

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

(Affiliated to Bharathiyar University, Re-Accredited by NAAC, Approved by AICTE & ISO9001:2008 Certified)

Eachanari, Coimbatore – 641021

DEPARTMENT OF BIOTECHNOLOGY



Syllabus for

B.Sc. Biotechnology

(I,II,III,IV,V & VI Semester)

2019 to 2020 Batch on wards

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Eachanari, Coimbatore – 641021

DEPARTMENT OF BIOTECHNOLOGY

VISION AND MISSION OF THE INSTITUTION

VISION

To emerge as a world renowned Institution that is integrated with Industry to impart knowledge, Skills, Research Culture and Values in youth who can accelerate the overall development of India.

MISSION

The impart superior quality education at affordable cost, nurture academic and research excellence, maintain eco-friendly and future ready infrastructure, and create team of well qualified teaching professionals who can build global competency and employability.

VISION AND MISSION OF THE DEPARTMENT

VISION

To create a competent center of excellence in Biotechnology research and provide technically sound graduates to serve as valuable resource for Industry and society; towards excellence and pride to be an Indian.

MISSION

To impart a holistic education and impetus to research through implementation of an integrated approach in the design of a global curriculum.

PROGRAM EDUCATIONAL OBJECTIVE (PEO)

PEO 1: To produce graduate in Biotechnology with strong technical sounds in Bioscience.

PEO 2: To promote the students towards research aspect to resolve the social problems.

PEO 3: To generate potential knowledge to identify, assess and formulate the needs of biotechnology industries.

PEO 4: Recognition of the need for and an engage in lifelong learning process for productive career.

PEO 5: To inculcate the capability to work as Researcher and entrepreneur with strong ethics.

PROGRAM OUTCOMES

PO1: Ability to gain the knowledge fundamental fields of biotechnology

PO2: To empower the students to acquire technological knowhow by connecting disciplinary and interdisciplinary aspects of biotechnology.

PO3: To learn research based knowledge including design of experiments, analysis and interpretation of data and valid conclusions.

PO4: Create, select and apply appropriate techniques, resources with an understanding of the limitations.

PO5: Able to think originally, conceptualize and solve different field of biotechnology problems, evaluate a wide range of potential solutions for the core area of expertise.

PO6: To distinguish the need for and have the preparation and ability to engage in lifelong learning independently with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

PO7: Apply ethical principles and commit to professional ethics and responsibilities and norms of the research practice.

PO8: Recognize the importance of Bioethics, IPR, and entrepreneurship so as to usher next generation of Indian Industrialists.

Mapping of PEO's and PO's

	PEO1	PEO2	PEO3	PEO4	PEO5
PO1			√	√	
PO2	√			√	√
PO3		√			
PO4	√				
PO5		√	√		√
PO6			√	√	
PO7		√			√
PO8			√		√

Mapping of Courses and POs

S-Strong Correlation M – Medium Correlation L- Low Correlation

S.No.	Sem	Part	Sub Type	Sub Code	Subject	Credit	Hours	INT	EXT	Total
1	1	1	L1	19BGE1BT	Language – I	4	4	40	60	100
2	1	2	L2	19BGE1BE	English for Communication – I	4	4	40	60	100
3	1	3	Core	19BBT1CA	Core - Fundamentals of Microbiology	4	4	40	60	100
4	1	3	Core Practical	19BBT1CP	Core Practical - Lab in Fundamentals of Microbiology	2	4	20	30	50
5	1	3	DSC	19BBTC01	Cell Biology	4	4	40	60	100
6	1	3	DSC Practical	19BBTCP1	Lab in Cell Biology	2	4	20	30	50
7	1	3	Allied-I	19BCHA01	Chemistry I	4	4	40	60	100
8	1	4		19BCSAFC	Environmental Studies	2	2	50		50
9	1	6		19BBT1VA	Good Lab Practice	2	-	50		50
						28	30			
1	2	1	L3	19BGE2BT	Language – II	4	4	40	60	100
2	2	2	L4	19BGE2BE	English for Communication – II	4	4	40	60	100
3	2	3	Core	19BBT2CA	Core - Principles of Genetics	4	4	40	60	100
4	2	3	Core Practical	19BBT2CP	Core Practical - Lab in Genetics	2	4	20	30	50
5	2	3	DSC	19BBTC02	Bioinstrumentation	4	4	40	60	100
6	2	3	DSC Practical	19BBTCP2	Lab in Bioinstrumentation	2	4	20	30	50
7	2	3	Allied-II	19BMAA12	Biostatistics and Computer Application	4	4	40	60	100
8	2	4		19BPYAFC	Human Rights	2	2	50		50
9	2	6		19BBT2VA	Food Adulteration	2	-	50		50
						28	30			
1	3	3	Core	19BBT3CA	Core - Plant Biotechnology	4	5	40	60	100
2	3	3	Core Practical	19BBT3CP	Core Practical - Lab in Plant Biotechnology	2	4	20	30	50
3	3	3	DSC	19BBTC03	Biochemistry	4	5	40	60	100
4	3	3	DSC Practical	19BBTCP3	Lab in Biochemistry	2	4	20	30	50
5	3	3	Allied-III	19BBTA01	Nanoscience & Nanotechnology	4	5	40	60	100
6	3	4	SEC	19BBTS01	Human Anatomy & Physiology	2	5	20	30	50
7	3	4		19BENAFc	Communicative English	2	2	50		50
8	3	6		19BBT3VA	Medical Coding I	2	-	50		50
9	3	6		19BBT3IS	Nature Medicine	2	-	50		50
						24	30			
1	4	3	Core	19BBT4CA	Core – Immunology and Immunotechnology	4	5	40	60	100

2	4	3	Core Practical	19BBT4CP	Core Practical - Lab in Immunology and Immunotechnology	2	4	20	30	50
3	4	3	DSC	19BBTC04	Animal Biotechnology	4	5	40	60	100
4	4	3	DSC Practical	19BBTCP4	Lab in Animal Biotechnology	2	4	20	30	50
5	4	3	Allied-IV	19BBTA02	Pharmaceutical Biotechnology	4	5	40	60	100
6	4	4	SEC	19BBTS02	Research Methodology	2	5	20	30	50
7	4	4		19BMAAFC	Quantitative Aptitude	2	2	50		50
8	4	6		19BBT4VA	Medical Coding II	2	-	50		50
9	4	6		19BBT4IS	Food Processing & Preservation	2	-	50		50
						24	30			
1	5	3	Core	19BBT5CA	Core – Genetic Engineering	4	4	40	60	100
2	5	3	Core Practical	19BBT5CP	Core Practical - Lab in Genetic Engineering	2	4	20	30	50
3	5	3	DSC	19BBTC05	Molecular Biology	4	4	40	60	100
4	5	3	DSC Practical	19BT5CP	Lab in Molecular Biology	2	4	20	30	50
5	5	3	DSE	DSE – I	Elective - I – DSE 1E	4	5	40	60	100
6	5	3	DSE	DSE - II	Elective - II – DSE 2E	4	5	40	60	100
7	5	4	SEC	19BBTS03	Bioinformatics	2	4	20	30	50
8	5	6		19BBT5VA	Techniques in Molecular Markers	2	-	50		50
						24	30			
1	6	3	Core	19BBT6CA	Core - Environmental Biotechnology	4	6	40	60	100
2	6	3	Core Practical	19BBT6CP	Core Practical - Lab in Environmental Biotechnology	2	4	20	30	50
3	6	3	DSE	DSE – III	Elective – III – DSE 3E	4	6	40	60	100
4	6	3	DSE	DSE – IV	Elective – IV – DSE 4E	4	6	40	60	100
5	6	3	Core Course - XI	DSC	Core Project	8	4	80	120	200
6	6	4	SEC	19BBTS04	Entrepreneurial Development Program	2	4	20	30	50
7	6	5			Extension Activity- EX %	2	-	50		50
						26	30	1900	1950	3850
Total credit						154				

ELECTIVE I	ELECTIVE II	ELECTIVE III	ELECTIVE IV
Food Biotechnology (19BBTE01)	Medical Biotechnology (19BBTE03)	Industrial Biotechnology (19BBTE05)	Bioethics, IPR and Biosafety (19BBTE07)
Cancer Biology (19BBTE02)	Agriculture Biotechnology (19BBTE04)	Herbal Technology (19BBTE06)	Biodiversity and Ecology (19BBTE08)

Course Code	Course Name	Program Outcome							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
	Core I - Fundamentals of Microbiology	S	M	L	L	M	S	S	L
	Core II – Cell Biology	S	S	M	M	S	S	S	S
	Core III – Principles of Genetics	S	M	S	M	L	S	S	L
	Core IV - Bioinstrumentation	S	S	M	S	M	S	S	M
	Core V – Plant Biotechnology	S	S	S	M	S	S	S	M
	Core VI – Biochemistry	S	S	S	S	S	S	S	S
	Core VII – Immunology & Immuno-technology	S	S	M	S	L	S	S	S
	Core VIII – Animal Biotechnology	S	M	S	S	M	S	L	S
	Core IX- Genetic Engineering	S	M	S	S	S	M	S	S
	Core X – Molecular Biology	S	S	M	S	M	M	S	M
	Core XI - Environmental Biotechnology	M	S	M	L	L	S	M	S
	Core XII – Industrial Biotechnology	S	S	M	S	M	L	S	S

முதற்பருவம்

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11T	Part I Tamil	3	6	1	0	Theory

Introduction: பகுதி முதல் பாடமாக அமையும், தமிழ்ப்பாடம் கவிதைகள், இலக்கணம், இலக்கியவரலாறு ஆகியவைகள் கொண்டு அமைந்து உள்ளது. இந்து அலகுகளாக பகுக்கப்பட்டுள்ளது.

Course Outcome:

- C01 : பாரதியார், பாரதிதாசன், சிற்பி, சுரதா ஆகிய கவிதைகளின் விளக்கத்தை மாணவர்கள் அறிந்து கொள்ளுவதால், தன்னம்பிக்கையை வெளிக்கொணரும் வகையில் உள்ளது.
- C02 : பெண் கவிஞர்களின் படைப்பு கவிதையை அறிவதன் மூலம் வாழ்வியல் செய்திகளையும், யதார்த்த நிலையும் அறிய உதவுகிறது.
- C03 : திரு.வி.க. மற்றும் மு.வா கட்டுரைகளை அறிவது படைப்பையும், படைப்பின் சிறப்பையும் சங்க கால இலக்கிய செய்திகளையும் அறிய முடிகிறது.
- C04 : படைப்புத்திறனை வெளிப்படும் விதமாகவும், இலக்கணத்தை அறிய பயனுள்ளதாக அமைகிறது.
- C05 : இலக்கியவரலாறு பற்றியச் செய்திகளை கொண்டு அதன் வளர்ச்சி நிலையை அறிவும் வகையில் உள்ளது.

Unit I: [12 Periods]
பாரதியார் - பெண் விடுதலை, பாரதிதாசன் - வீரத் தமிழன், சிற்பி - நிலவுப்பு சுரதா - நாடு ஆகியவற்றின் விளக்கம் தருதல்.

Unit II: [12 Periods]
பு.அ இரவிந்திரன் - தாகம் தீர்க்காத தண்ணீர், அ. வெண்ணிலா - நீரிலடையும் முகம் மாலதி மைத்ரி - கன்னியாகுமரி, க்ருஷாங்கினி - புன்னை மரம் ஆகிய கவிதைகளின் செய்திகளை அறிவதால் வாழ்வியல் சூழலையும், யாதார்த்த நிலையையும் விளக்குதல்.

Unit III: [12 Periods]
திரு.வி.கா -பெண்ணின் பெருமை மு.வ - கற்பனை முனைவர் சித்ரா-தமிழ் தரமுயர்த்தலும், நிலைப்படுத்தலும், இரணியன் நா.கு பொன்னுசாமி - சங்க இலக்கியத்தில் சமூக அறம் ஆகியவற்றின் கட்டுரைகளின் செய்திகளை விளக்கம் தருதல்.

