

**CURRICULUM FRAMEWORK AND SYLLABUS
FOR OUTCOME BASED EDUCATION IN
CBCS & LOCF PATTERN**

BACHELOR OF SCIENCE IN BIOTECHNOLOGY DEGREE PROGRAM

**FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2020 – 2021 and
ONWARDS**



HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

(Affiliated to Bharathiar University and Accredited by NAAC)

COIMBATORE-641028 TAMILNADU, INDIA.

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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 Biotechnology

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	20BTU01	DSC	Cell Biology and Genetics	5	3	30	70	100	5
III	20BTU02	GE	Allied I - Chemistry	5	3	30	70	100	3
III	20BTU03	DSC	Practical I: - Cell Biology and Genetics	4	5	40	60	100	2
	20BTU04	SEC	Allied: Practical II- Chemistry	4	5	40	60	100	2
IV	20BTUV01	ACC	VAC I	2	1	50	-	50	Grade*
IV	20BTUJ01	AEE	Communicative Skills	2	1	50	-	50	Grade*
IV	20BTUJ02	AEE	Soft skill	2	1	50	-	50	Grade*
				36					18
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	20BTU05	DSC	Biotechniques	5	3	30	70	100	5
III	20BTU06	GE	Allied II – Biochemistry	4	3	30	70	100	3
III	20BTU07	DSC	Practical III - Biotechniques	4	5	40	60	100	2
III	20BTU08	SEC	Allied: Practical IV- Biochemistry	3	5	40	60	100	2
IV	20GSU01	AECC	Value Education- Human Rights	2	-	100		100	2
IV	20BTUV02	ACC	VAC II	2	1	50	-	50	Grade*

IV	20BTUJ03	AEE	Communicative Skills	2	1	50	-	50	Grade*
IV	20BTUJ04	AEE	Online Classes	2	1	-	-	-	Grade*
				36					20

*Students should complete value added courses, communicative English and soft skills at the end of the first year

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	20BTU09	DSC	Microbiology	4	3	30	70	100	4
III	20BTU10	DSC	Molecular Biology	4	3	30	70	100	4
III	20BTU11	GE	Allied III - Biostatistics (MAT)	4	3	30	70	100	3
III	20BTU12	DSC	Practical V - Microbiology and Molecular Biology	4	5	40	60	100	2
III	20BTU13	SEC	Institutional Training	-	-	100	-	100	2
IV	20GSU02	AECC	Environmental Studies	2	-	100	-	100	2
IV	20BTUV03	ACC	VAC-III	2	1	50	-	50	1
IV	20BTUJ05	SEC	Aptitude / Placement Training	2	1	50	-	50	Grade*
IV	20BTUJ06	SEC	Online Classes	2	1	-	-	-	C/NC**
				3					24
				6					

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	20BTU14	DSC	Immunology	4	3	30	70	100	4
III	20BTU15 A	DSE	Elective I: Clinical Biotechnology	3	3	30	70	100	3
	20BTU15 B		Elective I: Human Pathology						
III	20BTU16	GE	Allied IV –Python Programming (CSC)	4	3	30	70	100	3
III	20BTU17	DSC	Practical VI – Immunology and Clinical Biotechnology	3	5	40	60	100	2
III	20BTU18	SEC	Allied: Practical VII - Programming using Python Lab (CSC)	2	3	40	60	100	2
IV	20GSU03	AECC	Skill Based - Internet Security	2	-	100	-	100	2
V	20GSU04	AECC	Extension Activity*	-	-	100	-	100	Grade*
IV	20BTUV04	ACC	VAC-IV	2	1	50	-	50	1
IV	20BTUJ07	SEC	Aptitude / Placement Training	2	1	50	-	50	Grade*
IV	20BTUJ08	SEC	Online Classes	2	1	-	-	-	C/NC**
				3					23
				6					

*Students should complete **value added courses, online courses** (or) participation certificates for seminars, workshops from other institutions for each semester and women's studies interdisciplinary at the end of second year

***Extension Activity** – means all those activities under NSS/NCC/sports/YRC Programme and other Co and extracurricular activities offered under **part V** of the programme. Every student shall participate compulsorily for a period of not less than two years (IV semesters) in any one of these programmes.

SEMESTER – V

III	20BTU19	DSC	Recombinant DNA Technology and Forensic Biotechnology	4	3	30	70	100	4
III	20BTU20	DSC	Plant and Agricultural Biotechnology	4	3	30	70	100	4
III	20BTU21	DSC	Computational Biology	3	3	30	70	100	4
III	20BTU22	DSC	Practical V III- Recombinant DNA Technology and Forensic Biotechnology	4	6	40	60	100	2
III	20BTU23	DSC	Practical IX - Plant and Agricultural Biotechnology	4	6	40	60	100	2
III	20BTU24	DSC	Practical X – Computational Biology	3	6	40	60	100	2
III	20BTU25 A	DSE	Elective II: Plant System Physiology	3	3	30	70	100	3
	20BTU25 B		Elective II: Bioremediation						
	20BTU25 C		Elective II: Biotechnological approach for waste water treatment						
III	20BTU26A	DSE	Elective III: IPR, Bioethics & Biosafety	3	3	30	70	100	3
	20BTU26B		Elective III: Developmental Biology						
	20BTU26C		Elective III: Human Physiology						
	****	SEC	Mini Project	2	-	-	-	-	-
IV	20GSU05	AECC	Non-Major Elective General Awareness	-	2	100	-	100	2
V	20GSU06	AECC	Law of Ethics	-	2	100	-	100	2
IV	20BTUV05	ACC	VAC-V	2	1	50	-	50	1
IV	20BTUJ09	SEC	Aptitude / Placement Training	2	1	50	-	-	Grade*
IV	20BTUJ10	SEC	Online Classes	2	1	-	-	-	C/NC**
				36					29
SEMESTER VI									
III	20BTU27	DSC	Animal Biotechnology	4	3	30	70	100	4
III	20BTU28	DSC	Fermentation Technology	4	3	30	70	100	4

III	20BTU29	DSC	Environmental Biotechnology	4	3	30	70	100	4
III	20BTU30 A	DSE	Elective IV: Industrial Biotechnology	4	3	30	70	100	3
	20BTU30 B		Elective IV: Biotechnology in Human Welfare						
	20BTU30 C		Elective IV: Medical Biotechnology						
III	20BTU31	DSC	Practical XI - Animal Biotechnology	4	6	40	60	100	2
III	20BTU32	DSC	Practical XII- Fermentation Technology	4	6	40	60	100	2
III	20BTU33	DSC	Practical XIII - Environmental Biotechnology	4	6	40	60	100	2
III	20BTU34	SEC	Mini project	2	-	100	-	100	8
IV	20BTUV06	ACC	VAC-VI	2	1	50	-	50	1
IV	20BTUJ11	SEC	Aptitude / Placement Training	2	1	50	-	-	Grade*
IV	20BTUJ12	SEC	Online Classes	2	1	-	-	-	C/NC**
				36					30
*Students Should Complete Value Added Courses, Online Courses / Entrepreneurship/Start-ups/ Job Oriented Courses and Placement Training at the end of the Third Year									
Actual credit=140, Extra credit =04 (for value added course)									144

- 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)

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	100	400
2	Part II	AECC	4	3	12	100	400
3	Part III	DSC	2	5	10	100	200
			9	4	36	100	900
			10	2	20	100	1000
		GE	4	3	12	100	400
		DSE	4	3	12	100	400
		SEC	4	2	8	100	400
4	Part IV	SEC	1	8	8	100	100
			4	Grade	Grade	50	200
		AEE	4	Grade	Grade	50	200
		AEE	2	Grade	Grade	50	100
		ACC	4	1	4	50	200
		AECC	4	2	8	100	400
5	Part V	AECC	1	2	2	100	100
			1	Grade	Grade	100	100
Total			66	38	144	1400	5500

List of Open Elective Papers		
S. No		Courses offered by the Departments (Additional Credit Courses)
1	a	Food Nutrition and safety
2	b	Quality Control and Assurance
3	c	Herbal Technology
4	d	Nanotechnology and its Applications
5	e	Alternative medicines
6	f	Organic Farming
7	g	Sericulture
8	h	Floriculture and Ornamental gardening
9	i	Sea Food Processing Technology
10	j	Biological Databases and Tools

List of Elective Papers/ DSE
(Can choose any one of the paper as electives)

	Course Code	Title
Electives/ DSE-I	20BTU15A	Elective I: Clinical Biotechnology
	20BTU15B	Elective I: Human Pathology
Electives/ DSE-II	20BTU25A	Elective II: Plant System Physiology
	20BTU25B	Elective II: Bioremediation
	20BTU25C	Elective II: Biotechnological approach for waste water treatment
Electives/ DSE-III	20BTU26A	Elective III: IPR, Bioethics & Biosafety
	20BTU26B	Elective III: Developmental Biology
	20BTU26C	Elective III: Human Physiology
Electives/ DSE-IV	20BTU30A	Elective IV: Industrial Biotechnology
	20BTU30B	Elective IV: Biotechnology in Human Welfare
	20BTU30C	Elective IV: Medical Biotechnology

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 Marks

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 EXAMINATION

Reg.No:-----

Q.P.CODE:

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

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

(-----SEMESTER)

BRANCH : -----

SUBJECT NAME:-----

Duration: Three Hours

Maximum: 70 Marks

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)

Course type:	DSC	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU01	Course Title					Batch:	2020-2021 onwards	
		CELL BIOLOGY AND GENETICS					Semester:	I	
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To recall the cell structures, functions, cellular organelles and various concepts of genetics
2. To study the biological information and will demonstrate the activity to articulate, verbally and in writing knowledge of biology, biological methods and biological issues in context.
3. To gain knowledge about the inheritance pattern of the genes
4. To analyze and take up career in research or clinical molecular genetics labs.

