0	0	3	50	50	19
6.	SBB4201	Cell Biology Lab	0	0	3	2	50	50	20
7.	SBB4202	Immunology Lab	0	0	3	2	50	50	20
Total Credits for Semester 2 – 21									
Total Marks for Semester 2 – 700									

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

SEMESTER III									
S. No.	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1.	SBB2101	Introduction to Molecular Biology & Genetics	4	0	0	4	50	50	22
2.	SMB2101	Microbial Ecology	3	0	0	3	50	50	23
3.	SBB2103	Concepts in Biotechnology	3	1	0	4	50	50	24
4.	SMB2103	Bioinstrumentation	3	1	0	4	50	50	25
5.		Elective	3	0	0	3	50	50	
6.	SMB4301	Molecular biology Lab	0	0	3	2	50	50	26
7.	SMB4302	Bioinstrumentation Lab	0	0	3	2	50	50	26
Total Credits for Semester 3 – 21									
Total Marks for Semester 3 – 700									

SEMESTER IV									
Sl. No.	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1.	SMB2201	Soil & Agricultural Microbiology	3	0	0	3	50	50	27
2.	SMB2202	Food & Dairy Microbiology	3	0	0	3	50	50	28
3.	SMB2203	Air and Water Microbiology	3	0	0	3	50	50	29
4.	SMB2204	Industrial microbiology	4	0	0	4	50	50	30
5.		Elective	3	0	0	3	50	50	
6.	SMB4401	Soil & Agricultural Microbiology Lab	0	0	3	2	50	50	31
7.	SMB4402	Food microbiology Lab	0	0	3	2	50	50	31
Total Credits for Semester 4 – 21									
Total Marks for Semester 4 – 700									

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

SEMESTER V									
Sl. No.	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1.	SMB3101	Medical Bacteriology	3	1	0	4	50	50	32
2.	SMB3102	Medical Virology	3	0	0	3	50	50	33
3.	SMB3103	Medical Mycology	3	0	0	3	50	50	34
4.	SMB3104	Phycology and Medical Parasitology	3	1	0	4	50	50	35
5.		Elective	3	0	0	3	50	50	
6.	SMB4501	Bacteriology and Virology Lab	0	0	3	2	50	50	36
7.	SMB4502	Mycology and Parasitology Lab	0	0	3	2	50	50	36
Total Credits for Semester 5 – 21									
Total Marks for Semester 5 – 700									

SEMESTER VI									
Sl. No.	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1.	SBT1002	Research Methodology	3	0	0	3	50	50	37
2.	SMB3201	Clinical Microbiology	3	0	0	3	50	50	38
3.	S30PROJ	Project	0	0	30	15	50	50	
Total Credits for Semester 6 – 21									
Total Marks for Semester 6 – 300									

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION,

Semester	Theory courses (including elective courses)			Practical Courses (including Project)		
	Total No.	Total Credits	Total Marks	Total No.	Total Credits	Total Marks
1	5	17	500	2	4	200
2	5	17	500	2	4	200
3	5	17	500	2	4	200
4	5	17	500	2	4	200
5	5	17	500	2	4	200
6	2	6	500	1	15	100
Overall Total	27	91	3000	11	35	1100

Overall total credits for B.Sc.(Microbiology) Programme	126
Overall total marks for B.Sc.(Microbiology) Programme	4100

LIST OF ELECTIVES

ELECTIVE COURSES									
Sl. No.	Course Code	Course Title	L	T	P	C	Marks		Page No.
							CAE	ESE	
1	SMB1601	Advances in Microbiology	3	0	0	3	50	50	39
2	SMB1602	Biofertilizers and Biopesticides	3	0	0	3	50	50	40
3	SMB1603	Food Fermentation Techniques	3	0	0	3	50	50	41
4	SMB1604	Management of Human Microbial Diseases	3	0	0	3	50	50	42
5	SBB1601	Advanced instrumentation Techniques	3	0	0	3	50	50	43
6	SBB1605	Computer Application in Biology	3	0	0	3	50	50	44
7	SMB1605	Entrepreneurial Microbiology	3	0	0	3	50	50	45
8	SMB1606	Microbial diversity	3	0	0	3	50	50	46
9	SBB1609	Introduction to Bioinformatics	3	0	0	3	50	50	47
10	SMB1507	Medical Laboratory techniques	3	0	0	3	50	50	48
11	SMB1608	Human Physiology	3	0	0	3	50	50	49
12	SMB1609	Marine microbiology	3	0	0	3	50	50	50
13	SBB3103	Plant biotechnology	3	0	0	3	50	50	51
14	SBB1611	Biostatistics	3	0	0	3	50	50	52
15	SBB1615	Bioethics, Biosafety and IPR	3	0	0	3	50	50	53
16	SBB1616	Nanobiotechnology	3	0	0	3	50	50	54

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

STA 1101	தமிழ்-முதல் தாள்	L	T	P	Credits	Total Marks
		3	0	0	3	100

நோக்கம்:

- மாணவர்களுக்குத் தமிழ் இலக்கியப்பரப்பை எடுத்துரைத்து சிற்றிலக்கியம், உரைநடை, புதினம், சிறுகதை, புதுக்கவிதை ஆகிய இலக்கியவகைமைகளை அறிமுகப்படுத்துதல்.

பயன்

- நெடிய தமிழ் இலக்கிய வரலாற்றில் சிற்றிலக்கியம், உரைநடை, புதினம், சிறுகதை, புதுக்கவிதை ஆகிய இலக்கியவகைமைகளை அறிதல்.
- பல்வேறு இலக்கிய ஆளுமைகளையும் அவர்தம் படைப்பு, மொழி நடை, மொழிப்பற்று ஆகியவற்றை உணர்ந்து கொள்ளுதல்.
- நவீன சிந்தனைகளோடு மாணவர்தம் கருத்தாக்கங்கள் உருப்பெறல்.
- படைப்பாக்க உத்திகளையும் திறன்களையும் அறிதல்.
- மாணவர்கள் இலக்கியப்படைப்புகளை உருவாக்க அறிந்து கொள்ளுதல்.

அலகு - ஒன்று: தமிழ்இலக்கியவரலாறு

1. சிற்றிலக்கியம்-தோற்றமும் வளர்ச்சியும்
2. உரைநடை-தோற்றமும் வளர்ச்சியும்
3. புதினம்-தோற்றமும் வளர்ச்சியும்
4. சிறுகதை-தோற்றமும் வளர்ச்சியும்
5. புதுக்கவிதை-தோற்றமும் வளர்ச்சியும்

அலகு - இரண்டு: சிற்றிலக்கியம்

1. கலிங்கத்துப்பரணி-போர்பாடியது : 404 --- 408 பாடல்கள்
2. குற்றாலக்குறவஞ்சி - மலைவளம்
 - i.வானரங்கள்கனிகொடுத்து...எனத்தொடங்கும்பாடல்
 - ii.முழங்குதிரைப்புனலருவிகழங்கெனமுத்தாடும்...எனத்தொடங்கும்பாடல்

அலகு - மூன்று: புதுக்கவிதைகள்

1. பாரதியார் - நெஞ்சுபொறுக்குதிலையே...என்றுதொடங்கும் கவிதை.
2. பாரதிதாசன் - உலகஒற்றுமை -தன்பெண்டுதன்பிள்ளை...என்று தொடங்கும் கவிதை.
3. நா.காமராசன் - கருப்புமலர்கள் -காகிதப்பூக்கள் -காலமழைத்தாறலிலே...என்று தொடங்கும் கவிதை
4. இன்குலாப்-மரங்களின்சுற்றம்
5. பாரதிபுத்திரன்-மாரிக்கால இரவுகள் - சிவகாசிச்சிசுக்கள்-மகனே அன்றொருநாள்.... என்று தொடங்கும் கவிதை

அலகு - நான்கு : சிறுகதை மற்றும் புதினம்

1. புதுமைப்பித்தன் சிறுகதைகள்
 - சாபவிமோசனம்
 - கடவுளும் கந்தசாமிப்பிள்ளையும்
 - அன்று இரவு
 - வாடாமல்லி
 - ஒரு நாள் கழிந்தது
2. புதினம்
 - வாடிவாசல்-சி.சு. செல்லப்பா

அலகு - ஐந்து : உரைநடைப்பகுதி

பண்டைத்தமிழர் வாழ்வும் வழிபாடும்-கலாநிதிக . கைலாசபதி

பார்வைநூல்கள்

1. புதுக்கவிதை தோற்றமும் வளர்ச்சியும் – வல்லிக்கண்ணன்
2. தமிழில் சிறுகதை வரலாறும் வளர்ச்சியும் – சிட்டி, சிவபாதசுந்தரம்
3. தமிழ்நாவல் (புதினம்) தோற்றமும் வளர்ச்சியும் – சிட்டி, சிவபாதசுந்தரம்,
4. தமிழ்உரைநடைவரலாறு - வி.செல்வநாயகம்
5. நூற்றாண்டுதமிழ்உரைநடை – சு.சுத்திவேல்
6. கலிங்கத்துப்பரணி – புலியூர்க்கேசிகன்உரை
7. குற்றாலக்குறவஞ்சி – புலியூர்க்கேசிகன்உரை
8. பாரதியார்கவிதைகள்
9. பாரதிதாசன்கவிதைகள்
10. மரங்களின்சுற்றம் - இன்குலாப்
11. கருப்புமலர்கள் – நா.காமராசன்
12. மாரிக்காலஇரவுகள் - பாரதிபுத்திரன்
13. புதுமைப்பித்தன் சிறுகதைகள்
14. வாடிவாசல்-சி.சு. செல்லப்பா
15. பண்டைத்தமிழர்வாழ்வும்வழிபாடும்-கலாநிதிக. கைலாசபதி

பருவத் தேர்வு வினாத்தாள் அமைப்பு

மொத்தமதிப்பெண்கள்: 100

பகுதி அ: 10 வினாக்களுக்குத்தலா 2 மதிப்பெண்கள்

பகுதி ஆ: 7 வினாக்களில் 5 வினாக்களுக்குத்தலா 7 மதிப்பெண்கள்

பகுதி இ: 3 வினாக்களுக்குத்தலா 15 மதிப்பெண்கள்

காலம் : 3 மணி நேரம்.

