



KG College of Arts and Science
 Autonomous Institution | Affiliated to Bharathiar University
 ISO 9001-2015 Certified Institution
 KGJL Campus, Saravanampatti, Coimbatore – 641 035



Regulations 2024 - 25 for Undergraduate Programme

Learning Outcomes Based Curriculum Framework- (LOCF) model with

Choice Based Credit System (CBCS)

Programme: B.Sc. Biotechnology

Programme Code: BBT

(Applicable for the Students admitted during the academic year 2024 - 25 onwards)

Eligibility

Candidates for admission to the first year of the Bachelor of Science (Biotechnology) Degree Programme should have passed Higher Secondary examination with Chemistry with Biology / Botany/ Zoology/ Microbiology / Biotechnology / Biochemistry / Nutrition & Dietetics / Nursing Vocational group – Agricultural / Food Science / Home Science.

(As per the eligibility condition given by Bharathiar University Ref.BU/R/B3-B4/Eligibility condition/2024/9206 dated 24/5/2024).

Program Learning Outcomes (PLOs)

The successful completion of the B.Sc. Biotechnology programme shall enable the students to

PLO1	Inculcate deeper knowledge in theoretical and practical skills enabling them to work with disciplinary and interdisciplinary domains of biotechnology.
PLO2	Enhance students learning abilities, technological solutions in digital domains of biotechnology for their applications in industry, research and entrepreneurship.
PLO3	Demonstrate their skills to apply approaches and methods in biotechnology for global environmental problems like climate change and waste management.
PLO4	Validate health safety and legal issues ethically with an understanding in the biotechnological principles behind, for society which could fetch career in food and agricultural industry.
PLO5	Understand and apply the Indian Knowledge System (IKS) in emerging biotechnological industry.

B.Sc. Biotechnology

Distribution of Credits and Hours for all the Semesters

Part	Course Category	No. of Courses	Hours		Credits		Total credits	Semester
I	Language	4	4 X 4	16	4 X 3	12	12	1 – 4
II	English	4	4 X 4	16	4 X 3	12	12	1 – 4
III	Core Theory (6 hrs. / week)	2	2X6	12	2 X 4	8	100	6
	Core Theory (5 hrs. / week)	11	11 X 5	55	11 X 4	44		1 – 6
	Core Lab (4 hrs. / week)	4	4 X 4	16	4 X 3	12		1 – 4
	Core Lab (5 hrs. / week)	2	2 X 5	10	2 X 3	6		5
	Allied (4 hrs. / week)	2	2 X 4	08	2 X 2	4		1, 3
	Allied Lab (4 hrs. / week)	2	2 X 4	8	2 X 2	4		2, 4
	Electives	2	2 X 5	10	2 X 3	6		5 - 6
	Project	1	1 X 6	6	1 X 5	5		6
	Internship (IT)	1	-	-	1 X 2	2		5
Skill Enhancement (SEC)	3	3 X 2	6	3 X 2	6	3, 4 & 6		
IV	Foundation Course (FC)	3	3 X 2	6	3 X 2	6	14	1 – 3
	Ability Enhancement Compulsory Course (AECC)	3	3 X 2	6	3 X 2	6		1, 2 & 4
	Ability Enhancement Compulsory Course (AECC) – Online course- MOOC	1	-	-	1 X 2	2		3
V	Liberal Arts - Extension Activities	-	-	-	2	2	2	4
Total		46		180		140	140	

Consolidated Semester wise and Component wise Hours and Credits Distribution

Semester	Part I		Part II		Part III		Part IV		Part V		Total	
	Hrs	Credits	Hrs	Credits	Hrs	Credits	Hrs	Credits	Hrs	Credits	Hrs	Credits
1	4	3	4	3	18	13	4	4	-	-	30	23
2	4	3	4	3	18	13	4	4	-	-	30	23
3	4	3	4	3	20	15	2	4	-	-	30	25
4	4	3	4	3	20	15	2	2		2	30	25
5	-	-	-	-	30	23	-	-	-		30	23
6	-	-	-	-	30	21	-	-	-	-	30	21
Total	16	12	16	12	136	100	12	14	0	2	180	140

Curriculum
B.Sc. Biotechnology

Semester – 1									
Course Code	Part	Course Category	Course Name	Hrs. / week	Examination			Credits	
					Duration in hrs.	Max Marks			
						CIA	ESE		Total
24TAM11L	I	Language – I	Tamil – I	4	3	25	75	100	3
24HIN11L	I		Hindi – I						
24MAL11L	I		Malayalam – I						
24FRE11L	I		French – I						
24ENG12L	II	English – I	English – I	4	3	25	75	100	3
24BBT13C	III	Core – I	Cell Biology	5	3	25	75	100	4
24BBT14C	III	Core - II	Genetics	5	3	25	75	100	4
24BBT15P	III	Core Lab - I	Lab: Cell Biology & Genetics	4	3	40	60	100	3
24BBT16A	III	Allied – I	Chemistry	4	3	25	75	100	2
24ENV1FC	IV	FC – I	Environmental Studies	2	2	50	-	50	2
24QUA1AE	IV	AECC – I	Quantitative Aptitude	2	2	-	50	50	2
Total				30				700	23

Semester – 2									
Course Code	Part	Course Category	Course Name	Hrs. / week	Examination				Credits
					Duration in hrs.	Max Marks			
						CIA	ESE	Total	
24TAM21L	I	Language – II	Tamil – II	4	3	25	75	100	3
24HIN21L	I		Hindi – II						
24MAL21L	I		Malayalam – II						
24FRE21L	I		French – II						
24ENG22L	II	English - II	English – II	4	3	25	75	100	3
24BBT23C	III	Core - III	Microbiology	5	3	25	75	100	4
24BBT24C	III	Core - IV	Biochemistry	5	3	25	75	100	4
24BBT25P	III	Core Lab - II	Lab: Microbiology & Biochemistry	4	3	40	60	100	3
24BBT26P	III	Allied Lab - I	Lab: Chemistry	4	3	40	60	100	2
24HUM2FC	IV	FC - II	Human Rights	2	2	50	-	50	2
23SOF2AE	IV	AECC - II	Soft Skills	2	2	-	50	50	2
Total				30				700	23

Semester – 1

Part – I : Language I
(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours/ Week	Credits
24TAM11L	Tamil - I	Part - I	4	3

Course Objectives

The course intends to cover

- இலக்கிய வளர்ச்சியை அறிந்துகொள்ளுதல்
- இலக்கியம் படைக்கும் திறன்
- இலக்கிய இலக்கண உரைசெய்தல்
- திறனாய்வு முறையினைக் கற்றுத்தேர்தல்

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	புதுக்கவிதையின் மூலம் வாழ்வியல் விழுமியங்களை உணர்ந்து கொள்ளுதல்.	K1, K2
CLO2	சிறந்த மற்றும் வாழும் கவிஞர்களை அறிந்துகொள்ளுதல்.	K2, K3
CLO3	சிறந்த படைப்பாளர்களின் சிறுகதையில் வெளிப்படும் சமூகச்சிந்தனைகளை அறிந்து விழிப்புணர்வைப் பெறுதல்.	K3
CLO4	தற்கால இலக்கியங்களான புதுக்கவிதை, சிறுகதை தோன்றி வளர்ந்த பின்புலத்தை அறிதல்.	K1, K3
CLO5	மொழியைப் பிழையின்றி பேச, எழுத, கற்கத் தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்தல். நடைமுறை வாழ்வியலுக்குத் தேவைப்படும் ஆங்கிலக் கடிதத்தைத் தமிழாக்கம் செய்தலுக்கான பயிற்சி பெறுதல்.	K2, K3
K1 - Remember; K2 - Understand; K3 – Apply		