COURSE OUTCOMES (CO):

S. No.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the cell structures, functions, cellular organelles and various concepts of genetics	K1
CO2	Understand to think critically in reading and analyzing biological information and will demonstrate the activity to articulate, verbally and in writing knowledge of biology, biological methods and biological issues in context.	K2
CO3	Apply and gain knowledge about the inheritance pattern of the genes	K3
CO4	Analyze and take up career in research or clinical molecular genetics labs.	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

SYLLABUS

Code	Subject Name	Semester
20BTU01	CELL BIOLOGY AND GENETICS	I
Unit No.	Topics	Hours
I	Introduction to Cell biology Definition of cell biology, history of cell biology from 6th century to 20th century, cell theory, protoplasm theory and organismal theory, unit of measurement of cell, Prokaryotic cell structure and function, eukaryotic cell structure and function, comparison and characteristics of plant cell, animal cell and microbial cells.	12
II	Cytoplasmic Matrix and Cell Division Structure and function of cell organelles – cell wall, plasma membrane – different models of plasma membrane, golgi apparatus, mitochondria, nucleus, chromosomes and ribosomes. Special note on microtubules, microfilaments and intermediate filaments. Cell cycle and Cell Division –mitosis, meiosis comparison – different stages – significance of mitosis and meiosis	12
III	Introduction to Genetics History of genetics – vapour and fluid theories, preformation theories – rediscovery of Mendel's work, Mendel's selection of experimental plant – phenomenon of dominance, incomplete dominance and coinance. Monohybrid and dihybrid cross, Law of segregation, law of independent assortment. Dihybrid cross in Drosophila. Epistasis- Back cross and test cross.	12
IV	Concepts in genetics Inbreeding, Outbreeding and Hybrid vigour – linkage – crossing over – sex-linked inheritance – multiple alleles -fine structure of gene - chromosomal mutation – changes in structure of chromosome – changes in number of chromosomes – cytoplasmic or extranuclear inheritance	12
V	Population Genetics and Human genetics Gene pool and gene frequency – two models of gene pool structure – classical hypothesis, balance hypothesis and chance mating or panmixis – Hardy Weinberg law – calculating gene frequency in a population with an example. Human genetics – pedigree analysis – inborn errors of metabolism – Phenyluria, alkaptonuria, albinism, sickle cell anaemia, human cytogenetics, eugenics, eugenics and eugenics.	12
Total		60

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Videos, Assignment, Discussion and Activity .

TEXT BOOK:

1. P. S. Verma and V. K. Agarwal., 2020, *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*, Reprint Colour Edition, S. Chand and Company.

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

2. Ajoy Paul, 2015, *Cell and Molecular Biology*, 4th Edn., Books and Allied chemical publication.
3. Wilson and Walker's, 2017. *Principles and Techniques of Biochemistry and Molecular Biology*. 8th Edn., Andreas Hofmann, Samuel Clokie. Cambridge University.

REFERENCE BOOKS:

1. Alberts Bruce, 2015, "*Molecular Biology of Cell*", 8th Edn., Garland Science, New York.
2. Cooper G. M., 2016, "*The Cell: A Molecular Approach*", 2nd Edn., ASM Press.
3. Helena M. Christoffersen, 2020, "*Gene Mutations – Causes & Effects*", 1st Edn., NOVA Publishers.
4. Gardner and Simmons, 2006, "*Principles of Genetics*", 8th Edn., Snustad, Wiley Publisher.

WEB RESOURCES: NPTEL, COURSERA, SWAYAM

WEB LINK:




1. <https://nptel.ac.in/courses/102/106/102106025/>
2. <https://www.coursera.org/learn/genetics>
3. https://onlinecourses.swayam2.ac.in/cec20_ma14/preview

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

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 Co-ordinator
 Mrs. G. BRINDHA Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
 HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
 COIMBATORE - 641 038

Co-ordinator
 Curriculum Development Cell
 Hindusthan College of Arts & Science,
 Coimbatore - 641 038

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type:	GE	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU02	Course Title					Batch:	2020-2021 and onwards	
		ALLIED I: CHEMISTRY					Semester	I	
Hrs/Week:	5	L	5	T	-	P	-	Credits:	3

Course Objectives

1. To acquire comprehensive knowledge on the principles of chemical bonding
2. To gain knowledge about stereoisomerism, inter-halogen compounds and chemistry of heterocyclic compounds
3. To explore chemical kinetics with respect to different orders of reactions.
4. To obtain basic knowledge on preparation and properties of Aromatic and Heterocyclic compounds and enlighten the properties of different dyes and its industrial applications

Course Outcomes (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember to describe the chemical bonding structure	K1
CO2	Understand the hybridization, geometric and isomeric properties of molecules	K2
CO3	Apply and compare the rate and order of chemical reactions	K3
CO4	Analyze about electrophilic substitution reactions in aromatic compounds	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

Code	Subject Name	Semester
20BTU02	ALLIED CHEMISTRY	I
Unit No.	Topics	Hours
I	Chemical bonding Molecular Orbital Theory - MO diagram of H ₂ , He ₂ , N ₂ and O ₂ Molecules. Interhalogen Compounds – Preparation, Properties, Structure and uses of ICl, BrF ₃ . Diborane – Preparation, Properties and Structure.	12
II	Hybridization and Stereoisomerism Orbital Overlap - Geometry of Organic Molecules – Methane, Ethylene and Acetylene. Inductive Effect, Electromeric Effect, Mesomeric Effect - Effects in Properties of Compounds. Stereoisomerism - Optical Isomerism, Symmetry - Elements of Symmetry, Cause of Optical Activity - Optical Activity in Lactic and Tartaric acid. Racemisation and Resolution - Geometric Isomerism exhibited by Maleic and Fumaric acid.	12
III	Chemical Kinetics Introduction - Rate of a Reaction - Order and Molecularity of a Reaction – Examples. Various Order of a Reaction – Zero, First, Second Order Reactions - Pseudo First Order Reaction - Methods of Determining Order of a Reaction - Effect of Temperature on Reaction Rate – Energy of Activation.	12
IV	Aromatic compounds Electrophilic substitution in benzene - Mechanism of nitration, halogenation, alkylation, acylation, sulphonation - Preparation and properties of naphthalene. Heterocyclics: Preparation and properties of furan and pyrrole.	12
V	Dye chemistry Definition of Terms – Chromophore – Auxochrome- Bathochromic Shift - Hypsochromic Shift - Hyperchromic Effect - Hypsochromic Effect. Synthesis of Azo Dyes - Methyl Red, Methyl Orange, Aniline Yellow, Triphenylmethane Dyes - Preparation of Malachite Green.	12
Total		60

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Videos, Assignment, Discussion and Activity.

Text Book

1. Veeraiyan V. and Vasudevan A.N.S, "Allied Chemistry Paper I & II", High Mount Publishing House, Chennai. 2nd Edn, 2005
2. 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. Puri B.R., Sharma L.R and Pathania M. S., 2020, "Principles of Physical Chemistry", 33rd Edn., Vishal Publishing Co., New Delhi.

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

2. Puri B. R. and Sharma L. R., 2020, "Inorganic chemistry", 33rd Edn., Shobanlal Nagin Chand and Co., New Delhi, 2010

WEB RESOURCES: NPTEL, COURSEERA, SWAYAM

WEB LINK:

1. www.chem.kyushu-u.ac.jp
2. <https://chemed.chem.purdue.edu/genchem/topicreview/bp/ch22/rate.php>
3. www.khanacademy.org/.../sp3-hybrid-orbital-jay-final

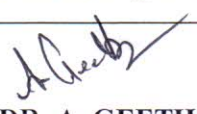


Mapping of Outcomes

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

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 Co-ordinator
 DR. A. GEETHA Name & Signature of the Staff	 DR. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
COIMBATORE - 641 028.

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

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type:	DSC	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU03	Course Title					Batch:	2020-2021 and onwards	
		PRACTICAL I – CELL BIOLOGY AND GENETICS					Semester:	I	
Hrs/Week:	4	L	-	T	1	P	3	Credits:	3

COURSE OBJECTIVE:

1. To know the basics of cell and its components give them a strong foundation on the basic unit of life.
2. To learn the microscopic techniques, method laboratory management and handling
3. To study the experimental concept of mutation by physical and chemical methods
4. To explore the knowledge in raising mutants using physical and chemical agents

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the basics of cell and its components give them a strong foundation on the basic unit of life.	K1
CO2	Understand the microscopic techniques, method laboratory management and handling	K2
CO3	Apply experimentally the concept of mutation by physical and chemical methods.	K3
CO4	Analyse the knowledge in raising mutants using physical and chemical agents	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

SYLLABUS

Code	Subject Name	Semester
20BTU03	PRACTICAL I- CELL BIOLOGY AND GENETICS	I
	Topics	
	<p>Cell Biology</p> <ol style="list-style-type: none"> 1. Laboratory Rules and Regulations. 2. Microscopy – Light Microscope – Compound Microscope – Dark – Field Microscope and Bright Field Microscope. 3. Observation of distinguishing features of prokaryotic and eukaryotic cells 4. Fraction of Cellular components - Chloroplast and Mitochondria. 5. Study of divisional stages in Mitosis using onion root tip. 6. Cell Permeability 7. Karyotyping <p>Genetics</p> <ol style="list-style-type: none"> 8. Drosophila – Morphology, Section Culture and Maintenance-Demo 9. Monohybrid and Dihybrid Cross Using Plants – Demo 10. Identification of Mutants - Physical and Chemical Methods 11. Identification of Barr Bodies. 12. Mounting of Polytene Chromosome from Chironomous Larvae. 	48

Distribution of marks for Practical: (IE 40; EE 60)

Teaching methods: Demonstration, Lecturing, PowerPoint Projection through LCD, Discussion and Activity.