- 20 மதிப்பெண்கள்

- 35 மதிப்பெண்கள்

- 45மதிப்பெண்கள்

SFR1101	FRENCH- I	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course objectives:

- To teach basic skills in written and spoken French.
- To encourage students' oral and written mastery of the language.

UNIT- I**9Hrs**

Se présenter à des publics différents et saluer - Saluer et Prendre congé - La presentation. Pronoms, objets et sujets. Articles définis /indéfinis. Des cartes d'identité. Présenter quelqu'un. Les chiffres 1 à 50. Épreuves.

UNIT- II**12Hrs**

Exprimer ses goûts, ses preferences. La negation. Les mois et les jours / le calendrier - Les verbes - L'interrogation avec intonation - Décrire un lieu, les noms des différentes salles - Les adjectifs - Les articles. Épreuves.

UNIT- III**12Hrs**

Donner des directions / localiser un lieu/ trouver un lieu-Les verbes aller et mettre.-L'article contracté et les prépositions de lieu - L'impératif- Les mots de caractérisation d'un lieu et les lieux urbains - Les transports. Épreuves.

UNIT- IV**12Hrs**

Discuter et acheter des produits - Les expressions de quantité-Les fruits, les légumes, les produits alimentaires-les produits propres aux pays différents.-La negation-le COD-Le conditionnel et les verbes-irréguliers - Épreuves.

UNIT- V**15Hrs**

Fixer un rendez-vous avec le médecin-L'heure et Les nombres de 51 à 100-L'interrogation avec est-ce que- Les parties du corps, avoir + les expressions et les-maladies communes-Les adjectifs possessifs – Le COI - L'entraînement DELF et épreuves.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Panorama De La Langue Francaise: Level 1 by Jacky Girardet, Jean-Marie Cridlig, CLE International, 2004.
2. Krishnan, C & Albert Adeline, Le Tramway Volant - I, Saraswathi House Pvt Ltd, India, 2011.
3. CAPELLE Guy; MENAND, Robert Taxi-1, Hachette, Paris, 2008.
4. MERIEUX , Régine; LOISEAU, Yves, Connexions-1, Didier, Paris , 2004.
5. MIQUEL, Claire,Vite et Bien-1, CLE International, Paris, 2009.
6. POISSON QUINTON, Sylvie, SIREJOLS, Evelyne, Amical -1, CLE International, Paris, 20011

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** :6 Questions to be answered out of 8 questions and each question carries 5 Marks**30 Marks****PART B**: 4 questions to be answered out of 8 questions and each question carries 10 Marks**40 Marks****PART C**: 2 questions/Problems to be answered out of 4 questions each carries 15 marks**30 Marks**

SHN1101	HINIDI - I	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT I ALPHABETS, VOWELS**10 hrs.**

स्वर अ से अः तक - व्यंजन क से झ तक,
बारह खड़ी अनुस्वार - अनुनासिक व विसर्ग ,संयुक्ताक्षर

UNIT II WHO, WHERE, HERE, THERE**10 hrs.**

क्या ,कौन ,कहाँ ,वहाँ ,यहाँ । मैं हूँ । तुम हो । पढ़ते हो।

UNIT III ITS, HER, HIS, MINE**10 hrs.**

का, के, की, बड़ा, बड़े, बड़ी ,मेरा, तुम्हारा, हमारा ,आउँगा ,आएगा, आओगे आँगे ,किससे , किसपर ,किसको ,
था ,थे ,थी ,थीं ,आया ,आये, आयी, आयीं , खाया , खायी , खयीं आया है ,आया था ,रहा ,रहे ,रही

UNIT IV**10 hrs.**

प्रार्थना 2 पर्यटन 3 पालतु पशु 4 महाकवी तिरुवल्लुवर

UNIT V**10 hrs.**

Grammar प्रयोग काल Tense कारक विभक्तियाँ Case Endings का के की -
Possessive Case गिनती - Numbers(1-50)

TEXT BOOK:

1. Hindi Parichaya Publisher: Dakshin Bharat Hindi Prachar Sabha
2. Central Hindi directorate – Certificate course material, MHRD.

EVALUATION PATTERN**1. Exercises for written test**

Fill In The Blanks With Suitable Word
Write The Number Names
Write The Hindi Meanings
Write The English Meanings
Write The Opposites
Write The Correct Word

SHS1109	GENERAL ENGLISH- I	L	T	P	Credits	Total Marks
		3	0	0	3	100

OBJECTIVES OF THE COURSE:

- The paper provides opportunities for students to read and respond to representations of current issues through texts that present themes and topics that are familiar, insightful and informative. The thrust is on preparing students to effectively communicate by applying reflective thinking practices.
- Students will have an opportunity to improve their vocabulary related to immediate environment, practice speaking skills by discussing about issues based on reading texts, read texts that include everyday problems that provide opportunities to develop problem solving skills in cooperative learning situations, develop writing skills through writing paragraphs and letters based on prompts, of a poem, email and letters and composition of dialogues/paragraphs.

UNIT 1 DRESS IN COMMUNICATION**12 Hrs.**

Speaking - Rhetorical analysis and Group Discussion. Reading for details and Global Comprehension - Dress in communication, I have a Dream Speech by Martin Luther King and The Justice Peace by Hilaire Belloc. Critical Thinking: Asking Questions, Analyzing Assumptions and Biases. Vocabulary: Expressions and markers. Collocations – Identifying collocations by reading prose passages mentioned in the UNIT one. Language Focus: Determiners, Parts of Speech Writing: Paragraph writing based on hints given on topics like 'My dream for my family/ country', 'importance of clothing for communication', 'social inequality in society', 'Judge the Book by its Cover- Can we judge people by their appearance?

UNIT II: AN INCONVENIENT TRUTH**12 Hrs.**

Speaking: Debate on the topics related to Environmental issues and Discrimination in Society, Reading for details and Global Comprehension on An Inconvenient Truth, A Different History by Kamala Das and Sujata Bhatt. Critical Thinking: Identifying Facts and Opinions, Distinguish a main idea in text from a subordinate idea. Examine views on a controversial issue and consider one's own biases and personal interest. 'Vocabulary: Collocations, Useful words to express point of view. Language focus- Tenses, Conjunctions and discourse markers Writing- Responding to Slogans, Campaign Leaflet and Writing Film Review , Letter writing

UNIT 3 A SPEECH BY N R NARAYANA MURTHY**12 Hrs.**

Speaking: Giving Impromptu speeches- Welcome address and Vote of Thanks. Reading for details and Global Comprehension- A Speech by NR Narayana Murthy and Digging by Seamus Heaney Critical Thinking: Asking ' wh ' questions Questions, Making informed decisions based on evidence, Examining Evidence by citing evidence from the textbook or lecture to support a position. Vocabulary - Word association, onomatopoeic words. Language focus: Sentence Function and Sentence Kinds Writing: Writing email , Writing Diary Entry

UNIT 4 AFTER TWENTY YEARS**12 Hrs.**

Listening: For details and Overall Idea , Speaking: Informal Speech, Reading for details and Global Comprehension- After Twenty Years by Jamila and After Twenty Years by O Henry Writing: Problem solving paragraph writing. Letter to the editor with solutions to current problems related to areas covered in the course Critical Thinking: Problem Solving selecting effective solutions for overcoming obstacles or constraints by explaining why it is the most effective of the possible solutions. Vocabulary : Phrasal Verbs Language Focus Types of sentences -simple, compound and complex. Language Focus: Subject verb Agreement

UNIT 5 I LOVE YOU MOM**12 Hrs.**

Listening for details Speaking- Greeting , thanking , apologising, offering condolences by doing Role plays Reading for details and Global Comprehension- I Love you Mom by Joanna Fuchs and Prose passage on ' I Love You Mom'. Writing: Writing restaurant review, argumentative writing. Vocabulary: Phrasal Verbs , Synonyms and Antonyms Critical Thinking : Argumentation provides a well-articulated and detailed argument

Max Hours.60

TEXT / REFERENCE BOOKS

1. P Bhaskaran Nair, C Radha Krishna Pillai, Geetha Rajeevan, CLN Prakash, Nadhini Nayar Reflections - An Anthology of Prose, Poetry and Fiction (2015) Foundation Books, Chennai . Foundation Books. ISBN 978-93-85386-008
2. Sen S , Mahendra etal. (2015) Communication and Language Skills . Foundation books. Chennai