Part – I: Tamil – I

Unit	Content	No. of Hours
I	<p>(நாட்டுப்பற்று)</p> <ol style="list-style-type: none"> 1. உலகத்தை நோக்கி வினவுதல் - பாரதியார் 2. பாரதிதாசன் கவிதைகள் - பாரதிதாசன் <ul style="list-style-type: none"> • தமிழ்ப்பேறு 3. ஒற்றுமையே உயிர்நிலை - கவிமணி 4. தேவதேவன் கவிதைகள் - தேவதேவன் <ul style="list-style-type: none"> • சாலையும் மரங்களும் செருப்பும் • புதிய வீடு 5. ஆலாபனை - கவிக்கோ அப்துல் ரகுமான் <ul style="list-style-type: none"> • போட்டி • பாதை 6. புத்தகச் சந்தை - கவிஞர் வாலி 	14
II	<p>(சமூகம்)</p> <ol style="list-style-type: none"> 1. எட்டாவது சீர்..... - ஈரோடு தமிழன்பன் 2. தொலைந்து போனேன் - கவிஞர் தாமரை 3. திருநங்கைகள் காகிதப் பூக்கள் - நா. காமராசன் 4. மரங்களைப் பாடுவேன் - வைரமுத்து 5. புள்ளிப் பூக்கள் (ஹைக்கூ) - அமுத பாரதி 6. நாட்டுப்புறப் பாடல்கள் <ul style="list-style-type: none"> • தாலாட்டுப் பாடல், தெம்மாங்கு பாடல், உழவுத்தொழில் 	14
III	<p>(சிறுகதை)</p> <ol style="list-style-type: none"> 1. அகல்யை - புதுமைப்பித்தன் 2. சுமைதாங்கி - ஜெயகாந்தன் 3. அம்மா ஒரு கொலை செய்தாள் - அம்பை 4. சோற்றுக் கணக்கு - ஜெயமோகன் 5. தூரத்து உறவு - வைரமுத்து 	12

Unit	Content	No. of Hours
IV	(இலக்கிய வரலாறு) 1. மரபுக்கவிதையின் தோற்றமும் வளர்ச்சியும் 2. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் 3. ஹைக்கூ கவிதையின் தோற்றமும் வளர்ச்சியும் 4. சிறுகதையின் தோற்றமும் வளர்ச்சியும்	10
V	(இலக்கணம்) 1. எழுத்துக்கள் (முதல் எழுத்துக்கள், சார்பெழுத்துக்கள்) 2. எழுத்துக்களின் பிறப்பு 3. மாத்திரைகள் 4. பயிற்சிக்குரியன - மொழிப்பெயர்ப்பு (ஆங்கிலத்திலிருந்து தமிழுக்கு மொழிப்பெயர்த்தல்)	10
Total		60

Reference Books	
1	பாரதி பாடல்கள் ஆய்வுப் பதிப்பு, பேரா. ம ரா போ குருசாமி,(2016) தமிழ்ப் பல்கலைக் கழகம், தஞ்சாவூர்
2	ஆலாபனை, அப்துல் ரகுமான்,(2000) கவிக்கோ பதிப்பகம்
3	தாமரை கவிதைகள், தாமரை, (2012) நியூ செஞ்சுரி புக் ஹவுஸ்
4	தமிழ் இலக்கிய வரலாறு, மு வரதராசனார், (2021) சாகித்திய அகாதெமி பதிப்பு
5	புதிய வெளிச்சத்தில் தமிழ் இலக்கிய வரலாறு, முனைவர் க பஞ்சாங்கம், (2017) அன்னம் வெளியீட்டு
6	தமிழ் இலக்கிய வரலாறு, முனைவர் கா கோ வேங்கடராமன்,(2008) கலையக வெளியீட்டு
7	நல்ல தமிழ் எழுத வேண்டுமா?, அ கி பரந்தாமனார் எம். ஏ., (2002)அல்லி நிலையம்
8	100 சிறந்த சிறுகதைகள் (தொகுதி 1 & 2) தொகுப்பு: எஸ் ராமகிருஷ்ணன் (2006) பதிப்பகம்: தேசாந்திரி பதிப்பகம்
9	தமிழ் இலக்கணம் எளிய அறிமுகம் , கோ குமரன் (2010) சந்தியா பதிப்பகம்
10	நாட்டுப்புற இயல் ஆய்வு, சு சக்திவேல்,(2012) மணிவாசகர் பதிப்பகம்

Part – II : Language II - English -I
(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24ENG12L	English - I	Part - II	4	3

Course Objectives

The course intends to cover

- Various genres of literature.
- Active and passive vocabulary.
- Usage of Grammar and Communication.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Identify aesthetic sense and appreciate poetry, enhancing creativity and understanding relevant to professional environments.	K1
CLO2	Understand diverse styles of prose, facilitating versatility in writing and inculcating interpersonal skills.	K2
CLO3	Apply the characters and the narrative techniques in creative writing and content creation ethically.	K3
CLO4	Employ vocabulary and grammatical proficiency in communication to enhance clarity in workplace interactions.	K3
CLO5	Enhance overall communication competence. Practicing these skills in combination reinforces learning and provides students with opportunities to use the language in authentic contexts.	K3
K1 - Remember; K2 - Understand; K3 - Apply		

Part - II: English - I

Unit	Content	No. of Hours
I	Poetry : Nature 1. I Wandered Lonely as a Cloud - William Wordsworth 2. The Sparrow - Paul Laurence Dunbar 3. Stopping by woods on a snowy Evening – Robert Frost	12
II	Prose : Friendship 1. The Man in Black - Oliver Goldsmith 2. Of Friendship - Francis Bacon 3. The Blessing of Friends - Sir John Lubbock	12
III	Short Stories: Morality 1. The Necklace – Guy de Maupassant 2. The Lottery - Shirley Jackson 3. The Monkey’s Paw - W. W. Jacobs	12
IV	Language Competency: Vocabulary 1. Vocabulary : Synonyms, Antonyms, Word Formation 2. Appropriate use of Articles and Parts of Speech 3. Error correction	12
V	English for Communication 1. Listening for General and Specific Information. 2. Self - Introduction, Introducing others, Greetings. 3. Reading a prose passage, Reading a poem and Reading a short story 4. Descriptive writing – writing a short descriptive essay of two to three paragraphs.	12
Total Hours		60
Text Books		
1.	Zama, M. (2004). Poetry Down the Ages. Orient Blackswan.	
2.	Goldsmith, O. (1869). The Works of Oliver Goldsmith. J. Dicks	
3.	Bacon, F., & Montagu, B. (1857). The Works of Francis Bacon (Vol. 1). Parry & McMillan.	
Reference Books		
1.	Kumar, V. T. Bhavani, Durga.K. Srinivas.YL. (2018). English in use - A textbook for College Students. (English, Paperback).	
2.	Swan, M. (2005). Practical english usage (Vol. 7). Oxford: Oxford university press.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/109105205	

Course Code	Course Name	Category	Hours/Week	Credits
24BBT13C	Cell Biology	Core – I	5	4