Unit IV: [12 Periods]
பெயர் சொல், வினைச்சொல், இடைச்சொல், உரிச்சொல், எச்சம் -இலக்கணத்திற்கு விளக்கம் அளித்தல்- படைப்பிலக்கியப் பயிற்சி, கவிதை எழுதல் வானொலித் தமிழ், தொலைக்காட்சித் தமிழ் பயன்பாட்டுத்தமிழ், இலக்கண நோக்கில் பயிற்றுவித்தல் எழுதுதல் கவிதை+வானொலி பேச்சுத்திறன் வளர்த்தல். ஆகியவைகள் கொண்டு திறன் வளர்க்க உதவுதல்.

[12 Periods]

Unit V:

நவீனக் கவிதை இலக்கிய வழுவங்களான ஹைக்கூ, குக்கூ, சென்ட்ரியூ, கஜல், கணினித் தமிழ் - கலைச்சொற்கள் ஆகியவைகளின் வளர்ச்சி நிலைகளை அறிய உதவுதல்.

Textbook:

பாடநூல்கள்

1. பாரதியார் கவிதைகள்
2. பாரதிதாசன் கவிதைகள்
3. சுரதா கவிதைகள்
4. சிற்பி கவிதைகள்
5. அ. வெண்ணிலா

- பார்வை நூல்கள் :
1. இலக்கியவரலாறு – பாக்கியமேரி,
 2. இலக்கண நூல்,
 3. மு.வ. -தமிழ் இலக்கிய வரலாறு

முதற்பருவம்

(கவிதை, கட்டுரை, இலக்கணம், படைப்பிலக்கியம், இலக்கியவரலாறு)

அலகு 1

1. பாரதியார் - பெண் விடுதலை
2. பாரதிதாசன் - வீரத் தமிழன்
3. சிற்பி - நிலவுப்பு
4. சுரதா - நாடு

அலகு 2

1. பூ.அ இரவிந்திரன் - தாகம் தீர்க்காத தண்ணீர்
2. அ. வெண்ணிலா - நீரிலலையும் முகம்
3. மாலதி மைத்ரி - கன்னியாகுமரி
4. க்ருஷாங்கினி - புன்னை மரம்

அலகு 3 உரைநடை

1. திரு.வி.கா -பெண்ணின் பெருமை
2. மு.வ - கற்பனை
3. முனைவர் சித்ரா - தமிழ் தரமுயர்த்தலும், நிலைப்படுத்தலும்
4. இரணியன் நா.கு.பொன்னுசாமி - சங்க இலக்கியத்தில் சமூக அறம்

அலகு 4

I பெயர் சொல், வினைச்சொல், இடைச்சொல், உரிச்சொல், எச்சம்
படைப்பிலக்கியப் பயிற்சி - 1. கவிதை எழுதல்

2. வானொலித் தமிழ்
3. தொலைக்காட்சித் தமிழ்

பயன்பாட்டுத்தமிழ் - இலக்கண நோக்கில் பயிற்றுவித்தல்

1. எழுதுதல்- கவிதை+வானொலி
2. பேச்சுத்திறன் வளர்த்தல்

அலகு 5 இலக்கிய வரலாறு

நவீனக் கவிதை இலக்கிய வடிவங்கள்

1. ஹைக்கூ 2. குக்கூ 3. சென்ட்ரியூ 4. கஜல்..
2. கணினித் தமிழ் - கலைச்சொற்கள்

பயிற்சிக்குரியன

பாடநூல்கள்

1. பாரதியார் கவிதைகள்
2. பாரதிதாசன் கவிதைகள்
3. சுரதா கவிதைகள்
4. சிற்பி கவிதைகள்
5. அ. வெண்ணிலா

பார்வை நூல்கள் : 1. இலக்கியவரலாறு - பாக்கியமேரி,
2. இலக்கண நூல்,
3. மு.வ. -தமிழ் இலக்கிய வரலாறு

SEMESTER I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11F	PART I French	3	6	1	0	Theory

Prescribed Text: **LATITUDES I**

Units: 1 – 4

Authors: Régine Mérieux

Yves Loiseau

Available at: Goyal Publishers Pvt Ltd 86,

University Block Jawahar Nagar (Kamla Nagar)

New Delhi – 110007

Tel : 011 – 23852986 / 9650597000

SEMESTER I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11H	PART I Hindi	3	6	1	0	Theory

(Prose, Non-detailed, Grammar & Translation, Comprehension)

1. PROSE : NUTHAN GADYA SANGRAH

Editor : Jayaprakash

(Prescribed Lessons – only 6)

Lesson 1 – Bharathiya Sanskurthi

Lesson 3 – Razia

Lesson 4 – Makreal

Lesson 5 – Bahtha Pani Nirmala.

Lesson 6 – Rashtrapitha Mahathma Gandhi

Lesson 9 – Ninda Ras.

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

2. NON DETAILED TEXT : KAHANI KUNJ

Editor : Dr. V.P. Amithab.

(Stories 1-6 only)

Publisher : Govind Prakashan Sadhar Bagaar,
Mathura,
Uttar Pradesh – 281 001.

3. GRAMMAR : SHABDHA VICHAR ONLY

(NOUN, PRONOUN, ADJECTIVE, VERB, TENSE, CASE ENDINGS)

Theoretical & Applied.

Book for Reference : Vyakaran Pradeep by Ramdev

Publisher : Hindi Bhavan, 36,

Tagore Town Allahabad – 211 002.

4. TRANSLATION : English – Hindi only.

ANUVADH ABHYAS – III

(1-15 lessons only)

Publisher : DAKSHIN BHARAT HINDI PRACHAR SABHA
CHENNAI – 17.

5. COMPREHENSION : 1 Passage from ANUVADH ABHYAS – III (16-30)

DAKSHIN BHARATH HINDI PRACHAR
SABHA CHENNAI-17.

SEMESTER I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11M	PART I Malayalam	3	6	1	0	Theory

(Paper I Prose, Composition & Translation)

This paper will have the following five units:

Unit I & II Novel

Unit III & IV Short story

Unit V Composition & Translation

Text books prescribed:

Unit I & II Pathummayude Aadu - Vaikam Muhammed Basheer
(D.C.Books, Kottayam, Kerala)

Unit III & IV Ente Priyappeta Kadhakal – Akbar Kakkattil)
(D.C. Books, Kottayam, Kerala)

Unit V Expansion of ideas, General Eassay and Translation.

(A simple passage from English about 100 works to Malayalam)

Reference Books: 1.Malayala Novel Sahithya Charitram-K.M.Tharakan
(N.B.S.Kottayam)

2. Cherukatha Innale Innu-M.Achuyuthan (D.C Books, Kottayam)

4. Sahithya Charitram Prasthanangalilude- Dr.K.M George, (D.C.Books Kottayam)

5.Malayala Sahithya vimarsam-Sukumar Azhee kode (D.C.books)

SEMESTER I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11A	PART I Arabic	3	6	1	0	Theory

PAPER-I: PROSE AND GRAMMAR-I

Books Prescribed: 1. Duroos Al-Lugha Al-Arabiyya Part-I (Lesson 1 to 12)

By Dr. V. Abdur Rahim, IFT, Perambur, Chennai-12.

2. An-Nahwu Al-Wadeh Part-I (Al-Ibtidaiyyah - Selected Lessons) By Ali Alijarim and Mustafa Ameen, Al-Huda Book Stall, Calicut, Kerala

(Lessons: Al-Jumlah Al-Mufeedha, Ajza Al-Jumlah, Al-Fi'l al-Madhi, Al-Fi'l-al-Mudhari', Fi'l al-Amr, Al-Fa'il, Al-Maf'uool, Al-Mubthdha Wal- Khabar)

SEMESTER I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11U	PART I Urdu	3	6	1	0	Theory

(PROSE, GRAMMER & TRANSLATION)

Book Prescribed: **Faizan-e-Adab** - Edited by Dr.K.Habeeb Ahmed
[Published by Ansaar Educational & Welfare Society,
Melvisharam- Contact No.9994965700,9443818785]

[a] Prose:

The following lessons only

1. SAIR PAHLAY DARWESH KI - Meer Amman Dehalvi
2. UMEED KI KHUSHI – Sir Syed
3. MIRZA GHALIB KE AKHLAQ WA ADAT – Moulana hali
4. ZUBAIDA KHATOON – Abdul Haleem Sharar
5. NOOR JHAN – Mohamed Hussain Azad
6. MARHOOM DI YAAD MEIN – PATRAS BUKHARI
7. SIR SYED MARHOOM AUR URDU LITERATURE – Shibi
8. KHAJA MOHINUDEEN SHITHI- Shabaz Hussain

[b] Grammar: 1. ISM AUR USKI KHISMEIN

2. ZAMEER AUR USKI KHISMIEN

3. SIFAT AUR USKI KHIMEIN

4. FE'L AUR USKI KHIMEIN

5. LAWAZIM-E-ISM

6. ALAMAT-E-FAEL "NAY" AUR ALAMAT-E-MAFO'OL "KO" KE QUAIDE BOOK FOR
REFERENCE Urdu Grammar by Yaqoob Aslam

[c] TRANSLATION: A GENERAL PASSAGE FOR TRANSLATION FROM ENGLISH TO URDU

Semester :I						
Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core I 19BBTC01	Cell Biology	4	4	0	0	Theory

Course Objective: Understanding the structural and functional aspects of the cell, provide the student with a strong foundation in the cellular organization and function.

Course Outcome

CO1: To become skillful the basics of cell structure and classification.

CO2: To understand the component and functions of cells.

CO3: To learn the functional activity of cells.

CO4: To become familiar with cell multiplication and action.

CO5: Examine the characteristics of cellular organelles and interpret how it is involved in cell activity and communication.

Unit I: [12 Periods]

Cell as a basic unit: discovery of the cells, Classification of cell types, development of cell theory, early chemical investigation in cell biology. Prokaryotic and Eukaryotic cell organization.

Unit II: [12 Periods]

Cell transport phenomenon: Membrane architecture. Active, Passive, diffusion and osmosis.
Chemistry of carbohydrates, lipids, proteins and nucleic acid.

Unit III: [12 Periods]

Structure and functions of cytoplasmic components of the cell: Ribosome and protein synthesis, energy flow through mitochondrion, chloroplast and photosynthesis, Golgi apparatus, lysozymes and microbodies, endoplasmic reticulum, cytoskeleton, vacuoles, peroxysomes, lysosomes and Nuclear compartment. Heterochromatin and euchromatin, polytene chromosomes.

Unit IV: [12 Periods]

Cell division in prokaryotes and eukaryotes: Cell cycle, mitosis, meiosis, crossing over and characteristics of cancer. Apoptosis, Stem cell, Prions

Unit V: [12 Periods]

Integrative and specialized cellular events: Cell – Cell signaling, Specialized cells – nerve cells, sperm cells, microfilaments, microtubules, muscle cells. Cells of Vision, Nucleo –cytoplasmic interaction, cell cloning.

Text Book:

1. Cell Biology by P S Verma and V K Agarwal, 2016

References:

1. Cell and molecular biology, 3rd edition, Philip Sheeler, Donal E Bianchi, John Wiley
2. Molecular biology of cell, Albert et al
3. Molecular cell biology, Lodish, Baltimore, Scientific American books, 1994

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Subject Code	Subject Title	Credit	Semester :I			Practical	Type
			Lecture	Tutorial	Practical		
19BBT1CA	Fundamentals Microbiology	4	4	0	0	Theory	

Course Objective : The successful completion of this course students able to know the isolation, identification and characterization microbes from environmental samples.

Course Outcome

CO 1: To gain insights on how the subject area developed over a period of time.

CO 2: To impart knowledge on the working of different types of Microscopes.

CO 3: To internalize the techniques used to observe microorganisms by different staining techniques.

CO 4: To identify the different types of medium and techniques used for the growth and cultivation of microorganisms.

CO 5: Able to aware of microbial Disease caused by Human.

UNIT I: (12 Hours)

Definition , History and scope of microbiology, composition of Microbial world. Basic principles in microscopy - Types of microscopes, light, dark, phase contrast, fluorescent. Electron microscope- TEM & SEM

UNIT II: (12 Hours)

Prokaryotic cell structure and Function: Cell structure, Cell Membrane, Cytoplasmic matrix, Nucleoid, Prokaryotic cell Wall, Component of external cell wall, Bacterial Endospore.