Reference Links for teachers on Critical Thinking

<https://designteachengage.wisc.edu/course-activities-learner-interaction/sdc-activity-types-active-learning/>

<https://www.uen.org/rubric/previewRubric.html?id=1219>

<https://www.diigo.com/profile/Teachonlineuw?query=%22Critical+Thinking%22+rubric>

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks

80 Marks

SMB1101	GENERAL MICROBIOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- This course is aimed give an understanding about the basics of microbiology dealing types of microbes, classification & characterization

UNIT 1 HISTORY AND CLASSIFICATION**12 Hrs.**

History and scope of Microbiology, Spontaneous generation - Biogenesis theory - Contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Paul Ehrlich and Sir Alexander Flemming. Germ theory of disease. Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms

UNIT- 2 MICROSCOPY AND STAINING**12 Hrs.**

Microscope- Principles, working mechanism and application - Simple and compound microscope -Dark field -Phase contrast, Fluorescence, SEM and TEM. Structure and organization of bacterial cell, Gram positive and Gram negative bacterial cell wall. Types of Staining - Simple, Differential (Gram's, AFB), Special - Capsular staining (negative), Spore. LPCB, KOH mount

UNIT- 3 SUBCELLULAR STRUCTURES**9 Hrs**

Microbial cell : Ultrastructure of bacteria, subcellular structures and cell envelope – slime, capsule, cell wall, pili, flagella, cell inclusions, biosynthesis of bacterial cell wall, cell membrane – Bio-membrane, liposomes – membrane transport – diffusion, active and passive transport and osmoregulation.

UNIT- 4 STERILIZATION**12 Hrs.**

Sterilization and Disinfection- principles -methods of sterilization- physical methods - Dry heat- Moistheat- Radiation. Filtration (Membrane and HEPA). Chemical sterilization- Chemical agents- mode of action- phenol coefficient test- sterility testing.

UNIT- 5 MEDIA AND TECHNIQUES**12 Hrs.**

Culture and media preparation - solid and liquid. Types of media- Semi synthetic, Synthetic, Enriched, Enrichment, Selective and Differential media. Pure culture techniques – Tube dilution, Pour, Spread, Streak plate. Anaerobic culture technique Wright's Tube, Roll tube method, Anaerobic Jar.

TEXT / REFERENCE BOOKS

1. Prescott, Harley, Klein. 2003. Microbiology. 5th Edition. McGraw Hill Publ.
2. Bernard R. Glick & Jack J. Pasternak. 2002. Molecular Biotechnology. Indian edition. Panima Publishing Corporation.
3. Pelzer, Chan and Kreig. 1986. Microbiology. 5th Edition. McGraw-Hill.
4. Tortora, G.J., Funke, B.R. and Case, C.L. 2012. Microbiology - An Introduction. 11th Edition. Pearson Education.
5. Stainer, Ingharam, Wheelis and Painter. 1987. General Microbiology. 5th Edition. Macmillan Education, London.
6. A.J. Salle. 1974. Fundamental Principles of Bacteriology. Tata McGraw – Hill Edition.

Max Hours.60**END SEMESTER EXAMINATION QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 questions of 2 marks each - No choice**20 Marks****PART B** : 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB1102	BASIC BIOCHEMISTRY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- This course is aimed give an understanding about the basics of biochemistry dealing carbohydrates, Amino acids, Lipids, nucleic acid and vitamins

UNIT 1 CARBOHYDRATES**12 Hrs.**

Carbohydrate – Definition, Classification, biological significance, structure of glucose, digestion and absorption of carbohydrates.

UNIT 2 PROTEIN**12 Hrs.**

Amino acids – structure, classification (Essential and non-essential, protein and non-protein amino acids). Proteins – definition, classification and structure (primary, secondary, tertiary and quaternary).

UNIT 3 LIPIDS**12 Hrs.**

Lipids – definition, classification and biological significance. Structure, properties and functions of fatty acids.

UNIT 4 NUCLEIC ACIDS**12 Hrs.**

Nucleic acids – Structure of DNA and its functions. Different forms of DNA. Different types of RNA and its functions.

UNIT 5 VITAMINS**12 Hrs.**

Vitamins – Source, biological function, daily requirement and deficiency symptoms of fat soluble vitamins (A, D, E and K) and water soluble vitamins (Ascorbic acid, thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B12).

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper—s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 questions of 2 marks each - No choice**20 Marks****PART B** : 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SBT1001	ENVIRONMENTAL SCIENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on the issues related to environment and to emphasize the importance of a clean environment

UNIT 1 MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10 Hrs

Definition, scope and importance- Need for public awareness. Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT 2 ECOSYSTEMS, BIODIVERSITY AND ITS CONSERVATION

10 Hrs

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Definition-genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega- diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT 3 ENVIRONMENTAL POLLUTION

12 Hrs.

Definition -Cause, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT

8 Hrs.

Idea of Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

UNIT 5 HUMAN POPULATION AND THE ENVIRONMENT**8 Hrs.**

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain

- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Erach Bharucha, Text Book of Environmental Studies, 2nd Edition, University Press, Chennai, 2006
2. Meenakshi. P, Elements of Environmental Science and Engineering, 1st Edition, Prentice Hall of India, New Delhi, 2009.
3. Ravikrishnan. A, Environmental Science & Engineering, 3rd Edition, Sri Krishna Publications, Chennai, 2008.
4. Wrigh. R. T & Nebel B.J, Environmental science-towards a sustainable future by Richard 8th edition, Prentice Hall of India, New Delhi, 2006

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SMB4101	GENERAL MICROBIOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Handling of Instruments and Laboratory safety measures.
2. Handling and Maintenance of compound microscope.
3. Cleaning of Glassware and preparation of cleaning solutions.
4. Preparation of media: Simple media, Complex media-Nutrient agar, McConkey agar, EMB agar.
5. Simple staining
6. Gram's staining
7. Motility by hanging drop method
8. Negative staining
9. Acid fast staining-permanent slide only.
10. Capsule staining
11. Endospore staining.
12. Isolation of pure cultures of bacteria by streaking method.
13. Preservation of bacterial cultures by various techniques.
14. Estimation of CFU count by spread plate method/pour plate method.

SMB4102	BASIC BIOCHEMISTRY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Properties of water, Concept of pH and buffers, preparation of buffers and Numerical problems to explain the concepts
2. Estimation of Ascorbic acid.
3. Carbohydrates: Glucose, fructose, maltose and lactose.
4. Amino acids: Arginine, cysteine, tryptophan and tyrosine.
5. Colorimetric analysis (only for demonstration)
6. Estimation of protein by Lowry's method.
7. Estimation of DNA using diphenyl amine.
8. Estimation of glucose by O-Toluidine.

STA 1102	தமிழ்-இரண்டாம்தாள்	L	T	P	Credits	Total Marks
		3	0	0	3	100

நோக்கம்

மாணவர்களுக்குத்தமிழின்செவ்விலக்கியங்கள்மற்றும்காப்பியங்களைஅறிமுகப்படுத்துதல்.

பயன்

- ஈராயிரம்ஆண்டுகளுக்குமுந்தையதமிழின்செவ்விலக்கியங்களின்சிறப்பினைஉணர்தல்.
- பண்டையகாலத்தமிழ்மக்களின்அகமற்றும்புறவாழ்வியலையும்பண்பாட்டையும்அறிதல்.
- தமிழர்தம்அறச்சிந்தனைகளையும்அறவாழ்வியலையவர்கள்பேணியமுறையினையும்உணர்தல்.
- தமிழர்களுடையமெய்யியல்த்தத்துவங்களையும்கடவுள்பற்றியகோட்பாடுகளையும்உணர்தல்.
- நெடுங்கதைகளாகத்திகழும்காப்பியங்களின்வழிபலப்பண்பாட்டுச்செய்திகளைஅறிதல்.

அலகு-ஒன்று : தமிழிலக்கியவரலாறு

1. சங்க இலக்கியங்கள்
2. அற இலக்கியங்கள்
3. பக்தி இலக்கியம்
4. காப்பியங்கள்

அலகு-இரண்டு : சங்கஇலக்கியம்

1. 'முளிதயிர்பிசைந்த' என்று தொடங்கும்குறுந் தொகைப்பாடல் (167)
2. 'நின்றசொல்லர்' என்று தொடங்கும் நற்றிணைப்பாடல் (1)
3. 'மனைநடுவயலை வேழம் சுற்றும்' என்று தொடங்கும் ஐங்குறுநூற்றுப்பாடல் (11)
4. 'எம்வெங்காமம்இயைவதுஆயின்' என்று தொடங்கும் அகநானூற்றுப்பாடல் (15)
5. 'சுடர்தொடிகேளாய்' என்று தொடங்கும் கலித்தொகைப்பாடல் (51)
6. 'மண்டுஅமர்அட்ட' என்று தொடங்கும் புறநானூற்றுப்பாடல் (213)
7. 'நறவுவாய்உறைக்கும்நாகுமுதிர்'என்று தொடங்கும் சிறுபாணாற்றுப்படை பாடல் (51 - 67)

அலகு-மூன்று : அறஇலக்கியங்கள்

1. திருக்குறள்-நட்பாராய்தல், புலவிநுணுக்கம் (2 அதிகாரம்).
2. நாலடியார்-பொருட்பால்-மேன்மக்கள்-(5) பாடல்கள்

அலகு-நான்கு : பக்திலக்கியங்கள்**சைவம்-பன்னிருதிருமுறைகள்**

1. திருஞானசம்பந்தர்தேவாரம்-முதலாம்திருமுறை
'காதல்ஆகி, கசிந்து'என்றுதொடங்கும்பாடல்.
2. திருநாவுக்கரசர்தேவாரம்-ஐந்தாம்திருமுறை
'மாசில்வீணையும்மாலை'என்றுதொடங்கும்பாடல்.
3. சுந்தரர்தேவாரம்-ஏழாம்திருமுறை
'பொன்னார்மேனியனே' என்று தொடங்கும்பாடல்.