Course Objectives

The course intends to cover

- The structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
- The cellular components are used to generate and utilize energy in cells.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Know the cell discovery and cell organization.	K1
CLO2	Know the mechanisms of cell transport phenomenon.	K1
CLO3	Understand the cell cytoplasmic compartments.	K2
CLO4	Understand the cell division.	K2
CLO5	Understand the communications of cells with other cells and to the environment.	K2
K1 - Remember; K2 – Understand		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	3	2	2	2
CLO2	3	2	2	3	2
CLO3	-	-	3	3	-
CLO4	2	2	2	-	3
CLO5	1	1	2	1	1
3 - Substantial (high)		2 - Moderate (medium)		1 - Slight (low)	

Core - I: Cell Biology

Unit	Content	No. of Hours
I	Basics of Cells: 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.	15
II	Mechanisms of Cell Transport: Cell transport phenomenon: Membrane architecture. Active, Passive, diffusion and osmosis. Chemistry of carbohydrates, lipids, proteins and nucleic acids.	15
III	Cytoplasmic Compartments of The Cell: Structure and function of cytoplasmic Compartments of the cell: ribosome and protein synthesis, energy flow through mitochondrion, chloroplast and photosynthesis, Golgi apparatus, lysozymes and micro bodies, endoplasmic reticulum, vacuoles, peroxysomes, lysozymes and Nuclear compartment. Heterochromatin and euchromatin, polytene chromosomes.	15
IV	Cell Division: Cell division in prokaryotes and eukaryotes: Cell cycle, Mitosis, Meiosis, Crossing over and Characteristics of cancer. Apoptosis, Stem cell, Prions.	15
V	Specialized Cells and Interaction: Integrative and specialized cellular events: Cell-cell signaling, specialized cells nerve cells, sperm cells, microfilaments, microtubules, muscle cells. Cells of vision, Nucleocytoplasmic interaction, cell cloning.	15
Total Hours		75
Text Books		
1.	Alberts. B., (2014), Molecular Biology of the cell, W. W. Norton & Company, 6 th Edition.	
2.	Devasena.T., (2012), Cell Biology, Oxford University Press, New Delhi, 1 st Edition	
3.	Granger.S., (2018), Text Book of Cell Biology, Callisto Publishers, USA	
4.	Kukerti. S, Joshi.D, Sharma.C.S., (2022), Text of Study of Cell Biology, Lambert Publishers,Uttarakhand.	
5.	James. D, Watson., (2001), The Double Helix: A personal account of the Discovery of the Structure of DNA, Touchstone Publishers	
Reference Books		
1.	Cooper.G.M., (2015), The Cell: A Molecular Approach, Sinauer Associates, Qxford University Press, 7th Edition	
2.	James. D, Watson.,(2014), Molecular Biology of the Gene, Pearson Publications, 7th Edition.	
3.	Karp's.,(2015), Cell and Molecular Biology: Concepts and Experiments. Wiley Publications, 8th Edition.	
4.	Lodish.H., (2016), Molecular Cell Biology, W. H. Freeman Publications, 6th Edition.	
5.	Plopper.G, Ivankovic.D.B., (2020), Principles of Cell Biology, Jones & Bartlett, USA,3rd Edition.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/102108086	
2.	https://nptel.ac.in/courses/102103012	

Course Code	Course Name	Category	Hours/Week	Credits
24BBT14C	Genetics	Core – II	5	4

Course Objectives

The course intends to cover

- The concepts of heredity, genes, Mendelian genetics, Blood group inheritance, Genetic map preparation, Human and Population genetics and Recombination.
- Inherited diseases and related traits.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand historical overview of genetic materials for a better appreciation of genetic evolution	K2
CLO2	Gain knowledge on chromosomes, linkage & crossing over to imply on genetic disorders.	K1
CLO3	Understand structure of gene and the genetic material hypothesis	K2
CLO4	Gain knowledge on Mutation.	K2
CLO5	Apply and Analyze the concepts of genetics in genetic counseling.	K3, K4
K1 - Remember; K2 - Understand; K3 – Apply; K4 - Analyze		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	2	2	2
CLO2	2	-	2	2	2
CLO3	1	3	1	1	1
CLO4	-	1	3	3	3
CLO5	2	2	-	3	3
3 - Substantial (high)		2 - Moderate (medium)		1 - Slight (low)	

Core - II: Genetics

Unit	Content	No of Hours
I	History of Genetics: Mendel's experiments, Monohybrid cross, Dihybrid cross, Backcross or Testcross, Mendel's laws. Incomplete dominance. Interaction of Genes. Epistasis – Lethal genes. Multiple alleles – In drosophila. Rabbit, and Blood group inheritance in man.	15
II	Linkage and Crossing over: Linkage - linkage in Drosophila- Morgan's experiments, factors affecting linkage. Crossing over- types, mechanism, significance of crossing over. Mapping of Chromosomes, interference and coincidence. Cytoplasmic inheritance. Sex Linked Inheritance and Sex Determination in Man.	15
III	Fine Structure of Gene: Fine structure of the gene and gene concept, Operon Concept. Identification of the DNA as the genetic material- Griffith experiments, Avery, McLeod, McCarty and Hershey Chase experiment. Microbial Genetics- bacterial recombination, Conjugation, Transformation, Transduction and sexduction.	15
IV	Mutation: Types of mutation, mutagens, DNA damage and Repair Mechanism. Chromosomal aberrations- Numerical and Structural, Pedigree Analysis-Mendelian inheritance in human. (Cystic Fibrosis, Muscular Dystrophy).	15
V	Population Genetics: Population Genetics– Hardy Weinberg principle, gene frequency, genotype frequency and factors affecting gene frequency. Eugenics, Euphenics and Euthenics. Pedigree analysis and genetic counselling.	15
Total Hours		75
Text Books		
1.	Dr. Veer Bala Rastogi., (2000). Elements of Genetics	
2.	Verma, P.S. and Agarwal, V.K., (2022). Genetics, S. Chand & Co.	
Reference Books		
1.	Gardener E.J. Simmons M.J. Slustad D. P., (2006). Principles of Genetics.	
2.	Griffiths, Miller, J.H., (2003). An Introduction to Genetic Analysis W.H. Freeman. New York.	
3.	Good Enough U., (1985). Genetics. Hold Saunders international.	
4.	Lewis, R., (2001). Human Genetics- Concepts and application. 4 th edition. McGraw Hill.	
5.	Winter, P.C., Hickey, G.J. and Fletcher., (2010), Instant notes in Genetics. Viva books, Ltd.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/102104052	
2	https://nptel.ac.in/courses/102/103/102103013/	

Course Code	Course Name	Category	Hours /Week	Credit
24BBT15P	Cell Biology & Genetics	Core Lab – I	4	3

S. No.	List of Practicals
1	Laboratory Rules & Regulations. a) Basic reagents preparation & Basic lab instrumentation.
2	Components of a Compound / Light Microscope.
3	Blood smear preparation and Identification of Blood cells. Simple staining techniques
4	Buccal smear preparation and Identification of squamous epithelial cells.
5	Isolation and Identification of plant cells.
6	Mitotic stages of onion (<i>Allium cepa</i>) root tip.
7	Meiotic stages of cockroach testes/ Flower bud.
8	Giant chromosomes from <i>Chironomus</i> larvae/ <i>Drosophila</i> salivary glands.
9	Identification of Barr bodies from Buccal smear.
10	Blood typing in humans for multiple alleles and Rh factor.
11	Monohybrid cross and Dihybrid cross analysis
12	Problem solving in Sex Linked Inheritance
13	Problem solving in Pedigree analysis.
Total Hours	
60	