UNIT III: (12 Hours)

Microbial Nutrition: Nutrient requirements, Growth factors, Culture media, Isolation of pure culture. Microbial growth: Growth curve, Measurement of microbial growth, continuous culture of microorganisms, Balanced and unbalanced growth.

UNIT IV: (12 Hours)

Antimicrobial Chemotherapy: Development of Chemotherapy, General characteristics of Antimicrobial drugs, Determination the level of Antimicrobial activity, Antibacterial drugs, Antifungal drugs, Drug resistance.

UNIT V: (12 Hours)

Human Disease caused by microbes: Airborne Disease, Arthropod Borne disease, Direct contact disease, food borne and water borne disease. Human disease caused by fungi and protozoa. Human disease caused by viruses.

Text Book

Microbiology: Concepts and Applications Michael J, Pelczar JR; 1993. McGraw Hill Inc.

References

Microbiology: Prescott, L.M; J.P. Harley and D.A.Klein. 2004. 6th edition Brown publisher.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

		Semester: I				
Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BCHA01	Chemistry I	4	4	1	0	Theory

CO 1: To understand the fundamental chemistry applied in Biotechnology

CO 2: To know the industrial processing of agriculture chemistry

CO 3: To aware of the metals on industrial application

CO 4: To become skillful amino acids and their properties.

CO 5: To learn the principles of Electrochemical properties.

Unit 1:

[12 Hours]

Industrial Chemistry Synthesis, properties and uses of silicones. Fuel gases: natural gas, water gas, semi water gas, carburetted water gas, producer gas, oil gas (manufacturing details not required). 2. fertilizers urea, ammonium sulphate, ammonium nitrate, potassium nitrate NPK fertilizer. Triple superphosphate.

Unit II:

[12 Hours]

Stereoisomerism Optical isomerism: symmetry, elements of symmetry. Cause of optical activity, tartaric acid, Racemisation, Resolution. Geometric isomerism of maleic and fumaric acids. Unit I: 1. Metals General methods of extraction of metals. Types of ores. Methods of ore dressing.. Reduction methods, electrical methods, types of refining Van Arkel Zone refining.

Unit III:

[12 Hours]

Terms: chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect. 2. Dyes: azo and triphenylmethane dyes- Preparation one example. Solutions types. Liquid in Liquid. Raoult's law. Fractional distillation. 2. Kinetics Rate, order, molecularity, pseudo first order, determination of order. Energy of activation. Chromatography: column, paper, thin layer

Unit IV:

[12 Hours]

Amino Acids: Classification, preparation and properties, preparation of peptides. Classification of proteins by physical properties and by biological functions. 2. Carbohydrates: classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose.

Unit V:

[12 Hours]

Electrochemistry: Measurement of conductance. Kohlraush's law .pH determination. Conductometric titrations. Hydrolysis of salts: pH and buffer in living systems. Galvanic cells, e.m.f. standard electrode potentials, reference electrodes. Electrochemical series, its applications. Principles of electroplating.

Text Book

Dr. V. Veeraiyan.,”Text book of Ancillary chemistry”, Volume I, High mount Publishing house, Chennai-14, Edition-2008 (Unit-I to Unit-V)

References

P.L. Soni, “Text Book of Inorganic Chemistry”, Sultan Chand & Sons, New Delhi, 2013

Puri and Sharma, “Text book of Inorganic Chemistry”, Vishal publishing, 2014

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester I						
Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core Practical I– 19BBT1CP						
Lab in Cell Biology and Microbiology		4	0	0	4	Practical

Course Objective: This practical session students able to know the microbial media preparation, isolation and characterization.

1. Mitosis in onion (*Allium cepa*) Root tip
2. Meiosis in Flower Buds of *Allium cepa*
3. Buccal Epithelial Smear and Barr Body
4. Media Preparation and Sterilization
5. Isolation of microorganism from soil , water and Air
6. Pure culture Techniques
7. Selective and Differential Media Preparation
8. Measurement of Bacterial Growth
9. Staining of Microorganism
10. IMVIC test
11. Carbohydrate fermentation test
12. TSI
13. H₂S production test
14. Antibiotic sensitivity test

References

1. Laboratory Exercises in Microbiology by Harley and Prescott, 5th edition,
2. Laboratory Manual in General Microbiology by Benson, 8th edition

இரண்டாம் பருவம்

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE21T	Part I Tamil	3	6	1	0	Theory

Introduction: இரண்டாம் பருவ பாடத்திட்டம் அற இலக்கியம், சிற்றிலக்கியம், சிறுகதைகள், இலக்கணம், இலக்கிய வரலாறு ஆகியவைகள் கொண்டு உருவாகியுள்ளது.

Course Outcome:

- C01 : நீதிநெறி கருத்துக்களை அறிந்து கொள்ளுவதால், வாழ்க்கையில் பண்புகளை பின்பற்றவும், அறநெறிவாடு வாழவும் பயனுள்ளதாக அமையும்.
- C02 : சிற்றிலக்கியத்தின் செய்திகள் மாணவர்கள் தெளிவாக அறிந்துகொள்வது அன்பின் மேன்மை, பண்பு ஆகியவைகள் அறிந்து கொள்ள முடிகிறது.
- C03 : அணி இலக்கணம் அறிவதால் இலக்கணத்தின் சிறப்பு முக்கியம் என்பதை அறியலாம்.
- C04 : சிறுகதைகளில் உள்ள கதைகளில் உள்ள மையக்கருத்துகளைத் தெரிந்து கொள்ளுவது சமுதாயச் சிந்தனையையும், விழிப்புணர்வும் உருவாக்க உதவுகிறது.
- C05 : நீதி சிற்றிலக்கியங்கள் ஆகியவற்றின் செய்திகளை அறிவது தமிழின் வரலாற்றையும், படிநிலைகளையும் அறிய பயன் உள்ளது. களப்பணிகளை அறியலாம்.

Unit I: [12Periods]
அற இலக்கியம் திருக்குறள், அன்புடைமை, அறிவுடைமை, நாலடியார், பழமொழி நானூறு ஆகியவைகள் நீதியின் கருத்துக்கள் கொண்டு பாடமாக உள்ளது.

Unit II: [12Periods]
முக்கூடற்பள்ளு-பள்ளி ஏசல், குற்றலாக் குறவஞ்சி - மலைவளம், கலிங்கத்துப்பரணி காடு பாடியது, அழகர் கிள்ளை விடு தூது, கலிங்கத்துப்பரணி-கோயில் பாடியது, கிள்ளை விடு தூது ஆகிய சிற்றிலக்கியங்களின் கருத்துக்களை தெளிவாக எடுத்துரைத்தல்.

Unit III: [12 eriods]
உருவக அணி, தற்குறிப்பேற்றணி, சொற்பொருள் பின்வரு நிலை அணி, உவமை அணி அணி இலக்கணம் - விளக்கத்துடன் கற்பிக்கப்படும்.

Unit IV: [12 eriods]
தேர்ந்தெடுக்கப்பட்ட 4 சிறுகதைகள் - மாணவர்களின் தனித்திறனை வளர்க்கும் பொருட்டு எடுக்கப்படும். சமுதாய செய்திகளை பற்றி விளக்கம் தருதல்.

Unit V: [12 eriods]
நீதி இலக்கியம், சிற்றிலக்கியம், ஆகியவைகளின் தோற்றத்தையும், வளர்ச்சியும் எடுத்துரைக்கப்படும். தொல்லியல் அகழாய்வு அண்மைப் பதிவுகள் - திட்டக்கட்டுரை ஒப்படைப்பு, களப்பணிகளைப் பார்வையிடல், தரவுகளைப் பட்டியலிடல். விளக்கத்துடன் கூறுதல்.

Textbook:

பாடநூல்கள்

1. பதினெண்கீழ்க்கணக்கு நூல்கள்
2. முக்கூடற்பள்ளு நூல்
3. குற்றலாக்குறவஞ்சி
4. கலிங்கத்துப்பரணி

பார்வை நூல்கள்

1. ஜெயகாந்தன் சிறுகதை
2. புதுமைப்பித்தன் சிறுகதை
3. சூடாமணி சிறுகதை
4. அம்பை சிறுகதை
5. மு.வ. -தமிழ் இலக்கிய வரலாறு
6. டாக்டர் கே.கே பிள்ளை – தமிழக வரலாறு மக்களும் பண்பாடும்.
7. பேரா.முனைவர் பாக்யமேரி - இலக்கணம் இலக்கிய வரலாறு மொழித்திறன்.

இரண்டாம் பருவம்

(அற இலக்கியம், சிற்றிலக்கியம், இலக்கணம், சிறுகதை, இலக்கிய வரலாறு)

அலகு I அற இலக்கியம்

1. திருக்குறள் - 2 அதிகாரங்கள்
 1. அன்புடைமை 10 குறள்கள் அதிகாரம் -8
 2. அறிவுடைமை 10 குறள்கள் அதிகாரம் -43
2. நாலடியார் - 5 பாடல்கள் (132,133,135,136,139)
3. பழமொழி நானூறு - 5 பாடல்கள் (90,91,93,95,100)

அலகு II சிற்றிலக்கியம்

1. முக்கூடற்பள்ளு - பள்ளி ஏசல்
2. குற்றலாக் குறவஞ்சி - மலைவளம்
3. கலிங்கத்துப்பரணி - காடு பாடியது
4. அழகர் கிள்ளை விடு தூது

அலகு III இலக்கணம்

அணி இலக்கணம் - விளக்கத்துடன் கற்பித்தல்.

1. உவமை அணி
2. உருவக அணி
3. தற்குறிப்பீற்றணி
4. சொற்பொருள் பின்வரு நிலை அணி

அலகு IV சிறுகதைகள்

1. ஜெயகாந்தன் 2. புதுமைப்பித்தன் 3. சூடாமணி 4. அம்பை - (4 சிறுகதைகள்)

அலகு V இலக்கிய வரலாறு

1. நீதி இலக்கியம்
2. சிற்றிலக்கியம்
3. தொல்லியல் அகழாய்வு அண்மைப் பதிவுகள் - திட்டக்கட்டுரை ஒப்படைப்பு களப்பணிகளைப் பார்வையிடல், தரவுகளைப் பட்டியலிடல்.

பாடநூல்கள்

1. பதினெண்கீழ்க்கணக்கு நூல்கள்
2. முக்கூடற்பள்ளு நூல்
3. குற்றலாக்குறவஞ்சி
4. கலிங்கத்துப்பரணி

பார்வை நூல்கள்

1. ஜெயகாந்தன் சிறுகதை
2. புதுமைப்பித்தன் சிறுகதை
3. சூடாமணி சிறுகதை
4. அம்பை சிறுகதை
5. மு.வ. -தமிழ் இலக்கிய வரலாறு
6. டாக்டர் கே.கே பிள்ளை – தமிழக வரலாறு மக்களும் பண்பாடும்.
7. பேரா.முனைவர் பாக்யமேரி - இலக்கணம் இலக்கிய வரலாறு மொழித்திறன்.

SEMESTER II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE21F	PART I French	3	6	1	0	Theory

Prescribed Text: **LATITUDES I**

Units: 5 – 8

Authors: Régine Mérieux

Yves Loiseau

Available at: Goyal Publishers Pvt Ltd 86,

University Block Jawahar Nagar (Kamla Nagar)

New Delhi – 110007

Tel : 011 – 23852986 / 9650597000

SEMESTER II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE21H	PART I Hindi	3	6	1	0	Theory

(Modern Poetry, One Act Play, Translation & Letter Writing, Conversation)

1. MODERN POETRY : BHOOMIJA by NAGARJUN
Publishers : Rajkamal Prakashan
1B Nethaji Subash Marg,
New Delhi.
2. ONE ACT PLAY :
NAVEEN EKANKI SANGRAH
By Dr. Smt. MALATI THIVARI
SUMITHRA PRAKASHAN
ASHOK NAGAR
ALLAHABAD – 1.
3. TRANSLATION : HINDI-ENGLISH ONLY
(ANUVADH ABYAS-III)
Lessons – 1-15 only

PUBLISHER : DAKSHIN BHARATH HINDI PRACHAR SABHA
CHENNAI – 600 017.
4. LETTER WRITING : (Leave Letter, Job Application, Ordering Books,
Letter to Publisher, Personal Letter)
5. CONVERSATION : (Doctor & Patient, Teacher & Student, Storekeeper &
Buyer, Two Friends, Booking Clerk & Passenger at
Railway Station, Autorickshaw driver and Passenger)
Ref : Bolchal Ki Hindi Aur Sanchar by Dr. Madhu
Dhavan Vani Prakashan, New Delhi.