வைணவம்-நாலாயிரத்திவ்யப்பிரபந்தம்

1. பூதத்தாழ்வார்
'பெருகுமதவேழம்மாப்பிடிக்கு'என்றுதொடங்கும்பாடல்.
2. குலசேகராழ்வார்
'ஆனாதசெல்வத்துஅரம்பையர்கள்தற்குழ்'என்றுதொடங்கும்பாடல்.

அலகு-ஐந்து : காப்பியஇலக்கியங்கள்

1. சிலப்பதிகாரம்
மங்கலவாழ்த்துப்பாடல்முழுவதும்
2. சீவகசிந்தாமணி
கோவிந்தையார்இலம்பகம்முழுவதும்
3. கம்பராமாயணம்
திருவடித்தொழுதபடலம் (பாடல்எண் : 25 - 48)

பார்வைநூல்கள்

1. தமிழ்இலக்கியவரலாறு-மு.வ.
2. தமிழ்இலக்கியவரலாறு-மது. ச. விமலானந்தம்
3. சங்கஇலக்கியம்-ஒளவைசு. துரைசாமிப்பிள்ளை
4. சங்கஇலக்கியம் - புலியூர்கேசிகன்
5. திருக்குறள் - பரிமேலழகர்உரை
6. திருக்குறள் - மு.வ. உரை
7. நாலடியார் - கு. மதுரைமுதலியார்
8. சைவத்திருமுறைகள்-வர்த்தமான்பதிப்பகம்
9. நாலாயிரதிவ்வியப்பிரபந்தம்-வர்த்தமான்பதிப்பகம்
10. சிலக்கதிகாரம்-ஞா.மாணிக்கவாசகன்
11. சீவகசிந்தாமணி-துரைராசாராம்
12. கம்பராமாயணம்-கழகவெளியீடு.

பருவத்தேர்வுவினாத்தாள்அமைப்பு**மொத்தமதிப்பெண்கள்: 100****பகுதிஅ:** 10 வினாக்களுக்குத்தலா 2 மதிப்பெண்கள்**பகுதிஆ:** 7 வினாக்களில் 5 வினாக்களுக்குத்தலா 7 மதிப்பெண்கள்**பகுதிஇ:** 3 வினாக்களுக்குத்தலா 15 மதிப்பெண்கள்**காலம் : 3 மணிநேரம்.****- 20 மதிப்பெண்கள்****- 35 மதிப்பெண்கள்****- 45 மதிப்பெண்கள்**

SFR1102	FRENCH- II	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To teach basic skills in written and spoken French.
- To encourage students' oral and written mastery of the language.

UNIT I

Acheter un billet - Les nombres au-delà de 100 - Les différents types de places (fumeur, non fumeur, aller-retour) - Les adjectifs démonstratifs - L'interrogation avec inversion - Les vêtements - L'entraînement DELF - Compréhension/Production écrite - Épreuves

UNIT II

Discuter les plats au restaurant - Les recettes, des plats et boissons différents, - les formules de cuisine, des recettes simples - des différents pays - Le passé récent - Les pronoms toniques - Il faut + infinitif, Le pronom - Faire des projets pour les vacances, décrire le temps - les lieux touristiques et le climat des différents pays - Le futur proche et les adverbes, le il - m personnel, le pronom y - Épreuves et entraînement DELF

UNIT III

Le passé composé - Les pronoms relatifs (qui, que) - Québec et son histoire - Parler du passé et de soi - Compréhension/production écrite - Entraînement DELF - Épreuves

UNIT IV

Les verbes réfléchis - Les pronoms relatifs (dont, où) - L'impératif négatif - Compréhension/production écrite - Entraînement DELF - Épreuves

UNIT V

L'imparfait - La place des pronoms doubles - Décrire les mœurs et les pays - La Réunion - Compréhension/production écrite - Entraînement DELF - Épreuves

Max Hours.60**Text books:**

- Panorama De La Langue Française: Level 1 by Jacky Girardet, Jean-Marie Cridlig, CLE International, 2004.
- Krishnan, C & Albert Adeline, Le Tramway Volant - I, Saraswathi House Pvt Ltd, India, 2011.
- CAPELLE Guy; MENAND, Robert Taxi-1, Hachette, Paris, 2008.

Reference books:

- MERIEUX, Régine; LOISEAU, Yves, Connexions-1, Didier, Paris, 2004.
- MIQUEL, Claire, Vite et Bien-1, CLE International, Paris, 2009.
- POISSON QUINTON, Sylvie, SIREJOLS, Evelyne, Amical -1, CLE International, Paris, 2011

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SHN1102	HINIDI -II	L	T	P	Credits	Total Marks
		3	0	0	3	100

Unit- I

- (i) पत्य – Poetry
- (ii) गत्य – Prose
- (iii) एकांकी एवं नाटक – One Act Play and Drama
- (iv) कहानी एवं उपन्यास – Story and Novel

Unit -II

- (v) हिन्दी व्याकरण (Hindi Grammer)
1.सज़ं, 2. सर्वनाम, 3.विशेषण, 4.क्रिया-विशेषण, 5.काल, 6.लिंग, 7.वचन, 8.वाक्य-विचार, 9. शुद्ध लेखन.

Unit -III

- (vi) परिभाषिक शब्द – 250 आग्रेजी पारिभाषिक शब्दों को हिन्दी परिपाषिक शब्द
Translate from English to Hindi – 250 Official words.
- (vii) अनुवाद अभ्यास (Translation):

Unit -IV

- (viii) निबंध लेखन(Essay):
गाँधी, नेहरु, अंबेडकर, बगत सिंह, अब्दुल कलाम
- (ix) पत्र लेखन(Letter Writing):
आवेदन पत्र, रासकीय पत्र, अर्धशासकीय पत्र, प्रत्यावेदन पत्र, प्रतिवेदन पत्र
Application letter, Official letter, Semi-Official letter, Government letter.

Unit -V

- (x) संक्षेपण और विस्तारण (Comprehensions)
- (xi) लोकोक्तियाँ एवं मुहावरे (Proverbs)

SHS1110	GENERAL ENGLISH - II	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- The paper provides opportunities for students to read and respond to representations of current issues through texts that present themes and topics that are familiar, insightful and informative. The thrust is on preparing students to effectively communicate by applying reflective thinking practices. Students will have an opportunity to improve their vocabulary related to immediate environment, practice speaking skills by discussing about issues based on reading texts, read texts that include everyday problems that provide opportunities to develop problem solving skills in cooperative learning situations, develop writing skills by summarising substance of a poems, letters and composition of dialogues and paragraphs.

UNIT 1 UNITY OF MINDS - A P J ABDUL KALAM**(9Hrs)**

Listening for details, Speaking - making a presentation, Reading for details and Global Comprehension UNITY of Minds by APJ Abdul Kalam -Vocabulary Binomials Writing: Writing compare contrast paragraphs by representing data given in pie chart, Tables; Writing Speeches. Vocabulary : Binomials, Affixes Language Focus : Active and Passive Voice, Punctuation. Critical Thinking : Comparing & Contrasting presenting information by including important characteristics on which the items should be compared or contrasted

**UNIT 2 LEAVE THIS CHANTING AND SINGING AND TELLING OF BEADS BY RABINDRANATH TAGORE AND
ENGINE TROUBLE BY R K NARAYANAN**
12 Hrs.

Listening for details Speaking: Giving impromptu speech based on topics given in the class for clarifying one's point of view. Reading for Comprehension and for overall idea -Leave this Chanting and Singing and Telling of Beads by Rabindranath Tagore and Engine Trouble by R K Narayanan, Vocabulary : Archaic words, phrases Writing: Language Focus Imperatives. Writing: Writing Instructions and recommendations based on quotations given as prompts, writing an advertisement Critical Thinking: Expressing point of view

UNIT 3 THE HAPPY PRINCE BY OSCAR WILDE**9Hrs**

Speaking Telephonic conversation, Drama In the class based on the story prescribed Reading for details and Global Comprehension The Happy Prince by Oscar Wilde Language Focus: Adjective- degrees of Comparison, Functional and personal Nouns Vocabulary : positive and negative connotations. Writing: Letter writing- personal letters Critical Thinking Self-regulation: Continuing improvement in thinking, involving monitoring one's cognitive process and correcting errors and biases as needed.