Course Code	Course Name	Category	Hours /Week	Credits
24BBT16A	Chemistry	Allied – I	4	2

Course Objectives

The course intends to cover

- The fundamentals of chemical structure, pH and bonding of water molecules.
- Role of chemistry in day today life.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the importance of bonding and order.	K2
CLO2	Understand the importance of carbohydrates.	K2
CLO3	Apply and Analyze the adulteration in food meticulously	K3, K4
CLO4	Analyse the role as agricultural and textile chemist	K4
CLO5	Analyze the empirical role as a pharmaceutical chemist	K4
K2 – Understand; K3- Apply; K4 - Analyze		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	-	2	3
CLO2	3	3	1	-	-
CLO3	-	1	3	1	3
CLO4	2	2	2	2	2
CLO5	3	3	3	3	3
3 - Substantial (high)		2 - Moderate (medium)		1 - Slight (low)	

Allied - I: Chemistry

Unit	Content	No. of Hours
I	Atomic theory and Water molecules: Atomic theory, formation of molecules, electronic configuration of atoms- s & p shapes of atomic orbitals. Types of chemical bonds. Types of reactions - addition, substitution, elimination, Condensation and polymerization. Chemical foundation of life. Water: its unique properties, ionization of water, buffering action in biological system, Properties, and characteristics of water.	12
II	Environmental Chemistry: Concept and scope of environmental Chemistry- Nomenclature: Pollutant, contaminant, receptor, sink, pathways of a pollutant. Water – Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness- water pollution- dissolved oxygen, chemical oxygen demand (COD), biochemical oxygen demand (BOD)-Environmental segments. Atmosphere: Composition and structure of atmosphere, particles, ions and radicals in the atmosphere, Air Pollution: Air Pollutants, e.g. carbon monoxide, nitrogen oxides, hydrocarbons, oxides of sulfur, photochemical smog, acid rain and particulates.	12
III	Food chemistry: Food and Nutrition – Carbohydrates, Proteins, Fats, Vitamins and Minerals – Definition, Classification and their importance as food constituents- Balanced diet- Calorie. Food Adulteration- Types and detection methods.	12
IV	Pharmaceutical Chemistry: Medicinally important Inorganic compounds: Compounds of Aluminium, Phosphorous, Arsenic, Iron and Mercury. Sulphonamide: mechanism and action of sulpha drugs- preparation and uses of sulphanimide sulphadiazine & sulphapyridine. Analgesics-definition and actions-narcotic and non narcotic-morphine, Heroin. Heroin. Antipyretic analgesics- preparation and uses - methyl salicylate, aspirin & paracetamol	12
V	Agricultural and Textile Chemistry: Fertilizers: Effect of Nitrogen, potassium and phosphorous on plant growth – commercial method of preparation of urea, triple superphosphate. Complex fertilizers and mixed fertilizers – their manufacture and composition. Secondary nutrients – micronutrients – their function in plants. Dyes: azo and triphenylmethane dyes- Preparation one example-Methyl Orange, Malachite green.	12
Total Hours		60

Text Books

1. Soni P.L., (2005), A Text book of Organic Chemistry, S. Chand & Sons publications, 11th Edition.
2. Krishnamurthy. N, Jayasubramanian.K and Vallinayagam., (1990), Applied Chemistry, Prentice Hall of India, New Delhi.
3. Chang.R and Overby.J., (2017), Chemistry, McGraw-Hill, 14th Edition.

Reference Books

1. Jeyashre Ghosh., (2005), A Text book of Pharmaceutical Chemistry, S.Chand & Company, New Delhi.
2. Meyer L. H., (2006).Text book of Food Chemistry - CBS Publishers, New Delhi.

Web Resources (Swayam / NPTEL)

1. <https://nptel.ac.in/courses/104105130>
2. <https://nptel.ac.in/courses/104105076>

**Components for Internal Assessment and
Distribution of Marks for CIA and ESE (Theory)**

Max Marks	Marks for		Components for CIA									
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Attendance	Active Engagement	Total
100	25	75	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	5	5	25
			50	5	50	5	5	75	10			

Question Paper Pattern

Component	Duration in Hrs.	Section A			Section B			Section C			Total
		Type of question	No. of questions	Marks	Type of question	No. of questions	Marks	Type of question	No. of questions	Marks	
CIA – I & II	2	MCQ	8	8x1=8	Either or	3	3x6=18	Either or	3	3x8=24	50
Model Exam / ESE	3	MCQ	10	10x1=10	Either or	5	5x5=25	Either or	5	5x8=40	75

**Components for Internal Assessment and Distribution of Marks for CIA
(Lab)**

Max Marks	Marks for		Components for CIA							
	CIA	ESE	Test – I		Test - II		Model		Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Actual	Weightage	5	40
			50	10	50	10	60	15		

Examination Pattern

Component	Duration in Hrs.	Marks			Weightage
		Practical	Record	Total Marks	
Test – I	1	50	-	50	10
Test – II	1	50	-	50	10
Model	3	60	-	60	15
ESE	3	50	10	60	-

Part – IV : Foundation Courses

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24ENV1FC	Environmental Studies	FC- I	2	2

Unit	Content
I	The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.
II	<p>Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.</p> <ul style="list-style-type: none"> - Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies. - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. <p>Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.</p>
III	<p>Ecosystems</p> <ul style="list-style-type: none"> - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem. - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: - <ul style="list-style-type: none"> a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit	Content
IV	<p>Biodiversity and its Conservation</p> <ul style="list-style-type: none"> - Introduction-Definition: genetic, species and ecosystem diversity. - Bio geographical classification of India. - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. - Biodiversity at global, National and local levels. - India as a mega-diversity nation. - Hot-spots of biodiversity. - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India. - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
V	<p>Environmental Pollution Definition</p> <ul style="list-style-type: none"> - Causes, effects and control measures of: - <ul style="list-style-type: none"> a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.
VI	<p>Social Issues and the Environment</p> <ul style="list-style-type: none"> - From Unsustainable to Sustainable development. - Urban problems related to energy. - Water conservation, rain water harvesting, watershed management. - Resettlement and rehabilitation of people; its problems and concerns. Case studies. - Environmental ethics: Issues and possible solutions. - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. - Wasteland reclamation. - Consumerism and waste products. - Environment Protection Act. - Air (Prevention and Control of Pollution) Act. - Water (Prevention and Control of Pollution) Act. - Wildlife Protection Act. - Forest Conservation Act. - Issues involved in enforcement of environmental legislation. - Public awareness.