SEMESTER II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE21M	PART I Malayalam	3	6	1	0	Theory

(Prose: Non-Fiction)

This paper will have the following five units:

Unit I & II Autobiography

Unit III,IV & V Travelogue

**Text Books prescribed: Unit I & II Vazhithiruvukal-Dr.A.P.J.Abdulkalam
(D.C.Books, Kottayam)**

Unit III,IV & V Alkoottathil Thaniyae - M.T Vasudhevan Nair
(D.C.Books, Kottayam)

Reference books:

1. Athmakathasahithyam Malayalathil-Dr.Vijayalam Jayakumar (N.B.S.Kottayam)
2. Sancharasahithyam Malayalathil –Prof.Ramesh chandran. V,(Kerala Bhasha Institute, Trivandrum)

SEMESTER II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE21A	PART I Arabic	3	6	1	0	Theory

PAPER-II: COMMUNICATIVE ARABIC

Books Prescribed: 1. Arabic Conversation Book (Lesson 1 to 19)

By Mohd. Harun Rashid and Khalid Perwez, Published by Good word Books

SEMESTER II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE21U	PART I Urdu	3	6	1	0	Theory

**(POETRY, GHAZALITH & LETTER WRITING)
Urdu Language**

Book Prescribed: **Faizan-e-Adab** - Edited by Dr.K.Habeeb Ahmed
[Published by Ansaar Educational & Welfare Society,
Melvisharam- Contact No.9994965700,9443818785]
Part- I Urdu Language (Colleges) 2014-15

Annexure : 13F Page 2 of 4 SCAA DT. : 6-2-2014

[a] MANZOOMATH

1. BARQ-E-KALESA – AKBAR ALLAHBADI
2. SHIKWA – ALLAMA IQBAL

(Selected four stanzas from each of the above)

3. JAWAB-E-SHIKWA – ALLAMA IQBAL

(Selected four stanzas from each of the above)

4. SUBH-E-AZADI – FAIZ AHMED FAIZ
5. TAJ MAHAL – SAHIR LUDHYANWI

[b] GHAZALITH:

1. MEER TAQI MEER
2. KHAJA MEER DARD
3. SHAIK IBRAHIM ZAUQ
4. MIRZA GHALIB
5. MOMIN KHAN MOMIN
6. JIGAR MURADABADE
7. HASRATH MOHANI
8. FANI BADAYUNI
9. DANISH FARAZI
10. SHAKIR NAITHI

[c] LETTER WRITING:

1. LETTER TO THE PRINCIPAL SEEKING LEAVE
2. LETTER TO THE MANAGER OF A FIRM SEEKING EMPLOYMENT
3. LETTER TO A PUBLISHER OT BOOK SELLER PLACING ORDER FOR BOOKS
4. LETTER TO THE MUNICIPAL COMMISSIONER DRAWING HIS ATTENTION
5. LETTER TO THE FATHER / GUARDIAN ASKING MONEY FOR PAYMENT OF COLLEGE FEES
6. LETTER TO A FRIEND INVITING HIM TO YOUR SISTER'S MARRIAGE

Subject Code	Subject Title	Semester :II				Practical Theory	Type
		Credit	Lecture	Tutorial			
19BBT2CA	Principles of Genetics	4	4	0	0		

Introduction: This course present the various ways in which characters get transferred through different generations and methods to analyze and modify them.

CO 1: Understand the significance of Genetic materials and Mendel's law

CO2: Recognize differences between the biological sexual mechanisms

CO3: Analyze the genetic material based on their confirmation

CO4: Evaluate the nature and action of mutation

CO5: Predict the nature of gene frequency in a population.

Unit I: [12 Hours]

Genetic Material: DNA is a Genetic Material, Structure, Semiconservative replication, Overview of DNA replication. The replisome: a remarkable replication machine, replication ignition, replication termination.

Unit II: [12 Hours]

Mendel's experiment and principle of segregation, monohybrid cross- Dominance, Recessiveness, Codominance and Lethals; Principle of independent assortment – Dihybrid crosses, multiple alleles.

Unit III: [12 Hours]

Mechanism of sex determination, sex differentiation and sex linked inheritance, linkage, crossing over and chromosomal mapping.

Unit IV: [12 Hours]

Mutation: General properties of mutation – Molecular Basis of Mutation – Spontaneous mutations – Induced mutation. Mechanism of DNA repair – Reverse mutation and Suppressor mutation and Recombination

Unit V: [12 Hours]

Population Genetics: Genetic variation, Random mating and Hardy Weinberg method, Inbreeding, outbreeding and Assortative mating, Genetic drift, Genetic Counseling, Genetic load, and Evolutionary genetics.

Text Books:

Principles of Genetics – Gardner/Simmons/Snustad, 8th edition (1991), John Wiley & Sons, Inc.

Reference Books:

1. Principles of Genetics – Robert Tamarin 7th Ed. WMC Brown publication, Boston, 2004.
2. Gene IX – Benjamin Lewin (2007), Jones & Bartlett Learning, New Jersey.
3. Genetics – Danial L.Hartl, Elizabeth W. Jones (2006), Jones and Bartlett public. New Jersey.
4. Molecular Cell Biology – Harvey Lodish, Arnold Berk, et al., 8th edition (2016), Published by W.H freeman and company, New York.
5. Microbial Genetics – Friefelder (1994), Jones and Bartett public.

Mapping of Course Outcomes with Programme Outcomes
PROGRAMME OUTCOMES

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :II

Subject Code	Subject Title	Credit Lecture	Tutorial	Practical	Type
Core Paper – 19BBTC02	Bioinstrumentation	4	4	0	Theory

Introduction: This course present the various instrumentation Principle, operation and applications.

Course Outcome

- CO1: Able to understand the principles of spectroscopy.
- CO2: Analyze the application of chromatography techniques.
- CO3: Apply the techniques for biomolecule separation process.
- CO4: Evaluate the DNA and protein through Electrophoresis techniques.
- CO5: Know the techniques for Gene amplification and sequencing.

Unit I: [12 Hours]

Spectroscopy- UV Visible spectroscopy- – Beer – Lambert law Applications – Instrumentation Applications. Vibrational spectroscopy - infrared Absorption spectroscopy , Raman spectroscopy –, instrumentation, applications. Fluorescence spectroscopy instrumentation – Applications.

Unit II: [12 Hours]

Separation technique – chromatography – column chromatography, Thinlayer chromatography – paper chromatography – ion exchange chromatography, exclusion chromatography - Reversed phase chromatography. Affinity chromatography – HPLC , Equipment, Application. Advanced chromatography techniques.

Unit III: [12 Hours]

Centrifugation – Analytical centrifugation sedimentation co-efficient – sedimentation diffusion method – Svedberg equation- sheraga mandelkern Equation. Application of analytical centrifugation. Preparative centrifugation– Density gradient centrifugation – Rate Zonal centrifugation, isopycnic centrifugation.

Unit IV: [12 Hours]

Electrophoresis – polyacrylamide gel electrophoresis applications - SDS PAGE. Agarose Gel Electrophoresis – pulsed field gel electrophoresis. 2D gel electrophoresis . Molecular Biology Methods – Radioactivity – – Geiger Muller counter – Autoradiography – Applications.

Unit V: [12 Hours]

Polymerase chain reaction – DNA synthesis in PCR – Variations of the basic PCR methods. Quantitative PCR – Nested PCR – Reverse transcription PCR- Inverse PCR. Protein Sequencing – tRNA sequencing- DNA sequencing – sequencing by selective cleavage Maxam Gilbert method – Sanger sequencing, - genome sequencing – sequencing of single DNA molecules.

Reference:

1. Bioanalytical techniques by Sekhar Tallar (2009)- IK International Publishing House Pvt Ltd.
2. Biophysical Chemistry- Avinash Upadhyay, Nirmalendu Nath, Kakoli Upadhyay, (2014), Himalaya publishing House
3. Practical Biochemistry- Wilson & Walker – Vth edition (2009)Cambridge University Press
4. Practical Biochemistry- David Plummer- Tata McGraw Hill 3rd edition.

Mapping of Course Outcomes with Programme Outcomes
PROGRAMME OUTCOMES

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAA12	Biostatistics and Computer Application	4	4	0	0	Theory

Course Outcome

- CO1: Able to understand the Basic statistical approach.
CO2: Analyze the application of various statistical calculations .
CO3: Apply the techniques for ANOVA.
CO4: Able to understand the Basics of Computer operation.
CO5: Know to access the windows operation.

Unit I: [12 Hours]

Measures of central tendency – Mean, Median, Mode- Measures of Dispersion – Range, Mean Deviation, and Standard deviation.

Unit II: [12 Hours]

Measures of relationship – Covariance, Karl Pearson coefficient of Correlation, Rank correlation – Sampling distribution – Mean, proportion, students t –Distribution, Chi-square Distribution, F-Distribution. Degree of freedom, Standard error.

Unit III: [12 Hours]

Analysis of variance: Anova technique – principles of ANOVA - One way ANOVA – Two way ANOVA – Analysis of co-variance.

Unit IV: [12 Hours]

INTRODUCTION TO COMPUTER : What is Computer – Evolution – Basic Components – Memory – Software Components - Input / Output Devices - External Storage Devices – Personal Computer – Work Station - Mainframes

Unit V: [12 Hours]

MS – WORD - MS-EXCEL - MS-POWER POINT - MS-ACCESS

References:

1. Research Methodology methods and Techniques 3rd edition, C R Kothari and Gaurav Garg, New age international publisher.
2. Biostatistic, Danniell, W.W., 1987. New York, John Wiley Sons.
3. An introduction to Biostatistics, 3rd edition, Sundarrao, P.S.S and Richards, J. Christian Medical College, Vellore

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :III						
Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBT2CP	Lab in Genetics and Bioinstrumentation	4	0	0	5	Practical

1. Breeding Experiments In Drosophila Melanogaster
2. Preparation Of Salivary Gland Chromosomes
3. Mounting Of The Sex Comb In Drosophila Melanogaster
4. Study Of Drumsticks In The Neutrophils Of Females
5. Microscopy – observation of Algae
6. Spectrophotometer - Protein Quantification
7. Electrophoresis – Age & Page
8. Column Chromatography – Separation of Plant pigments
9. PH Meter – Buffer Preparation
10. Centrifugation – Separation of Cell Mass

References

1. Laboratory Manual for Biotechnology Verma, Ashish S./ Das Surajit & Singh Anchal S. Chand Publishing, 2014
2. Biotechnology Procedures And Experiments Handbook, S. Harisha, Ph.D. Infinity Science Press Llc, Hingham, Massachusetts, New Delhi, India

Semester :III						
Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBT3CA	Plant Biotechnology	4	5	0	0	Theory

Introduction: This course presents the Basics of Plant tissue culture and quality enhance the plant based products.

Course Outcome

CO1: To become familiar with plant tissue culture techniques and preparations.

CO2: To know the techniques for plant gene transformation and process.

CO3: To learn the functional activity of vectors for transformation.

CO4: To become familiar with transgenic plant with regulations.

CO5: To learn about Quality analysis of plant based products.

Unit I: [12 Hours]

Plant Tissue Culture: Introduction, Plasticity and totipotency, Culture environment, plant cell culture media, growth regulators. Culture types: Callus, Cell suspension culture, Protoplast, Root culture, Shoot tip and meristem culture, Embryo culture, Microspore culture. Plant regeneration – Somatic embryogenesis and Organogenesis.

Unit II: [12 Hours]

Techniques for plant transformation: Introduction, Agrobacterium mediated gene transfer, Crown gall disease. Ti plasmid and T DNA, The process of T DNA transfer and integration. Practical applications of Agrobacterium mediated plant transformation. Methods of Transformations.