UNIT 4 TWO GENTLEMEN OF VERONA BY A J CRONIN**12 Hrs.**

Listening for Overall information of 'Anthem for Doomed Youth' by Wilfred Owen Speaking: Making requests and suggestions. Reading for details Two Gentlemen of Verona by A J Cronin, Vocabulary: Simile, metaphor, adjectives to describe people and their personalities. Idioms. Writing: Writing recommendations; Narratives based on prompts on plot and characters. Critical Thinking: identifying the subject of the investigation and presenting a well-articulated solution to the confusions or contradictions associated with the situation based on listening speaking tasks in the class. Creative writing - stories and poems Language Focus: Reported Speech

UNIT 5 THE AVENGER BY ANTON CHEKHOV**12 Hrs.**

Listening for specific details Speaking using imagination. Reading to identify factual and inferential information Writing: Imaginative writing by predicting. Vocabulary : Countable forms and meaning, foreign nouns and framing of plurals. Language focus: Modal verbs, use of would. Critical Thinking: Deductive reasoning- generating a valid prediction or conclusion by articulating the relationship between the prediction or conclusion

Max Hours.60**TEXT / REFERENCE BOOK**

P Bhaskaran Nair, C Radha Krishna Pillai, Geetha Rajeevan, CLN Prakash, Nadhini Nayar Reflections - An Anthology of Prose, Poetry and Fiction (2015) Foundation Books, Chennai . Foundation Books. ISBN 978-93-85386-008

Sen S , Mahendra etal. (2015) Communication and Language Skills . Foundation books. Chennai

<https://designteachengage.wisc.edu/course-activities-learner-interaction/sdc-activity-types-active-learning/>

<https://www.uen.org/rubric/previewRubric.html?id=1219>

<https://www.diigo.com/profile/Teachonlineuw?query=%22Critical+Thinking%22+rubric>

SBB1101	CELL BIOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- Cell biology is the study of the structure and function of prokaryotic and eukaryotic cells. In this course the students will learn different areas of cellular biology including the structure and functions of cell, its organelles, synthesis and function of macromolecules such as carbohydrate, protein, lipid, DNA & RNA; membrane structure and function; bioenergetics; cellular communication; and microscopic techniques to understand the cell structure.

UNIT 1 FUNDAMENTALS OF CELL STRUCTURE**12 Hrs.**

Discovery of cells; Basic properties of cells; Different classes of cells – Prokaryotic and eukaryotic cells. Cell division: Cell cycle; mitosis; meiosis, binary fission.

UNIT 2 CELLULAR MEMBRANES AND MATRICES**12 Hrs.**

Chemical composition and fluidity of membranes; dynamic nature of membranes; transportation across cell membrane; membrane potentials; extracellular matrices – structure and function; cytoskeleton – structure and function.

UNIT 3 CELLULAR ORGANELLES IN ENERGY METABOLISM**12 Hrs.**

Mitochondria – structure and function; Chloroplast – structure and function. Structure of nucleus – nuclear membrane, nucleolus, chromatin, structure of nucleic acids

UNIT 4 CELLULAR ORGANELLES IN METABOLISM**12 Hrs.**

Endoplasmic reticulum – smooth & rough; function of endoplasmic reticulum; Golgi complex – structure and function; Ribosomes – Types, structure and function; Morphology and functions of peroxisomes and glyoxisomes; Plant cell vacuoles.

UNIT 5 TRANSPORT ACROSS CELL MEMBRANE**12 Hrs.**

Passive and active transports, Permeases, Sodium -potassium pumps, Ca²⁺ ATPase pump, ATP dependant proton pumps, co-transport, symport, antiport, Endocytosis and Exocytosis. Introduction to intra and extra cellular products of medicinal use.

Max Hours.60**Text Books**

- Freifelder D. 1985. Molecular Biology, Narosa Publishing House. New Delhi.
- Lewin B. 2007. Genes IX. Oxford University Press, London.
- Ajoy Paul. 2011. Textbook of Cell and Molecular Biology. Books and Allied Ltd.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. 2008. Molecular Biology of Cell. 6th Edition. Garland Science, Taylor & Francis group Publishers.
- Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 1995. Molecular Cell Biology. 3rd Edition. W.H. Freeman Publishers.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SBB1201	IMMUNOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- To know the fundamentals of innate and acquired Immunity .To understand how immune system fights and combats the infection and diseases. To get an insight about the principle mechanism of Immunity.

UNIT 1 IMMUNITY

History of Immunology – Host-parasite relationship – Immunity – Innate and acquired Immunity – Humoral and Cell-mediated Immunity .

UNIT 2 IMMUNE CELLS

Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – BoneMarrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT

UNIT 3 ANTIGENS

Antigens – Types, properties – Immunoglobulins – Structure,types and Functions, Antigenic determinants on antibodies(Isotypic, allotypic, idiotypic); VDJ rearrangements; Complement – Classical and alternative pathways.

UNIT 4 ANTIBODY

Monoclonal antibodies, Antigen – Antibody reactions:Agglutination – Precipitation –Complement fixation – Immunofluorescence – ELISA, RIA.

UNIT 5 AUTOIMMUNITY, HYPERSENSITIVITY AND TRANSPLANTATION

AutoImmunity : Hypersensitivity reactions – Antibody mediated – Type I, Type II and Type III – cell mediated - Type IV; Transplantation immunology; Tumor immunology

Max Hours.60

TEXT / REFERENCE BOOKS

1. Zeev Pancer and Max D. Cooper, (2006), The Evolution of Adaptive Immunity , Ann. Rev.Immunol., 24: 497–518
2. Roitt Evan, Brostoff J. Male D. (1993) Immunology 6th Ed., Mosby & Co. London.
3. Roitt I. M. (1988) Essentials of Immunology, ELBS, London.
4. Roitt M. (1984) Essentials of Immunology, P. G. Publishers Pvt. Ltd., New Delhi.
5. Stites D. P., Stobo J. D., Fudenberg H. H. and Wells J. V., (1982), Basic and Clinical Immunology, 4th Ed., Lange Medical Publications, Maruzen Asia Pvt. Ltd., Singapore
6. Janeway Charles A., Paul Travers, Mark Walport, Mark Shlomchik. Immunobiologyinteractive. 2005. Garland Science Publishing. USA.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks

80 Marks

SBB1202	INTERMEDIARY METABOLISM	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course aims at understanding the essential metabolic functions of the organism as well as consumption and storage of energy intermediary metabolism of main biomolecules and its regulatory mechanisms.

UNIT 1 BASIC THERMODYNAMICS**12 Hrs.**

Anabolism – catabolism, Enthalpy enthalpy free energy, forward and reverse reaction equilibrium state

UNIT 2 CARBOHYDRATE METABOLISM**12 Hrs.**

Glycolysis, TCA cycle and its energy production. Glycogen metabolism: Glycogenesis and Glycogenolysis, Alternative pathways: HMP pathway, gluconeogenesis

UNIT 3 LIPID METABOLISM**12 Hrs.**Fatty acid oxidation – α , β , ω oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of cholesterol, triglycerides.**UNIT 4 PROTEIN METABOLISM****12 Hrs.**

Ketogenic and Glucogenic amino acids metabolism. Deamination, Transamination and Decarboxylation, Urea cycle.

UNIT 5 NUCLEIC ACID METABOLISM & ENERGY PRODUCTION**12 Hrs.**

Biosynthesis and degradation of purine and pyrimidine nucleotides. Mitochondrial Electron Transport Chain: Oxidative phosphorylation

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Fundamentals of Biochemistry, J.L. Jain, S.Chand publications, 2004.
2. Lehninger's Principles of Biochemistry (2000) by Nelson, David I. and Cox, M.M. Macmillan /Worth, NY.
3. Harper's Biochemistry Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 24th edition, Prentice Hall International. Inc.
4. Principles of Biochemistry, Geoffrey L. Zubay, 3rd edition William W. Parson, Dennis E. Vance, W.C. Brown Publishers, 1995.
5. Principles of Biochemistry, David L. Nelson, Michael M.Cox, Lehninger, 4th edition, W.H. Freeman and company.
6. Biochemistry, Lubert Stryer, 4th edition, W.H. Freeman & Co, 1995.
7. Fundamentals of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley & Sons, NY.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SBB4101	CELL BIOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENT

1. Light Microscopy
2. Simple staining
3. Studying algal cell
4. Studying fungal cell
5. Studying plant cell (Onion cells)
6. Studying animal cell (Human cheek cells)
7. Studying mitotic cell division in root tips of *Allium cepa*
8. Identifying meiotic cell division

SBB4201	IMMUNOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENT

1. Identification of human blood groups.
2. To perform Total Leukocyte Count of the given blood sample.
3. To perform Differential Leukocyte Count of the given blood sample.
4. Agglutination reaction
 - i) Widal test
 - ii) ASO test
 - iii) RA test
 - iv) CRP test
 - v) Pregnancy test (Direct/Indirect)
5. To perform immunodiffusion by
 - i. Single Radial Immunodiffusion
 - ii. Ouchterlony double diffusion.
6. To perform DOT ELISA.
7. To perform immunoelectrophoresis.