Unit	Content
VII	<p>Human Population and the Environment</p> <ul style="list-style-type: none"> - Population growth, variation among nations. - Population explosion-Family welfare Programme. - Environment and human health. - Human Rights. - Value Education. - HIV/AIDS. - Women and Child Welfare. - Role of information Technology in Environment and human health. - Case Studies.
VIII	<p>Field Work (Practical).</p> <ul style="list-style-type: none"> - Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain. - Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. - Study of common plants, insects, birds. - Study of simple ecosystems-pond, river, hill slopes, etc.
Total Hours. 30	

Web Resources	
1.	https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

Components for Internal Assessment and

Distribution of Marks for CIA (Theory)

Max Marks	Marks for		Components for CIA							
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Total (Best + Model)
			Actual	Weightage	Actual	Weightage		Actual	Weightage	
50	50	-	50	25	50	25	25	50	25	50

Question Paper Pattern

Duration in Hrs.	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Offline	Open Choice	5 (Out of 8)	5 x 10=50

Part – IV : Ability Enhancement Compulsory Courses
(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours/Week	Credits
24QUA1AE	Quantitative Aptitude	AECC - I	2	2

Course Objectives

The course intends to cover

- Basic concepts of numbers, time and work, interests, data representation and graphs
- Concepts of permutation, probability, discounts, percentage & profit loss.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Remember and Understand the concepts of numbers and average	K1, K2
CLO2	Understand about percentage and apply profit & loss related processing.	K2, K3
CLO3	To understand the concepts of time and work and interest calculations.	K2
CLO4	To understand about the concepts of permutation, combination and probability.	K2
CLO5	Understand , Apply and analyze the concept of problem solving involved in graphs and age.	K2,,K3,K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 -Analyze		

Ability Enhancement Compulsory Course - I: Quantitative Aptitude

Unit	Content	No. of Hours
I	Numbers - Simplification - BODMAS rule - Algebraic formulas - Decimal fractions - Square root and cube roots - Surds and indices - Divisibility rules - HCF and LCM - same remainder - different remainder - application problems – average – equation - mistaken value – replacement - including/excluding.	6
II	Percentage - increase/decrease – net change – salary – election – marks – consumption - population / machine - profit and loss - profit and loss % - finding cp and sp - profit=loss - same product cp and sp with percentage – discount - ratio and proportion - divided into parts - based on numbers - increase/decrease/ income / expenditure – coins – partnership.	6
III	Time-and-work - individual/combined - alternative days - remaining work - efficiency based - amount split - chain rule - group of male and female or boys - pipes and cistern - finding time - efficiency based – alternative - remaining part - capacity of the tank - simple interest - finding principal - rate of interest – amount -time period - doubles or triples - compound interest - finding rate - finding time, principal - doubles or triples - difference between SI and CI.	6
IV	Permutation - finding value - vowels come together - vowel never comes together - some letters come together - no two vowels come together - vowels in odd/even places - based on repetition - circular permutation – application – combination - finding value and application – probability – coins - dice-cards - balls and miscellaneous problems - odd man out and number series.	6
V	Clock - finding angle - reflex angle - gain or loss – calendars - finding particular day - data interpretation - bar chart - line chart - pie chart – table – combined – ages ratio - twice or thrice - addition /subtraction - family based - problems on numbers - equations.	6
Total Hours		30
Text Book		
1.	R.S. Aggarwal , Quantitative Aptitude, S.Chand & Company Ltd.,	
Reference Book		
1.	Ashish Arora, Quantitative Aptitude.	
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.indiabix.com/aptitude/questions-and-answers/	

Components for and Distribution of Marks for ESE (Theory)**Ability Enhancement Compulsory Course(AECC)**

Duration in Hrs.	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50

Semester 2

Course Code	Course Name	Category	Hours/ Week	Credit
24TAM21L	Tamil – II	Language - II	4	3

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	அற இலக்கியங்கள் வழி வாழ்வியல் ஒழுக்கங்களைக் கற்றுத் தருதல்.	K1, K2
CLO2	பக்தி இலக்கியங்கள் வழி பக்தி நெறிகளை உணர்த்துதல்.	K2
CLO3	தமிழில் உரைநடை இலக்கியப் படைப்பாளர்களின் சிந்தனைகளை எடுத்துரைத்தல்.	K3
CLO4	தமிழ் இலக்கிய வரலாற்றில் அற இலக்கியம் மற்றும் உரைநடையின் தாக்கம் குறித்து அறிதல்.	K1, K3
CLO5	பிழையின்றி எழுத இலக்கணங்களைக் கற்றுத் தருதல்.	K2, K3
K1 - Remember; K2 - Understand; K3 – Apply		

Part – I: Tamil – II

Unit	Content	No. of Hours
I	(அறம்) 1. திருக்குறள் • புகழ் • வினை செயல்வகை • நெஞ்சொடு கிளத்தல் 2. திரிகடுகம்(தேர்ந்தெடுக்கப்பட்ட 10 பாடல்கள்) 3. பழமொழி நானூறு(தேர்ந்தெடுக்கப்பட்ட 10 பாடல்கள்)	14
II	(பக்தி) 1. அபிராமி அந்தாதி(10 பாடல்கள்) - அபிராமி பட்டர் 2. உமர்கயாம் பாடல்கள் (தனிப்பாடல்கள்) - கவிமணி தேசிய விநாயகம் பிள்ளை 3. முத்துக்குமாரசாமி பிள்ளைத்தமிழ்(தாலப் பருவம்) – குமரகுருபரர் 4. இயேசுகாவியம் - மலைப்பொழிவு - கண்ணதாசன் 5. சித்தர் பாடல்கள் - சிவவாக்கியர் பாடல்	14
III	(கலை மற்றும் பண்பாடு) 1. அறம் எனப்படுவது - அமுதன் 2. ஏட்டில் எழுதா இலக்கியம் - ஒளவை துரைச்சாமி 3. கீழடி - தொல்லியல் துறை, வெளியீடு 4. மனம் எனும் சொர்க்கவாசல் - டாக்டர் எம்.எஸ்.உதயமூர்த்தி 5. ஆளுமைத் திறன் - அறிவுக்கதிர் (அரசுப்பணி சிறப்பிதழ்)	12
IV	(இலக்கிய வரலாறு) 1. பதினெண் கீழ்க்கணக்கு நூல்கள் 2. உரைநடையின் தோற்றமும் வளர்ச்சியும்	10
V	(இலக்கணம்) 1. சொல்லின் வகைகள் 2. வேற்றுமைத் தொகைகள் 3. பயிற்சிக்குரியன:(விண்ணப்பங்கள், மடல்கள் எழுதச் செய்தல்)	10
Total Hours		60

Reference Books	
1	முத்துக்குமாரசாமி பிள்ளைத்தமிழ்,(2021) கமலா முருகன், சாரதா பதிப்பகம்
2	இயேசு காவியம், கவிஞர் கண்ணதாசன்,(2006) கலைக்காவிரி பதிப்பகம்
3	உரைகளும் உரையாசிரியர்களும்,(2013) தி ச நடராசன் நியூ செஞ்சுரி புக் ஹவுஸ்
4	அபிராமி அந்தாதி, முனைவர் சி சேதுராமன்,(2010) நியூ செஞ்சுரி புக் ஹவுஸ்
5	புதிய வெளிச்சத்தில் தமிழ் இலக்கிய வரலாறு, முனைவர் க பஞ்சாங்கம், (2017) அன்னம் வெளியீட்டு
6	தமிழ் இலக்கிய வரலாறு, மு வரதராசனார்,(2021) சாகித்ய அகாடமி பதிப்பு
7	தமிழ் உரைநடை வரலாறு, வி செல்வநாயகம்,(2003) அடையாளம் பதிப்பகம்
8	தமிழ் இலக்கிய வரலாறு, முனைவர் கா கோ வேங்கடராமன்,(2010) கலையக வெளியீடு
9	எண்ணங்கள் - டாக்டர் எம் எஸ் உதயமூர்த்தி,(2016) வெளியீடு: கங்கை புத்தக நிலையம், சென்னை
10	அடோன் தமிழ் இலக்கணம், புலவர் பொன்மணிமாறன்,(2011) அருண் பப்ளிஷிங்

