SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

BACHELOR OF SCIENCE
IN
BIOTECHNOLOGY

Curriculum and Syllabus
(For Students admitted from academic year 2018 – 2019 onwards)

UNDER CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF BIOTECHNOLOGY
FACULTY OF SCIENCE AND HUMANITIES
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
SRM NAGAR, KATTANKULATHUR – 603 203

BACHELOR OF SCIENCE IN BIOTECHNOLOGY
(For Students admitted from academic year 2018-2019 onwards)
CURRICULUM

SEMESTER I							
CAREER STREAM TITLE	**SUBJECT CODE**	**SUBJECT TITLE**	**L**	**T**	**P**	**Total of LTP**	**C**
Language	ULT18101	Tamil - I	4	1	0	5	4
	ULH18101	Hindi - I					
	ULF18101	French - I					
	ULE18101	English - I	4	1	0	5	4
Compulsory Core	UBT18101	Cell Biology	4	0	0	4	4
Compulsory Core Lab	UBT18102	Cell Biology Laboratory	0	0	3	3	3
Compulsory Core	UBT18103	Microbiology	4	0	0	4	4
Compulsory Core Lab	UBT18104	Microbiology Laboratory	0	0	4	4	3
Allied	UBT18105	Chemistry	3	0	0	3	3
Supportive Course (Internal Evaluation)	CAC18101	Soft skills	2	0	0	2	2
TOTAL			**21**	**2**	**7**	**30**	**27**

SEMESTER II							
CAREER STREAM TITLE	**SUBJECT CODE**	**SUBJECT TITLE**	**L**	**T**	**P**	**Total of LTP**	**C**
Language	ULT18201	Tamil - II	4	1	0	5	4
	ULH18201	Hindi - II					
	ULF18201	French - II					
	ULE18201	English - II	4	1	0	5	4
Compulsory Core	UBT18201	Biochemistry	4	0	0	4	4
Compulsory Core Lab	UBT18202	BiochemistryLaboratory	0	0	3	3	3
Compulsory Core	UBT18203	Basics of Genetics	4	0	0	4	4
Compulsory Core Lab	UBT18204	Basics of Genetics Laboratory	0	0	3	3	3

Allied	UBT18205	Basics of Computers	4	0	0	4	3
Extension Activities	UNS18201	NSS	0	0	0	0	1
	UNO18201	NSO					
	UNC18201	NCC					
	UYG18201	Yoga					
Supportive Course (Internal Evaluation)	CAC18201	Quantitative Aptitude and logical Reasoning -I	2	0	0	2	2
TOTAL			**22**	**2**	**6**	**30**	**28**

SEMESTER III							
CAREER STREAM TITLE	**SUBJECT CODE**	**SUBJECT TITLE**	**L**	**T**	**P**	**Total of LTP**	**C**
Compulsory Core	UBT18301	Molecular Biology	3	2	0	5	4
Compulsory Core	UBT18302	Bioinstrumentation	3	2	0	5	4
Compulsory Core Lab	UBT18303	Molecular Biology Laboratory	0	0	4	4	3
Compulsory Core Lab	UBT18304	Bioinstrumentation Laboratory	0	0	4	4	3
Allied	UBT18305	Biostatistics	3	2	0	5	3
Skill Based Electives - I	UBT18E51	Disease Management	3	0	0	3	2
	UBT18E52	Diagnostic Tools					
Non-Major Electives		Open Elective -I	2	0	0	2	2
Supportive Course (Internal Evaluation)	CAC18301	Quantitative Aptitude and logical Reasoning -II	2	0	0	2	2
TOTAL			**16**	**6**	**8**	**30**	**23**

SEMESTER IV							
CAREER STREAM TITLE	**SUBJECT CODE**	**SUBJECT TITLE**	**L**	**T**	**P**	**Total of LTP**	**C**
Compulsory Core	UBT18401	Bioprocess Technology	3	2	0	5	4
Compulsory Core	UBT18402	Enzymology	3	2	0	5	4
Compulsory Core Lab	UBT18403	Bioprocess Technology Laboratory	0	0	4	4	3
Compulsory Core Lab	UBT18404	Enzymology Laboratory	0	0	4	4	3
Allied	UBT18405	Biophysics	3	2	0	5	3
Skill Based Electives- II	UBT18E53	Biofertilizer Technology	3	0	0	3	2
	UBT18E54	Agricultural Biotechnology					
Non-Major Electives		Open Elective -II	2	0	0	2	2
Supportive Course (Internal Evaluation)	CAC18401	Verbal ability and Reasoning	2	0	0	2	2
TOTAL			**16**	**6**	**8**	**30**	**23**

SEMESTER V							
CAREER STREAM TITLE	**SUBJECT CODE**	**SUBJECT TITLE**	**L**	**T**	**P**	**Total of LTP**	**C**
Compulsory Core	UBT18501	Plant and Animal Biotechnology	4	1	0	5	4
Compulsory Core	UBT18502	Genomics and Proteomics	4	1	0	5	4
Compulsory Core Lab	UBT18503	Plant and Animal Biotechnology Laboratory	0	0	5	5	3
Compulsory Core Lab	UBT18504	Genomics and Proteomics Laboratory	0	0	4	4	3
Core Elective - I	UBT18E01	Human Physiology	3	1	0	4	3
	UBT18E02	Medical Biotechnology					
Core Elective -II	UBT18E03	Food Biotechnology	3	1	0	4	3
	UBT18E04	Bioethics, IPR and					

		Biosafety					
Supportive Course	UES18501	Environmental Studies	3	0	0	3	3
TOTAL			**17**	**4**	**9**	**30**	**23**

SEMESTER VI							
CAREER STREAM TITLE	**SUBJECT CODE**	**SUBJECT TITLE**	**L**	**T**	**P**	**Total of LTP**	**C**
Compulsory Core	UBT18601	Biology of Immune Systems and Immunotechnology	4	1	0	5	4
Compulsory Core	UBT18602	rDNA technology	4	1	0	5	4
Compulsory Core Lab	UBT18603	Immunotechnology Laboratory	0	0	3	3	3
Compulsory Core Lab	UBT18604	rDNA Technology Laboratory	0	0	3	3	3
Core Elective - III	UBT18E05	Environmental Biotechnology	3	1	0	4	3
	UBT18E06	Nanobiotechnology					
Core Elective - IV	UBT18E07	Cancer Biology	3	0	0	3	2
	UBT18E08	Structural Bioinformatics					
Supportive Course (Internal Evaluation)	CAC18601	Communication Skills	2	0	0	2	2
Mini Project	UBT18605	Mini Project (Review/Research)	0	0	5	5	3
TOTAL			**16**	**3**	**11**	**30**	**24**

Total credits to be earned for the degree - 148

Department of Biotechnology
Bachelor of Biotechnology

Program Educational Objectives (PEOs)

- PEO1. Graduates will have skills and knowledge to excel in their professional career in biotechnology and related disciplines
- PEO2. Graduates will contribute and communicate effectively within the team to grow into leaders
- PEO3. Graduates will practice lifelong learning for continuing professional development
- PEO4. Graduates will have the capability to continue their formal education and successfully complete an advanced degree
- PEO5.Graduates will contribute to the growth of the nation and society by applying acquired knowledge in technical, research oriented implementation and managerial skills.