REFERENCE BOOKS:

1. Joseph Sambrook, Fritsch E. F, Tom M and Chris N., 1982, "Molecular Cloning: A Laboratory Manual", 3rd Edn., Cold Spring Harbor Laboratory, New York.
2. Cappuccino, P. and Sherman, D., 2004, Microbiology - A Lab Manual, 7th Edn., Pearson Education, Singapore.
3. Dubey, R. and Maheswari, E., 2004, Practical Microbiology, 1st Edn., S. Chand Publishers, New Delhi.

WEB RESOURCES: EASYBIOLOGYCALSS, KHAN ACADEMY

WEBLINK:

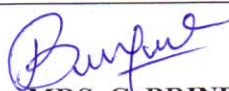


1. <https://www.easybiologyclass.com/molecular-biology-video-lectures-interactive-online-classes/>
2. <https://www.khanacademy.org/science/high-school-biology/hs-cells/hs-basic-cell-structures/v/introduction-to-the-cell>

MAPPING WITH PROGRAM OUTCOMES

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

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 Co-ordinator
 MRS. G. BRINDHA Name & Signature of the Staff	 DR. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
COIMBATORE - 641 028.

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BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type :	SEC	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU04	Course Title						Batch:	2020-2021 and onwards
		Allied: Practical II - CHEMISTRY						Semester	I
Hrs/Week:	4	L	-	P	3	T	1	Credits:	2

Course Objectives

1. To understand the basic concepts of volumetric analysis
2. To enlighten basic mechanism of detection of elements
3. To learn the distinguishing characteristics of aliphatic and aromatic compounds
4. To explore saturated and unsaturated properties of chemical compounds

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the concepts of volumetric analysis; molarity, molality, normality and concentration.	K1
CO2	Explain the concept for estimation of Nitrogen, Halogen, and Sulphur	K2
CO3	Illustrate the standardization of protocol for aliphatic and aromatic compounds	K3
CO4	Identify the various experimental methods for exploring saturated and unsaturated compounds	K4
K1- Remember; K2- Understand; K3-Apply; K4- Analyze		

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Code	Subject Name	Semester
20BTU04	ALLIED: PRACTICAL II - CHEMISTRY	I
Topics		
Chemistry Volumetric Analysis 1. Estimation of Hydrochloric Acid- Standard Oxalic Acid. 2. Estimation of Ferrous Sulphate - Standard Mohr Salt Solution. 3. Estimation of Potassium Permanganate - Standard Sodium Hydroxide Organic Analysis 4. Detection of Elements (N, S, Halogens). 5. To distinguish between Aliphatic and Aromatic. To distinguish between Saturated and Unsaturated. 6. Functional group tests for Phenols, Dicarboxylic Acids, Aromatic Primary Amine, Diamide, Carbohydrate. 7. Functional groups characterized by Confirmatory Test		48

Distribution of marks for Practical: (IE 40; EE 60)

Teaching methods: Demonstration, Lecturing, PowerPoint Projection through LCD, Discussion and Activity.

REFERENCE BOOKS

1. Venkateswaran, V. Veeraswamy R. and Kulandaivelu. A.R, 2017, "Basic Principles of Practical Chemistry", Revised Edn., Sultan Chand and Sons, New Delhi.
2. B.K Sharma, 2005, Instrumental Methods Of Chemical Analysis 24th Edn., GOEL Publishing House

WEB SOURCES: SWAYAM

WEB LINKS:

1. www.bbc.co.uk/bitesize/guides/ztkdd2p/revision/4
2. www.sciencedirect.com/.../carboxylic-acid

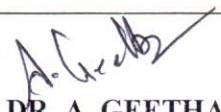

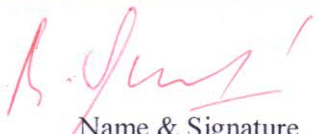
Mapping of Outcomes

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

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 Co-ordinator
 DR. A. GEETHA Name & Signature of the Staff	 DR. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
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BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type:	DSC	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU05	Course Title						Batch:	2020-2021 onwards
		BIOTECHNIQUES						Semester:	II
Hrs/Week: 5		L	5	T	-	P	-	Credits:	5

Course Objectives

1. To learn the concepts of laboratory instructions and metric system concepts
2. To explore different microscopic techniques and analytical balance in various fields
3. To know the principles and applications of spectroscopy in environmental and biomedical fields
4. To study the chromatography, electrophoresis techniques and their applications in biomedical sciences

S.No	COURSE OUTCOME	BLOOM S LEVEL
CO1	Remember the concepts of laboratory instructions and learn the metric system concepts	K1
CO2	Understand to analyse different microscopic techniques and learn the analytical balance in various fields.	K2
CO3	Apply the principles and applications of spectroscopy in environmental and biomedical fields	K3
CO4	Analyse the chromatography, electrophoresis techniques and their applications in biomedical sciences	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse;		

SYLLABUS

Code	Subject Name	Semester
20BTU05	BIOTECHNIQUES	II
Unit No.	Topics	Hours
I	Laboratory Safety and Units in Measurement Safe Use of Laboratory equipment – Electrical equipment, Personal protection – Hazards and Corrosive substances in laboratory, Ionising radiation, Waste disposal and First Aid, The Metric systems – Conversion of Units – Units used in Preparation of Solutions – Units used in laboratory calculations – Ratios and dilution	12
II	Microscopy, Balance and pH meter Historical Development of Microscope – Components of a microscope – Working principle of bright field microscope, polarizing microscope and confocal microscope. Analytical Balance – Single Pan and Double Pan analytical balance – Physical Balance – Triple Beam Single Pan Balance and Double Pan Balance. pH meter – Principle, calomel electrode, glass electrode, combined electrode – operation and applications of pH meter	12
III	Centrifugation, Chromatography, Osmometry Basic principles of Sedimentation – sedimentation coefficient – types of centrifuges – bench, high speed and ultracentrifuges – types of centrifugation – analytical and ifugation. Chromatography – Principle and applications of Paper, Thin layer, Column and Ion Ex Chromatography. Osmometry – Vant Hoff's law of osmotic pressure – Determination of osmotic pressure – Types of Simple osmometers – Applications of osmometry.	12
IV	Colorimetry and Spectroscopy Colorimetry – Beer Lamberts law – applications. Spectrophotometry – Principle and applications of UV- Visible spectroscopy, Flame photometry and Fluorimetry. Mass Spectroscopy - principle and applications of GC MS.	12
V	Manometry, Radio – isotope Techniques and Biosensors Manometry – Types of manometers – manometers used for measurement of oxygen in tissue or animal – Warburg manometer. Radioisotopes – applications of radioisotopes – radio techniques – detection and measurement of radio. Biosensors – components of biosensors – types of biosensors – applications in healthcare and environmental issues.	12
Total		60

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Videos, Assignment, Discussion and Activity .

TEXT BOOK:

1. Veerakumari, L., 2015, "Bioinstrumentation", 1st Edn., MJP Publishers, Chennai.
2. Abhilasha Shourie, Shilpa S., Chapadgaonkar, 2017, Bioanalytical Techniques, 1st Edition, The Energy and Resources Institute, TERI.

Reference Books:

1. Boyer Rodney F., 2020, "Modern Experimental Biochemistry", 2nd Edn., Benjamin Cummings Publication, Sydney.
2. Wilson and Walker's, 2017, Principles and Techniques of Biochemistry and Molecular Biology, 8th Edn., Andreas Hofmann, Samuel Clokie. Cambridge University Press.
3. S. M. Khopkar, 2016, Instrumental Methods in Bioanalytical Chemistry, 1st Edn., New Age International Private Limited.

WEB RESOURCES: Automation forum, Courseera, lab training.**WEB LINK:**


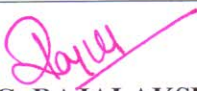
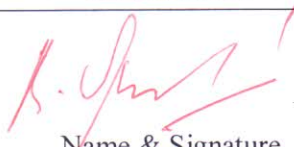
1. <https://automationforum.in/t/free-online-instrumentation-courses/4783>
2. <https://www.coursera.org/learn/spectroscopy>
3. <https://lab-training.com/2011/12/20/free-e-courses/>
4. <https://www.coursera.org/lecture/forensic-science/week-2b-1-introduction-to-chromatography-MSip0>

PO CO	PO1	PO2	PO3	PO4
CO1	S	M	L	M
CO2	S	S	L	L
CO3	S	M	M	M
CO4	S	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 Co-ordinator
 Mrs G. BRINDHA Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
 HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
 COIMBATORE - 641 028.