Part – II : English - II
(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours/ Week	Credits
24ENG22L	English-II	Part - II	4	3

Course Objectives

The course intends to cover

- The literary elements in poetry.
- The critical contemplation and writing in styles of prose texts.
- The modernist techniques and ethics in the narratives of short stories.
- The interpersonal skills essential in the work environment.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Identify the common techniques underlying free verse and traditional forms of poetry for crafting poems.	K1
CLO2	Understand humour in prose texts psychologically to master the oratory skills.	K2
CLO3	Employ empathy and morale in diplomatic Day-to-day circumstances.	K3
CLO4	Strengthen the writing skills for documentation.	K3
CLO5	Persist flexibility and mobility in the sequel LSRW.	K3
K1 - Remember; K2 - Understand; K3 - Apply		

Part - II: English - II

Unit	Content	No. of Hours
I	Poetry: Motherhood 1. My Grand Mother’s House – Kamala Das 2. Of mother, among others things – A.K Ramanujam 3. Night of the Scorpion – Nissim Ezekiel	12
II	Prose: Humour 1. With The Photographer – Stephen Leacock 2. Travel by Train – J.B.Priestley 3. On Forgetting – Robert Lynd	12
III	Short Stories: Integrity 1. The taxi driver – K.S. Duggal 2. A Retrieved Reformation- O Henry 3. Kabuliwala - Rabindranath Tagore	12
IV	Language Competency: Vocabulary 1. Homonyms, Homophones, Homographs Portmanteau words 2. Verbs and Tenses, Subject Verb Agreement 3. Error correction Vocabulary : Synonyms, Antonyms, Word Formation	12
V	English for Communication 1. Listening with courtesy and adding ideas and giving opinions during the meeting and making concluding remarks 2. Participating in a meeting: face to face and online 3. Reading news and weather reports 4. Preparing first drafts of short assignments	12
Total Hours		60
Text Books		
1.	Ezekiel Nissim, 1989 .Collected Poems 1952-1988. Oxford University Press.	
2.	Hewings, M. (2000). Advanced English Grammar. Cambridge. University Press.	
Reference Books		
1.	Bakshi, S.P. & Sharma, R. (2019). Descriptive English. Arihant Publications (India) Ltd.	
2.	Cameron S & Dempsey L. (2019). The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing.	
3.	Sherman B. (2014) Skimming and Scanning Techniques. Liberty University Press.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/109103020	

Course Code	Course Name	Category	Hours /Week	Credits
24BBT23C	Microbiology	Core – III	5	4

Course Objectives

The course intends to cover

- The basics of microbiology - types of microbes, classification and characterization, various applied aspects of microbes in biotechnology.
- The pathological aspects by identifying the diseases.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Know history & classifications of microbes.	K1
CLO2	Understand and differentiate the different types of microbes.	K2
CLO3	Apply the knowledge on culturing techniques.	K3
CLO4	Analyze the Microbial pathology and apply the knowledge in control measures.	K3
CLO5	Apply the knowledge on the economic importance of microbes in Food and Agro industry	K3, K4
K1 - Remember; K2 - Understand; K3 – Apply; K4 – Analyze		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	1	1	1	1	1
CLO2	2	2	2	-	3
CLO3	2	3	-	3	3
CLO4	2	-	3	2	-
CLO5	3	3	1	3	3
3 - Substantial (high)		2 - Moderate (medium)		1 - Slight (low)	

Core - III: Microbiology

Unit	Content	No. of Hours
I	Microbes and their Classifications: History of Microbiology, Classification of bacteria, fungi, virus, protozoa and algae – classical and molecular approaches. Scope of microbiology – Role of microbes in industries	15
II	Media and Culture Methods: Structure of bacteria - Bacterial growth and measurement of growth, Media – types and preparation- plating methods - staining methods (Gram's, capsule, spore, LCB mount)- methods of preservation and storage of microbes. Culture of fungi, virus and algae.	15
III	Methods of Sterilization: Sterilization methods - physical and chemical methods- Mode of action – Antibiotic in clinical use - Resistance to antimicrobial agents - MRSA, ESBL, Retro & non retro virus, systemic-griseofulvin, topical-candidiasis- ketoconazole.	15
IV	Microbial Disease: Microbial Disease- host -pathogen interaction, clinical features, lab diagnosis and treatment of Airborne disease (Pneumonia, Chicken pox), food borne disease (Typhoid, Aspergillosis), Water borne disease (Cholera, Amoebiasis), Sexually transmitted disease (AIDS, Trichomoniasis), Vector borne disease (Dengue, Malaria). Parasite- Trypanosomiasis. Sars Covi 2.	15
V	Applications of Microbes: Bioinsecticides- <i>Bacillus thuringiensis</i> , Baculoviruses - Biofertilizers - <i>Azospirillum</i> and blue green algae - single cell protein – prebiotics and probiotics - Dairy products (Cheese and Yoghurt).	15
Total Hours		75
Text Books		
1.	Ananthanarayanan, Panicker, Kapil., (1987), Textbook book of Microbiology, Orient Black Swan.	
2.	Dubey R.C. and Maheswari, S., (2003). A Textbook of Microbiology, S. Chand & Co., NeW Delhi.	
3.	Pelczar.M. J, Chan E.C.S. and Noel. R.K., (2007). Microbiology, McGraw –Hill, New York, 7th Edition.	
4.	Prescott, Harley, Klein., (2016), Microbiology, McGraw – Hill, 10 th Edition.	
Reference Books		
1.	Boyd. R.F., (1998), General Microbiology, Times Mirror, Mosby College Publishing, St Louis, 2 nd Edition.	
2.	Bamford.G.,(2012), Medical Microbiology and Infection at a Glance,Wiley- Blackwell,4 th edition.	
3.	Madigan, Bender, Buckley, Stahl., (2019), Brock Biology of Microorganisms, Pearson Publishers,USA,14 th edition.	
4.	Salle.A.J., (1992), Fundamental Principles of Bacteriology, McGraw Hill Inc. New York	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/102105087	
2.	https://onlinecourses.nptel.ac.in/noc21_ce07	

Course Code	Course Name	Category	Hours /Week	Credits
24BBT24C	Biochemistry	Core – IV	5	4

Course Objectives

The course intends to cover

- Structure, classification and functions of biomolecules.
- Metabolism of biomolecules.