Student outcomes (SOs)

The curriculum and syllabus for Bachelor degrees (2018) conform to outcomebased teaching learning process. In general, FOURTEEN STUDENT OUTCOMES (a-n) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

a. An ability to apply knowledge on basic sciences and advance sciences using technical tools in the appropriate discipline.

b. An ability to analyze a problem, identify and elucidate the biological parameters to find relevant solution in appropriate disciplines

c. An ability to design new projects and implement their applications in relevant field.

d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security and social issues and responsibilities

f. An ability to communicate effectively with a range of audiences

g. An ability to analyze the local and global impact of biotechnology on society

h. Recognition of the need and ability to engage in continuing professional development

i. An ability to use current techniques, skills, and tools necessary for new innovations in biotechnology

j. An ability to use and apply current technical concepts and practices in the core biotechnology field

k. An ability to identify and create new methodologies and standardizing them according to the requirement strategy

l. An ability to effectively integrate biotechnological solutions into the user environment

m. An understanding of best practices and standards and their application

n. An ability to assist in the creation of an effective project plan.

SEMESTER I

முதல்பருவம்

குறியீட்டுஎண்	பாடம்	L	T	P	Total of LTP	C
ULT18101	தமிழ்-I	4	1	0	5	4

	INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:	Student Outcomes				
1.	இரண்டாயிரம்ஆண்டுகாலத்தமிழின்தொன்மையையும்வரலாற்றையும்அதன்விழுமியங்களையும்பண்பாட்டையும்எடுத்துரைப்பதாக இப்பாடத்திட்டம்அமைக்கப்பட்டுள்ளது.	b	c	i	e	n
2.	காலந்தோறும்தமிழ்இலக்கியம்உள்ளடக்கத்திலும், வடிவத்திலும்பெற்றமாற்றங்கள், அதன்சிந்தனைகள், அடையாளங்கள்ஆகியவற்றைகாலந்தோறும் எழுதப்பட்டஇலக்கியங்களின்வழியாகக்கூறுவதாகவும், மொழியின்கட்டமைப்பைப்புரிந்துகொள்வதாகவும்பாடத்திட்டம்வடிவமைக்கப்பட்டுள்ளது.	b	c	i	e	n
3.	வாழ்வியல்சிந்தனைகள், ஒழுக்கவியல்கோட்பாடுகள், சமத்துவம்,சூழலியல்எனப்பலகூறுகளைமாணவர்களுக்குஎடுத்துரைக்கும்விதத்தில்இப்பாடத்திட்டம்உருவாக்கப்பட்டுள்ளது.	b	c	i	e	n

அலகு – 1

இக்காலக்கவிதைகள் - 1

1. பாரதியார் – கண்ணன்என்சேவகன்
2. பாரதிதாசன் – தமிழ்ப்பேறு
3. அப்துல்ரகுமான் – அவதாரம்
4. மீரா –கனவுகள் +கற்பனைகள் = காகிதங்கள்

5. து. நரசிம்மன் – மன்னித்துவிடுமகனே

அலகு – 2

இக்காலக்கவிதைகள் - 2

1. ராஜாசந்திரசேகர் – கைவிடப்பட்டகுழந்தை
2. அனார் – மேலும்சிலஇரத்தக்குறிப்புகள்
3. சுகிர்தராணி – அம்மா
4. நா.முத்துக்குமார் –தூர்

அலகு 3 - சிற்றிலக்கியம்

1. கலிங்கத்துப்பரணி– பொருதடக்கைவாள்எங்கே(பாடல் - 485)

2.அழகர்கிள்ளைவிடுதூது–இதமாய்மனிதருடனே...
(கண்ணி – 45)

3. நந்திக்கலம்பகம்– அம்பொன்றுவில்லொடிதல்(பாடல் – 77)

4. முக்கூடற்பள்ளு –பாயும்மருதஞ்செழிக்கவே(பாடல் – 47)

5.குற்றாலக்குறவஞ்சி– ஓடக்காண்பதுமே...(பாடல் - 9)

காப்பியங்கள்

மணிமேகலை–உலகவறவிபுக்ககாதை– மாசுஇல்வால்ஒளி!
- இந்நாள்போலும்இளங்கொடிகெடுத்தனை". (28 அடிகள்)

அலகு – 4 – தமிழ்இலக்கியவரலாறு

1)சிற்றிலக்கியம் - தோற்றமும்வளர்ச்சியும்
2) புதுக்கவிதை - தோற்றமும்வளர்ச்சியும்
3) சிறுகதை - தோற்றமும்வளர்ச்சியும்
4) புதினம் - தோற்றமும்வளர்ச்சியும்
5) உரைநடை - தோற்றமும்வளர்ச்சியும்

அலகு5 - மொழிப்பயிற்சி :

1.கலைச்சொல்லாக்கம், 2. அகரவரிசைப்படுத்துதல், 3. மரபுத்தொடர் / பழமொழி, 4. கலைவிமர்சனம்,
5. நேர்காணல்

உரைநடைப்பகுதி

1. உ.வே.சாமிநாதையர்–
சிவதருமோத்திரச்சுவடிபெற்றவரலாறு,

2. தஞ்சாவூர்க்கவிராயர் –கூஜாவின்கோபம்,
3. இரா.பச்சியப்பன் – மாடல்லமற்றையவை

பார்வைநூல்கள்

1. கைலாபதி, க., தமிழ்நாவல்இலக்கியம்,குமரன்பதிப்பகம், வடபழனி. **1968.**
2. சுந்தரராஜன், பெ. கோ., சிவபாதசுந்தரம்,சோ., தமிழில்சிறுகதைவரலாறும்வளர்ச்சியும், க்ரியா, சென்னை, **1989.**
3. பரந்தாமனார், அ.கி., நல்லதமிழ்எழுதவேண்டுமா, பாரிநிலையம், சென்னை, **1998,**
4. பாக்யமேரி, வகைமைநோக்கில்தமிழ்இலக்கியவரலாறு, என்.சி.பி. எச். பதிப்பகம், சென்னை, **2011.**
5. வல்லிக்கண்ணன்,புதுக்கவிதையின்தோற்றமும்வளர்ச் சியும், அன்னம், சிவகங்கை,1992.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Totalof LTP**	**C**
ULH18101	**HINDI- I**	**4**	**1**	**0**	**5**	**4**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To express and communicate literature which is part of life	b	c	i	e	n
2.	To incorporate day to day personal and professional life's need to communicate in the language.	b	c			