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

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type:	GE	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU06	Course Title						Batch:	2020-2021 onwards
		ALLIED II – BIOCHEMISTRY						Semester:	II
Hrs/Week: 4		L	4	T	-	P	-	Credits:	3

Course Objective

1. To study the foundation for biochemical aspects of cellular functions which forms a base for their future studies
2. To explore the structures and functions of biomolecules that form the basis of what we understand to be living organisms
3. To know the principles of biochemical pathways which regulate the cellular mechanism
4. To identify the different aspect of metabolism and biosynthesis of bio molecules in regulatory functions

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the foundation in the biochemical aspects of cellular functions which forms a base for their future studies.	K1
CO2	Understand the structures and functions of biomolecules that form the basis of what we understand to be living organisms.	K2
CO3	Apply the principles of biochemical pathways which regulate the cellular mechanism.	K3
CO4	Analyse and create the aspect of metabolism and biosynthesis of bio molecules in regulatory functions.	K4
K1-Remember; K2- Understand; K3-Apply; K4-Analyse		

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

SYLLABUS

Code	Subject Name	Semester
20BTU06	ALLIED II – BIOCHEMISTRY	II
Unit No.	Topics	Hours
I	Atoms, Chemical bonds and Biomolecules Atomic theory – Valency - Atomic weight - Molecular weight - Molarity. Chemical Bonding – Le theory & Kos theory. Types of chemical bonding: Ionic, Covalent, Hydrogen and Polar bond, Vanderwaals interaction. Physical properties of water. Structure of Water Molecules, Role of water in life - Properties and Ionization of Water. pH-Buffer Lowry concept of acids and bases and Buffers-Henderson Hassel Balas equation & Biological buffer systems.	10
II	Biomolecules- Carbohydrates and Proteins Carbohydrates: Classification-Simple & Complex, Structure and Biological Functions - Physical and Chemical Properties. Proteins: General Structure and Classification of Amino Acids & Peptides- Classification Proteins –Structure of Proteins Primary – Secondary - Tertiary and Quaternary – Physical and Chemical properties of proteins	10
III	Enzymes and Nucleic Acid IUB Classification and Nomenclature of Enzymes –Characteristics and Three-Dimensional structure. Mechanism of enzyme action, Modifiers of enzyme activity, Allosteric enzymes. Nucleic Acids: DNA -Structure, Denaturation & Renaturation, RNA-Structure & Types, Informosome. Functions of nucleic acid.	10
IV	Organic Compound-Lipid Lipids –General Structure, Biological role of lipids, Classification-Simple, Compound & Derived lipids, Physical properties of fats & Oils, Quantitative test. Functions of lipids in biological system.	9
V	Metabolism & Biosynthesis Metabolism-Definition, Metabolic Pathways-Catabolic & Anabolic pathways, Difference between catabolism & anabolism, Anaplerotic pathway. Regulation of metabolic pathways. Biosynthesis -of purines & pyrimidines-Denovo synthesis & Salvage pathway.	9
Total		48

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Videos, Assignment, Discussion and Activity.

TEXT BOOK:

1. Jain, J. L., Sunjay Jain, Nithin Jain, 2016, *Fundamentals of Biochemistry*, 7th Edn., S. Chand and Company, Ltd. New Delhi.

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

2. *Principles of Biochemistry – Smith et al., McGraw – Hill International book Company, 8th Edition, 2003*

Reference Books

1. *Harper's Biochemistry – R.K.Murray, D.K.Granner, P.A.Mayes and V.W Rodwell, Prentice-Hall International, 2015*
2. *Biochemistry (VIth Ed.) – J.M Berg; J.L.Tymoczko and L.Stryer, W H Freeman and Company, NY, 2016*
3. *Biochemistry (3rd Edition) - Christopher K. Mathews, Kensal E. van Holde, Kevin G.Ahern, Pearson Education, 2017*

WEB RESOURCES: Swayam, NPTEL, Harvard, edx

WEB LINK:




1. https://onlinecourses.swayam2.ac.in/cec19_bt02/preview
2. https://onlinecourses.nptel.ac.in/noc20_cy10/preview
3. <https://online-learning.harvard.edu/course/principles-biochemistry-1?delta=0>
4. <https://www.edx.org/learn/biochemistry>

PO \ CO	PO1	PO2	PO3	PO4
CO1	S	M	M	L
CO2	S	S	M	L
CO3	S	S	L	L
CO4	S	S	L	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 Co-ordinator
 Dr. D. BHARATHI Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
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Co-ordinator
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 Hindusthan College of Arts & Science,
 Coimbatore-641 028.

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type:	DSC	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU07	Course Title						Batch:	2020-2021 onwards
		PRACTICAL III - BIOTECHNIQUES						Semester:	II
Hrs/Week: 4		L	-	T	1	P	3	Credits:	2

Course Objective

1. To gain knowledge on handling and critical analysis of various laboratory equipments
2. To understand the characteristics and principles of Colorimetry: Beer's law
3. To explore the various separation techniques for identification and quantification
4. To enrich with contemporary sophisticated equipment and able to elucidate and characterize their essential features and principle

COURSE OUTCOMES (CO)

S.NO	COURSE OUTCOME	BLOOMS LEVEL
CO1	Knowledge on handling and critically analysis of various Laboratory Equipments: Laminar Air Flow, Air Oven, Weighing balance, and preparation of buffers	K1
CO2	Understanding the characteristics and Principles of Colorimetry: Beer's law	K2
CO3	Demonstrate various separation techniques, identification, and quantification	K3
CO4	Students enrich themselves with contemporary sophisticated equipment and able to elucidate and characterize their essential features and principle	K4
K1-Remember; K2- Understand; K3-Apply; K4-Analyse		

SYLLABUS

Course code	Subject Name	Semester
20BTU07	PRACTICAL III - BIOTECHNIQUES	II
	Topics	
	1. Working principle of Laboratory Equipment: Autoclave, Incubator, Laminar Air Flow, Hot Air Oven, Weighing balance. 2. Preparation of Buffers 3. Determination of pH using pH meter. 4. Principles of Colorimetry & Spectrophotometry 5. Separation of Amino acids by paper chromatography. 6. Thin Layer chromatography 7. Distillation Unit- Demonstration 8. HPLC- Demonstration 9. GC-MS – Demonstration 10. Flame photometry- Demonstration	48

Distribution of marks for Practical: (IE 40; EE 60)

Teaching methods: Demonstration, Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity

REFERENCE BOOKS:

1. Boyer Rodney F., 2020, "Modern Experimental Biochemistry", 2nd Edn., Benjamin Cummings Publication, Sydney.
2. Wilson and Walker's, 2017, Principles and Techniques of Biochemistry and Molecular Biology, 8th Edn., Andreas Hofmann, Samuel Clokie. Cambridge University Press.
3. S. M. Khopkar, 2016, Instrumental Methods in Bioanalytical Chemistry, 1st Edn., New Age International Private Limited.

WEB RESOURCES: NIL

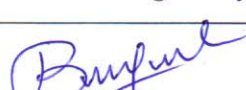
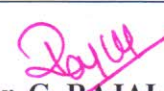
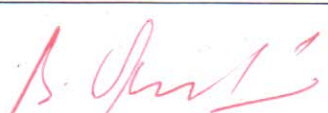
Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	L
CO2	S	M	L	M
CO3	S	M	S	L
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 Co-ordinator
 Mrs. G. BRINDHA Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

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BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Course type:	SEC	Programme Title: Bachelor of Science in Biotechnology							
Course Code:	20BTU08	Course Title						Batch:	2020-2021 onwards
		Allied: Practical IV - BIOCHEMISTRY						Semester:	II
Hrs/Week: 3		L	1	T	-	P	2	Credits:	2

COURSE OBJECTIVE

1. To understand the basic techniques involved in estimation of Aminoacids and Proteins
2. To learn the basic principle for quantitative estimation of Nucleic acids
3. To comprehend the methods involved in estimation of sugar and analysis of oil
4. To gain insights on the estimation of macro elements i.e. calcium and inorganic phosphate and explore key role of analytical separation techniques in biological experiments

COURSE OUTCOME:

CO1	Describe the estimation procedure for Aminoacids and Proteins from biological samples.	K1
CO2	Outline the biochemical method involved in estimation of nucleic acids	K2
CO3	Use the appropriate procedure for estimation of sugars and assessment of oil to determine adulteration	K3
CO4	Investigate the basic principle involved in identification of nutritional deficiency for calcium and inorganic phosphate	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

SYLLABUS

Code	Subject Name	Semester
20BTU08	Allied: Practical IV- BIOCHEMISTRY	II
	Topics	
Biochemistry <ol style="list-style-type: none"> 1. Estimation of Protein by Lowry's method. 2. Estimation of DNA by DPA Method. 3. Estimation of RNA by Orcinol method. 4. Estimation of Sugars by Anthrone method. 5. Estimation of amino acids by Ninhydrin method. 6. Analysis of Oils- Iodine Number - Saponification Value - Acid Number. 7. Estimation of Calcium 8. Estimation of inorganic phosphate by Subbarow method 9. Ion Exchange Chromatography-Demo 10. Gel permeation Chromatography-Demo 		48

Distribution of marks for Practical: (IE 40; EE 60)

Teaching methods: Demonstration, Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity

Reference Books:

REFERENCE BOOKS:

1. J. Jayaraman, 2011, *Laboratory Manual in Biochemistry, 5th Edn., Willy Eastern.*
2. S. Sadasivam and A. Manickam, 2009, *Biochemical Methods, 3rd Edn., New age publishers*

WEB RESOURCES: Nil

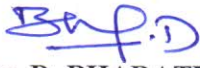


Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	S	L	L
CO3	S	S	M	M
CO4	S	S	L	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 Co-ordinator
 Dr. D. BHARATHI Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
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Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

BOS meeting approved

Approved in 6th Academic Council meeting on: 04.08.2020

Programme Code:	DSC	Programme Title: Bachelor of science in biotechnology							
Course Code:	20BTU09	Course Title					Batch:	2020-2021	
		MICROBIOLOGY					Semester:	III	
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To remember the concepts of basic principle of microscopy and cultivation of microorganisms, its staining protocols, their classification and its pathology
2. To understand the composition of different cellular components of various microorganisms and their growth kinetics
3. To provide insights on viral replication, its cultivation assays and the various factors affecting the growth of microorganisms
4. To learn the concept of structural studies using electron microscopy, nutritional classification of microbes and microbial pathogenesis caused in humans and plants

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recognize the basic principle of microbiology like microscopy, cultivation of microorganisms, staining, classification and its pathology	K1
CO2	Predict the different components of microbial cells, its structure, functions and also the growth kinetics	K2
CO3	Explain viral replication and cultivational assays, various culture systems and the factors affecting the growth of the microorganisms	K3
CO4	Evaluate the microbial structures in electron microscopy and diseases caused by them to humans and plants and the way to control them	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse;		

