LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)

in the

UNDER GRADUATE PROGRAMME MICROBIOLOGY

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2020-2021 AND ONWARDS

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICAS

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)
(Affiliated to Bharathiar University and Accredited by NAAC)
COIMBATORE-641028
TAMILNADU, INDIA.
Phone: 0422-4440555
Website: www.hindusthan.net/hicas/

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

Preamble

Learning Outcome based curriculum framework for undergraduate/postgraduate education in Microbiology

Vision

To become a centre of academic excellence with highly qualified, knowledgeable, competent Microbiologists and to empower students as responsible citizens who can work for the progress of the society

Mission

To incorporate outcome based curriculum by practicing innovative teaching methodologies both in theory an practicals, building self confidence, values and optimistic thinking among the students.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Under Graduates of MICROBIOLOGY program will

PEO1: Understand the impact of science in societal and environmental contexts, and demonstrate the need for sustainable development

PEO2: Create, select and apply appropriate techniques and scientific resources with a professional understanding of the limitations

PROGRAMME OUTCOME (PO)

PO1: Acquire, articulate, retain and apply specialized language and knowledge relevant to Microbiology.

PO2: Design and carry out experiments safely and to interpret experimental data

PO3: Prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed.

PO4: Apply ethical principles and commit to professional ethics, communicate effectively and recognize the need for life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: To prepare students as skilled scientific manpower with an understanding of Research ethics (public policy, biosafety, and intellectual property rights) involving microorganisms to contribute to application, advancement and impartment of knowledge in the field of Microbiology.

PSO2: Production of substantial original research of significance and quality sufficient for publication.

PSO3: Ability to present their work through written, oral, and visual presentations, including an original research proposal

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
COIMBATORE -641028
SCHEME OF EXAMINATIONS - CBCS & LOCF PATTERN
(For the Students admitted from the Academic year 2020-2021 and onwards)
UG PROGRAMME

Programme: Bachelor of Science in Microbiology

Part	Course Code	Course Type	Course Title	Lecture Hours/ Week	Exam Duration (hours)	MAX. MARKS			CREDIT POINTS
						I.E	E.E	TOTAL	
Semester – I									
I	20LAT01/ 20LAH01/ 20LAM01/ 20LAF01	MIL	Tamil-I/ Hindi-I/ Malayalam – I/ French-I	6	3	30	70	100	3
II	20ENG01	AECC	English – I	6	3	30	70	100	3
III	20MBU01	DSC	Basic concepts of Microbiology	6	3	30	70	100	6
III	20MBU02	DSC	**Practical I** – Basic concepts of Microbiology	5	3	40	60	100	3
III	20MBU03	GE	**Allied** Chemistry	4	3	30	70	100	4
III	20MBU04	SEC	**Allied: Practical II – Chemistry**	3	3	40	60	100	2
									21
IV	20MBUV01	ACC	**VAC-I**	2	1	50	-	50	Grade*.
IV	20MBUJ01	AEE	**Communicative Skills**	2	1	50	-	50	Grade*
IV	20MBUJ02	AEE	**Soft skill**	2	1	50	-	50	Grade*
Semester - II									
I	20LAT02/ 20LAH02/ 20LAM02/ 20LAF02	MIL	Tamil-II/ Hindi-II/ Malayalam-II/ French-II	6	3	30	70	100	3
II	20ENG02	AECC	English – II	6	3	30	70	100	3
III	20MBU05	DSC	Microbial Physiology and Metabolism	4	3	30	70	100	4
III	20MBU06	DSC	**Practical III -** Microbial Physiology and Metabolism	5	9	40	60	100	3
III	20MBU07	GE	**Allied –** Biomolecules (MIC)	4	3	30	70	100	4
III	20MBU08	SEC	**Allied: Practical IV** Biomolecules(MIC)	3	3	40	60	100	2
IV	20GSU01	AECC	Value Education – Human Rights	2	2	100	-	100	2
IV	20MBUV02	ACC	**VAC-II**	2	1	50	-	50	Grade*

IV	20MBUJ03	AEE	**Communicative Skills**	2	1	50	-	50	Grade*
IV	20MBUJ04	AEE	**Soft Skill**	2	1	50	-	50	Grade*
									22
			Semester - III						
I	20LAT03 20LAH03 20LAM03 20LAF03	MIL	Tamil – III Hindi - III Malayalam – III French – III	6	3	30	70	100	3
II	20ENG03	AECC	Functional English – I	6	3	30	70	100	3
III	20MBU09	DSC	Microbial Taxonomy and Genetics	5	3	30	70	100	5
III	20MBU10	DSC	**Practical V** – Microbial Taxonomy and Genetics	4	9	40	60	100	3
III	20MBU11	GE	**Allied** - Biochemistry (MIC)	4	3	30	70	100	4
III	20MBU12	SEC	**Allied: Practical VI** - Biochemistry (MIC)	3	3	40	60	100	2
IV	20GSU02	AECC	Environmental Studies	2	2	100	-	100	2
IV	20MBUV03	ACC	**VAC-III**	2	1	50	-	50	1
IV	20MBUJ05	SEC	**Aptitude / Placement Training**	2	1	50	-	50	Grade*
IV	20MBUJ06	SEC	**Online Classes**	2	1	-	-	-	C/NC**
									23
			Semester - IV						
I	20LAT04 20LAH04 20LAM04 20LAF04	MIL	Tamil-IV Hindi-IV Malayalam -IV French-IV	6	3	30	70	100	3
II	20ENG04	AECC	Functional English – II	6	3	30	70	100	3
III	20MBU13	DSC	Medical Bacteriology and Immunology	5	3	30	70	100	5
III	20MBU14	DSC	**Practical VII** – Medical Bacteriology and Immunology	4	9	40	60	100	3
III	20MBU15	GE	**Allied** - Biostatistics and Computers (MAT)	4	3	30	70	100	4
III	20MBU16	SEC	**Allied: Practical VIII** - Biostatistics and Computers (MAT)	3	3	40	60	100	2
III	20MBU17	SEC	*Institutional/Industrial training	-	-	100	-	100	3
IV	20GSU03	AECC	**Skill Based Subject** Internet Security	2	2	100	-	100	2
V	20GSU04	AECC	Extension Activity	-	-	100	-	100	G
IV	20MBUV04	ACC	**VAC-IV**	2	1	50	-	50	1
IV	20MBUJ07	SEC	**Aptitude / Placement Training**	2	1	50	-	50	Grade*
IV	20MBUJ08	SEC	**Online Classes**	2	1	-	-	-	C/NC**
									25

*Students should undergo an institutional training/ Internship for a continuous period of 15days before semester IV and submit report along with attendance certificate.

Semester - V										
III	20MBU18	DSC	Genetic Engineering		5	3	30	70	100	5
III	20MBU19	DSC	Environmental and Agricultural Microbiology		5	3	30	70	100	5
III	20MBU20	DSC	Food and Industrial Microbiology		4	3	30	70	100	4
III	20MBU21A	DSE	Elective - I	Advanced Microbiology	4	3	30	70	100	4
III	20MBU21B			Pharmaceutical Microbiology						
III	20MBU21C			Waste Management						
III	20MBU22	DSC	**Practical IX**- Genetic Engineering, Food, Industrial and Environmental Microbiology		4	9	40	60	100	3
III	20MBU23A	DSE	Elective - II	**Practical X –** Advanced Microbiology	4	9	40	60	100	2
	20MBU23B			**Practical X –** Pharmaceutical Microbiology						
	20MBU23C			**Practical X –** Waste Management						
III	20MBU24	SEC	Mini Project		4	-	100	-	100	-
IV	20GSU05	AECC	**Non-Major Elective** General Awareness		-	2	100	-	100	2
V	20GSU06	AECC	Law of Ethics		-	2	100	-	100	2
IV	20MBUV05	ACC	**VAC-V**		2	1	50	-	50	1
IV	20MBUJ09	SEC	**Aptitude / Placement Training**		2	1	50	-	50	Grade*
IV	20MBUJ10	SEC	**Online Classes**		2	1	-	-	-	C/NC**
										28
Semester - VI										
III	20MBU25	DSC	Virology and Nanotechnology		5	3	30	70	100	5
III	20MBU26	DSC	Medical Mycology and Parasitology		5	3	30	70	100	5
III	20MBU27	DSC	Entrepreneurship in Microbiology		4	3	30	70	100	4
III	20MBU28A	DSE	Elective - III	Computational Biology	4	3	30	70	100	4
III	20MBU28B			Large Scale Manufacturing Practices						
III	20MBU28C			Bioethics. IPR and Biosafety						
III	20MBU29	DSC	**Practical XI**- Virology. Mycology and Parasitology		4	9	40	60	100	3
	20MBU30A	DSE	Elective - IV	**Practical XII**- Computational	4	3	40	60	100	2