3.	To help the students to imagine and express their mind through literature	b	c			

UNIT – I - PROSE **(35 Hours)**

1. BADE GHAR KI BETI - PREMCHAND
2. VAISHNAV KI FISLAN - HARISHANKAR PARSAI (VYANGYA KATHA)
3. BENAM RISHTA - MRIDULA GARG
4. UTSAH - RAMCHANDAR SHUKLA (NIBAND)
5. PURUSKAR - JAYSHANKAR PRASAD
6. HARDAM.COM - ALKA SINHA

UNIT -II- ONE ACT PLAY **(15 Hours)**

1. MAHABHARAT KI EK SANJH - BHARAT BHUSHAN AGRAWAL
2. REED KI HADDI - JAGDISH CHANDR MATHUR

UNIT -III- CORRESPONDENCE **(10 Hours)**

1. OFFICIAL LETTER
2. DEMI-OFFICIAL LETTER

UNIT -IV- CINEMA **(10 Hours)**

1. PANCHLIGHT - PHANISHWAR NATH RENU
2. CHANDI KA JUTA - BAL SHAURI REDDI

UNIT -V- TECHNICAL TERMINOLOGY **(5 Hours)**

REFERENCES

1. PRAYOJAN MULAK HINDI – MADHAV SONTAKKE.
2. A PRACTICAL GUIDE TO ENGLISH TRANSLATION AND COMPOSTITION – K.P. THAKUR.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Totalof LTP**	**C**
ULF18101	**FRENCH-I**	**4**	**1**	**0**	**5**	**4**

INSTRUCTIONAL OBJECTIVES	**Student Outcomes**

At the end of this course the learner is expected:						
1.	To encourage greater written skills through comprehension writing and composition writing	e	f	h	m	n
2.	Improve their oral and written skills through a combination of theory and practice.	e	f			
3.	Extend and expand their savoir-faire through the acquisition of latest skills and techniques by practical training.	e	f			

Unité-I **(15 heures)**

Salut-Saluer- Entrer en contact avec quelqu'un – se présenter – s'excuser- *tu* ou *vous* ? Les jours de la semaine – Quelques formules de politesse – L'alphabet – Quelques consignes de classe – Je, tu, vous, il. Elle – Etre – Quelques nationalités – Masculin et féminin –Les nombres de 0 à 10 – Quelques sigles.

Unité-II **(15 heures)**

Enchanté- Demander de se présenter – Présenter quelqu'un – La négation : ne…pas – Les adjectifs possessifs –Etre, avoir+quelques verbes en –er – C'est, il est – L'interrogation par l'intonation – Quelques professions – Les nombres de 11 à 69 – Oui, non, si. **J'adore !**- Exprimer ses gouts –échanger sur ses projet – Aller – Moi aussi – Nous, ils, elles – La conjugaisons des verbes en –er être et avoir – Faire du, de l', de la +sport – Les nombres après 69 – On=nous – Le futur proche – Quelques indicateurs de temps – Les adjectifs possessifs.

Unité-III **(15 heures)**

Tu veux bien – Demander à quelqu'un de faire quelque chose – Demander poliment – Parler d'actions passées –Il y a – Les articles définis et indéfinis – Les marques du pluriel des noms – Les pronoms après une préposition (avec lui, chez, moi) – Le passé composé – Pouvoir, vouloir, venir, connaître.

Unité-IV **(15 heures)**

On se voit quand ? - Proposer, accepter, refuser une invitation – indiquer la date – Prendre et fixer un rendez-vous –Demandez et indiquer l'heure –Les pronoms compléments directs me, te, nous, vous –Pourquoi ? Parce que – Quel(s), Quelle(s) – L'interrogation avec est-ce que – Finir- Savoir – L'heure et la date – Les mois de l'année – Quelques indicateurs de temps.

Unité-V **(15 heures)**

Bonne idée ! – Exprimer son point de vue positif et négatif – s'informer sur le prix – S'informer sur la quantité – Exprimer la quantité – La négation : ne …pas de – Les articles partitifs – Combien ? –Un peu de, beaucoup de,…. –Qu'est-ce que, combien

– offrir, croire – Penser à, penser de – Plaire à – Les couleurs – Le masculin et le féminin des adjectifs – Les pronoms compléments directs le, la, les.

Référence

‘‘**Latitudes-1’’** Méthode de français, REGIME MERIEUX, YVES LOISEAU Les éditions Didier, Paris, 2012.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Totalof LTP	C
ULE18101	ENGLISH-I	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To enable the students to think in English	b	c	i	e	n
2.	To become aware of the regional literature and the writers.	b	c	i		
3.	To equip students with the awareness and strategies needed to enable the study of English as a lifelong process.	b	c	i		

UNIT I - POETRY **(15 Hours)**

1. YayumNyayum – Kurunthogai 40
2. My Grandmother’s House – Kamala Das
3. Transgender – Olivia Kent
4. Obituary – A K Ramanujam

UNIT II - PROSE **(15 Hours)**

1. On Marriages – Nirad C Choudhary.
2. Response to Welcome addresses ii)Why Do We Disagree– Swami Vivekananda.
3. I have a dream – Martin Luther King.

UNIT III -SHORT STORY **(15 Hours)**

A Nincompoop – Anton Chekhov

1. The Rat – Ashokamitran
2. Quantum of Solace – Ian Flemming
3. Squirrel - Ambai

UNIT IV -POPULAR LITERATURE **(15 Hours)**

1. Shabdo -Kaushik Ganguli
2. TEDX Talks
3. John Lennon - Imagine
4. Bob Marley - No woman no cry

UNIT V -LANGUAGE COMPONENT **(15 Hours)**

1. Spot the Errors
2. Jumbled Sentence
3. Homophones & Homonyms
4. Idioms and Phrases
5. Antonyms and Synonyms
6. Story through Images
7. Hints Development
8. Autobiography of Concrete Objects
9. Advertisements
10. Slogan Writing

TEXT BOOK

1. Cambridge University Press, Raymond Murphy, *Essential Grammar in Use* 3rd Edition 2010.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Totalof LTP**	**C**
UBT18101	**CELL BIOLOGY**	**4**	**0**	**0**	**4**	**4**

INSTRUCTIONAL OBJECTIVES		**Student Outcomes**				
1.	To understand the basics of cell biology and to know the cellular role in depth.	a	c	i		
2.	To provide sound knowledge about cell functions.	a	b	i		
3.	To study the cellular organelles and their interconnectivity.	a	c	i		

UNIT I - AN OVERVIEW OF CELLS **(12 Hours)**

An Overview of cells, Classification of cells –Prokaryotic cells and Eukaryotic cells. Meiotic and Mitotic division.