Course Learning Outcomes

On the successful completion of the course, the students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Know the importance of bonding and order.	K1
CLO2	Understand the importance of carbohydrates.	K2
CLO3	Understand the notion of proteins, lipids.	K2
CLO4	Obtain a basic knowledge of structure and functions of bio-molecules.	K2
CLO5	Understand how energy is generated and utilized biochemically.	K2
K1-Remember; K2 – Understand.		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	-	2	3
CLO2	3	3	1	-	-
CLO3	-	1	3	1	3
CLO4	2	2	2	2	2
CLO5	3	3	3	3	3
3 - Substantial (high)	2 - Moderate (medium)		1 - Slight (low)		

Core - IV: Biochemistry

Unit	Content	No. of Hours
I	Biomolecules: Structure of atoms and biomolecules: Atomic theory, Valency, Atomic weight, Molecular weight, Molarity. Chemical Bonding - Electrostatic, Covalent, Ionic and Vander waals, Structure of water molecules, properties and ionization of Water, pH and buffers. Laws of Thermodynamics	15
II	Classification & Metabolism of Carbohydrates: Importance of Biochemistry. Structure, Classification, Properties, and Metabolism of Carbohydrates. Glycogenesis, Glycogenolysis, Cori's cycle, Glycolysis, TCA cycle, bioenergetics of carbohydrate metabolism.	15
III	Structure and Classification of Proteins: Classification and structure of amino acids. Structural conformation of proteins. Classification of proteins. Properties and biological importance of amino acids and proteins.	15
IV	Metabolism of Lipids & Nucleic acids: Metabolism of Fatty acids, triglycerides, phospholipids. Classification and Metabolism of nucleic acids, salvage pathway. Degradation of amino acids and urea cycle.	15
V	Enzymes, Vitamins and Hormone: Enzymes – Nomenclature, Mode of action and types. Role of Vitamins and Hormones in metabolism. ATP production. Oxidative phosphorylation, Electron transport chain and Photophosphorylation.	15
Total Hours		75
Text Books		
1.	Shourie.A, Shilpa.S, Chapadgoankar and Anamika Singh., (2021), Textbook of Biochemistry, Wiley–India Publishers.	
2.	Deb.A.C., (2016), Fundamentals of Biochemistry, New central book agencies, Kolkata, 7th edition.	
3.	Jain. J.L., (2016), Fundamentals of Biochemistry, S. Chand publication, Noida,7th edition.	
4.	Satyanarayana.U., (2016), Biochemistry, MJ publishers, 3 rd edition.	
5	Soni.P.L., (2005), A Text-book of Organic Chemistry, S. Chand & Sons publications, India, 11 th Edition.	
Reference Books		
1.	Arun.B, Bahl.B.S., (2016), A Textbook of Organic Chemistry, S. Chand & Sons publications, Noida, 22 nd Edition.	
2.	Geoffrey L. Zubay, William W. Parson, Dennis E. Vance., (1995), Principles of Biochemistry, W.C. Brown Publishers.	
3.	Lehninger., (2013), Principles of Biochemistry WH Freeman and Company ,NY, 4th edition.	
4	Stryer.L., (2007), Biochemistry , W H Freemann and company, San Francisco, 5th Edition.	
5	Murray <i>et al.</i> , (2003), Harper's Biochemistry, Appleton and Lange Publishers, Florida USA, 26 th edition.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/104105130	

Course Code	Course Name	Category	Hours /Week	Credit
24BBT25P	Microbiology & Biochemistry	Core Lab - II	4	2

S. No.	List of Practicals
1.	Sterilization techniques, Preparation of Media and Maintenance of culture.
2.	Inoculation techniques- Pour plate, Spread plate and Streak plate.
3.	Isolation of bacteria from various sources and dilution techniques.
4.	Staining techniques: Gram's, Capsule (Negative), Spores.
5.	Preparation of temporary mounts- Lactophenol cotton blue staining.
6.	Motility tests: Hanging drop technique.
7.	Biochemical characterization - Catalase, Oxidase, IMVIC test and TSI.
8.	Antibiotic sensitivity test.
9.	Estimation of Ascorbic acid
10.	Estimation of sugars- Glucose & Fructose.
11.	Estimation of Cholesterol- Zak's method.
12.	Estimation of total free amino acids.
13.	Estimation of Proteins – Bradford's method.
Total Hours	
60	
Text Books	
1.	Benson H.J., (1998). Microbiological applications: A laboratory manual in general microbiology, WCB/McGraw-Hill Publishers, USA.
2.	Cappuccino., (2005), Microbiology: A Laboratory Manual, Pearson Education, UK.

Course Code	Course Name	Category	Hours/Week	Credit
24BBT26P	Chemistry	Allied Lab - I	4	2

S. No.	List of Practicals	
I	Systematic analysis of Organic compounds	
1.	Functional group tests (Carboxylic acid (Benzoic acid, phthalic acid), Phenol, Urea, Benzaldehyde, Aniline (Aniline not to be given for exam).	
2.	Detection of elements (N, Halogens).	
3.	Distinguish between aliphatic and aromatic compounds.	
4.	Distinguish between Saturated and unsaturated compounds.	
II	Qualitative Analysis	
1.	Qualitative analysis of carbohydrates - Glucose, Fructose, Lactose, Maltose, Sucrose and Starch	
2.	Qualitative analysis of amino acids - Tyrosine, Tryptophan, Arginine, Proline and Cysteine.	
III	Volumetric Analysis:	
1.	Estimation of Glycine- Formal Titration.	
2.	Determination of Ascorbic acid – DCPIP method.	
3.	Estimation of Ferrous sulphate using standard Mohr's salt.	
Total Hours		
60		
Text Books		
1.	Venkateswran.V, Veerasmy.R, and Kulandavelu A. R., (1997), Basic principles of Practical Chemistry, Sultan Chand and Sons Publishers.	
2.	Joy P.P, Surya.S and Awathy., (2015), Laboratory Manual of Biochemistry, Web: www.kau.edu/prsvkm , http://prsvkm.tripod.com .	

**Components for Internal Assessment and
Distribution of Marks for CIA and ESE (Theory)**

Max Marks	Marks for		Components for CIA									
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Attendance	Active Engagement	Total
100	25	75	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	5	5	25
			50	5	50	5	5	75	10			

Question Paper Pattern

Component	Duration in Hrs.	Section A			Section B			Section C			Total
		Type of question	No. of questions	Marks	Type of question	No. of questions	Marks	Type of question	No. of questions	Marks	
CIA – I & II	2	MCQ	8	8x1=8	Either or	3	3x6=18	Either or	3	3x8=24	50
Model Exam / ESE	3	MCQ	10	10x1=10	Either or	5	5x5=25	Either or	5	5x8=40	75

**Components for Internal Assessment and Distribution of Marks
for CIA (Lab)**

Max Marks	Marks for		Components for CIA							
	CIA	ESE	Test – I		Test - II		Model		Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Actual	Weightage	5	40
			50	10	50	10	60	15		

Examination Pattern

Component	Duration in Hrs.	Marks			Weightage
		Practical	Record	Total Marks	
Test – I	1	50	-	50	10
Test – II	1	50	-	50	10
Model	3	60	-	60	15
ESE	3	50	10	60	-

Part – IV : Foundation Courses

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24HUM2FC	Human Rights	FC - II	2	2

Unit	Content
I	<p>Concept of Human Values, Value Education Towards Personal Development Aim of Education and Value Education; Evolution of Value Oriented Education; Concept of Human Values; Types of Values; Components of Value Education.</p> <p>Personal Development: Self-analysis and Introspection; Sensitization towards Gender Equality, Physically Challenged, Intellectually Challenged. Respect to - Age, Experience, Maturity, Family Members, Neighbors, Co-workers. Character Formation towards Positive Personality: Truthfulness, Constructively, Sacrifice, Sincerity, Self-Control, Altruism, Tolerance, Scientific Vision.</p>
II	<p>Value Education Towards National and Global Development National and International Values: Constitutional or National Values - Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, and Fraternity. Social Values - Pity and Probity, Self-Control, Universal Brotherhood. Professional Values - Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, and Faith. Religious Values - Tolerance, Wisdom, Character. Aesthetic Values - Love and Appreciation of Literature and Fine Arts and Respect for the Same. National Integration and International Understanding.</p>
III	<p>Impact of Global Development on Ethics and Values Conflict of Cross-Cultural Influences, Mass Media, Cross-Border Education, Materialistic Values, Professional Challenges, and Compromise. Modern Challenges of Adolescent Emotions and Behavior; Sex and Spirituality: Comparison and Competition; Positive and Negative Thoughts. Adolescent Emotions, Arrogance, Anger, Sexual Instability, Selfishness, Defiance</p>
IV	<p>Therapeutic Measures Control of the Mind through</p> <ol style="list-style-type: none"> Simplified Physical Exercise Meditation – Objectives, Types, Effect on Body, Mind and Soul Yoga – Objectives, Types, Asanas Activities: <ol style="list-style-type: none"> Moralisation of Desires Neutralisation of Anger Eradication of Worries Benefits of Blessings