-				Biology						
	20MBU30B			**Practical XII-** Large Scale Manufacturing Practices						
	20MBU30C			**Practical XII-** Bioethics, IPR and Biosafety						
III	20MBU24	SEC	Mini Project		4	-	100	-	100	4
IV	20MBUV06	ACC	**VAC-VI**		2	1	50	-	50	1
IV	20MBUJ11	SEC	**Aptitude / Placement Training**		2	1	50	-	50	Grade*
IV	20MBUJ12	SEC	**Online Classes**		2	1	-	-	-	C/NC**
										28
									Credits Grand Total	147

Actual credits: 143 Extra credits: 4

- **VAC**-Value Added Course (Extra Credit Courses)
- * Grades depends on the marks obtained

Range of marks	Equivalent remarks
80 and above	Exemplary
70 – 79	Very good
60 – 69	Good
50 – 59	Fair
40 – 49	Satisfactory
Below 39	Not Satisfactory = Not completed

- Part IV & V not included in total marks and CGPA calculation.
- **I.E**-Internal Exam
- **E.E**-External Exam
- **JOC**-Job Oriented Course
- **C/NC****- Completed/ Not Completed

PASSING MINIMUM

- Passing Minimum for UG 40% and for PG 50 %
- For UG : 35 % (25 marks) in EE and 40 % in Total Marks
- For PG 50 % (35 marks) in EE and 50 in Total Marks

ABSTRACT FOR SCHEME OF EXAMINATIONS

(For the Candidates admitted during the academic year 2020 – 2021 onwards)

S.No.	Part	Course (MIL/AECC/AEE/ DSC/DSE/SEC/GE/ACC)	Papers	Credit	Total Credits	Marks	Total Marks
1	Part I	MIL	4	3	12	30+70	400
2	Part II	AECC	4	3	12	30+70	400
3	Part II	DSC	16	3/4/5/6	66	30+70	1600
		DSE	4	2/4	12	100	400
		SEC	6	2/3/4	15	40+60	600
		GE (THEORY)	4	4	16	30+70	400
4	Part IV	ACC	6	1/Grade	4	50/100	300
		SEC	8	Grade*	Grade*	-/50	200
		AEE	4	Grade*	Grade*	50	200
		AECC	6	2/ Grade*	10	100	600
		Total	**62**		**147**		**5100**

List of Open Elective Papers	
Open Electives	Courses offered by the Departments (Additional Credit Courses)
	a) Human Microbiome
	b) Public Health Microbiology
	c) Mushroom Cultivation Technology
	d) Biofertilizers and Biopesticides
	e) Microbial quality control in food & pharmaceutical industries
	f) Forensic Microbiology
	g) Intellectual Property Rights
	h) Plant pathology & disease management
	i) Microbial Biotechnology
	j) Communicable and Non-communicable diseases
	k) Medical Informatics

List of Elective Papers/ DSE (Can choose any one of the paper as electives)		
	Course Code	Title
Electives/ **DSE-I**	20MBU21A	Advanced Microbiology
	20MBU21B	Pharmaceutical Microbiology
	20MBU21C	Waste Management
Electives/ **DSE-II**	20MBU23A	Practical X- Advanced Microbiology
	20MBU23B	Practical X- Pharmaceutical Microbiology
	20MBU23C	Practical X- Waste Management
Electives/ **DSE-III**	20MBU28A	Computational Biology
	20MBU28B	Large Scale Manufacturing Practices
	20MBU28C	Bioethics, IPR and Biosafety
Electives/ **DSE-IV**	20MBU30A	Practical XII- Computational Biology
	20MBU30B	Practical XII- Large Scale Manufacturing Practices
	20MBU30C	Practical VI- Bioethics, IPR and Biosafety

Syllabus Coordinator

BOS-Chairman

Department of Microbiology
Hindusthan College of Arts & Science
Coimbatore-641 028

Academic Council – Member Secretary

Co-ordinator
Academic Audit Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

PRINCIPAL
Hindusthan College of Arts and Science
Hindusthan Gardens, Behind Nava India,
Coimbatore - 641 028.

UG Courses- Scheme of Evaluation (Internal & External Components)

(For the students admitted during the academic year 2020-2021 Only)

1. Internal Marks for all UG

Components	Marks
Test I	5
Test II	5
Model Exam	10
Assignment	5
Attendance*	5
TOTAL	30

***Split-up of Attendance Marks**

- 75-79 - 1 marks
- 80-84 - 2 marks
- 85-89 - 3 marks
- 90-94 - 4 marks
- 95-100 - 5 marks

2. a) Components for Practical I.E.

Components	Marks
Test –I	20
Test - II	20
Total	40

b) Components for Practical E.E.

Components	Marks
Experiments	50
Record	5
Viva	5
Total	60

3. Institutional/ Industrial Training, Mini Project and Major Project Work

Institutional /Industrial Training (I.E)		**Mini Project (I.E)**	**Major Project Work**		
Component	**Marks**	**Marks**	**Component**	**Marks**	**Total Marks**
Work diary	25	-	I.E		
Report	50	50	a)Attendance	10	
Viva-voce	25	50	b)Review/Work diary*	30	40
Total	100	100	E.E** a) Final report	40	
			b)Viva-voce	20	60
				Total	100

*Review is for Individual Project and Work Diary is for Group Projects
(group consisting of minimum 3 and maximum 5)

**Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

4. Components for Value Education (Part IV):

S.No.	Components	Marks
a)	Attendance 96% and above - 30 marks 91% to 95% - 25 marks 86% to 90% - 20 marks 75% to 85% - 10 marks	30 marks
b)	Participation in group activity	30 marks
c)	Assignment (2 x 10)	20 marks
d)	Test (1 hr for 20 marks) 2 out of 3 questions, 10 marks each	20 marks
	Total	100 marks

5. **Guidelines for Environmental Studies (Part IV)**

Components	Marks
Two Tests (each 2 hours) of 30 marks each [3 out of 5 descriptive questions 3 x 10 = 30 Marks]	60
Field visit and report (10 + 10) (At least one field trip should be arranged)	20
Two assignments (2 x 10)	20
Total	100

6. **Guidelines for Skill based subject - Internet Security (Part IV)**

Components	Marks
Two Tests (each 2 hours) of 40 marks each [4 out of 7 descriptive type questions 4 x 10 = 40 Marks]	80
Two assignments (2 x 10)	20
Total	100

7. **Guidelines for General Awareness (Part IV)**

Components	Marks
Two Tests (each 2 hours) of 50 marks each [50 objective type questions 50 x 1 = 50 Marks]	100

8. **Guidelines for Law of Ethics (Part V)**

Components	Marks
Two Tests (each 2 hours) of 50 marks each [5 out of 8 descriptive type questions 5 x 10 = 50 Marks]	100

9. **Guidelines for Extension Activity (Part V)**

No of Activities	Marks
2 x 50 (Each Activity for two days) (Activities may be Educating Rural Children, Unemployed Graduates, Self Help Group etc)	100

10. **Value Added Courses and Aptitude/Placement courses:**

Components	Marks
Two Test (each 1 hour) of 25 marks each QP is objective pattern (25x1=25)	50
Total	50