Unit III: [12 Hours]

Vectors for Plant transformation: Introduction, Desirable features of Plasmid vector, Basic features of vector for plant transformation, promoters and terminators, Selectable Markers, Reporter genes, Arrangement of Gene in vectors.

Unit IV: [12 Hours]

Transgenic Plants: Genetic manipulation of herbicide tolerance – Genetic manipulation of pest resistance – Plant disease resistant – engineering of stress tolerance – improvement of crop yield and quality – Regulations of GM crops in India, EU and USA.

Unit V: [12 Hours]

Quality analysis of Plant and Plant Product: Extraction plant product - Phytochemical constituent – Antioxidant Properties – Antimicrobial Properties.

Text Book

- 1.Plant Biotechnology - Ramawat, K.G. 2008. Second Edition, S.Chand &Co., New Delhi.
2. An introduction to Plant tissue culture - Razdan. M.K 2003. Oxford & IBH Publishing Co, New Delhi.
- 3.An Introduction to Plant Biotechnology- Chawla, H.S.2009. 3r edition, science Publishers, Inc, Enfield, NH, USA.
4. Plant Biotechnology – the genetic manipulation of plants second edition –Adrian Slater, Nigel W.Scott and Mark R. Fowler. Oxford University press-2010.
- 5.Molecular Biotechnology – Glick, B.R and J.J .Pasternak 1998. Second Edition. ASM Press, Washington.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :III						
Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTC03	Biochemistry	4	5	0	0	Theory

Introduction: This course presents the Basic structure and functions of Biomolecules and their Metabolic activities.

Course Outcome

CO1: To become skillful the basics structure and functions of Amino acids and Proteins.

CO2: To understand the enzyme classification and activities.

CO3: To learn the functional activity of Carbohydrates.

CO4: To become familiar with Metabolism of carbohydrates.

CO5: To learn about Nucleic acid structure and functions.

Unit I: [12 Hours]

Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. different Level of structural organization of proteins. Fibrous and globular proteins.

Unit II: [12 Hours]

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, Role of: NAD⁺, NADP⁺, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions.

Unit III: [12 Hours]

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

Unit IV: [12 Hours]

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation. β -oxidation of fatty acids.

Unit V: [12 Hours]

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA

Reference Book

1. Lehninger Principles of Biochemistry By: David L. Nelson and Cox
2. Harper's Biochemistry By: Robert K. Myrray
3. Enzymes By:Trevor Palmer
4. Principles of Biochemistry By: Donald J. Voet, Judith G.Voet, Charlotte W.Pratt
5. Principles and techniques of Biochemistry and Molecular Biology Edited By Keith Wilson and John Walker

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :III						
Subject Code	Subject title	Credit	Lecture	Tutorial		Practical Type
19BBT3CP	Lab in Biochemistry and Plant Biotechnology	4	0	0	5	Practical

Introduction: This course presents the Basic and advanced plant tissue culture techniques and enhance the plant based product.

1. Extraction of plant materials
2. Quantification of carbohydrates and proteins.
3. Phytochemical analysis.
4. Antioxidant properties.
5. Isolation of protease/Rubisco from plant extract.
6. Partial purification of protease enzyme.
7. Compound separation from TLC.
8. Protein separation from SDS PAGE.
9. Identification of plant compounds using GCMS.
10. Preparation of complex nutrient medium (Murashige & Skoog's medium).
11. To selection, Prune, sterilize and prepare explants for culture.
12. Significance of growth hormones in culture medium.
13. Callus induction and regeneration of plant.

References:

Plant Tissue Culture Theory and Practicals 2nd edition, T.Pullaiyah, M.V. Subba Rao and E.Sreedevi, Scientific publishing

Plant tissue culture by K. Lindsey, 1997, Springer, Dordrecht

Semester :III

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTA01	Nanoscience & Nanotechnology	4	4	0	0	Theory

Introduction: This course presents the Basics of Nanotechnology, Nanoparticle preparations and Characterizations.

Course Outcome

CO1: To understand the History of Nanotechnology concept and applications.

CO2: To learn the biology of Nanoparticles synthesis and applications.

CO3: To know the techniques of Nanoparticle structure and preparations.

CO4: To become familiar with characterization of Nanoparticles.

CO5: To become know the applications of Nanobiotechnology.

Unit I: [12 Hours]

History of Nanotechnology: Early use of nanomaterials , concept and application. Nanoparticles – Size, Shape, Properties .

Unit II: [12 Hours]

Biological Nano objects – DNA, Protein and Lipids. Hot Nanoparticles – Quantum dot, synthesis, applications. Carbon quantum dots, synthesis and applications.

Unit III: [12 Hours]

Nanoparticles structure and Preparation – Solvent Evaporaion, Nanoprecipitation, Emulsification Diffusion, Supercritical fluid Technology, Polymerization in Emulsion, Interfacial Polymerization, Liposomes, Cubosomes, Hexosomes.

Synthesis of Nanoparticles in aqueous extract

Unit IV: [12 Hours]

Nanoparticles Characterization Techniques – X-ray diffraction (XRD), Scanning Electron Microscope (SEM), Energy Dispersive X-ray Spectroscopy (EDX), Transmission Electron Microscope (TEM), Scanning probe microscopes (SPM), Atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy (FTIR), Ultraviolet visible spectroscopy (UV-Vis).

Result analysis of characterized nanoparticles.

Unit V: [12 Hours]

Applications of Nanobiotechnology in Medicine, Drug Designing, and Cancer treatment. Nanobiotechnology in Medical, Social and Ethical Consideration.

To demonstration of cancer treatment using Nanoparticles.

Text Book

1. Text book of Nanotechnology by Dr.G.Dhamodharan, first edition, Umadevi Publication, India.
2. Nanotechnology Assessment and perspective by Professor H. Brune et al., Springer 2015.
3. The Handbook of Nanotechnology- Business, Policy and Intellectual Property law by John C. Miller et al., 2004.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :III

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTS01	Human Anatomy & Physiology	2	2	0	0	Theory

Introduction: This course presents the Basics of Anatomy and Physiology of Human Structure.

Course Outcome

CO1: To understand the structure of Human Body

CO2: To able to know the tissue level of Organization.

CO3: To become familiar with structure and functions of Nervous system.

CO4: To know the cardiovascular systems.

CO5: To learn about the respiratory and digestive system .

Unit I: [12 Hours]

An Introduction to the Human Body: Overview of Anatomy and Physiology – Structural Organization of the Human Body – Functions of Human Life – Requirements of Human Life – Homeostasis.

Unit II: [12 Hours]

Tissue Level of Organization: Types of Tissues – Epithelial Tissues – Connective Tissue Supports and Protects – Muscle tissue and Motion – Nervous Tissue Mediates perception and Response – Tissue Injury and Aging.

Unit III: [12 Hours]

Nervous System and Nervous Tissue: Basic structure and Function of the Nervous System – Functional Divisions of the Nervous System – Nervous Tissue – Neurons – Parts of Neurons and types of Neurons – Glial Cells - Functions of the Nervous tissue.

Unit IV: [12 Hours]

The Cardiovascular System: Heart – Anatomy, Location, Shape and Size - Structure and Functions of Blood Vessels.

Unit V: [12 Hours]

Organs and Structure of the Respiratory System: Conducting Zone - Nose, Pharynx, Larynx, Trachea – Respiratory Zone – Gross Anatomy of the Lung. Digestive System – Overview of the Digestive System – Digestive system process and Regulation.

Reference:

J. Gordon Betts – “Human Anatomy and Physiology”, OpenStax, Rice University

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester :III

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
IDC – 19BBT3IS	Nature Medicine	2	2	0	0	Theory

Introduction: This course presents the available of Natural Medicine in common Disease and Health improvement through nutrient supplements.

Course Outcome

CO1: To understand the principles and practice of nature cure.

CO2: To know the importance of vitamins and Amino Acids.

CO3: To become familiar with importance of Dietary.

CO4: To know the Common Disease and their Natural Treatments I.

CO5: To know the Common Disease and their Natural Treatments II.

Unit I: [12 Hours]

Nature Cure and Natural Methods of Treatment – Principles and practice of nature cure – Fasting : The master Remedy – Therapeutic Bath – Curative power of Earth – Exercise in Health and Disease – Yoga therapy – Healing power of Colors.

Unit II: [12 Hours]

Health Through Nutrition I: Optimum Nutrition For Vigour And Vitality - Miracles Of Alkalizing Diet - Vitamins And Their Importance In Health And Disease - Minerals And Their Importance In Nutrition - Amazing Power Of Amino Acids.

Unit III: [12 Hours]

Health Through Nutrition II: Secrets Of Food Combining - Health Promotion The Vegetarian Way - Importance Of Dietary Fibre - Lecithin - An Amazing Youth Element - Role Of Enzymes In Nutrition - Raw Juice Therapy - Sprouts For Optimum Nutrition.

Unit IV: [12 Hours]

Disease and Their Natural Treatment I : Anaemia – Appendicitis – Asthama - Common Cold – Dandruff – Diabetes - Falling Of Hair - Headaches And Migraine.

Unit V: [12 Hours]

Disease and Their Natural Treatment II: High Blood Cholesterol - High Blood Pressure – Indigestion – Jaundice - Kidney Stones – Obesity – Stress – Thinness – Tonsillitis.

Reference:

1. *The Modern Herbal Dispensatory: A Medicine-Making Guide.. Thomas Easley and Steven Horne*
2. *Herbs: A Color Guide to Herbs and Herbal Healing.. Jennie Harding*
3. *A Complete Hand Book of Nature Cure.. Marine Drive Dr. P.K. Bolar, N.D. Indian Institute of Drugless Therapy.*

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester IV:

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core – 19BBT4CA	Immunology and Immunotechnology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the basic history of Immunology

CO 2: To know the antigen and antibody classes and function.

CO 3: To apply the techniques for antigen and antibody interaction.

CO 4: To analyze the MHC molecules and complement system of our immunity.

CO 5: To understand the Hypersensitivity classes and reactions.

Unit I : [12 Hours]

History and scope of Immunology – Cell and organs involved in immune system – Organization and structure of lymphoid organs – Primary lymphoid organs – Secondary lymphoid tissues.

Unit II: [12 Hours]

Antigen – Immunogenicity versus Antigenicity – Biological system contributes to Immunogenicity – Epitopes – Antibody : Basic structure of Antibody – Antibody classes and biological functions. Antigenic Determinants on Immunoglobulins.

Unit III: [12 Hours]

Antigen – Antibody Interaction – Cross Reactivity, Precipitation Reactions, Agglutination Reaction, Radioimmunoassay, ELISA, Western Blotting, Monoclonal Antibody production. Flow cytometry.

Unit IV: [12 Hours]

Major Histocompatibility Complex: General Organization and inheritance of the MHC – MHC Molecules and Genes. Cytokines and Properties – Complement System: Functions of complement and Complement Components.

Unit V: [12 Hours]

Hypersensitive Reaction: Introduction – IgE Mediated Hypersensitivity, Antibody Mediated cytotoxic Hypersensitivity, Immune complex mediated Hypersensitivity, Delayed type hypersensitivity.

References:

1. Immunology – Kuby., J - 5th Edition
2. Immunology – Tizard
3. Introductory Practical Biochemistry – S. K. Sawhney and Randhir Singh. Narosa Publishing House
4. Principles of Applied Biomedical Instrumentation- Gedder A and L. E. Balsar, John Wiley and Sons.
5. Modern Experimental Biochemistry 2nd Edition- Boyer, Rodney F. Benjamin and Cummins

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester IV:

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core -19BBTC04	Animal biotechnology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the basic mechanism of mammalian cell

CO 2: To get a idea for designing the tissue culture laboratory area.

CO 3: To know the preparation and handling of primary culture

CO 4: To become a familiar with Stem cell culture.

CO 5: To know the applications and safety measures of Animal Biotechnology.

Unit I: [12 Hours]

Biology of Cultured Cells – The culture Environment – Cell Adhesion – Cell Proliferation and Differentiation. Cell Signaling – Energy metabolism – Initiation of the culture – Evolution and Development of Cell Lines - Origin of cultured cell.