UNIT II - CELL STRUCTURE AND FUNCTION **(12 Hours)**

Cell Membrane and their models. Membrane proteins, carbohydrates and their role. Transport across membranes –Diffusion - active and passive diffusion. Endoplasmic reticulum, Golgi apparatus, Lysosome, Peroxisomes and glyoxisomes. Types of Ribosomes.

UNIT III – CELL SIGNALLING **(12 Hours)**

Receptors – Cytosolic, Nuclear & Membrane bound receptors. antocrine / paracrine / endocrine signaling process. Concept of Secondary messengers, cAMP, cGMP, Protein Kinases, G Proteins – GPCR

UNIT IV - CHROMOSOMAL ORGANISATION **(12 Hours)**

Nucleus, Chromosomes, chromatin structure. Mitochondria, Cytoskeleton: Types of filaments and their functions.

UNIT V - CANCER **(12 Hours)**

Oncogenesis: Oncogenes, Development and causes of cancer, Types of cancer, Benign and malignant tumour, Treatment of cancer, tumor suppressor gene.

TEXT BOOKS

1. Alberts, Bruce, "Molecular Biology of Cell", 5th Edition, Garland Science, 2008
2. Veer BalaRastogi, "*Fundamentals of Molecular Biology"*Ane Books Pvt.Ltd2008.

REFERENCES

1. Robert Weaver. "Molecular Biology" 5th edition, 2011.
2. Cooper,G.M. "The Cell: A Molecular Approach, 4th Edition, ASM Press, 2007.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Totalof LTP	C
UBT18102	CELL BIOLOGY LABORATORY	0	0	3	3	3

INSTRUCTIONAL OBJECTIVES	Student

At the end of this course the learner is expected:		Outcomes				
1.	To acquire knowledge about basic cell biology	a				
2.	To develop the skills in understanding the isolation techniques of cell organelles	c	j			
3.	To develop the skill for learning morphological parameters of a cell	b				

1. Enumeration of RBC
2. Enumeration of WBC
3. Identification of giant chromosome in chironomous larvae
4. Estimation of hemoglobin by sahlis method
5. Observation of Barr bodies
6. Cell Counting and viability
7. Blood Smear Preparation

Course Nature : Practical					
Assessment Method (Max.Marks: 50)					
Assessment Tool	**Observation Note Book**	**Performance in practical**	**Result of the experiment**	**Attendance**	**Total**
Marks	**15**	**15**	**15**	**5**	**50**
End Semester Weightage					**50%**
Total					**100%**

SUBJECT CODE	TIE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18103	MICROBIOLOGY	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To understand the basics of microbiology and to know the role in environment.	a	g			
2.	To offer a sense of the history of microbial science, its methodology and its many contributions to humanity	g	i	j		
3.	To ensures the students to understand about the microbiology and diseases	m	n			

UNIT I - BASICS OF MICROBIOLOGY (14 Hours)

Introduction - History of Microbiology - General structure and characteristics of microorganisms (Acellular: Viruses, Viroids and Prions, Cellular: Bacteria, algae, fungi and protozoa)–Classification of microorganisms –Three Kingdom and Whittaker's Five Kingdom classification – Binomial nomenclature.

UNIT II– MICROSCOPY (12 Hours)

Microscopy – General principles of optics in relation to Microscopy. Principles and application of Microscopy – Magnification, Resolving power, Numerical Aperture. Types of Microscopy – Bright Field, Dark Field, Phase Contrast and Fluorescence – Electron Microscopy (SEM and TEM).

UNIT III - MEDIA ANDSTERILIZATION (12 Hours)

Sterilization and disinfection –Microbiological media – Growth curve – Nutritional types of microorganisms - Factors influencing the growth of microorganisms.

UNIT IV - FOOD AND INDUSTRIAL MICROBIOLOGY (10 Hours)

Role of microorganisms in food production - General principles and application of food preservation – Food spoilage. Alcoholic beverages – Beer and wine.

UNIT V - ENVIRONMENTAL MICROBIOLOGY (10 Hours)

Role of microbes in ecosystems – Microorganisms in soil, air and water- Sewage treatment methods - Biological nitrogen fixation – Bio-fertilizers.

TEXT BOOKS

1. A.H.Patel, *"Industrial microbiology"*, Macmillan Publishers India, 2002.
2. Pelezar, chan, *"Microbiology"*– Krieg Tata McGraw Hill Publications, 2007.
3. Prescott, Harley and Klein, *"Microbiology"*, McGraw Hill publications, Fifth edition, 2003.

REFERENCES

1. WulfCrueger and Anneliese Crueger, *"Biotechnology – A textbook of Industrial Microbiology"*, PanimaPublishing Corporation, New Delhi, 2000, reprint 2005.
2. Jacquelyn G.Black, *"Microbiology -Principles and Explorations*" Wiley publications 2008.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18104	MICROBIOLOGY LABORATORY	0	0	4	4	3

INSTRUCTIONAL OBJECTIVES	Student

At the end of this course the learner is expected:		Outcomes				
1.	To acquire knowledge about basic microbiology	a				
2.	To develop the skills in understanding the isolation techniques of microorganisms.	c	j			
3.	To develop the skill for learning morphological and functional parameters of microbes.	b	h			

1. Cleaning of Glassware and laboratory rules.
2. Principles and method of sterilization– Heat, Filtration &Radiation
3. Preparation of media (Solid, Semi solid and Liquid).
4. Smear preparation and simple staining.
5. Differential staining - Grams staining, spore staining, capsular staining.
6. Staining of Fungi – LPCB.
7. Demonstration of motility by hanging drop method.
8. Enumeration of Bacteria- Serial dilution- Pour plate and Spread plate method
9. Pure culture technique- Streak plate method and study of colony morphology.
10. Biochemical tests- IMViC and TSI.
11. Antibiotics sensitivity test- Disk diffusion-Kirby Bauer method.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	**Assessment Tool**	**Observation Note Book**	**Performance in practical**	**Result of the experiment**	**Attendance**	**Total**
	Marks	**15**	**15**	**15**	**5**	**50%**
End Semester Weightage						**50%**
Total						**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18105	CHEMISTRY	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the basics of organic and inorganic compounds	i	j			
2.	To study the kinetics of chemical reactions	m	n			

UNIT I – FUNDAMENTALS OF ORGANIC CHEMISTRY (14 Hours)

Hybridization in methane, ethylene, acetylene, benzene – Classification of reagents – electrophiles, nucleophiles and free radicals – Classification of reactions addition,

substitution, elimination, condensation and polymerization – Polar Effects – Inductive effect, resonance, hyper-conjugation steric effect – Keto-enol tautomerism – electrophillic substitution mechanism in benzene-Nitration, Sulphonation and Halogenation. Heterocyclic compounds– Preparation and properties of pyrrole and pyridine.