Guidelines:

1. The passing minimum for these items should be 40%
2. If the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent Semesters
3. Item No's:4,5,6,7,8,9, 10 are to be treated as 100% Internal papers.
4. For item No.10, Tests conducted through online modules (Google Form/any other)

UG PATTERN

QUESTION PAPER PATTERN FOR CIA I and CIA II EXAM

Reg.No:---------- **Q.P.CODE:**

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

---------- DEGREE CIA-I/CIA-II EXAMINATIONS ----------20---

(---------- SEMESTER)

BRANCH: ----------

SUBJECT NAME: ----------

Time: Two Hours **Maximum:50 M**

SECTION - A (6 x 1 = 6 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks

(Q.No: 1 to 6: Multiple choice/Fill up the blanks /True or False questions)

SECTION - B (4x 5 = 20 marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks

(Q.No: 7 to 10 Either Or type)

SECTION - C (3x 8 = 24 marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks

(Q.No: 11 to 13 : Either Or type)

QUESTION PAPER PATTERN FOR MODEL/END SEMESTER EXAMINA

Reg.No:---------- **Q.P.C(**

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

---------- DEGREE MODEL EXAMINATIONS ----------20---------

(----------SEMESTER)

BRANCH : ----------

SUBJECT NAME:----------

Duration: Three Hours **Maximum: 70**

SECTION - A (10x1=10 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks

(Q.No 1 to 10 Multiple choice/Fill up the blanks /True or False questions)

(Two questions from each unit)

SECTION - B (5x4=20 Marks)

Answer **ALL** Question

ALL Questions Carry **EQUAL** Marks

(Q.No 11 to 15 Either or type)

(One question from each Unit)

SECTION- C (5x8=40 Marks)

Answer **ALL** Questions

ALL Questions carry **EQUAL** Marks

(Q.No 16 to 20 Either Or type) (One question from each Unit)

ABSTRACT FOR SCHEME OF EXAMINATIONS

(For the Candidates admitted during the academic year 2020 – 2021 onwards)

S.No.	Part	Course (MIL/AECC/AEE/DSC/ DSE/SEC/GE/ACC)	Papers	Credit	Total Credits	Marks	Total Marks
1	Part I	MIL	4	3	12	30+70	400
2	Part II	AECC	4	3	12	30+70	400
3	Part II	DSC	16	3/4/5/6	66	30+70	1600
		DSE	4	2/4	12	100	400
		SEC	6	2/3/4	15	40+60	600
		GE (THEORY)	4	4	16	30+70	400
4	Part IV	ACC	6	1/Grade	4	50/100	300
		SEC	8	Grade*	Grade*	-/50	200
		AEE	4	Grade*	Grade*	50	200
		AECC	6	2/ Grade*	10	100	600
		Total	62		147		5100

List of Open Elective Papers	
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	c) Mushroom Cultivation Technology
	d) Biofertilizers and Biopesticides
	e) Microbial quality control in food & pharmaceutical industries
	f) Forensic Microbiology
	g) Intellectual Property Rights
	h) Plant pathology & disease management
	i) Microbial Biotechnology
	j) Communicable and Non-communicable diseases
	k) Medical Informatics

Course Code:	20MBU01	Course Title						Batch:	2020-2021 onwards
		BASIC CONCEPTS OF MICROBIOLOGY						Semester:	I
Hrs/Week:	6	L	6	T	-	P	-	Credits:	6

COURSE OBJECTIVES:

1. To discuss about the basics and fundamentals of Microbiology
2. To illustrate the structure and function of bacteria
3. To construct knowledge on microscopic techniques to observe the microorganisms
4. To impart knowledge on the aseptic techniques, methods to cultivate and preserve microorganisms

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Summarize the fundamental concepts of Microbiology and analyze the contributions of Scientists	K1, K2, K3, K4
CO2	Explain the structure and function of bacterial cell.	K1, K2, K3, K4
CO3	Apply microscopic techniques to observe microorganisms and compare different methods of	K1, K2, K3, K4
CO4	Discover the pure culture techniques and Illustrate preservation of cultures	K1, K2, K3, K4

SYLLABUS

20MBU01	BASIC CONCEPTS OF MICROBIOLOGY	Sem: I
Unit No.	Topics	Hours
I	**History and Scope of Microbiology** Spontaneous generation theory and conflict - Contributions of Antony Von Leeuwenhoek - Joseph Lister - Louis Pasteur - Robert Koch - Edward Jenner- Elie Metchnikoff - Martinus Beijerinck - Alexander Fleming - Selman Abraham Waksman - John Tyndall – Sergei WinoGradsky - Scope of Microbiology - Microbiology Institutions in India.	14
II	**Bacterial Cell structure and Function** Shapes of Bacteria - Subcellular structures of microbes- slime layer - capsule, cell wall- Gram positive and Gram negative, cytoplasmic membrane – fimbriae - pili- flagella - storage granules- comparison of prokaryotic and eukaryotic organisms- sporulation and germination- cell division in bacteria - binary fission.	14
III	**Microscopy, Stains and Staining Techniques** Working principle and applications of light microscopes- Bright field, Dark field, Phase contrast, Fluorescence, confocal scanning microscope-Electron microscope- SEM and TEM- *in situ* Electron Microscopy. Definition of auxochrome, chromophores, dyes, Staining methods- Simple and Differential (Gram and Acid fast), Negative, Capsule, Flagellar, Endospore and fungal staining – Wet mount and LPCB.	15
IV	**Sterilization and Disinfection** Principles, methods of sterilization: Physical methods: Dry heat (Hot air	15

	oven), Moist heat (Auto clave) – Sterilization control. Filtration (Membrane & HEPA) - Biosafety cabinets and Radiation (UV). Chemical sterilization: Chemical agents and mode of action: Phenol Coefficient test–Fumigation.	
V	**Culture techniques, Maintenance and Preservation of cultures** Media preparations: Solid and liquid- Types of media: Synthetic and semi synthetic enriched, enrichment, selective, differential. Anaerobic culture technique: Wright's tube, Roll tube, McIntosh fields jar method. Pure culture technique: Serial dilution, pour, spread, streak plate methods. Culture preservation- Mineral oil method and Lyophilization- Lyophilizer. Culture collection centers.	**14**

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

1. *Prescott, Hareley.P and Klein.A.,* "Microbiology", McGraw Hill Publishers, New Delhi *2017*

REFERENCE BOOKS

1. *Michael J Pelczar.Jr., "Microbiology", McGraw Hill Publishers, NewDelhi.2001*
2. *R.C Dubey., "Textbook of Microbiology", S. Chand and Company Ltd, New Delhi. 2013*
3. *Geeta Sumbali and Mehrotra R.S., "Principles of Microbiology", Tata McGraw Hill Publishers.New Delhi.2009.*
4. *Gerard J. Tortora and Berdell R. Funke Christine L. Case., "Microbiology, An Introduction", Calif Benjamin/Cummings Pub. Co., SanFrancisco.2015*
5. *Jacquelyn G. Black, Laura J. Black., "Microbiology: Principles and Explorations", Wileys Publishers, New Jersey.2012*

WEB RESOURCES

Web Link: <https://open.oregonstate.education/generalmicrobiology/>
<https://www.researchgate.net/publication/323547949_Microbiological_Culture_Media_A_Complete_Guide_for_Pharmaceutical_and_Healthcare_Manufacturers>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	L	L	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.N.VANITHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20MBU02	Course Title						Batch:	2020-2021 onwards
		PRACTICAL I - BASIC CONCEPTS OF MICROBIOLOGY						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To discuss about the basics and fundamentals of Microbiology
2. To illustrate the structure and function of bacteria
3. To construct knowledge on microscopic techniques to observe the microorganisms
4. To impart knowledge on the aseptic techniques, methods to cultivate and preserve microorganisms