Unit II: [12 Hours]

Laboratory Design and Layout – Requirement of a tissue culture Laboratory– Specialized equipments. Tissue culture Media – Development of Media, Physiochemical Properties, Balanced Salt Solution – Complete Media – Serum – Selection of Medium and Serum. Preparation of Serum free media.

Unit III: [12 Hours]

Primary culture - Types of Primary culture – Isolation of the Tissue – Mouse embryo, Chick embryo, Human Biopsy materials – Enzymatic Disaggregation – Trypsinisation – Mechanical Disaggregation – Subculture, culture age – Cell Line. Cell Viability Assay, Cytotoxicity Assay, Assay to detect Apoptosis, Counting of cell in Haemocytometer, Application of cell culture.

Unit IV : [12 Hours]

Stem Cells – Embryonic stem cells and grown in laboratory – Adult stem cell and differentiation – Transdifferentiation – Similarities and Differences between Embryonic and adult stem cells. Induced pluripotent stem cells – Potential uses of Human stem cells and the obstacles.

Unit V: [12 Hours]

Animal Breeding and Transgenic animals – Methods of genetic manipulation in animals – Cloning – Applications of Transgenic animals – Economic impact in developing countries – Ethical Issues; Biosafety and Ethics – Biosafety levels – Biopiracy -

References:

1. Animal cell culture – a practical approach, 4th ED., Freshney. John Wiley Pub.
2. Mammalian Cell Biotechnology- A practical approach. ED Butler. Oxford UNI Press.
3. Methods in Cell Biology. VOL 57 Animal methods, ED Mather & Barnes, Academic Press.
4. Exploring Genetic mechanisms. ED Singer & Berg.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester IV :

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTA02	Pharmaceutical Biotechnology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the biopharmaceuticals current status and future prospects

CO 2: To know the impact of genomes in drug discovery

CO 3: To apply the preclinical studies of drug development

CO 4: To analyze the purification of recombinant protein

CO 5: To understand the patents in the pharmaceutical industry

Unit I: [12 Hours]

Biopharmaceuticals - Introduction to pharmaceutical products - History of the pharmaceutical industry - The age of biopharmaceuticals; Biopharmaceuticals: current status and future prospects.

Unit II: [12 Hours]

drug development process – Introduction, Discovery of biopharmaceuticals - The impact of genomics and related technologies upon drug discovery - Gene chips - Proteomics - Structural genomics – Pharmacogenetics - Initial product characterization Delivery of biopharmaceuticals.

Unit III: [12 Hours]

Preclinical studies - Pharmacokinetics and pharmacodynamics - Toxicity studies – Cytokines in interferon family – Growth factors – Therapeutic hormones.

Unit IV: [12 Hours]

Upstream and Downstream Processing: Sources of biopharmaceuticals – E.coli, animal cell culture, Yeast, fungal, Transgenic animal and plant – cell banking system – microbial cell fermentation – Mammalian cell culture system – Purification of recombinant proteins – final product formulation.

Unit V: [12 Hours]

Patents in the Pharmaceutical Biotechnology Industry: Patent Law – Patent obtain – subject matter – Types of patents in pharmaceutical Biotechnology – Ethical policy issues in Biotechnology patent - role and remit of regulatory authorities.

Reference:

Pharmaceutical Biotechnology Concepts and Applications Gary Walsh University of Limerick, Republic of Ireland.

Pharmaceutical Biotechnology, Drug Discovery and Clinical Applications. Edited by O. Kayser and R.H. Muller.

Pharmaceutical Biotechnology Fundamentals and Applications Third Edition, Daan J. A. Crommelin and Robert D. Sindelar.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester IV

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTS02:	Research Methodology	4	2	0	0	Theory

Course Outcome

CO 1: To understand the research and research methods in bioscience.

CO 2: To know the design of experimental research

CO 3: To apply the sampling technique and survey

CO 4: To analyze the data and interpretation

CO 5: To understand the report writing and presentation of research report.

Unit I : [12 Hours]

Research Methodology: Introduction , Meaning and objective of Research – Types of research – significance of research – research methods – scientific methods – research process – criteria of Good research.

Unit II: [12 Hours]

Research Design – Meaning of Research design – Need for research design – Important concepts relating to research design – Different research design – Basic principles of experimental design – Important experimental design.

Unit III: [12 Hours]

Sample surveys: Sample design – Sampling and Non sampling error – Sample survey Vs. Census Survey – Types of sampling - measurement and Scaling: Quantitative and qualitative data- Classification of measurement scale – Goodness of measurement scale – scaling - Scaling techniques.

Unit IV : [12 Hours]

Data collection and Preparation: Experiment and survey – Collection of primary data – collection of secondary data – selection of method for data collection – Data preparation process –Types of analysis - statistics in research.

Unit V: [12 Hours]

Interpretation and Report writing: Meaning, techniques and precautions in interpretation - Significance of report writing – Types of report – oral presentation – Mechanics and precautions for writing research report.

Reference:

Research Methodology methods and Techniques 3rd edition, C R Kothari and Gaurav Garg, New age international publisher.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester IV:

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBT4CP	Lab in Immunology and Animal Biotechnology	4	0	0	5	Practical

Course Outcome

- CO 1: To understand the Antigen antibody interaction
- CO 2: To know the application of immune electrophoresis
- CO 3: To apply the protein identification and expression
- CO 4: To analyze the cells from chick embryo
- CO 5: To understand the establishment and maintenance of primary cell culture

1. Antigen-Antibody reactions – Agglutination (Blood grouping testing).
2. Ouchterlony Double Diffusion
3. Immuno-electrophoresis,
4. Dot ELISA
5. DNA Isolation Animal tissue/Blood
6. SDS PAGE
7. Western Blotting
8. Preparation of media
9. Isolation of cells from Chick embryo
10. Establishment and maintenance of primary cell cultures
11. Subculture of monolayer cells
12. Subculture of suspension cells
13. Determination of viable cells by trypan blue test

References

1. Laboratory Manual for Biotechnology Verma, Ashish S./ Das Surajit & Singh Anchal
S. Chand Publishing, 2014
2. Biotechnology Procedures And Experiments Handbook, S. Harisha, Ph.D. Infinity Science Press Llc,
Hingham, Massachusetts, New Delhi, India

Semester :IV

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
IDC - 19BBT4IS	Food Processing And Preservation	2	2	0	0	Theory

Introduction: This course presents the Food quality and safety has become a major concern to governments, industry and consumers

Course Outcome

CO1: To understand the methods of food preservation

CO2: To know the safety measure on food preservatives.

CO3: To become familiar packaging of food products

CO4: To know the exploitation of microorganisms in food industry

CO5: To learn the applications of HACCP in small food business.

Unit I: [12 Hours]

Methods of Food Preservation - Introduction, Why Do We Need to Preserve?, Conventional Food Preservation Methods, Preservation by modified and controlled atmospheres, Irradiation preservation of the foods. Preservation by low temperatures. Potential Food Preservation Methods.

Unit II: [12 Hours]

Preservative Measures for Food Safety: Introduction, Hygienic Design, Cleaning Validation.

Unit III: [12 Hours]

Food Packaging – Introduction, Food Packaging Techniques, Packaging Systems, Packaging Materials and Food Applications. Safety Aspects on Active and Modified Atmosphere Packaging

Unit IV: [12 Hours]

Exploitation of Microorganisms by the Food and Beverage Industry – Introduction, Why Fermented Products?, Bacteria, Starter Culture Production, Yeast, Value added products from the microorganisms.

Unit V: [12 Hours]

Application of HACCP in small food Businesses – Introduction, Present Status of HACCP Implementation, Food Safety Law, Food Safety Training, Management of HACCP Programmes.

Text Book:

Food Safety A Practical and Case Study Approach by Kristberg Kristbergsson, *University of Iceland Reykjavík, Iceland*

Semester V:

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core – 19BBT5CA:	Genetic Engineering	4	5	0	0	Theory

Course Outcome

- CO 1 : To understand the role of restriction enzymes
- CO 2 : To know the properties of recombinant vectors
- CO 3 : To apply the screening of cDNA library
- CO 4 : To analyze the PCR based molecular marker
- CO 5 : To understand the bacterial transformation and conjugation

Unit I : [12 Hours]

Restriction Enzymes: History, origin of Restriction endonuclease – Ligation – Alkaline phosphate – Digestion –Modification of Restriction Fragment ends.

Unit II: [12 Hours]

Recombinant vectors: Plasmid vector – Vector based on the Lambda Bacteriophage – Cosmids – M13 Vector - Expression vectors - Vector for Cloning and expression in Eukaryotic cells - Super vectors; YACs and BACs.

Unit III: [12 Hours]

Genomic and cDNA libraries : Genomic libraries – Growing and storing libraries – cDNA libraries – Screening Libraries with Gene probes – Screening expression Libraries with antibodies – characterization of plasmid clone.

Unit IV: [12 Hours]

Molecular Markers – PCR- Principle, Mechanism and application, Ligase chain reaction, RAPD, RFLP, AFLP, Site Directed Mutagenesis – DNA Sequencing – Maxam Gilbert and Sanger’s dideoxynucleotide method, Next generation sequencing (NGS), Gene mapping.

Unit V: [12 Hours]

Transgenic – Bacterial transformation – Conjugation – Transduction - Transgenic plants – Transgenic animals – DNA finger printing in forensic application - ethical issues involved in rDNA technology.

Text Book

1. Introduction to gene cloning – 7th Ed, (2016), Brown T A , Stanley Thomas Pub ltd, Germany.
2. Principles of gene manipulation – 7th Ed (2005), Primrose S.B, Black well Sci ld, Germany.
3. Gene Biotechnology (2009), Jogdand, Himalaya publishing House, Mumbai.
4. Genetic Engineering (1996), Mitra, S, MacMillan India Ltd. New Delhi

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Subject Code	Subject title	Credit	Semester V			Type
			Lecture	Tutorial	Practical	
19BBTC05	Molecular Biology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the genome organization in Prokaryotes and Eukaryotes

CO 2: To know the central Dogma of the organisms.

CO 3: To apply the mechanisms of gene regulation.

CO 4: To analyze the DNA repair mechanism of bacterial genetics

CO 5: To understand the chromosomal variation and mapping.

UNIT I – [12 Hours]

Genome Organization : Genome organization – Prokaryotic and Eukaryotic; Chromosome structure and function, chromatin; Chloroplast DNA; Mitochondrial DNA; Gene families; Gene Clusters

UNIT II – [12 Hours]

Central Dogma : Prokaryotic and Eukaryotic DNA replication, Transcription, Translation and regulation mechanisms – Post transcriptional modification– Post translational modifications - Ribosomes, protein biosynthesis and transportation- Different mechanisms of Signal transduction.

UNIT III – [12 Hours]

Gene Regulation Mechanisms: General aspects of Regulation, The lactose operon model, The Galactose operon, The Arabinose operon, The Tryptophan operon, Relative positions of Promoters and Operators, Feedback Inhibition

UNIT IV – [12 Hours]

DNA Repair Mechanisms: DNA repair mechanisms; Mutagenesis, Mutations - Types and Mutants, Biochemical Basis of Mutants, Mutagenesis, Mutational Hot Spots, Reversion. Transposable elements - Insertion sequence and transposons, Integrons and Antibiotic-Resistance cassettes; Bacterial Genetics (Conjugation, Transformation, Generalized transduction, Specialized Transduction)

UNIT V – [12 Hours]

Chromosomal Variations And Mapping : Chromosomal variation in Number & Structure – Chromosomal aberrations & evolution. Chromosome Mapping - Haploid mapping, Diploid mapping - Oncogenesis: Development and causes of cancer, Types of cancer, Oncogenes: Retro viral, proto, tumour suppressor gene.