Syllabus

Code	Subject Name	Semester
20BTU09	MICROBIOLOGY	III
Unit No.	Topics	Hours
Unit I	Fundamentals of Microbiology History and scope of Microbiology – Five-kingdom and three-kingdom classification, Bergey's, Molecular and Phylogenetic classifications. Bright field, dark field, phase contrast, Confocal Scanning Laser Microscope (CSLM) and Electron Microscopes Scanning tunneling Microscope – Atomic force Microscope.	9
Unit II	Structure and Characteristics of Bacteria and Viruses Bacteria - Shape and Structure, Composition - Gram Negative and Gram-Positive Cell Wall; Flagella: Structure – Types – Functions. Virus structures, animal and plant viruses. Virus structure and morphology, Viral multiplication, Attachment, entry, un-coating, replication, assembly, release, Cell transformations, Cultivation of viruses-Assay techniques	10
Unit III	Growth Kinetics and Identification Growth phases - Generation time. Kinetics of growth, Batch culture. Continuous culture. Synchronous culture. Physical factors influencing growth - Temperature. pH, osmotic pressure, salt concentration. Staining of cells-Auxochrome; Chromophores; Acidic and Basic dyes; Classification of stains; Simple and differential staining procedures Gram staining; acid fast staining, endospore staining, negative staining, capsule staining; and flagella staining.	10
Unit IV	Microbial Nutrition and Culturing Techniques Microbial Nutrition, nutrition uptake by cells-Nutritional types – Photoautotrophs, Photo- organotrophs, Chemo-organotrophs Chemo-lithotrophs. Effects of oxygen on growth, Classification on the basis of oxygen requirement and tolerance. Culture media and its types. Pure Culture Techniques – plating methods Preservation of microbes. Control of growth of Microbes-Sterilization-Physical and Chemical Methods.	10
Unit V	Microbial and Plant pathology Disease caused by bacteria to humans- <i>Salmonella typhi</i> - <i>Mycobacterium tuberculosis</i> - <i>Streptococcus pneumoniae</i> – <i>Yersinia pestis</i> - <i>Clostridium tetani</i> . Disease caused by virus to humans and Plants – <i>HIV</i> , <i>HSV-TMV</i> , <i>Gemini virus</i> . Disease caused by fungus to humans and plants – <i>Candida albicans</i> - <i>Phytophthora infestans</i> . Plant Diseases - i) Citrus Canker ii) Tikka disease of groundnut iii) Bacterial Blight of Pomegranate: Common symptoms produced by plant pathogens, Modes of transmission of plant diseases	9

Distribution of marks for Theory :(IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS:

1. Joanne Willey, Kathleen Sandman, Dorothy Wood. 2019. Prescott's Microbiology
2. Presscott L.M, Harley J.P and Klein D.A, "Microbiology", McGraw-Hill Education.
3. Ananthanarayan and Panicker 2009- 'TextBook of Microbiology'; Eighth Edition, Universities Press.

4. *Brock Biology of microorganisms*(2019), Fifteenth Edition, Global Edition by Madigan, Bender, Buckley, Sattley, Stahl, Pearsons Education ISBN 10: 1-292- 23510-1 ISBN 13: 978-1-292-23510-3

REFERENCE BOOKS:

1. *Environmental Microbiology* (2015), Third edition, I.L. Pepper, C.P. Gerba and Terry J. Gentry. Elsevier Publication, New Delhi, India.
2. *Microbial Technology* (2004) by H. J. Peppler and D. Perlman, second edition, Elsevier, academic press.
3. *Dubey R.C and Maheshwari D.K, 2002-'A Textbook of Microbiology'; Seventh Edition, S.Chand& Company Ltd.*
4. *Gerard J. Tortora, Berdell R. Funke., Christine L. Case.m Derek Weber., Warner B. Bair Microbiology: An Introduction, 13th edition, Published by Pearson. 2016*
5. *Medical Microbiology* (1997) by D. Greenwood, R. Slack and J. Peutherer, ELST with Churchill Livingstone, Hong Kong

WEB RESOURCES: NPTEL, SWAYAM, COURSERA

WEB LINK:

1. <https://nptel.ac.in/courses/102/103/102103015/>
2. <https://nptel.ac.in/courses/102/103/102103015/>
3. <https://www.coursera.org/lecture/stories-of-infection/introduction-to-microbiology-clinical-presentation-0tMM2>

MAPPING OF OUTCOMES

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

S - Strong; M-Medium

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. S. G. ANTONY GODSON Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
 HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
 COIMBATORE - 641 028

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

BOS meeting approved:

Approved in 76 Academic Council meeting on 24.08.2021

Programme Code:	DSC	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU10	Course Title						Batch:	2020-2021
		MOLECULAR BIOLOGY						Semester:	III
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To acquire knowledge on DNA as genetic Material, and its replication, concepts of RNA, Genetic code and various transposable elements.
2. To understand method and experiments for evidence of genetic material and mechanism involving Transcription and Translation also explaining about gene regulation.
3. To provide an outline on mechanism of DNA damage and its repair, wobble hypothesis and mechanism of recombination.
4. To learn the inhibitors of DNA replication, RNA synthesis, Translational process, genome organization, gene regulation in prokaryotes and eukaryotes, recombination models and transposons.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	State the significance of DNA as a genetic material, and steps involved in DNA replication, Basic concepts of RNA, Genetic code, Mutagens and transposable elements.	K1
CO2	Discuss the different experiments for evidence of genetic material, mechanism of transcription; role of RNA polymerase and translational mechanisms, Different ribosomes, types of mutations and levels of gene regulation.	K2
CO3	Interpretation on DNA replication, different types of transcription, Wobble hypothesis, the study of DNA damage due to mutation and their repair mechanisms and mechanism of recombination.	K3
CO4	Examine and defend the inhibitors of DNA replication, RNA synthesis, Different steps in translation, the chromosomal gene organization, expression and its regulation in prokaryotes and Eukaryotes and also Various models of recombination and transposons	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

SYLLABUS

Code	Subject Name	Semester
20BTU10	MOLECULAR BIOLOGY	III
Unit No.	Topics	Hours
Unit I	DNA as Genetic Material and DNA replication Overview of Central dogma. Organization of prokaryotic and eukaryotic chromosomes. Evidences for DNA as Genetic Material – Griffith Experiment, Hershey and Chase experiment. Experimental proof of DNA replication: Meselson & Stahl experiment. Steps involved in DNA replication - Initiation, Elongation and Termination. Telomerase in eukaryotic replication. D-loop and theta rolling circle mode of replication, Inhibitors of DNA replication.	10
Unit II	Transcription Structure and function of mRNA, rRNA and tRNA. RNA synthesis: Initiation, elongation and termination of RNA synthesis, Proteins of RNA synthesis, Fidelity of RNA synthesis, Inhibitors of transcription, Differences in prokaryotic and eukaryotic transcription. Basic concepts in RNA world: Ribozymes, RNA processing: 5'-Capping, Splicing-Alternative splicing, Poly 'A' tail addition and base modification	10
Unit III	Translation Introduction to Genetic code: Elucidation of genetic code, Codon degeneracy, Wobble hypothesis and its importance, Prokaryotic and eukaryotic ribosomes. Steps in translation: Initiation, Elongation and termination of protein synthesis. Inhibitors of protein synthesis. Post-translational modifications and its importance.	10
Unit IV	DNA Damage and Repair DNA mutations and their mechanism – Molecular Basis of Mutation - Spontaneous and Induced mutations. Mutagens, Mutations Induced by physical and chemical agents- Screening of chemicals for Mutagenicity: Ames Test. Various types of repair mechanisms – Photo reactivation, Base Excision repair, Nucleotide Excision Repair and Mismatch repair.	9
Unit V	Regulation of Gene Expression Organization of genes in prokaryotic and eukaryotic chromosomes, Hierarchical levels of gene regulation – lac operon, Mechanism of Recombination – Homologous Recombination – Holliday Model, Asymmetric Strand – transfer Model – Transposable elements – Insertion sequences – transposable elements in Maize	9

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Videos, Assignment, Discussion and Activity.

TEXT BOOK:

1. David Freifelder, 2005, "Molecular Biology", 2nd Edn., Narosa Publishing House, New Delhi.

REFERENCE BOOKS:

1. Gardner and Simmons, 2015, "Principles of Genetics", 7th Edn., Wiley Press.

2. Klug William S. and Cummings Michael R, 2014, *Concept of Genetics*, 11th Edn., Pearson publishers, UK.
3. Robert F. Weaver, 2003, *"Molecular Biology"* 2nd Edn., Tata McGraw-Hill.
4. Gerald Karp and Nancy L Pruitt, 2005, *"Cell and Molecular Biology: Concepts and Experiments"* 4th Edn., John Wiley.
5. David Friefelder and George M. Malacinski, 1993, *"Essentials of Molecular Biology"*, 2nd Edn., Panima Publishing.

WEB RESOURCES: Swayam

WEB LINK:

1. https://onlinecourses.swayam2.ac.in/cec20_ma13/preview




MAPPING OF OUTCOMES

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

S-Strong, M- Medium

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. D. BHARATHI Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
 HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
 COIMBATORE - 641 028.

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

Programme Code:	GE	Programme Title: Bachelor of Biotechnology							
Course Code:	20BTU11	Course Title						Batch:	2020-2021
		Allied III-BIOSTATISTICS						Semester:	III
Hrs/Week:	4	L	4	T	-	P	-	Credits:	3

COURSE OBJECTIVE:

1. To learn and understand the basic concept of statistics and its applications.
2. To study various method for solving Measures of Central Tendency and Dispersion.
3. To acquire the knowledge about relationship between the variables.
4. To gain knowledge about Sampling Distributions and Random Block Design.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Examine the knowledge of statistical methods and its applications.	K4
CO2	Classify and solve the Measures of central tendency and Dispersion	K2 & K3
CO3	Solve the problems in relationship between the variables	K3
CO4	Analyze the concept of Sampling Distribution and Random Block Design	K4
K1- Remember, K2- Understand, K3- Apply, K4- Analyze.		