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Practice handling of glasswares and experiment with equipments	K1, K2, K3, K4
CO2	Identify, test and interpret the microbial growth in different media	K1, K2, K3, K4
CO3	Experiment with various staining techniques, micrometry and hanging drop method	K1, K2, K3, K4
CO4	Interpret different pure culture techniques and analyze anaerobic cultivation methods	K1, K2, K3, K4

SYLLABUS

20MBU02	PRACTICAL I - BASIC CONCEPTS OF MICROBIOLOGY	Sem: I
	LIST OF EXPERIMENTS	Hours
1. Microbiology – Good laboratory practices & Biosafety.		5
2. Cleaning of Glassware.		5
3. Operation and maintenance of Microscope.		4
4. Culture media preparation and colony characteristics in agar medium.		5
5. Selective and differential media: a) EMB agar b) Mannitol salt agar Mac conkey agar d) SS agar		5
6. Pure culture techniques – Serial dilution, Pour plate, Spread plate and Streak Plate methods		5
7. Demonstration of the presence of microflora in the environment by exposing nutrient agar plates in the air		4
8. Enumeration of bacteria, fungi and actinomycetes from soil.		5
9. Determination of Motility – Hanging drop method, agar deep and swarming motility assay.		4
10. Staining of Bacteria and fungi a. Simple staining b. Gram staining		6

c. Negative staining d. Acid fast staining(demo) e. Endospore staining f. Fungal wet mount –KOH g. Fungal staining – Lacto Phenol Cotton Blue	
11. Micrometry- determination of size of bacteria.	4
12. Cultivation of anaerobes- Wrights tube method, Mc'Intosh fildesjar	4
13. Assessment of sterility of Hot air oven and Autoclave 14. Bacterial culture preservation techniques – Paraffin method (Mineral oil), Saline suspension method and Silica gel.	4

Teaching methods: Hands on Experiments

TEXT BOOKS

N. Murugalatha, Lali Growther, J. Vimalin Hena, N. Hema Shenpagam, R. Anitha, D. Kanchana Devi, G. Rajalakshmi, Microbiological Techniques, 2013, MJP Publisher.

REFERENCE BOOKS

James G. Cappuccino, Natalie Sherman, Microbiology: A Laboratory Manual, 2014: Pearson.

WEB RESOURCES

Web Link: <https://www.ronaldschulte.nl/files/Laboratory_manual_in_general_microbiology.pdf>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	S	M
CO2	S	M	S	M
CO3	S	M	L	M
CO4	S	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.N.VANITHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Coimbatore-641 028.

Course Code:	20MBU03	Course Title						Batch:	2020-2021 onwards
		ALLIED CHEMISTRY						Semester:	I
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To learn about atomic structure, bonding and industrial application of chemical compounds.
2. To understand the core concepts of organic chemistry i.e. resonance, inductive effect, hyper conjugation, etc. and their application.
3. To acquire knowledge on the concepts of electrochemistry.
4. To write a general form of the rate law for any chemical reaction and define the order of a chemical reaction.

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Correlate the chemical bonding structure	K1, K2, K3, K4
CO2	Categorize and illlustrate the geometric and isomeric properties of molecules	K1, K2, K3, K4
CO3	Apply and analyze the laws of conductance and buffer solutions	K1, K2, K3, K4
CO4	Categorize solutions chemically	K1, K2, K3, K4

SYLLABUS

20MBU03	ALLIED CHEMISTRY	Sem: I
Unit No.	Topics	Hours
I	**Chemical Bonding** Molecular orbital theory, bonding, antibonding and non-bonding orbitals. Molecular orbitals. MO configuration of H_2, N_2, O_2, F_2. Bond order. Diamagnetism and paramagnetism. Preparation and properties, structure, preparation and uses of Borane- $NaBH_4$, Borazole- Chemistry.	10
II	**Industrial Chemistry** Synthesis, properties and uses of silicones. Fuel gases: natural gas, water gas, semi water gas, carburetted water gas, producer gas, oil gas (manufacturing details not required). Dye Chemistry Terms: Chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect- Dyes: azo and triphenylmethane dyes- Preparation one example -Methyl Orange, Malachite green.	10
III	**Covalent bond** Orbital overlap, hybridization, geometry of organic molecules- CH_4,C_2H_4, and C_2H_2. Inductive effect, Electrometric, mesomeric, hyperconjucative and steric effects. Effect in properties of compounds. Stereoisomerism Conditions of optical activity-Optical isomerism of tartaric acid, Racemisation, Resolution of racemates- Geometrical isomerism of maleic and fumaric acids.	10
IV	**Conductance** Types (definition only) - Ostwald dilution law - Kohlraush's law- -	9

	Applications. Conductometric titrations. 2. pH and its calculations- Buffers in living systems-Action of buffer solutions- Henderson Hasselbalch equation	
V	**Solutions types** Liquid in Liquid. Raoult's law-Deviation from ideal behaviour –positive deviation- Negative deviation- Fractional distillation. Kinetics- Rate, order, moleculality,pseudo firstorder, determination of order. Effect of temperature on the rate. Energy of activation.	9

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

Malik,Wahid U., G.D. Tuli and R.D .Madan . Selected Topics in Inorganic Chemistry,7th ed., New Delhi S.Chand& Company Ltd., 2007.

REFERENCE BOOKS

1.*Principles of Inorganic Chemistry, B.R. Puri L.R. Sharma, Shobanlal Nagin Chand &Co.*
2.*Inorganic Chemistry, P.L.Soni, Sultan Chand &Sons.*
3.*Organic Chemistry, Vol. 1, 2, 3, S. M. Mughergee, S.P. Singh, R.P. Kapoor, WileyEastern.*
4.*Advanced Organic Chemistry, B.S. Bahl, Arun bahl, S.Chand&Co.*
5..*Essentials of Physical Chemistry, B.S. Bahl and G.D. Tuli, S.Chand&Co.*
6.*Text book of Physical Chemistry, P.L.Soni, D.B. Dharmarke, Sultan Chand &Sons.*

WEB RESOURCES

Web Link: <https://www.emedicalprep.com/study-material/chemistry/chemical-bonding/molecular-orbital-theory/>
<http://eyrie.shef.ac.uk/eee/cpe630/comfun5.html>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	L	S	M	M
CO2	M	S	M	M
CO3	S	S	M	M
CO4	M	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.A.GEETHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Cell
Science,

Course Code:	20MBU04	Course Title						Batch:	2020-2021 onwards
		ALLIED: PRACTICAL II - CHEMISTRY						Semester:	I
Hrs/Week:	3	L	-	T	-	P	3	Credits:	2

COURSE OBJECTIVES:

1. To develop the quantitative skills in volumetric analysis.
2. To estimate the quantity of chemical compounds through volumetric analysis.
3. To understand various procedures in organic compound analysis.
4. To know the elemental composition and differentiate organic compounds.

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Estimate chemicals by volumetric method	K1, K2, K3, K4
CO2	Infer the presence of elements	K1, K2, K3, K4
CO3	Experiment with organic compounds	K1, K2, K3, K4
CO4	Analyze the functional group tests	K1, K2, K3, K4

SYLLABUS

20MBU04	ALLIED: PRACTICAL II - CHEMISTRY	Sem: I
	LIST OF EXPERIMENTS	Hours
	I. VOLUMETRICANALYSIS:	4
1.	Estimation of sodium hydroxide using standard sodium carbonate.	4
2.	Estimation of hydrochloric acid- standard oxalicacid.	4
3.	Estimation of oxalic acid- standard sulphuricacid.	4
4.	Estimation of ferrous sulphate- standard Mohr salt solution.	4
5.	Estimation of $KMnO_4$- standard ferrous sulphate.	4
	II. ORGANICANALYSIS:	
6.	Detection of Elements (N, S, Halogens).	
7.	To distinguish between aliphatic and Aromatic.	4
8.	To distinguish between saturated and unsaturated.	4
9.	Functional group tests for phenols, acids (mono and di), aromatic primary amine, amide, diamide, carbohydrate, Functional groups characterized by confirmatory test.	4