References

1. Harvey Lodish, Baltimore. Arnold Berk et al. “*Molecular cell biology*” 7th edition. *Publisher:* W. H. Freeman, 2011.
2. DeRobertis, EDP, E.M.F Robertis,. *Cell and molecular biology*, Saunders Company, 2006.
3. David Freifelder, “*Molecular Biology*”, 3rd edition Jones & Bartlett publications, 2009.
4. Cooper M,. “*The cell molecular approach*”, ASM Press, 2004.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester V

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Elective I – 19BBTE01:	Food Biotechnology		4	5	0	0 Theory

Course Outcome

CO 1: To understand the associated microorganisms of food industry

CO 2: To know the natural food products and their control.

CO 3: To apply the food preservation methods.

CO 4: To analyze the principle and operations of packing

CO 5: To understand the methods and importance of quality control.

UNIT-I: [12 Hours]

History of microbiology of food - microbial growth pattern, physical and chemical factors influencing structure of micro-organisms - types of micro-organism normally associated with food - mold, yeast and bacteria.

UNIT-II: [12 Hours]

Micro-organisms in natural food products and their control - contaminants of foods - stuffs, vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing - biochemical changes caused by micro-organisms - deterioration of various types of food products - food poisoning and microbial toxins.

UNIT-III: [12 Hours]

Scope and importance of food processing - principles and methods of food preservation - freezing, heating, dehydration, canning, additives, fermentation, irradiation, extrusion cooking, hydrostatic pressure cooking, dielectric heating, microwave processing.

UNIT-IV: [12 Hours]

Introduction to packaging - packaging principles and operation - package functions and design - deteriorative changes in foodstuff and packaging methods for prevention - shelf life of packaged foodstuffs - methods to extend shelf life.

UNIT-V: [12 Hours]

Objectives, importance and functions of quality control - methods of quality - assessment of food materials - fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products - sampling and specification of raw materials and finished products - statistical quality controls - food regulations, grades and standards - food adulteration, food safety and evaluation.

REFERENCES

1. Rsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration, 2nd Edn. (2 Vol. Set). AVI, Westport.
2. Der, A.E. 1978. Food Processing and Nutrition. Academic Press, London.
3. Lows, P. and Ellis H. 1990. Food Processing. Prentice Hall, Reston Virginia, USA.
4. Jelen, P. 1985. Introduction to Food Processing. Prentice Hall, Reston Virginia, USA.
5. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.
6. Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York

Mapping of Course Outcomes with Programme Outcomes PROGRAMME OUTCOMES

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester V

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Elective II – 19BBTE02:	Cancer Biology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the fundamentals of cancer biology

CO 2: To know the principles of Carcinogenesis

CO 3: To apply the molecular tools to identify the cancer gene

CO 4: To analyze the genetic characters of cancer gene

CO 5: To understand the gene therapy cancer.

UNIT I: [12 Hours]

Fundamentals of Cancer Biology : Regulation of Cell cycle, Mutations that cause changes in signal molecules, effects on receptor, signal switches, tumour suppressor genes, Modulation of cell cycle-in cancer, Different forms of cancers, Diet and cancer.

UNIT II: [12 Hours]

Principles of Carcinogenesis : Chemical Carcinogenesis, Metabolism of Carcinogenesis, Natural History of Carcinogenesis, Targets of Chemical Carcinogenesis, Principles of Physical Carcinogenesis, X-Ray radiation – Mechanism of radiation Carcinogenesis.

UNIT III: [12 Hours]

Principles of Molecular Cell Biology of Cancer :Oncogenes, Identification of Oncogenes, Retroviruses and Oncogenes, detection of Oncogenes, Growth factor and Growth factor receptors that are Oncogenes. Oncogenes / Proto Oncogenes activity. Growth factors related to transformations.

UNIT IV: [12 Hours]

Principles of Cancer Metastasis : Clinical significances of invasion, heterogeneity of metastatic phenotype, Metastatic cascade, Basement membrane disruption, Three step theory of invasion, Proteinases and tumour cell invasion.

UNIT V: [12 Hours]

New Molecules For Cancer Therapy : Different forms of therapy, Chemotherapy, Radiation Therapy, Detection of Cancers, Prediction of aggressiveness of Cancer, Advances in Cancer detection.

REFERENCES :

1. Maly B.W.J., *Virology a practical approach*, IRL press, Oxford, 1987.
2. Dunmock.N.J and Primrose S.B., *Introduction to modern Virology*, Blackwell Scientific Publications.
3. Raddon.R.W., *Cancer Biology*, Oxford University Press, Oxford, 1995.
4. King R.J.B., *Cancer Biology*, Addison Wesley Longmann Ltd, U.K., 1996.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester V

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Elective III – 19BBTE03:	Medical Biotechnology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the associated reproductive technology and animal cell culture

CO 2: To know the chromosomal disorders and disease

CO 3: To apply the methods of diagnosis used in microbial disease

CO 4: To analyze the prevention and treatment of bacterial disease.

CO 5: To understand the modern medicine system and stem cell therapy.

UNIT I –

[12 Hours]

Art and Acc : Assisted reproductive technology- Pregnancy diagnosis - Animal cell culture-media, maintenance and culture of primary, secondary and continuous cell lines- organ culture- applications- cancer cell lines- apoptosis.

UNIT II –

[12 Hours]

Chromosomal Disorders: Chromosomal disorders – Gene controlled diseases –Identification of disease genes- Haemophilia, DMD, Alzheimer's – Molecular basis of human diseases: Pathogenic mutations – Oncogenes - Loss of function - Tumour Suppressor Genes- Immunopathology: Hepatitis, Autoimmune Disorders.

UNIT III –

[12 Hours]

Diagnostics Methods: Prenatal diagnosis - Invasive techniques and Non-invasive techniques – Diagnosis of pathogenic microbes: Classical and modern methods- Diagnosis using protein and enzyme markers, DNA/RNA based diagnosis - Molecular markers - Microarray technology - genomic and cDNA arrays.

UNIT IV –

[12 Hours]

Prevention and Treatment: Vaccines-conventional, recombinant, synthetic peptide, anti-idiotypic, DNA vaccines- Deletion mutant and vaccinia vector vaccine- Antibiotics-mode of action- antibacterial, antifungal, antiviral, antitumor antibiotics- synthetic chemotherapeutic agents- development of microbial resistance to antibiotics.

UNIT V –

[12 Hours]

Modern Medicine: Hybridoma technique for MAb production and applications- Gene therapy: Ex vivo, In vivo, In situ- Cell and tissue engineering- Stem cell therapy- Nanomedicines- Gene products in medicine – Humulin, Erythropoietin, Growth Hormone/Somatostatin, tPA, Interferon.

References

1. Jogdand, S. N.. Medical Biotechnology, Himalaya Publishing house, Mumbai, 2005.
2. Click, B. R. and Pasternak.. Molecular Biotechnology: Principle and applications of recombinant DNA. ASM Press, 2010.
3. Ramasamy, P.. “Trends in Biotechnology”, University of Madras, Pearl press, 2002.
4. Trevan.. “Biotechnology”. Tata McGraw-Hill, 2005

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COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester V

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Elective IV – 19BBTE04:	Agriculture Biotechnology	4	5	0	0	Theory

Course Outcome

- CO 1: To understand the history of Indian agriculture.
- CO 2: To know the microbes in agriculture and foods
- CO 3: To apply the production and utilization of essential amino acid
- CO 4: To analyze the genetic engineering for crop improvement
- CO 5: To understand the major crops and major disease in India.

UNIT - I [12 Hours]

History of Indian Agriculture, Green Revolution in India, Cropping patterns in India, Soil, Rainfall Patterns in India.

UNIT - II [12 Hours]

Microbes in Agriculture and Food: microbial enzymes and their applications in food processing and agro-chemical industries, agro-waste utilization, biodegradable polymers and their applications.

UNIT - III [12 Hours]

Production and utilization of essential amino-acids, chemicals from micro-algae, Micorrhiza: Applications in agriculture and forestry.

UNIT - IV [12 Hours]

Genetic Engineering for Crop Improvement: Plant cell and tissue culture, gene transfer techniques into plant cells, application in agricultural and food industries.

UNIT - V [12 Hours]

Plant Pathology – Major crops and major diseases in India. Developing diseases, Drought, Salinity, Cold tolerant crops in India and its economic importance. Post harvest and storage of grains.

REFERENCE BOOKS

1. Agricultural Biotechnology Edited by Arie Altman, Pub. Marcel Dekker, Inc., 1998
2. Biotechnology – Expanding Horizons. B. D. Singh. Kalyani Publishers, 2004.
3. Plant Genetic Engineering by J. H. Dodds, Cambridge University Press, 1983.
4. Biotechnology and Utilization of Algae – The Indian Experience. Venkataraman, V. and E.W. Becker 1985.
5. Agricultural Microbiology by Rangaswami G., Bagyaraj D.J. PHI; 2 edition, 1992.
6. Textbook of Agricultural Biotechnology by Dr. Ahindra Nag, PHI Learning Private Ltd., New Delhi, 2009

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COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Subject Code	Subject title	Semester V			Type
		Credit	Lecture	Tutorial	
SBC – 19BBTS03:	Bioinformatics	4	5	0	Theory

Course Outcome

- CO 1: To understand the major database in bioinformatics
- CO 2: To know the central dogma of molecular biology
- CO 3: To apply the tools for web search and retrieval tools
- CO 4: To analyze the alignment of multiple sequence and phylogenetic analysis.
- CO 5: To understand the protein identification and characterization.

Unit I: [12 Hours]

Bioinformatics : Introduction – History overview – Bioinformatics application – Major Databases in Bioinformatics – Data Management and Analysis.

Unit II: [12 Hours]

Genome Analysis: Molecular Biology and Bioinformatics – Central Dogma of Molecular biology – Genome Analysis – Genetic mapping and linkage analysis.

Unit III: [12 Hours]

Information search and Data retrieval: Introduction - Tools for web search – Data Retrieval tools – Data mining of biological Databases.

Unit IV: [12 Hours]

Alignment of Pairs of sequences: Biological motivation of Alignment problems – methods of sequence alignment – Alignment of Multiple sequence and phylogenetic analysis – Tools for similarity search and sequence alignment.

Unit V: [12 Hours]

Protein Structure Prediction: Protein identification and characterization – primary structure analysis and prediction – secondary structure analysis and prediction – Motifs, Profiles, Patterns and Fingerprints search.

Reference:

1. Bioinformatics Methods and Applications third edition, S.C Rastogi, N.Mediratta, P.Rastogi.
2. Arthur Lesk "Introduction to Genomics" 2nd edition. Oxford University Press 2007.
3. 2. Andreas D Baxevanis, B F Francis Oullette "*Bioinformatics: A practical guide to the analysis of genes and proteins*". 2nd edition. Wiley publishers, 2005.
4. Jin Xiong "*Essential Bioinformatics*", 1st edition Cambridge University Press, 2006.
5. 2. David Mount "*Bioinformatics: sequence and genome analysis*" 3rd edition. Cold Spring Harbor Laboratory Press, 2004.

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COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester V:

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBT5CP	Lab in Genetic engineering and Molecular Biology	4	0	0	5	Practical

Course Outcome

- CO 1: To understand the isolation of genomic DNA
- CO 2: To know the characteristics of restriction enzymes
- CO 3: To apply the gene amplification polymerase chain reaction
- CO 4: To analyze the gene polymorphism of using RAPD technique
- CO 5: To understand the southern hybridization process.

1. Bacterial DNA Isolation.
2. Plasmid DNA Isolation
3. Restriction Digestion
4. Ligation
5. Polymerase chain Reaction (PCR)
6. Gene cloning
7. Transformation
8. RAPD
9. Polyacrylamide gel electrophoresis (PAGE)
10. Southern Hybridization

References

1. Laboratory Manual for Biotechnology Verma, Ashish S./ Das Surajit & Singh Anchal
S. Chand Publishing, 2014
2. Biotechnology Procedures And Experiments Handbook, S. Harisha, Ph.D. Infinity Science Press Llc,
Hingham, Massachusetts, New Delhi, India

Semester VI:

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBT6CA	Environmental Biotechnology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the ecosystem structure and function

CO 2: To know the solid waste management system

CO 3: To apply the engineered bioremediation process

CO 4: To analyze the indication of water pollution.

CO 5: To understand the microorganisms and energy requirement of mankind.