UNIT II – BIOMOLECULES (12 Hours)

Classification, preparation, properties and reactions of glucose and fructose- Discussion of open and ring structure of glucose, mutarotation, interconversion of glucose and fructose. Amino acids- preparation and properties of glycine and alanine. Proteins - peptide linkage - primary, secondary and ternary structure of proteins.

UNIT III - CHEMISTRY OF HYDROGEN, HALOGEN, SILICON AND METALS (12 Hours)

Occurrence, extraction and chemical properties of iron, cobalt, nickel and copper. Electrochemical theory of rusting. Position of hydrogen in periodic table, atomic hydrogen and isotopes of hydrogen. Preparation and structure of borozole, SiO_2, SiC and $SiCl_4$. General characteristics of halogens-interhalogens.

UNIT IV - CHEMICAL KINETICS (12Hours)

Rate of reaction, order, molecularity, first order rate law and simple problems, half-life period of first order reaction, pseudo first order reaction, zero and second order reactions. Arrhenius and collision theories - assumption, derivation, demerits-experimental determination of order of reactions.

UNIT V - INDUSTRIAL CHEMISTRY (10 Hours)

Fuels-Classification –gaseous fuels – water gas, producer gas, liquefied petroleum gas, gobar gas, and compressed natural gas. Hardness of water – temporary and permanent hardness, disadvantages of hard water - boiler scales and sludges - softening of hard water – Zeolite process, demineralization process and reverse osmosis – Purification of water for domestic use: use of chlorine, Ozone and UV light – Definition and determinations of BOD and COD.

TEXT BOOKS

1. Puri B.R., Sharma L.R., Kalia K.K., "*Principles of Inorganic Chemistry*", Shobulal Nagin Chand & Co. 2001.
2. Bahl B.S. and ArunBahl, "*A text book of Organic Chemistry*", 21st Edition, Sultan Chand & Co., 2012.

REFERENCES

1. Puri B.R., Sharma L.R., Pathania M.S., "*Principles of Physical Chemistry*", Vishal Publishing Company, 2008.

2. Kamaraj P. and Arthanareeswari M., Chemistry – "*A Technological approach"*, Sudhandira Publications, 3rd edition. 2006.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
CAC18101	SOFT SKILLS	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes					
1.	To acquire inter personal skills and be an effective goal oriented team player	a	b	c	e		
2.	To develop professionalism with idealistic, practical and moral values	a	b	c	e		
3.	To acquire communication and problemsolving skills	a	b	c	e		
4.	To re-engineer their attitude and understand its influence on behavior	a	b	c	e		

UNIT I – ATTITUDE **(6 Hours)**

Who am I? SWOT analysis, Importance of self-confidence and self-esteem, Factors influencing attitude, Challenges and lessons from attitude

UNIT II – COMMUNICATION **(6 Hours)**

Practice activities (JAM, spin a story, diagram description, etc…), Activities for evaluation (Extempore, speaking news, book review).

UNIT III – GOAL SETTING **(6 Hours)**

SMART goals, Blue print for success, Short term, Long term, Life time goals, Value of time, Diagnosing time managementand Prioritizing work.

UNIT IV – PUBLIC SPEAKING **(6 Hours)**

Activities for evaluation (Surveying and reporting, Debate, Group discussion).

UNIT V – CREATIVITY **(6 Hours)**

Out of box thinking, lateral thinking.

REFERENCES

1. Covey Sean, Seven habits of highly effective teens, New York, Fireside Publishers, 1998.
2. Carnegie Dale, How to win friends and influence people, New York, Simon and Schuster, 1998.
3. Thomas A Harris, I am ok, you are ok, New York, Harper and Row, 1972.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SEMESTER II

இரண்டாம்பருவம்

குறியீட்டு எண்	பாடம்	L	T	P	Total of LTP	C
ULT18201	**தமிழ் - II**	**4**	**1**	**0**	**5**	**4**

	INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:	**Student Outcomes**				
1	**இரண்டாயிரம்ஆண்டுகாலத்தமிழின்தொன்மையையும்வரலாற்றையும்அதன்விழுமியங்களையும்பண்பாட்டையும்எடுத்துரைப்பதாகஇப்பாடத்திட்டம்அமைக்கப்பட்டுள்ளது.**	b	c	i	e	n
2	**காலந்தோறும்தமிழ்இலக்கியம்உள்ளடக்கத்திலும், வடிவத்திலும்பெற்றமாற்றங்கள், அதன்சிந்தனைகள், அடையாளங்கள்ஆகியவற்றைகாலந்தோறும்எழுதப்பட்டஇலக்கியங்களின்வழியாகக்கூறுவதாகவும், மொழியின்கட்டமைப்பைப்புரிந்துகொள்வதாகவும்பாடத்திட்டம்வடிவமைக்கப்பட்டுள்ளது.**	b	c	i		
3	**வாழ்வியல்சிந்தனைகள், ஒழுக்கவியல்கோட்பாடுகள், சமத்துவம், சூழலியல்எனப்பலகூறுகளைமாணவர்களுக்குஎடுத்துரைக்கும்விதத்தில்இப்பாடத்திட்டம்உருவாக்கப்பட்டுள்ளது.**	b	c	i		

அலகு – 1

1. **எட்டுத்தொகை :** 1. குறுந்தொகை (பாடல் – 130), 2. நற்றிணை (பாடல் - 27), 3. அகநானூறு (**பாடல்** – 86)
2. **பத்துப்பாட்டு** – சிறுபாணாற்றுப்படை **(**அடிகள் **-** 126-143)
3. **பதினெண் கீழ்க்கணக்கு** : திருக்குறள்- வெகுளாமை (அதிகாரம்31), காதல்சிறப்புரைத்தல் (அதிகாரம் 113)

அலகு – 2

1. **எட்டுத்தொகை :** 1. ஐங்குறுநூறு(பாடல் - 203), 2. கலித்தொகை - பாலைத்திணை (பாடல் - 9), 3. புறநானூறு (பாடல்- 235)
2. **பத்துப்பாட்டு -** முல்லைப்பாட்டு (அடிகள் - 6 – 21)
3. **பதினெண்கீழ்க்கணக்கு -**1. நாலடியார்- நல்லார்எனத்தான் (221), 2. திரிகடுகம் - கோலஞ்சிவாழும்குடியும் (33), 3. இனியவைநாற்பது - குழவிதளர்நடை (14), கார்நாற்பது- நலமிகுகார்த்திகை (26), 5. களவழிநாற்பது - கவளங்கொள்யானை (14)