Teaching methods: Hands on Experiments

TEXT BOOKS

1. *Vogel's text book of quantitative Chemical Analysis Sixth edition-J Mendham, R C Denney, J D Barnes, M J K Thomas, 2009*
2. *Vogel's Textbook of Practical Organic Chemistry, 5e, B.S. Furniss, A. J. Hannaford, P.W.G. Smith, A. R. Tatchell, 2003*

REFERENCE BOOKS

1. *Physical Chemistry [Seventh Edition] by Julio Atkins, Peter; De Paula, 2002*
2. *Practical Physical Chemistry by B. Viswanathan, P. S. Raghavan, 2014*
3. *Instrumental Methods Of Chemical Analysis by B.K Sharma, 1899*

WEB RESOURCES

Web Link: <http://www.brainkart.com/article/Estimation-of-sodium-hydroxide_38685/>
<https://ncert.nic.in/ncerts/l/lelm108.pdf>
<https://www.csub.edu/Chemistry/organic/manual/Lab14_QualitativeAnalysis.pdf>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	L	S	M	M
CO2	M	S	M	M
CO3	M	S	M	M
CO4	M	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.A.GEETHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Course Code:	20MBU05	Course Title						Batch:	2020-2021 onwards
		MICROBIAL PHYSIOLOGY AND METABOLISM						Semester:	II
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To transfer knowledge on various aspects of microbial physiology and metabolism
2. To explain the nutritional requirements and role of factors influencing the microbial growth.
3. To understand the mechanism of respiration and fermentation
4. To understand the mechanism and significance of cell signaling molecules and microbial biosynthetic pathways.

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Categorize microbial nutritional requirements and growth of bacteria	K1, K2, K3, K4
CO2	Illustrate the metabolic pathways involved in aerobic respiration	K1, K2, K3, K4
CO3	Analyze the pathways of anaerobic respiration and fermentation	K1, K2, K3, K4
CO4	Categorize the cell signaling molecules and illustrate the microbial biosynthetic pathways	K1, K2, K3, K4

SYLLABUS

20MBU05	MICROBIAL PHYSIOLOGY AND METABOLISM	Sem: II
Unit No.	Topics	Hours
I	**Nutrition** Nutritional requirements of microorganisms –macro elements, micro elements and growth factors, nutritional groups of microbes - transport mechanisms and types-simple diffusion – facilitated diffusion- active transport – group translocation - Iron uptake. Growth curve – Generation time – factors influencing microbial growth – batch, continuous, synchronous growth - diauxic growth. Methods of evaluating microbial growth.	12
II	**Aerobic respiration** EMP – HMP – ED pathways – TCA cycle- electron transport chain(ETC) –components, comparison of Mitochondrial and Bacterial ETC - oxidative and Substrate level phosphorylation, uncouplers and Inhibitors.	12
III	**Anaerobic respiration and Fermentation** Anaerobic respiration – sulphur, nitrogenous compounds, and CO_2 as terminal electron acceptor - Methanogenesis - Fermentation – alcoholic, lactic acid, propionic, butanediol and mixed acid fermentation.	12
IV	**Cell Signalling and Photosynthesis** Signalling molecules and their receptors - Functions of cell receptors –	12

	quorum sensing. Photosynthesis in green bacteria, purple bacteria and cyanobacteria – oxygenic and anoxygenic. carbon dioxide fixation.	
V	**Biosynthesis** Biosynthesis of bacterial cell wall - Biosynthesis of aminoacids (Pyruvate family)- Biosynthesis of fatty acids - general pathway-Biosynthesis of purine and pyrimidine nucleotides denovo and salvage pathways- bioluminescence	12

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

Caldwell DR., "Microbial physiology and Metabolism", WMC Brown Publishers, New Delhi. 1995

REFERENCE BOOKS

1. *Moat, A.G. and Foster, J.W., "Microbial Physiology", Springer, New York.*2002
2. *Schlegal HG., "Microbiology" Cambridge University press,London.*2009
3. *Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R.,* "Microbial Physiology", *McGraw-Hill Higher Education NewYork.*2008
4. *Lehninger, Nelson and Cox., "Principles of Biochemistry",W.H.Freeman & Company, New York.*2013

WEB RESOURCES

Web Link: <http://textbookofbacteriology.net/nutgro.html>
<https://www.biologydiscussion.com/microorganisms/nutritional-requirements-of-microorganisms/55070>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	S	M
CO2	S	M	M	M
CO3	S	M	S	M
CO4	S	M	S	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR. LALI GROWTHER Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Course Code:	20MBU06	Course Title						Batch:	2020-2021 onwards
		PRACTICAL III - MICROBIAL PHYSIOLOGY AND METABOLISM						Semester:	II
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To understand the generation time of bacteria
2. To perform and understand the biochemical characteristics of bacteria .
3. To study the hydrolytic enzymes in bacteria
4. To analyze the effects of different factors on bacterial growth

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Calculate the generation time of bacteria by different methods	K1, K2, K3, K4
CO2	Infer the biochemical characteristics of microorganisms	K1, K2, K3, K4
CO3	Analyze and identify organisms using carbohydrate fermentation test	K1, K2, K3, K4
CO4	Examine and analyze the degradation of polymers by microorganisms and the factors affecting microbial	K1, K2, K3, K4

SYLLABUS

20MBU06	PRACTICAL III - MICROBIAL PHYSIOLOGY AND METABOLISM	Sem: II
	LIST OF EXPERIMENTS	Hours
1.	Determination of generation time of *E.coli* a. Neubauer counting chamber. b. Turbidity. c. Viablecount	12
2.	Biochemical characterization: a) IMViC tests. b) Catalase, Oxidase c) Urease and nitrate tests. d) Triple sugar iron agar test.	12
a)	Carbohydrate fermentation tests.	6
b)	Hydrolysis test: a. Starch hydrolysis. b. Gelatin hydrolysis. c. Casein hydrolysis.	12
c)	Effect of pH and temperature on growth of *E.coli.*	6
d)	Effect of salt on growth of *E.coli.*	6

e) Effect of carbon and nitrogen sources on growth of *E.coli*.	6

Teaching methods: Hands on Experiments

TEXT BOOKS

N. Murugalatha, Lali Growther, J. Vimalin Hena, N. Hema Shenpagam, R. Anitha, D. Kanchana Devi, G. Rajalakshmi, Microbiological Techniques, 2013, MJP Publisher.

REFERENCE BOOKS

James G. Cappuccino, Natalie Sherman, Microbiology: A Laboratory Manual, 2014: Pearson.

WEB RESOURCES

Web Link: <https://sites.google.com/site/microbialphysiologyoddsem/practicals>
<https://www.researchgate.net/publication/306018042_Microbiology_Laboratory_Manual>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	S	M
CO2	S	M	M	S
CO3	S	S	S	M
CO4	S	M	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.N.VANITHA	DR. LALI GROWTHER	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
Curriculum Development
Hindusthan College of Arts & S
Coimbatore-641 028.