Unit I:

[12 Hours]

Ecosystem : Ecosystem structure and functions, abiotic and biotic component, Energy flow, food chain, food web, Ecological Pyramids-types, biogeochemical cycles.

Unit II:

[12 Hours]

Solid waste Management: Introduction, Reduce, Reuse and Recycle – Waste reduction and reuse – recycling – waste collection – treatment and disposal – thermal treatment – Dumps and landfills – Biological waste treatment – Integrated solid waste management.

Unit III:

[12 Hours]

Bioremediation :Introduction, constraints and priorities of Bioremediation, Biostimulation of Naturally occurring microbial activities, Bioaugmentation, in situ, ex situ, intrinsic & engineered bioremediation.

Unit IV:

[12 Hours]

Indicators of water pollution: Introduction – BOD & COD – pH, Acidity, Alkalinity – Nutrients – Electric conductivity and Dissolved solids – Metals and pesticides – Sediment and substrate – Temperature – overall water quality –Eutrophication.

Unit V:

[12 Hours]

Biofuels : Microorganisms and energy requirements of mankind; Production of non conventional fuels - Methane (Biogas), Hydrogen, Alcohols and algal hydrocarbons, Use of microorganisms in augmentation of petroleum recovery.

References

1. Agarwal S. K., “Advanced Environmental Biotechnology”, APH Publishing, 2005.
2. Thakur S, “Environmental Biotechnology: Basic Concepts and Applications”, I K International Publishing House, 2006.
3. Chandrawati Jee, Shagufta, , “Environmental Biotechnology”, APH Publishing, 2007.
4. Hans-Joachim Jördening, Josef Winter, “Environmental Biotechnology: Concepts and Applications”, Wiley, 2006.

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COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester VI

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTE05	Industrial Biotechnology		4	5	0	0 Theory

Course Outcome

CO 1: To understand the biotechnology based commercial product.

CO 2: To know the industrially importance microorganisms

CO 3: To apply the fermentor for batch and continuous culture.

CO 4: To analyze the downstream processing.

CO 5: To understand the industrial process of amino acid and organic acid.

UNIT-I

[12 Hours]

Introduction to biotechnology and products. Major classes of commercial products using micro organisms-enzymes, amino acids, vitamins, antibiotics, organic solvents, organic acids, food and beverages.

UNIT-II

[12 Hours]

Industrially important microorganisms: screening techniques - detection & assay of fermentation products-strain improvements - mutations, protoplast fusion and rDNA techniques for strain development.

UNIT-III

[12 Hours]

Bioreactors / Fermentor: Types, features, operation: sterilization (Batch and Continuous), inoculation and sampling. Control of bioprocess parameters. Microbial growth and media formulation. Microbial culture - batch, fed batch, semi-continuous, continuous. Growth kinetics of microorganisms.

UNIT-IV

[12 Hours]

Down stream processing: Solid-liquid separation, flotation, flocculation, filtration, centrifugation, cell disruption, concentration, evaporation, liquid-liquid extraction, membrane filtration, precipitation, adsorption. Product purification by chromatography.

UNIT-V

[12 Hours]

Industrial process of beverages - enzymes - amino acid - organic acids - organic solvents - antibiotics.

References:

1. Manual of industrial microbiology and Biotechnology, Demain A.L. Solomon, J.J., 1986. ASM press.
2. Industrial Microbiology, Reed C., Prescott and Dann's, 1982. Macmillan publishers.
3. Fundamentals of Biotechnology, Prave. P. Faust, V. Sitih. W., Sukatsh, DA, 1987. ASM press.
4. Biotechnology, Satyanarayana, U., 2006. Books and Allied (P) Ltd.
5. AN introduction to Genetic Engineering, Desmond, S.T., Nicholl, 1994. Cambridge press.

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PROGRAMME OUTCOMES

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester VI

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTE06	Bioethics, IPR and Biosafety	4	5	0	0	Theory

Course Outcome

CO 1: To understand the legal and ethical impact of biotechnology

CO 2: To know the intellectual property rights

CO 3: To apply the concept of patent system and law

CO 4: To analyze the bio-safety of good lab practice

CO 5: To understand the biodiversity and concepts

UNIT I – [12 Hours]

Bioethics - legal and socioeconomic impacts of biotechnology- ethical concerns of biotechnology research and innovation, Bioethics committees.

UNIT II - [12 Hours]

Intellectual property rights - patent, copyright, trade mark, TRIPS- GATT and PBR, WTO.

UNIT III - [12 Hours]

Patent system – patenting laws - Legal development- Patentable subjects and protection in biotechnology - patenting living organisms.

UNIT IV – [12 Hours]

Bio-safety GLP - Containment facilities – Biosafety levels - Genetically modified organisms - Genetically modified foods, Biosafety guidelines – National and International.

UNIT V – [12 Hours]

Biodiversity -Basic concepts of Biodiversity - Elements of Biodiversity - Ecosystem Diversity, Genetic Diversity, Species Abundance & Diversity.

REFERENCES

1. Shaleesha A, Stanley, Bioethics, Wisdom educational service, 2008.
2. Das H.K., Text book of Biotechnology, Wiley Publishers, 2010.
3. Singh B.D., Biotechnology, kalyani publishers, 2009.
4. Chawla H.S., Introduction to plant Biotechnology, Science publishers, 2004.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester VI

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTE07	Biodiversity and Ecology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the fundamentals of Ecology

CO 2: To know the Diversity of species

CO 3: To apply the population and community based research

CO 4: To analyze the aquatic and terrestrial communities

CO 5: To understand the practical and field experiments using standard methods.

UNIT-I

[12 Hours]

Introduction to Ecology & environmental sciences; Flow of energy and cycling of materials; water, carbon, nitrogen and phosphorus. Trophic pyramids and food webs; Alterations of ecosystem function: acid rain, nuclear winter, global warming and ozone hole.

UNIT-II

[12 Hours]

Diversity of life; origin of life on earth; Evolution of early life and changes in earth's atmosphere. Mendelian genetics – and Darwin Wallace theory of inheritance. Five kingdoms overview; Monera, Protists, Fungi, plant and animal kingdoms.

UNIT-III

[12 Hours]

Populations and communities; Birth, death and population size, age structure; Trends in human population growth; Malthusian growth. Intraspecific interactions and density dependence. Interspecific interactions; Commensalism, mutualism, competition and predation. Species diversity, community stability and disturbance.

UNIT-IV

[12 Hours]

Aquatic and terrestrial communities; rare communities; deep earth, deep sea floor, volcanoes. Primary productivity; basic concepts. Ecological succession inland, water; concepts. Invasive species and control.

UNIT-V

[12 Hours]

Practical and Field Experiments using standard methods; Estimation of density and relative abundance of species using quadrats and plotless methods. Estimation of species diversity: introduction to indices. Estimation of primary productivity. Ecological adaptations of the Plant and animal species in the hydrophytes, mesophytes and xerophytes.

References:

1. Chapman, J.L. & M.J. Reiss. 1998. Ecology: Principles and Applications. Cambridge Univ. press. 2nd edition. 336 pgs.
2. Krebs, C.J. 2008. Ecology: The experimental Analysis of Distribution and Abundance (6th Edition), Benjamin Cummings Publ. 688pgs.
3. Miller. G.T. 2004. Environmental Science. Thomson, California. 538 pgs.
4. Singh, J.S., Singh, S.P & Gupta, S.R. 2006. Ecology, Environment and Resource conservation. Anamaya Publ., New Delhi, 688 pp.

Mapping of Course Outcomes with Programme Outcomes
PROGRAMME OUTCOMES

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester VI

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBTE08	Herbal Technology	4	5	0	0	Theory

Course Outcome

CO 1: To understand the history and scope of herbal medicines

CO 2: To know the systematic use of Pharmacognosy studies

CO 3: To apply the phytochemistry through medicinal plant

CO 4: To analyze the drug adulteration and screening

CO 5: To understand the medicinal plant biotechnology in pharma industry

UNIT-I: [12 Hours]

Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

UNIT-II: [12 Hours]

Pharmacognosy - systematic position - chemical constitution and medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.

UNIT-III: [12 Hours]

Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; Catharanthus roseus (cardiotonic), Withania Somnifera (drugs acting on nervous system), Clerodendron Phlomoides (anti-rheumatic) and Centella asiatica (memory booster).

UNIT-IV: [12 Hours]

Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds, fatty acids, tannins, glycosides and volatile oils).

UNIT-V: [12 Hours]

Medicinal Plant Biotechnology: Genetics as applied to medicinal herbs - mutation - polyploidy. Plant tissue culture as source of biomedicinals - Historical developments - types of cultures - phytopharmaceuticals in tissue cultures.

REFERENCES:

1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.

Mapping of Course Outcomes with Programme Outcomes

COURSE OUTCOMES	PROGRAMME OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester VI

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
SBC 19CCA03	Entrepreneurial Development Program		4	5	0	Theory

Introduction: To build the necessary competencies and creativity and prepare them to undertake entrepreneurship as a desirable and feasible career option

- CO 1: To know about the role of the entrepreneur in India and around and the globe, understand the benefits and drawbacks of entrepreneurship and students has to avoid them; entrepreneurial failure.
- CO 2: The course aims to develop student's ability to create, lead and coordinate projects within the textile and fashion sector. It also intends to provide tools and methods in order to make use of entrepreneurial thinking to develop a business project.
- CO 3: Students will be able to define, identify and/or apply the principles of new venture financing, growth financing, and growth financing for existing businesses.
- CO 4: To understand process of women entrepreneur and how faced their problems
- CO 5: To understand difference between Micro, small and medium Enterprises.

Unit I: [12 Hours]

Entrepreneur – importance- qualities, nature types – difference between entrepreneur and entrepreneurship and economic development – its importance – role of entrepreneurship – entrepreneurial environment.

Unit II: [12 Hours]

Project management: sources of business idea – project classifications – identifications – formulation and design – feasibility analysis – preparation of project report and presentation. Financial analysis – concept and scope project cost estimate – operating revenue estimate – ratio analysis – investment.

Unit III: [12 Hours]

Project finance: sources of finance – institutional finance – role of IFC, IDBI, ICICI, LIC, SFC, SIPCOT, commercial bank – appraisal of bank for loans. Institutional aids for entrepreneurship development.

Unit IV: [12 Hours]

The innovation process – the diagnosis – the consultation of group – selecting a strategy preparing the organization setting up the investment. Women entrepreneur – problems faces by women entrepreneur – economic impact of women entrepreneur.

Unit V: [12 Hours]

Setting small scale industries – step in setting SSI unit – problems of entrepreneur – sickness in small industries – reason and remedies – Incentives and subsidies role of DICS, SIDCO, NSICS, IRCI, NIDC, SIDBI, SISI, SIPCOT.

Text Book:

1. Robert D. Hisrich, Mathew J Manimala, Michael P Peters, Dean A Shepherd, "Entrepreneurship", McGraw Hill Education, 2014.

Mapping of Course Outcomes with Program Outcomes

COURSE OUTCOMES	PROGRAM OUTCOMES							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√						
CO2			√	√		√		
CO3	√	√			√			
CO4		√		√	√	√		
CO5		√					√	√

Semester VI

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
19BBT6CP	Lab in Environmental and Industrial Biotechnology		0	0	5	Practical

Course Outcome

- CO 1: To understand the quality of water
CO 2: To know the biological and chemical oxygen demand
CO 3: To apply the industrial effluent treatment
CO 4: To analyze the quality of ethanol production
CO 5: To understand the production of antibiotics.

1. Estimation of Dissolved Oxygen
2. Estimation of Total hardness
3. Estimation BOD
4. Estimation of COD
5. Isolation of Bacteria and fungi from industrial effluent
6. Ethanol production from fruit waste
7. Wine production
8. Citric acid production from waste product
9. Industrial enzyme production Protease/Amylase
10. Production of antibiotics by using the isolated microbes from effluent.

References

1. Laboratory Manual for Biotechnology Verma, Ashish S./ Das Surajit & Singh Anchal
S. Chand Publishing, 2014
2. Biotechnology Procedures And Experiments Handbook, S. Harisha, Ph.D. Infinity Science Press Llc,
Hingham, Massachusetts, New Delhi, India