SYLLABUS

Code	Subject Name	Semester
20BTU11	Allied III - BIostatistics	III
Unit No.	Topics	Hours
I	Concept of Statistics Nature and Scope of Statistical methods and their limitations – Data collection – Classification and Tabulation – Primary and Secondary data and their applications in life sciences – Diagrams– Line diagram, Bar diagram and Pie diagram – Graphical presentation – Histogram and Ogives - Application of Statistics in Daily Life.	10
II	Measures of Central Tendency and Dispersion Measures of central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean - Measures of Dispersion – Significance of measuring variation – Properties of a good measure of variation – Methods of studying variation – Application: Measures of Central Tendency and Measure of Variation.	10
III	Correlation and Regression Correlation – Meaning and Definition – Scatter diagram, Karl Pearson's co-efficient of Correlation, Properties of the co-efficient of correlation- Spearman's Rank Correlation, Co-efficient of Concurrent deviation. Regression Analysis – Meaning of regression – Regression in two variables – Uses of Regression- Difference between correlation and Regression Analysis - Application: Uses of Correlation in Statistics.	10
IV	Sampling Distribution Concept of Sampling Distribution – Standard error – Tests of significance based on Normality, 't', 'F' and Chi square distributions - Application : Random Samples –Sampling Distribution of the mean.	9
V	Classification and Experimentation Analysis of Variance – One way and Two way Classifications – Completely Randomized Design and Randomized Block Design – Application : Analysis of Variance (ANOVA).	9
Questions related to Applications have been included in internals only and excluded in Semester questions		

Note: Distribution of marks: Problems 70%, Theory 30 %

Teaching methods:

Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activities

TEXT BOOKS

1. Dr S.P Gupta, "*Statistical Methods*", Sultan Chand & Sons Publishers, New Delhi .

Unit-I : Volume I-Chapter 1, 3,5 & 6 (Page No.2 -19,40 – 61,92 – 95, 109 – 113, 128 – 153, 166 -176)

Unit-II : Volume I-Chapter 7&8 (Page No. 178 -205, 212 - 226, 232 – 235, 268 – 276, 282 - 289)

BOS meeting approved:

Approved in 7th Academic Council meeting on: 24.08.2021

Unit-III: Volume I-Chapter 10 &11 (Page No. 381 – 390, 404 – 412,441 - 446)

Unit-IV: Volume II-Chapter 3, 4&5 (Page No. 890 – 901, 911- 915, 954 – 970, 1006 - 1009)

Unit-V: Volume II-Chapter 5&6 (Page No. 1011 – 1030, 1040-1043)

REFERENCE BOOKS

1. *Sundar Rao P.S.S., Richard.J., "An Introduction to biostatistics a manual for students in health sciences" Prentice Hall & India.*
2. *N.Gurumani , "An Introduction to Bio-Statistics", MJP Publishers.*

WEB RESOURCES

Web Link:

https://books.google.com/books/about/A_Textbook_Of_Biostatistics.html?id=RzpFKbU62u4C

Applications Links:

UNIT-I: <https://www.youtube.com/watch?v=HUThHJ6E3rY>

UNIT-II: <https://youtu.be/E6jNADpaY2Q>

UNIT-III: <https://www.youtube.com/watch?v=yceCyfncBY0>

UNIT-IV: <https://youtu.be/UNDju3vphEE>

UNIT-V: <https://youtu.be/RgKy7URFx1c>


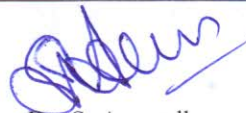

MAPPING WITH PROGRAM OUTCOMES

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

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 Co-ordinator
 S. KARUNALAKSHMI Name & Signature of the Staff	 Dr. S. Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA
 M.Sc., M.B.A., M.Phil., PGDCA, Ph.D.
 Professor & Head,
 PG & Research Dept. of Mathematics
 Hindusthan College of Arts & Science,
 Coimbatore - 641 028

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

Programme Code:	SEC	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU12	Course Title						Batch:	2020-2021
		PRACTICAL V - MICROBIOLOGY AND MOLECULAR BIOLOGY						Semester:	III
Hrs/Week:	4	L	-	T	1	P	3	Credits:	2

COURSE OBJECTIVES

1. To understand the basic concept of isolation, identification and culture techniques of bacteria.
2. To learn the method and measurement of bacterial growth in different environmental conditions and manifesting their antibiotic sensitivity
3. To provide experimental knowledge on isolation and quantification of Plasmid DNA from bacteria and Genomic DNA from bacteria and plant
4. To explore method of gene transfer such as conjugation, transformation

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall the basic microbiological laboratory techniques, isolation, identification and culture techniques of bacteria	K1
CO2	Explain the concept of bacterial growth and its effect on pH and temperature as well as to explore drug sensitive organism using Kirby Bauer method	K2
CO3	Examine the method of isolation and quantification of Genomic and Plasmid DNA	K3
CO4	Analyse mechanism involved in conjugation and transformation techniques.	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

Syllabus

Code	Subject Name	Semester
20BTU12	PRACTICAL V - MICROBIOLOGY AND MOLECULAR BIOLOGY	III
S. No	Topics	Hours
1	Microbiology: Media Preparation and Sterilization	3
2	Isolation and Enumeration of Microorganism from soil, water and food sample	5
3	Pure Culture Techniques	2
4	Staining Techniques – Simple Staining, Gram's Staining, Endospore Staining and Lacto phenol Cotton Blue Staining.	3
5	Biochemical Identification using IMVIC test.	5
6	Motility Test by Hanging Drop Method.	2
7	Measurement of Bacterial Growth (by turbidity method) – Effect of temperature and pH on bacterial growth	5
8	Antibiotic Sensitivity Test by Kirby Bauer method	5
9	MOLECULAR BIOLOGY: Isolation of genomic DNA from bacteria and plant	6
10	Isolation of plasmid DNA from bacteria by salt lysis method.	5
11	Quantification of DNA (UV/ Vis).	2
12	Transfer of genetic material through bacterial conjugation	3
13	Bacterial transformation	2
Total		48

Distribution of marks for Theory: (IE 40; EE 60)

Teaching methods: Demonstration, Hands-On training, PowerPoint Projection through LCD, Discussion and Activity.

REFERENCE BOOKS

1. J.G. Cappuccino and N. Sherman, 2014, *Microbiology: A Laboratory Manual 10th Edn.*, Addison-Wesley.
2. Miller, J.H., 1992, *A Short Course in Bacterial Genetics*, 1st Edn., CSH Press.
3. Murray, R.G.F., Wood, W.A. and Krieg, N.B., 1994, *Methods for General and Molecular Bacteriology*, 2nd Edn., Wiley Publications.
4. Snyder, L., Peters, J.E., Henkin, T.M. and Champness, W., 2013, *Molecular Genetics of Bacteria* 4th Edn., Wiley Publications
5. Clark, D.P. and Pazdernik, N. J., 2014, *Cell and Molecular Biology*, 4th Edn., Academia Press.

WEB RESOURCES: Nil

WEB LINK: Nil

MAPPING OF OUTCOMES

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

S - Strong; M-Medium



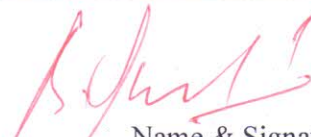
WEB RESOURCES: NPTEL, SWAYAM, COURSERA

WEB LINK:

1. <https://nptel.ac.in/courses/102/103/102103015/>
2. <https://nptel.ac.in/courses/102/103/102103015/>
3. <https://www.coursera.org/lecture/stories-of-infection/introduction-to-microbiology-clinical-presentation-0tMM2>

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. S. G. ANTONY GODSON Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY,
HINDUSTHAN COLLEGE OF ARTS AND SCIENCE,
COIMBATORE - 641 028.

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

Programme Code:	DSC	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU14	Course Title						Batch:	2020-2021
		IMMUNOLOGY						Semester:	IV
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. Identify the basic concepts of immunology as it relates to human and animal health and to understand the fundamentals of immunology.
2. Understanding of immune system and its components, the defense mechanisms that can establish a state of immunity against infection, and Immune-related diseases.
3. Describe immunological response and how it is triggered and regulated includes innate immunity and acquired immunity.
4. To provide an overview of the interaction between the immune system and pathogens, distinguish various cell types involved in immune responses and associated functions

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall the basic concepts of immunology as it relates to human and animal health and to understand the fundamentals of immunology	K1
CO2	Outline the of immune system and its components, the defense mechanisms that can establish a state of immunity against infection, and Immune-related diseases	K2
CO3	Examine the immunological response and how it is triggered and regulated includes innate immunity and acquired immunity	K3
CO4	Explain the overview of the interaction between the immune system and pathogens, distinguish various cell types involved in immune responses and associated functions	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse;		

Syllabus

Code	Subject Name	Semester
20BTU14	IMMUNOLOGY	IV
Unit No.	Topics	Hours
Unit I	Overview of Immune system Historical Perspectives. Innate and acquired immunity. Cells of immune system – Haematopoiesis-T cells, B cells, Null cells. Organs of Immune system – Primary and Secondary lymphoid organs - classification and properties of antigens –haptens, adjuvants and cytokines	9
Unit II	Humoral and Cellular Immunity Development, maturation, activation, regulation, differentiation and classification of T-cells and B cells. Antibodies: structure and functions – Multigene organization of Ig genes, Monoclonal antibody production and application. Antigen-antibody reactions – Principle of precipitation and agglutination – Radial Immunodiffusion, Double Immunodiffusion, Immunoelectrophoresis, Hemagglutination, radioimmunoassay and ELISA.	10
Unit III	Major Histocompatibility Complex and Complement System MHC – general organization and inheritance – Class I and Class II molecules – Regulation of MHC expression – MHC and Immuno-responsiveness. Antigen presenting cells, antigen processing and presentation. Complement System – Functions – Complement activation – classical, alternate and lectin pathways – Biological consequences of complement activation	10
Unit IV	Immune Tolerance and Immunodeficiencies Immune tolerance –Mechanism of Immune tolerance. Autoimmunity, Autoimmune disorders – Organ specific and Systemic autoimmune diseases (Lupus erythematosus, Rheumatoid arthritis). Immunodeficiencies – Primary and Secondary Immunodeficiencies; Transplantation – Mechanism of graft rejection and types of grafting.	10
Unit V	Hypersensitivity Reactions and Vaccine Development Hypersensitivity reactions – Types I to IV reactions – Delayed and Immediate hypersensitive reactions. Vaccines – Active and Passive Immunization – Designing Vaccines for active immunization – Whole -organism vaccines-Synthetic vaccines – mRNA vaccines	9

Distribution of marks for Theory :(IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Discussion and Activity.