Course Code:	20MBU07	Course Title						Batch:	2020-2021 onwards
		ALLIED - BIOMOLECULES (MIC)						Semester:	II
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To understand the structure, properties and classification of carbohydrate
2. To impart knowledge on classification of amino acids and proteins
3. To explain lipids and its biological significance
4. To give insight on different types of nucleic acids and enzymes

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Describe and deduce the structure and properties of carbohydrates	K1, K2, K3, K4
CO2	Summarize the structure and classification of amino acids	K1, K2, K3, K4
CO3	Illustrate the properties of lipids & Nucleic acids	K1, K2, K3, K4
CO4	Categorize enzymes and their functions	K1, K2, K3, K4

SYLLABUS

20MBU07	ALLIED - BIOMOLECULES (MIC)	Sem: II
Unit No.	Topics	Hours
I	**Carbohydrates** Carbohydrates: Definition, classification, structure, properties, Chemistry and functions. Monosaccharides - Structure, chemistry and functions. Isomers and Epimers. Action of acids and alkalies on sugars. Disaccharides- Structure, chemistry and function – Sucrose, Lactose, Maltose and Cellobiose. Oligosaccharides - Structure of Raffinose. Polysaccharides- Homo and hetero polysaccharides.	09
II	**Amino acids** Classification of amino acids – essential amino acids – properties – zwitter ion – isoelectric. Chemical reaction of amino acids due to carbonyl and amino groups. Titration curve of aminoacid and its significance. Peptides- Glutathione, Oxytocin and Vasopressin. Proteins: classification and function of proteins- structural level of organization.	10
III	**Lipids** Classification and properties of lipids. Types of fatty acids – saturated, unsaturated and essential fatty acids. Classification and significance of lipoproteins, glycolipids and phospholipids. Biological significance of steroids and cholesterol. Lipid functions: cell signals, cofactors, prostaglandins.	10

IV	**Nucleic acids** Nucleic acids; Structure of Purines and Pyrimidines; Nucleotides and Nucleosides. DNA: double helix: A, B and Z forms; Denaturation and renaturation of DNA. RNA: types, unusual bases. Structure of chromatids, nucleosome and histones.	09
V	**Enzymes** Classification of enzymes with examples, coenzymes and cofactors (structures not required) – Active site: Lock and key model- induced fit hypothesis. Factors affecting enzyme activity. Enzyme inhibitors. Clinical and industrial applications of enzymes.	10

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

Deb A.C., "Fundamentals of biochemistry", New Central Book Agency, Calcutta.2001

REFERENCE BOOKS

*1,Moat, A.G. and Foster, J.W., "Microbial Physiology", Springer, New York.*2002

2.AmbikaShanmugam.,"FundamentalsofBiochemistryforMedicalstudents"WMCBrownPublishers, New Delhi.2016

3.Sathyanarayana U., "Biochemistry"., Books and Allied Pvt. Ltd., New Delhi.2017

4.Lehninger A.L., and Nelson D.l., " Principles of Biochemistry".,Cox- CBS Publishers, NewDelhi.2013

5.Lubert Stryer., "Biochemistry", Freeman and Company, NewYork.2002

WEB RESOURCES

Web Link: <https://www.studocu.com/en-ca/document/university-of saskatchewan/biomolecules/lecture-notes/lecture-notes-all-lectures/331690/view>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	L	M	S	S
CO2	S	S	M	M
CO3	S	M	M	M
CO4	M	S	S	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
Ms. T. KRITHIKA Name & Signature of the Staff	DR. LALI GROWTHER' Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Course Code:	20MBU08	Course Title						Batch:	2020-2021 onwards
		ALLIED PRACTICAL-IV – BIOMOLECULES (MIC)						Semester:	II
Hrs/Week:	3	L	-	T	-	P	3	Credits:	2

COURSE OBJECTIVES:

1. To understand and analyze the types of carbohydrates
2. To analyze major amino acids
3. To characterize lipids and determine acid number
4. To analyze and determine iodine number

COURSE OUTCOME

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Identify and analyze carbohydrates qualitatively	K1, K2, K3, K4
CO2	Distinguish mono, di and polysaccharides	K1, K2, K3, K4
CO3	Analyze amino acids qualitatively	K1, K2, K3, K4
CO4	Experiment the properties of lipids	K1, K2, K3, K4

SYLLABUS

20MBU08	ALLIED PRACTICAL-IV – BIOMOLECULES (MIC)	Sem: II
	LIST OF EXPERIMENTS	Hours
	QUALITATIVE ANALYSIS	
1. Analysis of carbohydrates		
a. Monosaccharides - Glucose and Fructose		6
b. Disaccharides- Sucrose and Lactose		6
c. Polysaccharide-Starch		6
2. Analysis of Amino acids		
a. Histidine		3
b. Tyrosine		3
c. Tryptophan		3
d. Arginine		3
3.Characterization of Lipids		
a. Determination of acid number		3
b. Determination of iodine number		3

Teaching methods: Hands on Experiments

TEXT BOOKS

R.Sowndravally, D.Pooja, Biochemistry Practical Manual, 2019, Elseivier India.

REFERENCE BOOKS

Valleys practical clinical biochemistry,2006, Heineman medical books, NewDelhi

WEB RESOURCES

Web Link:
<https://www.researchgate.net/publication/332028407_Biochemistry_A_Practical_Manual>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	L	M
CO2	S	S	M	M
CO3	S	S	M	M
CO4	M	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
Ms. T. KRITHIKA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

ordinator
Curricu... Developmen... ...ll
Hindusthan College of Arts & ...nce,
Coimbatore-641 028.

Course Code:	20MBU09	Course Title						Batch:	2020-2021 onwards
		MICROBIAL TAXONOMY AND GENETICS						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To describe the taxonomy of microbial world
2. To gain knowledge about methods in taxonomy
3. To understand the DNA and RNA structures, mechanism of DNA replication, transcription, translation, gene regulation, mutations and genetic exchange.
4. To learn and understand the current status and importance of microbial genetics.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Illustrate the concepts and quote the techniques in microbial taxonomy	K1, K2, K3, K4
CO2	Categorize and explain about fungi, algae and protozoa	K1, K2, K3, K4
CO3	Explain the transcription and translation in prokaryotes and illustrate the genetic code	K1, K2, K3, K4
CO4	Distinguish the type of mutation and interpret on operon	K1, K2, K3, K4

SYLLABUS

20MBU09	MICROBIAL TAXONOMY AND GENETICS	Sem: III
Unit No.	Topics	Hours
I	**Taxonomy** Taxonomy- principle, classification - Phenetic, Phylogenetic, Genotypic; Modern approaches - Taxonomic Ranks. Phylogenetic tree. **Bacterial Taxonomy:** Bergey's Manual of systematic bacteriology-II edition; Low G+C content Gram positive bacteria-Eubacteria; High G+C content Gram positive bacteria- Bifidobacterium, Fusobacterium-Characteristics of Actinomycetes.	12
II	**Fungal, Algal & protozoan Taxonomy** Classification of fungi (Alexopoulos) - General characteristics and organization-economic importance of fungi- role of fungi in Biotechnology. Occurrence- algal cell structure- Classification of Algae (Fritsch) –General characteristics; Protozoa - General characteristics, classification, life cycle of Sarcodina, Mastigophora, Ciliophora, and Sporozoa.	12
III	**Replication** DNA replication – semi conservative- Meselson and Stahl's experiment- replication in Prokaryotes – mechanism and enzymology of replication – helicase, DNA gyrase, polymerases, ligase - rolling circle model – theta replication- Plasmids-concepts, properties, types and applications.	12
IV	**Transcription and Translation** Enzymology and mechanism of transcription in prokaryotes - structure of mRNA,	12

	rRNA and tRNA - genetic code – characteristics of genetic code - Enzymology and mechanism of translation in prokaryotes.	
V	**Mutation and gene regulation** Mutation – spontaneous and induced mutations- mutagenesis- - Physical and chemical agents — site specific mutagenesis- mutagenicity testing (Ames test) - DNA damage and repair - regulation of gene activity- operon model- *lac* and *trp* operon	12

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

1. *Prescott, Hareley.P and Klein.A.,* "Microbiology", McGraw Hill Publishers, New Delhi *2017*
2. *David Freifelder., "Molecular biology", Narosa publishing house, New Delhi 2004*

REFERENCE BOOKS

1. Bergey, *D. H., Buchanan, R. E., Gibbons, N. E., & American Society for Microbiology. (1974).* Bergey's manual *of determinative bacteriology. Baltimore: Williams & Wilkins.*
2. *Alexopoulos, Mims & Blackwell (1996) - Introductory mycology, 4th ed.1996*
3. *Gardner, E. J,Simmons, M J& D P Snustard., 2008 "Principles of Genetics", John Wiley & Sons, New York.2008*
4. *Klug .W.S. & Cummings, MR., "Essentials of Genetics", Mentics Hail, NewJersey.1994*