அலகு - 3

சைவம் – பன்னிருதிருமுறைகள்

1. திருஞானசம்பந்தர்– வேயுறுதோளிபங்கன் (இரண்டாம் திருமுறை)
2. திருநாவுக்கரசர் –மனமெனும்தோணி (நான்காம்திருமுறை)
3. சுந்தரர் – ஏழிசையாய்இசைப்பயனாய் (ஏழாம் திருமுறை)
4. மாணிக்கவாசகர்–ஆதியும்அந்தமும்இல்லா (திருவெம்பாவை)
5. திருமூலர் –அன்பு சிவம் இரண்டு (திருமந்திரம்)

வைணவம் – நாலாயிரத்திவ்யப்பிரபந்தம்

1. பேயாழ்வார் - திருக்கண்டேன்பொன்மேனி ...
2. பெரியாழ்வார் - கருங்கண்தோகைமயிற்பீலி...
3. தொண்டரடிப்பொடிஆழ்வார்–பச்சைமாமலைபோல்...
4. ஆண்டாள் - கருப்பூரம்நாறுமோ? கமலப்பூ ...
5. திருமங்கையாழ்வார் - வாடினேன்வாடிவருந்தினேன்

இஸ்லாமியம்

சீறாப்புராணம் -மானுக்குப் பிணை நின்ற படலம் **-** – 5 பாடல்கள்(பாடல்எண்கள் : 61 - 65)

கிறித்துவம்

இரட்சண்ய யாத்ரீகம் – கடைதிறப்புப்படலம் – 5 பாடல்கள் (பாடல்எண்கள் : 3,9,10,15,16)

அலகு – 4

தமிழ்இலக்கியவரலாறு

1. சங்கஇலக்கியங்கள், 2. நீதிஇலக்கியங்கள், 3.பக்திஇலக்கியங்கள், 4. காப்பியங்கள்

அலகு – 5

சிறுகதைகள்

1. புதுமைப்பித்தன் – அகலிகை
2. ந.பிச்சமூர்த்தி – வேப்பமரம்
3. அகிலன் – ஒருவேளைச்சோறு
4. ஜி. நாகராஜன் – பச்சக்குதிரை
5. கி.ராஜநாராயணன் – கதவு
6. சா.கந்தசாமி – தக்கையின்மீதுநான்குகண்கள்
7. ஆண்டாள்பிரியதர்ஷினி – மாத்திரை
8. வண்ணதாசன் – ஒருஉல்லாசப்பயணம்
9. சு. தமிழ்ச்செல்வன் – வெயிலோடுபோய்
10. பாரததேவி – மாப்பிள்ளைவிருந்து

பார்வைநூல்கள்

1. அரசு, வீ., இருபதாம்நூற்றாண்டுச்சிறுகதைகள்நூறு, அடையாளம்பதிப்பகம், திருச்சி, 2013
2. அருணாசலம், ப., பக்திஇலக்கியங்கள், பாரிநிலையம், சென்னை, 2010
3. தமிழண்ணல், புதியநோக்கில்தமிழ்இலக்கியவரலாறு, மீனாட்சிபுத்தகநிலையம், மதுரை, 2000
4. பாக்யமேரி, வகைமைநோக்கில்தமிழ்இலக்கியவரலாறு, என்.சி.பி. எச். பதிப்பகம், சென்னை, 2011
5. பசுபதி, ம.வே. செம்மொழித்தமிழ்இலக்கணஇலக்கியங்கள், தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர், 2010.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
ULH 18201	HINDI - II	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To express and communicate literature which is part of life	b	c	i	e	n
2.	To incorporate day to day personal and professionl life's need to communicate in the language.	b	c			
3.	To help the students to imagine and express their mind through literature	b	c			

UNIT I - POETRY **(30Hours)**

1. KABIR, TULSI, RAHIM, BIHARI
2. KAIDI AUR KOKILA - MAKHAN LAL CHATURVEDI
3. AB AUR NAHI - OM PRAKASH VALMIKI
4. PREM KA ROG - KUNWAR NARAYAN
5. MAA GAON ME HAI - DIVIK RAMESH
6. ADHIK NAYA HOTA HUN - LILADHAR MANDLOI

UNIT II - STORY **(25 Hours)**

1. VAISHNAVI - YASHPAL
2. DOPAHAR KA BHOJAN - AMARKANT
3. JUNGLE - CHITRA MUDGAL
4. KINARE SE DOOR - RAKESH BIHARI
5. PRECIOUS BABY - ANITA NAIR

UNIT – III **(10Hours)**

ADMINSTRATIVE WORDS, ANUVAD : ANUVAD KI PARISBHASHA EVAM BHED.

UNIT – IV **(10Hours)**

1. ANUVAD: ENGLISH TO HINDI.

REFERENCES

1. PRAYOJAN MULAK HINDI – MADHAV SONTAKKE

2. A PRACTICAL GUIDE TO ENGLISH TRANSLATION AND COMPOSTITION – K.P. THAKUR.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
ULF18201	FRENCH-II	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	Improve their oral and written skills through a combination of theory and practice.	b	c	i		
2.	Consolidate the knowledge of theoretical aspects of French grammar with examples provided from different angles: from present day literature, day to day conversation.	b	c	i		

Unité-I **(15 heures)**

C'est où ? – Demander et indiquer une direction – Localiser (près de, en face de,….) - L'impératif – Quelques prépositions de lieu- Les articles contractés au, à la …. – Le passé composé et l'accord du participe passé avec être –Les nombres ordinaux – Ne…plus, ne … jamais – Les adjectifs numéraux ordinaux – Faire.

Unité-II **(15 heures)**

N'oubliez pas ! - Exprimer l'obligation ou l'interdit – Conseiller – En dans les constructions avec de – Quelque chose, rien – Quelqu'un, personne – Il faut, devoir – Qui, que, où – Les pronoms compléments indirects (me, te, lui, leur…). **Belle vue sur la mer !** – Décrire un lieu –Situer – se situer dans le temps – La place des adjectifs – Des, De devant un adjectif – Le genre des noms de pays – Les prépositions et les noms de villes, de pays, de continents – Tout(e) (s), tous – Y, pronoms complément – Les adjectifs démonstratifs.

Unité-III **(15 heures)**

Quel beau voyage !- Raconter – Décrire les étapes d'une action – Exprimer l'intensité et la quantité – Interroger- Les verbes pronominaux – à la pièce, au kilo – un sachet de, un litre de … -d'abord, puis … - peu, assez, trop… - En pronom complément – L'interrogation par l'inversion et révision de l'interrogation – Partir.

Unité-IV **(15 heures)**

Oh !joli !- Décrire quelqu'un – comparer – Exprimer l'accord ou le désaccord – Se situer dans le temps –L'imparfait – L'imparfait ou le passé composé – la description d'une personne.

Unité-V **(15 heures)**

Et après ? - Parler de l'avenir- Exprimer des souhaits – Décrire quelqu'un- S'en aller, partir, quitter – Les indicateurs de temps (en, dans) – Le futur simple – Le subjonctif présent- La place des pronoms à l'impératif.