TEXT BOOKS:

1. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby, 2007, "Kuby Immunology", 6th Edn., W. H. Freeman.
2. David K. Male, Jonathan Brostoff, David E. Roth, and Ivan M Roitt, 2008, Immunology, 8th Edn., Elsevier.

REFERENCE BOOKS:

1. Ivan Riot, 2016, "Essentials of Immunology", 13th Edn., Wiley-Blackwell Scientific Publications.
2. Abul K. Abbas, Andrew Lichtman and Shiv Pillai, 2016, Cellular and Molecular Immunology, 9th Edn., Elsevier

MAPPING OF OUTCOMES

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




S - Strong; M-Medium

WEB RESOURCES: NPTEL, COURSERA**WEB LINK:**

1. <https://nptel.ac.in/courses/102/103/102103015/>
2. <https://www.coursera.org/lecture/stories-of-infection/introduction-to-microbiology-clinical-presentation-0tMM2>

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. U. SURIYAKALAA Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
 HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
 COIMBATORE - 641 028.

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

BOS meeting approved:

Approved in 7th Academic Council meeting on: 24.08.2021

Programme Code:	DSE	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU15 A	Course Title						Batch:	2020-2021
		Elective I: CLINICAL BIOTECHNOLOGY						Semester :	IV
Hrs/Week:	3	L	3	T	-	P	-	Credits:	3

COURSE OBJECTIVES

1. To gain knowledge on for laboratory safety measures and routine clinical tests for different samples like blood, body fluids cancer and malignant cells.
2. To provide insight on diagnostic methods and different types of examining procedures for all types of samples with its microbial and pathological identification of several diseases with the help of advanced equipment.
3. To gain insights clinical manifestation based on microbial, pathological and immunological diagnostic methodology for analyzing various specimens based on the symptoms and causes of the disease.
4. To develop analytical and clinical skills in hematology, serology, microbiology and pathological study and banking system for histological and cytological samples.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOMES	BLOOMS LEVEL
CO1	Describe the basics of clinical laboratory safety measures, and routine clinical tests for different samples like blood, body fluids cancer and malignant cells.	K1
CO2	Interpret the knowledge on different types of examining procedures for all types of samples with its microbial and pathological identification of several diseases with various modern and updated clinical diagnostic tests to examining the disease for human welfare	K2
CO3	Explaining the clinical manifestation of the biochemical, microbial and metabolic problems by examining diagnostic methodology for analyzing various specimen based on the symptoms and causes of the disease	K3
CO4	Investigate the Hematology, serology and clinical pathology specimen with various laboratory procedures and for analytical methods along with banking procedures.	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

Syllabus

Code	Subject Name	Semester
20BTU15 A	ELECTIVE I: CLINICAL BIOTECHNOLOGY	IV
Unit No.	Topics	Hours
Unit I	Haematology Laboratory Safety and First Aid - Routine Haematological Tests (e.g.: Complete blood count, Haemoglobin, cholesterol, Glucose, etc)– Special Haematological Tests – Blood Banking and Blood Transfusion Therapy- Hematology and Immunohematology studies.	7
Unit II	Serology Basic Serodiagnostics tests – Agglutination Test for Serodiagnosis – Serodiagnosis for Streptococcal Infection. – Immunological Test for Pregnancy. Direct and Indirect serological testing- Concept, general procedure and differences between direct and indirect testing. Basics of Qualitative and quantitative Serological tests.	7
Unit III	Clinical Pathology Urine analysis – Collection – Physical, Chemical and Microscopic Examination of Urine – Laboratory evaluation of Body Fluids like CSF – Synovial Fluid – Vaginal Discharge – Gastric Juices - Semen Analysis – Stool Examination.	7
Unit IV	Diagnostic Microbiology Laboratory Procedures in Microbiology, Quality Control in Microbiology– Identification of Pathogenic Microbes. Diagnosis of Sputum Specimen – Faecal Specimen – Urine Specimen – Body Exudates – CSF , Laboratory diagnosis of leprosy, fungal Diagnosis-Dermatocytosis- Subcutaneous-Mycosis.	7
Unit V	Other Diagnosis and Diagnostic Equipments Parasitic Examination of Stool Specimen – Histology and Cytology – Tissue Preparation – Staining of Tissues – Identifying Characteristics of Benign and Malignant Cells. Diagnostic Equipments: ECG – EMG – EEG – CT and MRI scans – X- Ray. Nuclear Medicines.	8

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Discussion and Activity.

TEXT BOOKS:

1. Kuby, R. A. Goldsby, Thomas J. Kindt and Barbara A. Osborne, 2002, *Kuby Immunology*, 6th Edn., W H Freeman Publication.
2. Brostoff, J., Seaddin, J. K., Male, D. and Roitt, I. M., 2002, *Clinical Immunology*, 6th Edn., Gower Medical Publishing.

REFERENCE BOOKS:

1. Betty A Forbes Daniel F Sahn, Alice S Weissfield, Bailey and Scott's, 2007. *Diagnostic Microbiology*, 12th Edn., Elsevier Mosby.

BOS meeting approved:

Approved in 7th Academic Council meeting on: 24.08.2021

2. Garry W. Procop et al., 2016, Color Atlas and Textbook of Diagnostic Microbiology, 6th Edn., Lippincott Williams and Wilkins

MAPPING OF OUTCOMES:

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

S - Strong; M-Medium

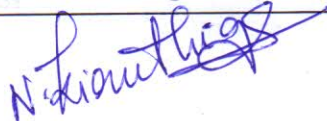


WEB RESOURCES: NPTEL, MOOC

WEB LINK:

1. <https://nptel.ac.in/courses/102/106/102106057/>
2. <https://www.mooc-list.com/tags/biotechnology>

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 Co-coordinator
 Mrs. N. KIRUTHIGA Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
COIMBATORE - 641 028.

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

Programme Code:	DSE	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU15 B	Course Title						Batch:	2020-2021
		Elective II: HUMAN PATHOLOGY						Semester:	IV
Hrs/Week:	3	L	3	T	-	P	-	Credits:	3

COURSE OBJECTIVES

- 1.To impart a fundamental theoretical knowledge on general aspects of different pathologies and disorders
- 2.To gain adequate and up-to-date knowledge on injuries, organs, deficiencies, blood related and biochemical properties.
- 3.To become conversant with the recent concepts of apoptosis, estimation to determine haemoglobin through different body fluids.
- 4.To impart knowledge on fluid accumulations in different organs through endocrine and nervous systems as well as serum and platelet assessment on coagulation.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	List the fundamental concepts of general pathology, Systemic pathology, Hematology, Chemical pathology, and Haematological Disorders	K1
CO2	Discuss types of cell injuries, cardiovascular, respiratory systems, deficiency and disorders for anemia, hemostasis and coagulation, leucocytes and platelets, alternations of biochemical parameters, and red cell indices.	K2
CO3	Examine the features of apoptosis, quantitative, qualitative and neoplastic haematology, body fluids in important diseases, free haemoglobin and test antibodies in serum	K3
CO4	Investigate the accumulation of body cells during degeneration and aging, kidney, lymphatic, endocrine and nervous systems, proliferation of cell by flow cytometry, and test for serum, platelet during defective coagulation.	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

SYLLABUS

Code	Subject Name	Semester
20BTU15 B	ELECTIVE II: HUMAN PATHOLOGY	IV
Unit No.	Topics	Hours
Unit I	General Pathology: Mechanism of cell injury, effects of sub lethal and lethal injury. Mechanism and relevance of apoptosis - Adaptations – in cells and tissues, intracellular accumulations, pigment accumulations, degenerations and aging	8
Unit II	Systemic Pathology: Cardiovascular Respiratory tract, Gastrointestinal system, Hepatobiliary system, Kidney and urinary tract, Lymph reticular system, Endocrine system, Nervous system	7
Unit III	Haematology: Anemia – deficiency, haemolysis and other causes. - Disorders of hemostasis and coagulation. - Disorders of leucocytes and platelets – quantitative, qualitative and neoplastic. Proliferations - Paraproteinemia and plasma cell disorders - Flow cytometry	7
Unit IV	Chemical Pathology: Alterations of biochemical parameters, hormones and other constituents in serum and other body fluids in important diseases. Planning, collection of specimen, principles, utility and interpretation.	7
Unit V	Haematological Disorders - Red cell indices - Free haemoglobin in plasma and urine - Tests for detection of antibodies in serum – complete and incomplete - Acid lysis test (Hams) - Serum electrophoresis - Platelet function test - Test for defective coagulation, DIC and coagulation inhibitors in blood	7

Distribution of marks for Theory: (IE 30; EE 70)

Teaching methods: Lecturing, PowerPoint Projection through LCD, Discussion and Activity.

TEXT BOOK:

1. Kim Suvarna, Christopher Layton and John Bancroft, 2012, *Bancroft's Theory and Practices of Histological Techniques*, 7th Edn., Elsevier.