SBB2101	INTRODUCTION TO MOLECULAR BIOLOGY & GENETICS	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- This course provides you with further knowledge associated with molecular biology and inheritance at the molecular, cellular and phenotypic levels.

UNIT 1 INTRODUCTION**12 Hrs.**

Introduction and History of Microbial Genetics. DNA as a Genetic material. Physical structure and Chemical composition of DNA – RNA and its types RNA as a Genetic material. DNA Replication – Types and Experimental proof of replication – Enzymes involved in DNA replication

UNIT 2 CENTRAL DOGMA**12 Hrs.**

Prokaryotic Transcription, Translation. Genetic code – Regulation of gene expression in prokaryotes – lac Operon. Gene transfer mechanisms – Transformation, conjugation and Transduction. Plasmid – Characteristics and types.

UNIT 3 MENDELIAN GENETICS**12 Hrs.**

Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information. Interrelation between the cell structure and the genetics function, Mitosis, Meiosis (explaining Mendel's ratios).

UNIT 4 INHERITANCE**12 Hrs.**

Principles of Inheritance, Chromosome theory of inheritance, Laws of Probability, Pedigree analysis, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex-linked inheritance. Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping.

UNIT 5 MUTATION**12 Hrs.**

Mutation – types of mutation – Molecular basis of mutation – Mutagenesis, Detection of mutants – Ames test, DNA repair mechanisms. Molecular basis of Mutations in relation to UV light and chemical mutagens, Detection of mutations: CLB method, Attached X method, DNA repair mechanisms.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. David Freifelder (1995). Molecular Biology. Narosa Publishing House, New Delhi.
2. Peter Snustad D and Michael J Simmons (2003). Principles of Genetics. 3rd Edition, John Wiley & Sons, Inc., Publication, New Delhi.
3. Peter J Russel (2002). Genetics. Benjamin Cummings.
4. Robert H Tamarin (2002). Principles of Genetics. 7th Edition, Tata Mc GrawHill Publication, New Delhi.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB2101	MICROBIAL ECOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course will introduce students about the interactions of these organisms with both the biotic and abiotic worlds will be discussed. Topics will include the roles of microorganisms in host-pathogen interactions in disease, the beneficial aspects of microorganisms in bioremediation and food production, and their application in biotechnology

UNIT 1**12 Hrs.**

Microorganisms habitat and their role in biogeochemical cycles and succession pattern Terrestrial Environment: Soil microflora. Aquatic Environment: Stratification & Microflora of Freshwater & Marine habitats. Atmosphere: Stratification of the Atmosphere, Aeromicroflora, Dispersal of Microbes .Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body. Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels.

UNIT- 2**12 Hrs.**

Carbon cycle: Nitrogen cycle Ammonification, nitrification, denitrification & nitrate reduction. Phosphorous cycle: Phosphate immobilization and phosphate solubilization. Sulphur Cycle Microbes involved in sulphur cycle. Succession of microbial communities in the decomposition of plant organic matter

UNIT- 3**12 Hrs.**

Microbe–Microbe Interactions Mutualism, Synergism, Commensalism, Competition, Amensalism, Parasitism, Predation, Biocontrol agents. Microbe–Plant Interactions: Roots, Aerial Plant surfaces, Biological Nitrogen fixation (symbiotic/nonsymbiotic- biofertilizers) Microbe–Animal Interactions : Role of Microbes in Ruminants, Nematophagus fungi, Luminescent bacteria as symbiont

UNIT- 4**12 Hrs.**

Microbial Pathogenicity: Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses (replicase, coat protein, silencing suppressors) in disease development. Effects of pathogens on host physiological processes (photosynthesis, respiration, cell membrane permeability, translocation of water and nutrients, plant growth and reproduction).

UNIT- 5**12 Hrs.**

Concept of plant disease- microbial plant diseases, types of plant pathogens, pathogenicity, symptoms, economic losses. Principles & practices involved in the management of plant diseases by different methods.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.
2. Atlas RM. (1989). Microbiology: Fundamentals and Applications. 2nd Edition, MacMillan Publishing Company, New York.
3. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/ Benjamin Cummings
4. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego,
5. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Science, Oxford.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 questions of 2 marks each - No choice**20 Marks****PART B** : 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SBB2103	CONCEPTS IN BIOTECHNOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

- Explain the current scenario about biotechnology
- Describes the biotechnological methods in crop development and transgenic animal production
- Highlighting the application of industrial biotechnology
- Demonstrate the healthcare application of biotechnology
- Implementation of biotechnology in the protection of environment
- Discuss the ethical issues of biotechnology

UNIT 1 BIOTECHNOLOGY: AN OVERVIEW**12 Hrs.**

What is Biotechnology? – an interdisciplinary pursuit, old Vs new biotechnology, scope and importance, commercial potential, public perception of Biotechnology, Biotechnology in India and Global. Branches of biotechnology.

UNIT 2 ANIMAL & PLANT BIOTECHNOLOGY**12 Hrs.**

Biotechnology methods of crop improvement- plant tissue culture. Transgenic plants, applications of transgenic plants, transgenesis, transgenic animals,

UNIT 3 INDUSTRIAL BIOTECHNOLOGY**12 Hrs.**

Isolation and screening of micro-organisms, Bioreactors, food and beverage fermentation, production of antibiotics (β -lactum antibiotic), vitamin B12, Enzyme- amylase, protease, Biotransformation, SCP and its economical implications.

UNIT 4 MEDICAL BIOTECHNOLOGY**12 Hrs.**

Conventional vaccines, recombinant vaccines, DNA vaccines, monoclonal antibodies and their applications, interferons, drug designing, genetherapy, forensic medicine applications in human genetic research.

UNIT 5 ENVIRONMENTAL BIOTECHNOLOGY AND BIOETHICS**12 Hrs.**

Novel and better bioinsecticides. Biofertilizers, Biodegradation of Xenobiotic compounds. Legal aspects genetically manipulated organisms and environment, biosafety, Social, moral and Ethical Considerations, IPR.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Satyanarayana. U. Biotechnology Books And Allied (p) Limited, 2013.
2. H.D. Kumar, Modern Concepts of Biotechnology, Vikas Publishing House Pvt Ltd, 1998.
3. P.K. Gupta, Elements of Biotechnology, Rastog Publications, 2003.
4. A.H. Patel, Industrial Microbiology, Macmillan Publishers, 1984

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SMB2103	BIOINSTRUMENTATION	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- This course aims at understanding the principle and application of various instruments used in Biotechnology industries.

UNIT 1 MICROSCOPY**12 Hrs.**

Bright field and dark field microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy) and Micrometry.

UNIT 2 LAB EQUIPMENT**12 Hrs.**

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge, density gradient centrifugation, pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT 3 CHROMATOGRAPHY AND ELECTROPHORESIS**12 Hrs.**

Principles and applications of Chromatography – Paper, Thin layer, Column, Ion-exchange, Gas and HPLC – Principle and applications of native polyacrylamide gel electrophoresis, SDS- polyacrylamide gelelectrophoresis, 2D gel electrophoresis, Isoelectric focusing, Zymogram preparation and Agarose gelelectrophoresis..

UNIT –IV PHOTOMETRY**12 Hrs.**

Colorimetry, Turbidometry, Spectrometry – UV & Visible spectrophotometer. Flame photometry- Micronutrient analysis.

UNIT BIOCHEMISTRY ANALYSIS**12 Hrs.**

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Gedder, A. and L. E. Balser, John Wiley and Sons, Principles of applied Biomedical instrumentation.
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
3. Fritschen, L. J and L. W. Gay, Springer, Verlag, Environmental Instrumentation, 1979, New York.
4. Boyer, Rodney, F. Benjamin and Cummins, Modern Experimental Biochemistry 2nd Edition.
5. E.Padmini., Biochemical Calculations and Biostatistics (2007) Books and Allied (P) Ltd., First Edtn

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SBB4301	MOLECULAR BIOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENT

1. Isolation of DNA from E. coli/ liver/ plant
2. Agarose gel electrophoresis of DNA
3. Restriction digests of DNA.
4. Isolation of plasmid
5. Separation of serum protein by SDS -PAGE
6. Western blotting

SBB4302	BIOINSTRUMENTATION LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENT

1. Sterilization: principles & operations – Autoclave, Hot Air Oven, Filtration, Laminar Air Flow
2. Principles & operations of Incubators & Shakers
3. Principle & operation of Centrifuge
4. Principle & operation of pH meter
5. Principle & operation of Colorimeter
6. Principle & operation of Spectrophotometer
7. Electrophoresis techniques

SMB2201	SOIL & AGRICULTURAL MICROBIOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- The purpose of this course is to introduce students to scientific foundation of microorganisms and their relationship to agriculture and environment. The course will appraise the students about application/control of microbes for agriculture and how to design approaches to mitigate environmental pollutants

UNIT 1 SOIL MICROBES ASSOCIATION**12 Hrs.**

Distribution of microorganisms in nature – Microbial communities in soil- factors influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT 2 DECOMPOSITION**12 Hrs.**

Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane wastes- coir pith composition- composting, principles and Applications- conversion process