WEB RESOURCES

Web Link:
http://vidyamandira.ac.in/pdfs/e_learning/ds_microbio/MICROBIAL%20TAXONOMY%20MCBA%20P1%20T.pdf

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	L	L
CO2	M	S	L	L
CO3	S	M	L	L
CO4	M	S	L	L

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.T.VINOTHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature.	Name & Signature Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Course Code:	20MBU10	Course Title						Batch:	2020-2021 onwards
		PRACTICAL V – MICROBIAL TAXONOMY AND GENETICS						Semester:	III
Hrs/Week:	4	L	-	T	-	P	4	Credits:	3

COURSE OBJECTIVES:

1. To impart practical knowledge on the techniques used in microbial genetics
2. To isolate & separate chromosomal DNA, plasmid DNA , protein
3. To observe representative forms of algae and fungi
4. To distinguish methods for isolation of mutants by physical & chemical agents.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Differentiate the diversity of bacteria, fungi and algae and explain their different ecological niche	K1, K2, K3, K4
CO2	Experiment the representative forms of algae and fungi and diagram their observations	K1, K2, K3, K4
CO3	Experiment and practice the protocol for isolation of DNA and Plasmids	K1, K2, K3, K4
CO4	Analyze the methods for isolation of mutants and differentiate the physical & chemical agents.	K1, K2, K3, K4

SYLLABUS

20MBU10	PRACTICAL V – MICROBIAL TAXONOMY AND GENETICS	Sem: III
	LIST OF EXPERIMENTS	Hours
1.	Isolation of halophiles from seawater.	6
2.	Observation of representative forms of Anabaena, Volvox, Yeast, Penicillium, Entamoeba and Plasmodium.	6
3.	Isolation of chromosomal DNA from *E.coli*.	6
4.	Isolation of plasmid DNA from *E. coli*.	6
5.	Separation of DNA by Agarose Gel Electrophoresis.	6
6.	Isolation of mutants using physical agent -UV.	6
7.	Isolation of auxotrophic mutants using chemical agents-EMS	6
8.	Isolation of antibiotic resistant mutants by Gradient plate technique.	6

Teaching methods: Hands on Experiments

TEXT BOOK

Holben, William E., "BIOM 411.01: Experimental Microbial Genetics Laboratory" (2015). Syllabi. 3349. https://scholarworks.umt.edu/syllabi/3349

REFERENCE BOOKS

James G. Cappuccino, Natalie Sherman, Microbiology: A Laboratory Manual, 2014: Pearson.

WEB RESOURCES

Web Link: <https://www.ronaldschulte.nl/files/Laboratory_manual_in_general_microbiology.pdf>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	S	M
CO2	S	M	S	M
CO3	S	M	L	M
CO4	S	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.N.VANITHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20MBU11	Course Title						Batch:	2020-2021 onwards
		ALLIED - BIOCHEMISTRY (MIC)						Semester:	III
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To understand the concepts of mole, mole fraction, molarity, etc. and to apply them in preparations of solutions of desired strengths.
2. To understand the mechanism of extraction and utilization of energy in living cells
3. To explain the fundamental properties and importance of vitamins, minerals and hormones
4. To explain the principle and applications of various analytical instruments in determination and characterization of biomolecules.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Analyze and describe the principle of buffer system and metabolic pathways and bioenergetics	K1, K2, K3, K4
CO2	Categorize the properties, physiological functions and indicate the deficiency of vitamins and minerals	K1, K2, K3, K4
CO3	Explain the hormonal imbalance and determine their physiological effects	K1, K2, K3, K4
CO4	Analyze and classify bioinstrumentation techniques	K1, K2, K3, K4

SYLLABUS

20MBU11	ALLIED - BIOCHEMISTRY (MIC)	Sem: III
Unit No.	**Topics**	**Hours**
I	**Buffer system** pH – acid base indicators, principle and application of pH meter - Henderson – Hasselbalch equation – Maintenance of blood pH - buffer systems – respiratory mechanism – renal mechanism - acidosis and alkalosis – distribution of fluids in the body – dehydration. Preparation of solutions- Normality, molarity and molality.	9
II	**Bioenergetics** Basic principles of thermodynamics – entropy, enthalpy and free energy. High energy phosphates - ATP - oxidation – reduction reactions – Oxidoreductases -oxidases, dehydrogenases, oxygenases, – organization of the respiratory chain in mitochondria – ETC – Oxidative phosphorylation - ATP synthase.	9
III	**Vitamins and Minerals** Classification, properties and physiological functions of vitamins – fat soluble – (A,D,E and K) and water soluble (B and C) – deficiency – Macroelements – Physiological importance of Calcium, Phosphorus, Magnesium, Sodium and Potassium – Trace elements – Physiological functions of Iron, Copper , Zinc, Selenium and Iodine	10
IV	**Hormones & Inborn errors of Metabolism** General characteristics – classification – functions of hormones – oxytocin – vasopressin – thyroid – T3,T4 – pancreas – insulin – Hyperglycemia – Glucagon - Hypoglycemia. Hereditary anemias – sickle cell anemia and thalassemia – errors of carbohydrate	10

	(galactosemia) and protein metabolism (phenylketonuria) – disease and syndromes.	
V	**Analytical techniques and its application** Shaker, Rotatory vacuum evaporator, Sonicator -Types of centrifuge – low and high speed, Ultra centrifuge- UV and Visible spectrophotometer-IR spectroscopy- FTIR-principle and application- Paper, TLC, Ion exchange, HPLC, AGE and PAGE.	10

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

1. *Deb A.C., "Fundamentals of biochemistry", New Central Book Agency, Calcutta.2011*
2. *Lehninger A.L., and Nelson D.L," Principles of Biochemistry Cox- CBS Publishers, New delhi.2005*

REFERENCE BOOKS

1. *Ambika Shanmugam., "Fundamentals of Biochemistry for Medical students" WMC Brown Publishers, New Delhi.2008*
2. *Sathyanarayana U., "Biochemistry"., Books and Allied Pvt. Ltd., New Delhi.2008*
3. *Lubert Stryer., "Biochemistry", Freeman and Company, New York.2002*
4. *Upadhyay & Upadhyay. Biophysical Chemistry. 2010 Edition. Himalaya Publishing House.2010*
5. *Boyer, Rodney, F. Benjamin and Cummins, Modern Experimental Biochemistry. 2nd Edition.1993*

WEB RESOURCES

Web Link: *<https://www.brainkart.com/subject/Biochemistry_302//>*

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	L	S	M	M
CO2	M	S	M	M
CO3	S	S	M	M
CO4	M	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
Ms.T.KRITHIKA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20MBU12	Course Title						Batch:	2020-2021 onwards
		ALLIED: PRACTICAL VI - BIOCHEMISTRY (MIC)						Semester:	III
Hrs/Week:	3	L	-	T	-	P	3	Credits:	2

COURSE OBJECTIVES:

1. To understand the concept of pH.
2. To understand the concepts of preparation of buffers
3. To use and analyze the results of photometry
4. To analyze various biomolecules quantitatively.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Calculate and differentiate the pH of solutions	K1, K2, K3, K4
CO2	Correlate and estimate the concepts of molarity and normality for solution preparation	K1, K2, K3, K4
CO3	Experiment and express the amount of Proteins, Vitamins and carbohydrates	K1, K2, K3, K4
CO4	Analyze and classify the structure of proteins	K1, K2, K3, K4

SYLLABUS

20MBU12	ALLIED: PRACTICAL VI – BIOCHEMISTRY (MIC)	Sem: III
	LIST OF EXPERIMENTS	Hours
1.	Preparation of Solutions (Molar and Normal Solutions)	4
2.	Preparation of Buffers – Acids and Alkaline Range	4
3.	Measurement of pH	4
4.	Estimation of protein by Lowry method	4
5.	Quantitative determination of protein by Bradford method	4
6.	Estimation of Carbohydrate by DNS method	4
7.	Estimation of ascorbic acid by DNPH method	4
8.	Determination of Maximum absorption (μmax) spectra of standard Proteins	4
9.	Study of Proteins-Primary, Secondary and tertiary structures with the help of models	4

Teaching methods: Hands on Experiments

TEXT BOOKS

1. *Wilson, E., Walker, J., Practical Biochemistry-Principles and techniques, Cambridge University press (2010).*
2. *Boyer, R.F., Modern Experimental Biochemistry. Nenjamin/Cummings publishing company Inc. Redwoodcity, California (2012).*

REFERENCE BOOKS

1. *R.Sowndravally, D.Pooja, Biochemistry Practical Manual, 2019, Elseivier India.*
2. *Valleys practical clinical biochemistry,2006, Heineman medical books, NewDelhi*

WEB RESOURCES

Web Link:
<https://www.researchgate.net/publication/313745155_Practical_Biochemistry_A_Student_Companion>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	L	S	M	M
CO2	M	S	M	M
CO3	M	S	M	M
CO4	M	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
Ms.T.KRITHIKA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science Coimbatore-641 028.