Référence

"**Latitudes-1"** Méthode de français, REGIME MERIEUX, YVES LOISEAU Les éditions Didier, Paris, 2012.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
ULE18201	**ENGLISH-II**	**4**	**1**	**0**	**5**	**4**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To enable the students to think in English	b	c	i	e	n
2.	To become aware of the world literature and the writers	b	c	i		
3.	To equip students with the awareness and strategies needed to enable the study of English as a lifelong process.	b	c	i		

UNIT I - POETRY **(15 Hours)**

1. The Unknown citizen – Auden
2. Nada KondroKadaKondro- PuraNaanooru 187
3. On being Trans- Lee Mokobe
4. Girl Child – PawaniMathur

UNIT II - PROSE **(15 Hours)**

1. Men and Women – Virginia Woolf
2. Farewell Speech of Mark Antony – William Shakespeare
3. The Autobiography of an unknown Indian –NiradC.Chaudhuri

UNIT III- SHORT STORIES AND PLAY **(15 Hours)**

1. A Wrong Man in Worker's Paradise – Rabindranath Tagore
2. Refund – Karen E.Bender
3. Paper Money – RaziaFasih Ahmad
4. Karukku - Bama

UNIT IV - POPULAR LITERATURE **(15 Hours)**

1. Paul Simon –The Sound of Silence
2. Tedx Talks – If I had a daughter
3. John Lennon – I have a dream
4. Pink Floyd – Brick in the Wall

UNIT V - LANGUAGE COMPONENT **(15 Hours)**

1. Spot the Errors & Punctuation
2. Antonyms and Synonyms
3. Parts of speech
4. Articles
5. Vowels
6. Road Mapping
7. Movie Review
8. Crossword Puzzles
9. Open ended Stories
10. Quiz.

TEXT BOOK

1. Cambridge University Press, Raymond Murphy, *Essential Grammar in Use* 3rd Edition 2010.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18201	BIOCHEMISTRY	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To make the students understand the basics of biomolecules.	a	i			
2.	To study structural and functional properties of carbohydrates, proteins, lipids and nucleic acids.	b	m			

UNIT I - CARBOHYDRATES **(10 Hours)**

Definition, classification & properties of carbohydrates, epimers, anomers, glycolysis, TCA cycle.

UNIT II - LIPIDS **(12 Hours)**

Definition, classification of lipids. Simple lipids- Physical and chemical properties of fats. Characterization of fat – Saponification number, acid number, Iodine number, Compound lipids-Structure and function of phospholipids, glycolipids and lipoproteins. Derived lipids, Biosynthesis of fatty acid.

UNIT III - PROTEINS **(12 Hours)**

Amino acids and peptides. Definition, amino acids as ampholytes. Structure and classification of amino acids based on chemical nature, Essential amino acids , Protein- classification, Structure and properties.

UNIT IV - NUCLEIC ACIDS **(12 Hours)**

Structure of Purines and Pyramidines; Nucleotides and Nucleosides. DNA: double helix: A, B and Z forms, Nucleic acid sequencing.

UNIT V - VITAMINS & MINERALS **(14 Hours)**

Vitamins: Definition, Classification. Fat soluble vitamins- sources, physiological functions and deficiency disease; Water soluble vitamins-sources, physiological functions and deficiency disease. Minerals: Mineral requirement, essential macro minerals and essential micro minerals, sources and functions.

TEXT BOOKS

1. Robert K. Murray, David Bender, Kathleen M. Botham and Peter J. Kennelly,Harpers*"Illustrated Biochemistry"* 29th Edition, Mc GrawHilL 2012.
2. Lehninger, Nelson and Cox, *"Principles of Biochemistry"*, 6th edition, W.H. Freeman & Company, 2013.

REFERENCE

1. Voet&Voet, *"Fundamentals of Biochemistry"*, John Willey & Sons, 2010. Jeremy M. Berg, John L. Tymoczko and LubertStryer, Biochemistry, 4th Edition , Freeman and Company, 2011

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18202	BIOCHEMISTRY LABORATORY	0	0	3	3	3

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To make the students perform qualitative analysis of biomolecules.	a	i			
2.	To understand and perform functional properties and separation techniques of carbohydrates, proteins, lipids and nucleic acids.	j	k			

QUALITATIVE ANALYSIS

1. Analysis of sugars.
   a) Monosaccharide-Glucose, Fructose, Galactose, Mannose, Pentose.
   b) Disaccharides-Sucrose, Maltose and Lactose.
   c) Polysaccharides-Starch and Dextrin.
2. Analysis of amino acids.
   a) Histidine b) Tyrosine c) Tryptophan d) Methionine e) Cysteine f) Arginine
3. Separation of amino acids by TLC.
4. Column chromatography.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18203	BASICS OF GENETICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To make the students understand the basics of genetics	a	b			
2.	To study structural and functional properties of cell organelles	a	b	i		

UNIT - I

Mendel's experiments, monohybrid cross, dihybrid cross, principles of segregation - independent assortment; epistasis; multiple alleles- ABO blood groups.

UNIT - II

Chromosome structure and organization in eukaryotes; Mutation - molecular nature - physical and chemical mutagens and its applications. DNA damage and repair mechanism - excision repair, recombination repair, SOS repair.

UNIT - III

Chromosomal abnormalities- Deletions, Duplications, Inversions, Translocations; and Types of chromosomal aberrations- euploidy, aneuploidy.

UNIT - IV

Linkage, crossing over and recombination - cytological basis of crossing over; Sex-Linked Inheritance, Chromosome mapping.

UNIT - V

Hardy Weinberg equilibrium, Application of Hardy Weinberg equilibrium, Random genetic drift, types of inbreeding, polygenic inheritance- characteristics of quantitative traits, types.

TEXT BOOK

1. Gardner, Simmons, Sunstad, “Principles of Genetics,” 8 th edition – John Wiley and Sons, Inc., 2003.

REFERENCES

1. Monroe W. Strickberger, “Genetics,” 3 rd edition – Phi Learning, 2008
2. Verma .P.S & Agarwal .K, “Cell Biology Genetics Molecular Biology Evolution & Ecology”, S Chand Publication, 2004.