UNIT 3 DISEASES**12 Hrs.**

Role of enzymes and toxins in pathogenesis. Fungal diseases of plants: Rusts of wheat, linseeds; late blight of potato; red rot of sugarcane. Bacterial diseases of plants: Citrus canker, blight of rice. Viral diseases of plants: Leaf curl of Papaya, vein clearing of lady's finger

UNIT 4 APPLICATIONS**12 Hrs.**

Microorganisms in the decomposition of organic matter- carbon cycle – nitrogen Cycle- nitrogen fixing microorganisms- root nodule bacteria – non-symbiotic Nitrogen fixers – biofertilizers in agriculture- Rhizobium and phosphate solubilisers- Mycorrhizal association – phosphorous cycle

UNIT 5 BIOFERTILIZERS**12 Hrs.**

Bio fertilizers: Types, production and application - Mycorrhizae : Types and their application in agriculture and forestry. – Vermicomposting - Reclamation of waste agricultural land by microorganisms

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Soil Microbiology by Prof. N.S. Subba Rao, Fourth edition, Oxford and IBH Publishing CO. PVT., LTD., New Delhi
2. Introduction to soil microbiology. Alexander M. (1977) John Wiley & Sons, Inc., New York.
3. Modern Soil Microbiology, Dirk J, Elsas V, Trevors JT, Wellington, EMH (1997) Marcel Dekker INC, New York.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB2202	FOOD & DAIRY MICROBIOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course aims on studying interaction of microorganisms and food in relation to food-borne diseases, food spoilage and bioprocessing of food and dairy products.
- To make students learn about technologies to render foods and dairy products safe and analytical techniques for monitoring of food biological safety.

UNIT 1 FACTORS**12 Hrs.**

Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.

UNIT 2 SPOILAGE**12 Hrs.**

Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods

UNIT 3 PRESERVATION**12 Hrs.**

Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO₂, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins

UNIT 4 FERMENTATION**12 Hrs.**

Dairy starter cultures, fermented dairy products: yogurt, acidophilus milk, kumiss, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tampeh, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.

UNIT 5 MICROBIAL DISEASES**12 Hrs.**

Food intoxications: *Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins; Food infections: *Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, Salmonellosis, Shigellosis, *Yersinia enterocolitica*, *Listeria monocytogenes* and *Campylobacter jejuni*.

HACCP, Indices of food sanitary quality and sanitizers

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
2. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
3. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
4. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SMB2203	AIR AND WATER MICROBIOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course prepares students to apply microbiological techniques to monitor water and air quality, domestic and industrial water and wastewater treatment systems and site remediation project

UNIT 1 AEROMICROBIOLOGY**12 Hrs.**

Aeromicrobiology - Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres, allergens Air flora Droplet, droplet nuclei, and aerosols Air pollution: Chemical pollutants, their sources in air and effects on human health.

UNIT 2 AIR SAMPLE ANALYSIS**12 Hrs.**

Air sample collection and analysis Bioaerosol sampling, air samplers, methods of analysis Identification characteristics Methods of Air sampling and types of air samplers - A. Impact on solids, B. Impingement in liquid, C. Sedimentation D. Centrifugation, E. Precipitation F. Thermal Precipitation, CFU, culture media for bacteria and fungi.

UNIT 3 CONTROL**12 Hrs.**

Control measures Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration Air sanitation: Physical and chemical methods Air borne infections

UNIT 4 WATER MICROBIOLOGY**12 Hrs.**

Water Microbiology, Water borne pathogens, water borne diseases

UNIT 5 WATER ANALYSIS**12 Hrs.**

Microbiological analysis of water Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests Precipitation, chemical disinfection, filtration, high temperature, UV light

Max Hours.60**TEXT / REFERENCE BOOKS**

1. da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water A Laboratory Manual, CRC Press
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3rd edition, ASM press

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SMB2204	INDUSTRIAL MICROBIOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- The objective of this course to enable students to correlate metabolic aspects of industrially relevant microorganisms with the corresponding biotechnological products, and learn the basics of simple strategies for strain improvements encompassing both classical and metabolic engineering methods, design medium and downstream processing.

UNIT 1 HISTORY**12 Hrs.**

Brief history and developments in industrial microbiology Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (Eg. Baker's yeast) and continuous fermentations

UNIT 2 BIO-REACTOR**12 Hrs.**

Components of a typical bio-reactor, Types of bioreactors-Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters, Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration

UNIT 3 UPSTREAM PROCESSING**12 Hrs.**

Sources of industrially important microbes and methods for their isolation, preservation and maintenance of industrial strains, strain improvement, Crude and synthetic media; molasses, corn steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates

UNIT 4 DOWNSTREAM PROCESSING**12 Hrs.**

Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray drying. Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12 Enzymes (amylase, protease, lipase)
Wine, beer

UNIT 5 IMMOBILIZATION**12 Hrs.**

Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase)

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
2. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
3. Waites M.J., Morgan N.L., Rockey J.S. and Highton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company
5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
6. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
7. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd..

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 questions of 2 marks each - No choice**20 Marks****PART B** : 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB4401	SOIL & AGRICULTURAL MICROBIOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Study soil profile
2. Study microflora of different types of soils/ rhizosphere
3. Rhizobium as soil inoculants characteristics and field application
4. Azotobacter as soil inoculants characteristics and field applications
5. Isolation of cellulose degrading organisms
6. To study viral diseases in plants
7. To study bacterial and fungal diseases in plants
8. Isolation of rhizobia from root nodules of leguminous plants
9. Testing of nodulation ability of rhizobia.
10. Inoculation of seeds with rhizobia.
11. To study pesticidal activity of *Bacillus thuringiensis*.

SMB4402	FOOD MICROBIOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Detection of adulterants in spices, pulses, sugar, tea, milk and milk products
2. Detection of arsenic by microbiological methods
3. Detection of nicotinic acid by bioassay
4. Detection of number of bacteria in milk by SPC
5. Determination of quality of milk sample by methylene blue reductase test.
6. To demonstrate role of yeast in bread-making
7. Isolation of spoilage microorganisms from food
8. Isolation of pathogenic microorganisms from food

SMB3101	MEDICAL BACTERIOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- This course aims at understanding important medically important bacteria its mode of infection, pathogenesis prophylaxis and treatment.

UNIT 1 INFECTION**12 Hrs.**

Infection-Sources of infection, method of transmission of infection, Factors predisposing to microbial pathogenicity, Types of infectious diseases. Normal Microbial flora of human body. Gram-positive pathogens *Staphylococcus*, *Streptococcus*, *Corynebacterium*, *Clostridium*.

UNIT 2 GRAM NEGATIVE PATHOGENS**12 Hrs.**

Gram negative pathogens- *Neisseria*, *E.coli*, *Klebsiella*, *Proteus*, *Salmonella*, *Shigella*, *Vibrio*, *Yersinia*.

UNIT 3 ACID FAST BACTERIS**12 Hrs.**

Acid fast bacteria-*Mycobacterium tuberculosis* and *M.lepreae*.

UNIT 4 SPIROCHETES**12 Hrs.**

Spirochetes-*Leptospira*, *Treponema*.

UNIT 5 OTHER MEDICALLY IMPORTANT ORGANISMS**12 Hrs.**

Mycoplasma. *Chlamydia*. *Helicobacter* and *Campylobacter*. Other important anaerobic pathogens.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Medical Microbiology-David Green wood
2. Text book of Microbiology, Ananthanarayan & Jayaram Panicker
3. Jawetz-Medical Microbiology-Geo F.Brooks, Janet S Butel.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 questions of 2 marks each - No choice**20 Marks****PART B** : 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB3102	MEDICAL VIROLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course aims at understanding important medically important virus its mode of infection, pathogenesis prophylaxis and treatment.

UNIT 1 GENERAL CONCEPTS**12 Hrs.**

General Concepts: Virus history, Diversity, shapes, sizes and components of genomes. Isolation and purification of viruses and components.

UNIT 2 INFECTION**12 Hrs.**

Consequences of virus infection to animals and human. Viral infection: affect on host macromolecules. Viral infection: establishment of the antiviral state. Viruses counter attack mechanisms.

UNIT 3 CLASSIFICATION**12 Hrs.**

Classification of viruses and nomenclatures.

Positive strand RNA viruses- Picornaviruses. Flaviviruses- West Nile virus and Dengue virus. Coronaviruses- SARS pathogenesis

Negative strand RNA viruses Paramyxoviruses. Orthomyxoviruses: Influenza pathogenesis and Bird flu. Rhabdoviruses: Rabies pathogenesis.

UNIT 4 RNA VIRUS**12 Hrs.**

dsRNA viruses- Reoviruses. Retroviruses: structure, classification, life cycle; reverse transcription. Retroviruses: HIV, viral pathogenesis and AIDS.

UNIT 5 DNA VIRUS**12 Hrs.**

Small DNA viruses: parvo- and polyomaviruses. Large DNA viruses: Herpes-ado-, and poxviruses. Miscellaneous viruses.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Principles of Virology 2nd edition by S.J.Flint, L.W.Enquist,R.M.Krug,V.R. Racaniello, and A.M.Skalka.
2. Fields Virology 5th Edition by Bernard Fields, David Knipeand Peter Howley.
3. Medical Virology 4th edition by David O.White and FrankJ. Fenner.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 questions of 2 marks each - No choice**20 Marks****PART B** : 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB3103	MEDICAL MYCOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course aims at understanding important medically important fungi its mode of infection, pathogenesis prophylaxis and treatment.