Unit	Content
V	<p>Human Rights</p> <ol style="list-style-type: none"> 1. Concept of Human Rights – Indian and International Perspectives <ol style="list-style-type: none"> a. Evolution of Human Rights b. Definitions under Indian and International Documents 2. Broad Classification of Human Rights and Relevant Constitutional Provisions. <ol style="list-style-type: none"> a. Right to Life, Liberty and Dignity b. Right to Equality c. Right against Exploitation d. Cultural and Educational Rights e. Economic Rights f. Political Rights g. Social Rights 3. Human Rights of Women and Children <ol style="list-style-type: none"> a. Social Practice and Constitutional Safeguards <ol style="list-style-type: none"> (i) Female Feticide and Infanticide (ii) Physical Assault and harassment (iii) Domestic Violence (iv) Conditions of Working Women 4. Institutions for Implementation <ol style="list-style-type: none"> a. Human Rights Commission b. Judiciary 5. Violations and Redressal <ol style="list-style-type: none"> a. Violation by State b. Violation by Individuals c. Nuclear Weapons and terrorism d. Safeguards

Web Resources	
1.	https://syllabus.b-u.ac.in/syl_college/ug_ve.pdf

**Components for Internal Assessment and
Distribution of Marks for CIA (Theory)**

Max Marks	Marks for		Components for CIA							
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Total (Best + Model)
50	50	-	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	50
			50	25	50	25	25	50	25	

Question Paper Pattern

Duration in Hrs.	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Offline	Open Choice	5 (Out of 8)	5 x 10=50

Part – IV : Ability Enhancement Compulsory Courses (All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24SOF2AE	Soft Skills	AECC - II	2	2

Course Objectives

The course intends to cover

- The essential soft skills that is crucial for success in today's dynamic and interconnected workplace.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the comprehensive skills to participate actively in conversation, writing short texts with expression	K1, K2, K3
CLO2	Infer the cohesive devices to describe and discuss any objects, pictures using compound, complex sentence forms.	K2, K3
CLO3	Comprehend the logic in the given situation to organize the ideas to write formal and informal letters.	K2, K3
CLO4	Understand the given material to organize it in a logical sequence to present a paragraph with main and supporting ideas with concluding sentences.	K3
CLO5	Present valuable ideas in conversation to emulate the main ideas and key points in short essays.	K3
K1 - Remember; K2 - Understand; K3 - Apply;		

Ability Enhancement Compulsory Course - II : Soft Skills

Unit	Content	No. of Hours
I	<p>Presentation Skills : Getting to Know You: Grammar: Introduction to Tenses; Listening: Fill in the blanks; Speaking: Self Introduction, Everyday English, Role-Play; Reading: Different ways of communication. My Day: Grammar: Present simple positive & negative / Adverbs of Frequency; Vocabulary & Speaking: Daily Activities; Listening: Observe and Answer / Telling the time; Reading & Writing: Describe where you live. Your World: Grammar: Possessive determiners; Vocabulary & Speaking: Talk about countries, nationalities; Listening: Positive & negative contractions; Reading & Writing: Personal profile. The World Of Work: Grammar: Yes/No & Wh Questions; Vocabulary & Speaking: Jobs; Listening: Recognize the schwa sound; Reading & Writing: Opening and closing an email. Places And Things: Grammar: There is / there are, articles; Vocabulary & Speaking: Talk about rooms & furniture; Listening: Directions; Reading & Writing: Imperatives. 24 Hours: Grammar: Likes & Dislikes; Vocabulary & Speaking: Speak about hobbies and interests; Listening: Observe & answer; Reading: Match the photos with descriptions; Writing: Write complete sentence using prompts;</p>	6
II	<p>Confidence : Clothes and Shopping: Grammar: Modal verbs / Adverbs of Frequency / Adjectives and Adverbs; Vocabulary & Speaking: Shopping; Listening: Observe and Answer; Reading & Writing: Product Review. Travel & Transport: Grammar: Past simple questions; Vocabulary & Speaking: Talk about holidays; Listening: At the train station; Reading & Writing: Email - A perfect holiday. Health & Fitness: Grammar: Past simple irregular verbs; Vocabulary & Speaking: Talk about a healthy lifestyle; Listening: Listen & Answer; Reading & Writing: Time sequencers. Music: Grammar: Present perfect simple; Vocabulary & Speaking: Survey about music; Listening: Listen two people talk about music; Reading: Use adjectives and create sentences. Let's go shopping: Grammar: Countable & Uncountable; Vocabulary & Speaking: Town Survey; Listening: Listen and answer; Reading & Writing: Read and match</p>	6
III	<p>Creativity :Cooking & Eating: Grammar: Some & Any, Quantifiers; Vocabulary & Speaking: Food & Drink; Listening: Kitchen conversation; Reading & Writing: Article reading & answering. Survival: Grammar: Comparison of adjectives; Vocabulary & Speaking: Describing people; Listening: Listen & Answer; Reading & Writing: Read and Answer. Working Together: Grammar: Verb + Noun phrases; Vocabulary & Speaking: Talk about technology; Listening: Listen & Answer; Reading & Writing: Notice. Music: Grammar: Present perfect simple; Vocabulary & Speaking: Survey about music; Listening: Listen two people talk about music; Reading: Use adjectives and create sentences. Culture and Arts: Grammar: Present perfect; Vocabulary & Speaking: Speak on the phone; Listening: Listen and answer; Reading & Writing: Review</p>	6

Unit	Content	No. of Hours
IV	Problem-Solving :Do's and Don'ts: Grammar: Modal verbs; Vocabulary & Speaking: Role play; Listening: Holidays in January; Reading & Writing: Article reading & answering. Body: Grammar: First conditional; Vocabulary & Speaking: Personality & Appearance; Listening: Listen to conversations about personality; Reading & Writing: Read and Answer about your skills. Speed: Grammar: Present simple passive; Vocabulary & Speaking: Talk about relationships; Listening: Listen & Answer; Reading & Writing: Error spotting. Work: Grammar: Adverbs of manner; Vocabulary & Speaking: Talk about work advice; Listening: Observe & Answer; Reading: Read & check your ideas	6
V	Critical Thinking : Influence: Grammar: would / past habits; Listening: Sentence Correction; Speaking & Vocabulary: Your inspiration; Reading: Picture description; Writing: Rewrite the sentences. Money: Grammar: Second conditional; Listening: radio programme; Speaking & Vocabulary: Talk about games; Reading & Writing: Fill in the blanks. Things that changed the world: Grammar: articles; Speaking & Listening: Talk about chewing gum; Reading & Writing: Read and write a book review	6
Total Hours		30

Components for and Distribution of Marks for ESE (Theory)

Ability Enhancement Compulsory Course(AECC)

Duration in Hrs.	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50