REFERENCE BOOKS:

1. H. Fox and Mike Wells, 2003, *Haines and Taylor – Obstetrical and Gynaecological Pathology*, 5th Edn., Edinburgh : Churchill Livingstone.
2. J. Charles Jennette, Jean L. Olson, M.D. Schwartz, Melvin M. and Fred G. Silva, 2009. *Hepinstall's Pathology of the Kidney*, 6th Edn., Lippincott Williams & Wilkins
3. David E. Elder, 2014, *Lever's Histopathology of the Skin*, 11th Edn., Wolters Kluwer

MAPPING OF OUTCOMES

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

S - Strong; M-Medium; L-Low



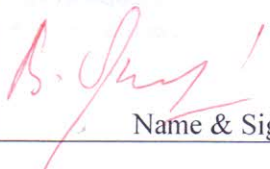
WEB RESOURCES: Mit open course ware, university of minasota

WEB LINK:

1. <https://ocw.mit.edu/courses/health-sciences-and-technology/hst-035-principle-and-practice-of-human-pathology-spring-2003/>
2. <https://med.umn.edu/pathology/education-training/online-course>

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. S. G. ANTONY GODSON Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

HEAD OF THE DEPARTMENT
 PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY
 HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
 COIMBATORE - 641 028.

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

Programme Code:	GE	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU16	Course Title					Batch:	2020-2021	
		Allied IV - PYTHON PROGRAMMING					Semester:	IV	
Hrs/Week:	4	L	4	T	-	P	-	Credits:	3

COURSE OBJECTIVE

- To understand why Python is a useful scripting language for developers.
- Learning to apply uses of lists, tuples, and dictionaries in Python programs..
- Explore the design and program in Python applications.,
- To learn how to design and solve problems using python.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.	K1
CO2	Associating the Dictionaries and keywords to form python programming Regular Expressions.	K3
CO3	Interpreting to apply proficiency in handling the Strings and File Systems.	K2
CO4	Programming, run and manipulate Python Programs using core data structures.	K4

SYLLABUS

Code	Subject Name	Semester
20BTU16	Allied IV - Python Programming	IV
Unit No.	Topics	Hours
I	PYTHON BASICS: Overview of Python -Basic of computers-Block diagram-Generation of computers-Types of programming- Downloading and Installing Python - Running Python. Sample programs -simple Python programs(Example- Hello world program.)	10
II	Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language. Scope and Lifetime of Variables, Default Parameters, Keyword Arguments	10
III	CONTROL FLOW: Conditionals: Boolean Values and Operators - Conditional (if), Alternative (if-else), Chained Conditional (if-elif-else). Iteration: State, While, For, Break, Continue, Pass. Strings: String Slices - String Functions and Methods - Lists as Arrays	9
IV	Values and Types: Int, Float, Boolean, String, and List; Variables – Expressions - Statements, Tuple Assignment - Precedence of Operators – Comments. Modules and Functions: Function Definition and Use, Flow of Execution, Parameters and Arguments. LISTS, TUPLES Lists: List Operations - List Slices - List Methods - List Loop – Mutability – Aliasing - Cloning Lists - List Parameters. Tuples: Tuple Assignment - Tuple as Return Value.	10
V	FILES: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Operations and Methods - Advanced List Processing - List Comprehension. Files and Exception: Text Files - Reading and Writing Files - Format Operator - Command Line Arguments.	9

Note: Distribution of marks for Internal Examination- 30 and for External Examination– 70

Teaching methods:

Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

- 1."A Practical Introduction to Python 3",David Amos, Dan Bader, Jonna Jablonski, Fletcher, fourth Edition.
2. "Learning python Powerful Object-oriented programming", O'Reilly Martz Lutz, fourth Edition

REFERENCE BOOK

1. "A Practical Introduction to Python Programming", Brian Heinold, Department of Mathematics and Computer Science Mount St. Mary's University, first Edition.

WEB RESOURCES

Web Link:

1. <https://static.realpython.com/python-basics-sample-chapters.pdf>
2. https://cfm.ehu.es/ricardo/docs/python/Learning_Python.pdf

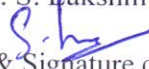

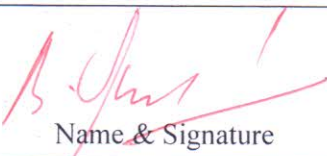
MAPPING WITH PROGRAM OUTCOMES

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

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN

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

Course Designed by	Verified by HOD	Approved by CDC Co-coordinator
Mrs. S. Lakshmi priya  Name & Signature of the Staff	Dr R Rangaraj  Name & Signature	 Name & Signature

Dr. R. Rangaraj
M.Sc.(CS), M.Phil., Ph.D., M.Sc(Psy).
Professor & Head,
PG & Research Dept. of Computer Science,
Hindusthan College of Arts & Science,
Coimbatore - 641 028.

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

Programme Code:	DSC	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU17	Course Title						Batch:	2020 - 2021
		PRACTICAL VI – IMMUNOLOGY AND CLINICAL TECHNOLOGY						Semester :	IV
Hrs/Week:	3	L	-	T	1	P	2	Credits:	2

COURSE OBJECTIVES

1. To learn the basic parameters of blood analysis, and estimation of Haemoglobin.
2. To give insights on basic principle behind Blood grouping and Rh typing
3. To perform qualitative and quantitative assessment on antigen and antibody interaction
4. To provide knowledge on human chorionic gonadotropin hormone present in urine sample

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the basic concept of blood component analysis	K1
CO2	Outline the various human hematological techniques	K2
CO3	Examine precipitation and agglutination reaction of antigen and antibody	K3
CO4	Analyse the role of human chorionic gonadotropin hormone level	K4
K1- Remember; K2- Understand; K3-Apply; K4-Analyse		

Syllabus:

Code	Subject Name	Semester
20BTU17	PRACTICAL VI – IMMUNOLOGY AND CLINICAL TECHNOLOGY	IV
S. No	Content	Hours
1	Preparation of serum from blood	3
2	Determination of Eosinophils	3
3	To perform total platelet count	3
4	Haemoglobin estimation by CMG (Cyanmethemoglobin) method	3
5	To perform bleeding time	3
6	To perform clotting time	3
7	Agglutination reaction - Blood grouping & Rh Typing – Cross matching demonstration	3
8	Dot ELISA	3
9	Serological Tests – WIDAL (Slide Test), ASO	3
10	Precipitation reaction – SRID Test	3
11	Human pregnancy test	3
12	Complement fixation test	3
Total		36

Distribution of marks for Theory :(IE 40; EE 60)

Teaching methods: Hands-On Training, PowerPoint Projection through LCD, Discussion and Activity.

REFERENCE BOOKS:

1. B Annadurai, 2008, *A Textbook of Immunology & Immuno Technology*, 1st Edn., S. Chand Publishing.
2. Sudha Gangal, 2007, *Principles and Practice of Animal Tissue Culture*. 2nd Edn., Universities Press.
3. Ed Harlow and David Lane, 2006, *Antibodies- A Laboratory Manual*, 2nd Edn., Panima Publishing Corporation.
4. Frank C. Hay Olwyn and M.R. Westwood, 2002, *“Practical Immunology”* 4th Edn., Blackwell Publishing Company.

MAPPING OF OUTCOMES

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

S - Strong; M-Medium

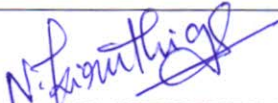

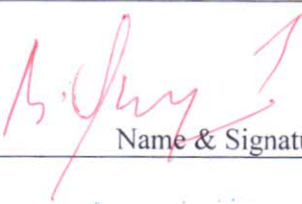
WEB RESOURCES: NPTEL, SWAYAM, COURSERA

WEB LINK:

1. <https://nptel.ac.in/courses/102/103/102103015/>
2. <https://nptel.ac.in/courses/102/103/102103015/>
3. <https://www.coursera.org/lecture/stories-of-infection/introduction-to-microbiology-clinical-presentation-0tMM2>

ASSESSMENT PATTERN (if deviation from common pattern)

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Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mrs. N. KIRUTHIGA Name & Signature of the Staff	 Dr. G. RAJALAKSHMI Name & Signature	 Name & Signature

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COIMBATORE - 641 028.

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

Programme Code:	SEC	Programme Title: Bachelor of SCIENCE IN BIOTECHNOLOGY							
Course Code:	20BTU18	Course Title						Batch:	2020-2021
		Allied :Practical VII - Programming using Python lab						Semester:	IV
Hrs/Week:	2	L	-	T	-	P	2	Credits:	2

COURSE OBJECTIVE

- To learn practical knowledge of Python Program.
- To acquire Object Oriented Skills in Python
- To Design and implement various applications using conditional statements in Python Programming
- To develop the Simple mathematical application using Python

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understanding the basic principles of Python programming language	K1
CO2	Implementing the logical skills using python programming.	K2
CO3	Apply the concepts of Conditional using python	K3
CO4	Developing the ability to apply mathematical skills	K4

SYLLABUS

Code	Subject Name	Semester
20BTU18	Allied :Practical VII - Programming using Python lab	IV
Ex. No.	Program List	Hours
1	How install and open python environment.	3
2	Find the sum of two numbers.	3
3	Find the maximum in the given list of numbers.	2
4	Find the odd and even numbers in the given set of numbers.	2
5	Compute the GCD of two numbers.	2
6	Find the Square root of numbers.	2
7	Find the value of Exponentiation.	3
8	Write a program to reverse a string.	2
9	Write a program to find prime numbers for given N numbers.	3
10	Write a program to find length of a string.	2

Note: Distribution of marks for Internal Examination- 40 and for External Examination– 60

Teaching methods:

PowerPoint Projection through LCD, Demonstration.

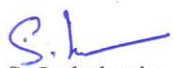
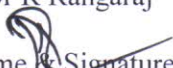

MAPPING WITH PROGRAM OUTCOMES

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

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN

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

Course Designed by	Verified by HOD	Approved by CDC Co-coordinator
 Mrs. S. Lakshmi priya Name & Signature of the Staff	Dr R Rangaraj  Name & Signature	 Name & Signature

Dr.R.Rangaraj
 M.Sc.(CS),M.Phil.,Ph.D.,M.Sc(Psy).
 Professor & Head,
 PG & Research Dept. of Computer Science,
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