UNIT 1 CLASSIFICATION**12 Hrs.**

General characteristics & classification of fungi - Morphology & reproduction of fungi - Pathogenesis of fungal infections - Isolation & identification of fungi

UNIT 2 YEAST**12 Hrs.**

Yeasts and yeast like fungi of medical importance including Candida. - Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces etc. Mycelial fungi of medical importance including Aspergillus, Zygomycetes, Pseudoallescheria, Fusarium, Piedra, other dematiaceous hyphomycetes and other hyalohyphomycetes etc.

UNIT 3 DIMORPHIC FUNGI**12 Hrs.**

Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicillium marneffei etc. - Dermatophytes

UNIT 4 FUNGI DISEASES**12 Hrs.**

Fungi causing mycetoma, keratomycosis & otomycosis. - Pneumocystis jirovecii infection - Rhinosporidium seeberi & Loboa loboi - Actinomycetes & Nocardia.

UNIT 5 COMMON LAB CONTAMINANTS**12 Hrs.**

Common laboratory fungal contaminants- Mycetism & mycotoxicosis - Antifungal agents & in vitro antifungal susceptibility tests. - Hypersensitivity to fungi

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
2. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
3. Waites M.J., Morgan N.L., Rockey J.S. and Higon G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company
5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
6. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
7. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd..

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SMB3104	PHYCOLOGY AND MEDICAL PARASITOLOGY	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- This course aims at understanding important medically important parasite its mode of infection, pathogenesis prophylaxis and treatment. To understand the Algal diversity.

UNIT 1 CLASSIFICATION**12 Hrs.**

Algae in diversified habitats (terrestrial, fresh water, marine) thallus organization, cell ultrastructure, reproduction (vegetative, asexual, sexual) criteria for classification of algae: pigments, reserve food, flagella, modern classification.

UNIT 2 CLASSIFICATIONS & APPLICATIONS**12 Hrs.**

Salient features of protochlorophyta, chlorophyta, charophyta, xanthophyta, Bacillariophyta, phaeophyta and Rhodophyta with special reference to Microcystis, Hydrodictyon, Chara, Draparnaldiopsis, Sargassum, Dictyota, Batrachospermum. **Algal blooms, algal biofertilizers; algae as food, feed and use in industry.**

UNIT 3 PARASITOLOGY**12 Hrs.**

Parasitology – General Concepts – Introduction to Parasitology, Classification – Host parasite relationship. Laboratory techniques in parasitology-Blood –Thick and thin smear, Faeces –Examination for ova and cyst.

UNIT 4 PROTOZOOLOGY**12 Hrs.**

Protozoology: Pathogenic mechanisms, Disease transmissions, their life cycles and Lab Diagnosis of the following- Entamoebahistolytica, Plasmodium vivax, Plasmodium falciparum, Leishmaniadonovani, Giardia lamblia, Trichomonasvaginalis, Balantidium coli, Toxoplasma gondii and Cryptosporidium parvum.

UNIT 5 HELMINTHOLOGY**12 Hrs.**

Helminthology: Classification, Cestodes – Taeniasolium, T. saginata, T. echinococcus, trematodes – Schistosoma haematobium, Fasciola hepatica, Nematodes – Ascaris, Anchylostoma, Trichuris, Enterobius and Wuchereria- their life cycle, Transmission, pathogenicity and Lab Diagnosis.

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Text Book of Medical Parasitology by P. Chakraborty
2. Text Book of Parasitology By Jayaram Panicker
3. Text Book of Medical Parasitology by Parija S.C.
4. Parasitology by K.D. Chatterjee

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**

SMB4501	BACTERIOLOGY AND VIROLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Collection and processing of clinical specimen for microbiological examination.
2. Staining techniques- Simple, Negative, Gram's, capsule, Spores(Organism – Bacillus, Enterobacter, Escherichia coli) Acid fast staining.
3. Study of composition and use of important differential media for identification of pathogenic bacteria: EMB Agar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS
4. Isolation and identification of microorganisms from urine sample(E.coli, Proteus, Pseudomonas
5. Biochemical tests for bacterial identification(IMViC, TSI, nitrate reduction, urease production, coagulase and catalase tests.)
6. Preparation of dried filter paper discs for susceptibility assay and Antimicrobial activity by Kirby – Bauer disc diffusion technique.
7. Determination of MIC & MBC.
8. Preservation of bacterial cultures by various techniques
9. Studying isolation and propagation of animal viruses by chick embryo technique
10. Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique
11. To perform HBsAg by ELISA
12. To perform HIV Tridot method.

SMB4502	MYCOLOGY AND PARASITOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Identification of common fungus like Mucor, Rhizopus, Penicillium, Aspergillus by Lactophenol cotton blue mount examination.
2. Preparation of fungal media and Cultivation of fungi study of colony characters of yeast and mold.
3. Leishman staining for malarial parasites
4. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
5. Saline wet mount for observing ova and eggs of parasites.
6. Iodine wet mount for observing ova and eggs of parasites.
7. Concentration of stool samples by floatation method
8. Zinc sulphate conc. Method for stool sample
9. Demonstration of various parasites by permanent slides.
10. Concentration of stool sample by sedimentation method

SBB1002	RESEARCH METHODOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course aims at understanding the research terminology. Be aware of the ethical principles of research, ethical challenges and approval processes. Describe quantitative, qualitative and mixed methods approaches to research. Identify the components of a literature review process. Critically analyze published research.

UNIT 1**12 Hrs.**

Research methodology-basic concepts-types- definition of research problems- statistical methods- Correlation and Regression, Binomial, Poisson and Normal Distributions (mean and variance applications only) - Sampling Distributions: Tests based on t, F, Z and Chi square distributions- Analysis of Variance.

UNIT 2**12 Hrs.**

Research design-Nature and Classification of research designs, data classification, primary and secondary data, primary and secondary data- sources-advantages- Sampling- sampling concepts and methods

UNIT 3**12 Hrs.**

Principles of biophysical methods used for analysis. X-ray diffraction, Fluorescence, UV, ORD/CD, visible, NMR and ESR spectroscopy, Hydrodynamic methods, Atomic absorption, Plasma emission spectroscopy.

UNIT 4**12 Hrs.**

Principles and techniques of nucleic acid hybridization and cot curves, sequencing of proteins and nucleic acids, southern, northern and south-western blotting techniques, PCR, methods for measuring nucleic acids and protein interactions.

UNIT 5**12 Hrs.**

Principles and applications of tracer techniques in biology, radiation dosimetry, radio-active isotopes and half-life of isotopes, effect of radiation on biological systems, autoradiography, cerenkov radiation and liquid scintillation spectrometry

Max Hours.60**TEXT BOOK/ REFERENCES:**

1. Principles of biochemistry and molecular biology – Keith Wilson & John Walker
2. Biostatistics – Khan & Khanum

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 questions from each UNIT of internal choice; each carrying 16 marks**80 Marks**

SMB3201	CLINICAL MICROBIOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course consists of instruction in practical application, and pathogenesis of clinical microbiology, including collection, setup, identification, susceptibility testing, and reporting procedures..

UNIT 1 COLLECTION AND TRANSPORT OF SAMPLE**12 Hrs.**

Selection, collection and transport of specimens – Blood, Urine, Sputum, CSF, Pus & Faeces – transport media and storage. Microscopic examination of specimen for Bacterial pathogens – simple, differential staining and motility. Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media. Identification of organisms - Biochemical reaction – Sugar fermentation test - Susceptibility testing – MIC, - reporting of results & interpretation.

UNIT 2 FUNGAL AND PARASATIC SAMPLE COLLECTION**12 Hrs.**

Fungal samples– Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing.

Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urogenital specimen.

UNIT 3 PROTOZOA**12 Hrs.**

Identification of Intestinal Protozoa – Amoeba, Blood protozoa – Malaria, Intestinal Helminthes: *Ascaris*, *Taenia*, *Entrobilus* and Blood Helminthes: *Wuchereria bancrofti*.

UNIT 4 VIROLOGY**12 Hrs.**

Laboratory methods in basic Virology- Detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT 5 VIRAL CULTURE**12 Hrs.**

Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses. Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis

Max Hours.60**TEXT / REFERENCE BOOKS**

1. Diagnostic Microbiology, Bailey and Scott's., 1990. Eighth edition. The Mosby Company.
2. Medical laboratory techniques, Abdul Khader, 2003, First edition. Frontline Publications, Hyderabad.
3. Virology, Sawant, K.C., 2005, First edition, Dominant Publishers and distributors, Delhi.
4. Medical Parasitology, Rajesh Karyarkarte, Ajit Damla, 2004. Books and allied publishers Ltd. Kolkata.
5. Textbook of Medical Parasitology, Subash O. Barija , 1996. First edition. All India Publishers and Distributors Regd. 920 Poonamallee High Road, Chennai.
6. Rajesh Karyakarte and Ajith Damle (2005) Medical Parasitology, Books and Allied(P)Ltd.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 questions of 2 marks each - No choice****20 Marks****PART B : 2 questions from each UNIT of internal choice; each carrying 16 marks****80 Marks**