Course Code:	20MBU13	Course Title						Batch:	2020-2021 onwards
		MEDICAL BACTERIOLOGY AND IMMUNOLOGY						Semester:	IV
Hrs/Week:	5	L	5	T	-	P	-	Credits	5

COURSE OBJECTIVES:

1. To discover the sources, modes of transmission and virulent factors of bacterial infections.
2. To understand the pathophysiology of important bacterial infections
3. To develop a thorough understanding of host factors and the immune machanisms
4. To conceptualize the protective role of the immune system as well as the mechanisms underlying and its response to pathogenic microorganisms

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Categorize and illustrate about infectious agents and infections.	K1, K2, K3, K4
CO2	Classify and describe the cells and organs involved in immune system	K1, K2, K3, K4
CO3	Explain hypersensitivity and differentiate the auto immune disorders	K1, K2, K3, K4
CO4	Illustrate the serological diagnosis and generalize the molecular methods	K1, K2, K3, K4

SYLLABUS

20MBU13	MEDICAL BACTERIOLOGY AND IMMUNOLOGY	Sem: IV
Unit No.	**Topics**	**Hours**
I	**Infections** Normal microflora of human body – Sources, methods and types of infections - exotoxins and endotoxins - Epidemic, Endemic and Pandemic diseases- Infectious disease cycle. **Gram positive organisms** Gram positive organisms - Morphology, cultural characteristics, pathogenicity *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae, Clostridium tetani*	12
II	**Gram negative organisms** Gram negative organisms Morphology, cultural characteristics, pathogenicity and clinical manifestations of *E. coli, Klebsiella pneumoniae, Salmonella typhi, Shigella dysentriae, Proteus mirabilis, Pseudomonas aeruginosa, Vibrio cholerae, Neiserria gonorrhoeae* and *Helicobacter pylori* **Mycobacteria, Spirochaetes and Intracellular parasites** Morphology, cultural characteristics, pathogenicity and clinical manifestations of, *Mycobacterium tuberculosis- Spirochaetes – Treponema pallidum, Mycoplasma pneumoniae, Rickettsia rickettsii* and *Chlamydia trachomatis.*	12
III	**Immune system** History and Scope of Immunology - Types of immunity- Cell and Organs involved in immune system- Hematopoiesis-Phagocytosis, apoptosis and necrosis **Antigen and Antibody** Antigen & its types, Immunoglobulins -types - structure and functions- Complement pathways	12

IV	**Hypersensitivity and Auto immune diseases**-Hypersensitivity – Classification & Mechanisms – Immunodeficiency diseases (SCID & AIDS). Auto immune diseases - Addison's disease & Rheumatoid arthritis (RA) **Grafting and Immunohematology** Types of grafting, graft rejection. Monoclonal antibodies and its applications. Blood transfusion - ABO grouping - Rh factor - Tissue typing.	12
V	**Immunotechnology in diagnosis of Infection** Precipitation-VDRL-WIDAL-RIA – ELISA – western blotting — immunofluroscence, complement fixation test. Process of sample collection, transportation and processing-Molecular methods of diagnosis (PCR, DNA Probes). Antibacterial susceptibility testing- drug resistance – MRSA - VISA – ESBL.	12

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion, Activity, and Online – Google classroom.

TEXT BOOKS

1. *Ananthanarayan and Jayaram Paniker., "Textbook of Microbiology", University Press India Pvt ltd. New Delhi. 2017*
2. *Coleman, R.M.,Lourbard,M.F and Sicard,R.E.,. "Fundamental immunology", W.H.Freeman and co., New York 1997*

REFERENCE BOOKS

1. *Jawetz E Melnic JL and Adelberg EA , "Review of Medical Microbiology"., Lange Medical Publications, USA.1974*
2. *Bailey and Scotts "Diagnostic Microbiology", 9th edition, Baron and Finegold CV Mosby Publications, USA. 1994*
3. *Kuby. J., "Immunology",W.H.Freeman and co., New York..2006*
4. *Roitt,I.M.,"Essential of Immunology", Black Well Scientific Publishers, New York.2017*

WEB RESOURCES

Web Link:
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_occupational_health_students/medicalbacteriology.pdf
https://icuadelaide.com.au/files/primary/physiology/immunology.pdf

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	L	L
CO2	S	M	L	L
CO3	L	L	S	M
CO4	L	L	S	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR. T.VINOTHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20MBU14	Course Title						Batch:	2020-2021 onwards
		PRACTICAL VII – MEDICAL BACTERIOLOGY AND IMMUNOLOGY						Semester:	IV
Hrs/Week:	4	L	-	T	-	P	4	Credits	3

COURSE OBJECTIVES

1. To interpret clinically important bacteria and to relate infections.
2. To identify suitable antibiotic to treat bacterial infections.
3. To experiment on antigen-antibody reactions to diagnose diseases.
4. To examine the cell, count present in the blood.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Experiment and illustrate the appropriate methods for the identification of pathogens	K1, K2, K3, K4
CO2	Experiment and group the antibiotic sensitivity test	K1, K2, K3, K4
CO3	Experiment and compare antigen antibody reactions for diagnosis	K1, K2, K3, K4
CO4	Experiment and indicate the immunological methods for diagnosis	K1, K2, K3, K4

SYLLABUS

20MBU14	PRACTICAL VII – MEDICAL BACTERIOLOGY AND IMMUNOLOGY	Sem: IV
	LIST OF EXPERIMENTS	Hours
1. Identification of clinically important bacteria: a) *Staphylococcus aureus* b) *Streptococcus pyogenes* c) *Escherichia coli* d) *Salmonella typhi* e) *Klebsiella pneumoniae* f) *Pseudomonas aeruginosa* g) *Proteus mirabilis*		5
2. Antibiotic sensitivity testing – Kirby Bauer method.		5
3. Agglutination - Blood grouping, WIDAL, RPR, ASO.		4
4. Enzyme Linked Immunosorbant Assay		4
5. Precipitation - a) Immunodiffusion-Radial and Ouchterlony's double Immunodiffusion. b) Immunoelectrophoresis-Rocket and counter current.		5
6. Erythrocyte Sedimentation Rate		5

7. Erythrocyte count.	5
8. Leukocyte count.	5
9. Differential count.	5
10. Estimation of Hemoglobin.	5

Teaching methods: Hands on Experiment

TEXT BOOK

N. Murugalatha, Lali Growther, J. Vimalin Hena, N. Hema Shenpagam, R. Anitha, D. Kanchana Devi, G. Rajalakshmi, Microbiological Techniques, 2013, MJP Publisher.

REFERENCE BOOK

James G. Cappuccino, Natalie Sherman, Microbiology: A Laboratory Manual, 2014: Pearson.

WEB RESOURCES

Web Link: *https://bluegrass.kctcs.edu/education-training/media/natural-sciences/biology/documents/bsl214_lab_manual_2010.pdf*
https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	S	M
CO2	S	M	M	S
CO3	S	S	S	M
CO4	S	M	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
DR.C.AJITHA Name & Signature of the Staff	DR. LALI GROWTHER Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.