3. Gerald Karp, "Cell and Molecular Biology Concepts and Experiments", Wiley 6 th Edition, 2010.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18204	BASICS OF GENETICS LABORATORY	0	0	3	3	3

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To make the students understand cellular experiments	a	c			
2.	To study structural and functional properties of chromosome	i	j	k		

1. Blood Group identification
2. Sub cellular fractionation
3. Observation of Mitosis in onion root tip
4. Observation of polytene / Lampbrush chromosome
5. Cytoplasm and nuclear staining
6. Karyotyping
7. Isolation of chromosomes

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT	COURSE NAME	L	T	P	Total of	C

CODE					LTP	
UBT18205	BASICS OF COMPUTERS	4	0	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To know about computer and to operate the computer.	a	d	h		
2.	To familiarize the office suite.	l	n			

UNIT I -INTRODUCTION TO COMPUTER (9 Hours)

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

UNIT II - MS - WORD (9 Hours)

Introduction – User Interface – Themes and Quick Styles - Server Components**Word Basics:** Parts of Word Window – Formatting Features – Menus, Commands, Toolbars and their Icons – MS Word menus in focus - Word Exercise I – Word Exercise II.

UNIT III - MS-EXCEL (9 Hours)

Introduction – Entering and Editing Text - Menus, Commands and Toolbars – MS Excel Menus in Focus - Excel Exercise-I – Alternate method - Entering formulas – Formatting Cells, Date Range – Inserting Headers & Footers – Saving a file and opening a file.

UNIT IV - MS-POWER POINT (9 Hours)

Creating a new presentation and new slide– Opening a presentation – Deleting a slide, Copying a slide – Numbering the Slides – Saving a presentation – Changing the default directory – Printing a presentation – Working with Power Point – MS Power Point Menus in focus – Formatting in Power Point.

UNIT V - MS-ACCESS (9 Hours)

Parts of an Access Window – MS Access Menus in Focus – Starting Microsoft Access – Creating a New Database – Creating Table using Table Wizard – Saving the Database - Creating Tables in design view – Query – Forms – Reports.

TEXT BOOK

1. Sanjay Saxena, *"MS Office for Everyone",*Vikas Publishing House Pvt. Ltd., New Delhi, 2010, Reprinted 2010,

REFERENCE

1. Sinha P.K., *"Computer Fundamentals"*, BPB Publications, 6th Edition, New Delhi, 2004.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
CAC18201	**QUANTITATIVE APTITUDE AND LOGICAL REASONING - I**	**2**	**0**	**0**	**2**	**2**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**			
1.	To improve aptitude, problem solving skills and reasoning ability of the students	b	c	e	
2.	To help them qualify the written test of competitive exams, campus placements and PSUs	b	c	e	
3.	To collectively solve problems in teams and groups	a	b	c	e
4.	To adopt new techniques in solving problem	a	b	c	n

UNIT – I **(6 Hours)**

Numbers: Classification of numbers – Test of divisibility – Unit digit – HCF and LCM – Remainder theorem – Progression – Simplification – Averages – Combined mean (simple problems)

UNIT – II **(6 Hours)**

Simple interest and compound interest – Word problems

UNIT – III **(6 Hours)**

Problems related to permutation and combination – Probability (simple problems)

UNIT – IV **(6 Hours)**

Reasoning (Analytical and logical): Odd man out – Word series – Number series – Direction test – Blood relationship – Coding and decoding – Seating arrangements

UNIT – V **(6 Hours)**

Problems related to clocks and calendar.

REFERENCES

1. Dinesh Khattar-The Pearson guide to quantitative aptitude for competitive examinations**.**
2. Dr. Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chandand Company Limited
3. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata Mcgraw Hill, 3rd Edition.
4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata Mcgraw Hill, 4th Edition
5. http://fw.freshersworld.com/placementweek/papers.asp.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SEMESTER III

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total Of LTP	C
UBT18301	MOLECULAR BIOLOGY	3	2	0	5	4

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To study about the genome and its organization in prokaryotic and eukaryotic organism.	a	c	j		
2.	To imparts the knowledge about the regulation of genes and chromosomal abnormalities.	a	j			
3.	To learn the basic concepts of cancer, their causes and identification procedures.	c	n			

UNIT I - GENOME ORGANIZATION (12 Hours)

Genome organization – Prokaryotic and Eukaryotic; Structure of DNA; Chromosome structure and function.

UNIT II - CENTRAL DOGMA (12 Hours)

Structure of Ribonucleic acids; Prokaryotic DNA Replication, Transcription, and Translation.Genetic code.

UNIT III - GENE REGULATION MECHANISMS (12 Hours)

General aspects of Gene Regulation, The lactose operon model, The Galactose operon, The Tryptophan operon, Feedback regulation.

UNIT IV - DNA REPAIR MECHANISMS (12 Hours)

DNA repair mechanisms; Light dependent and light independent repair mechanism; Mutagenesis, Types of Mutations.

UNIT V - CHROMOSOMAL VARIATIONS AND MAPPING (12 Hours)

Chromosomal aberrations -Chromosomal variation in Number & Structure – Oncogenesis: Development and causes of cancer, Types of cancer, Oncogenes: Retro viral, proto, tumour suppressor gene.

TEXT BOOKS

1. Harvey Lodish, Baltimore. Arnold Berk et al. "*Molecular cell biology"* 7thedition.*Publisher*: W. H. Freeman, 2011.
2. DeRobertis, EDP, E.M.F Robertis,.Cell and molecular biology, Saunders Company, 2006.

REFERENCES

1. David Freifielder, *"Molecular Biology*", 3rd edition Jones & Bartlett publications, 2009.
2. Cooper M,.*"The cell molecular approach*", ASM Press, 2004.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18302	BIOINSTRUMENTATION	3	2	0	5	4

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To provide knowledge about the various techniques in Biotechnology.	a	i			
2.	To understand the applications of these techniques in life science research.	a	i	m		

UNIT I - CENTRIFUGATION (12 Hours)

Centrifugation Principle, Types of centrifuge, Preparative and Analytical Centrifugation, Density Gradient Centrifugation, Differential centrifugation. Cell Disintegration: Physical, chemical and enzymatic methods of microbial, plant and animal cell disintegration.

UNIT II - CHROMATOGRAPHY TECHNIQUES (12 Hours)

Theory principle and applications of Paper, TLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, GLC and HPLC.

UNIT III - ELECTROPHORESIS (10 Hours)

Theory principle and applications of SDS -PAGE, Agarose Gel Electrophoresis 2DE, Immunoelectrophoresis.

UNIT IV - SPECTROSCOPY (14 Hours)

Theory principle and applications of UV and Visible Spectroscopy, Fluorescence Spectroscopy, Mass spectroscopy, NMR, Atomic Absorption Spectroscopy, Flame spectrophotometry, Luminometry.

UNIT V - RADIOISOTOPES **(12 Hours)**

Radioactivity - radioactive Decay. Principles and Applications of GM Counter, Scintillation Counter, Autoradiography Use of radio isotopes in Life Sciences. Safety aspects.

TEXT BOOKS

1. Keith Wilson and John walker *"Principles and Techniques of Biochemistry and Molecular biology*" 7th edition. Cambridge University Press, 2010.
2. Upadhyay, Upadhyay and Nath*"Biophysical chemistry Principles and Techniques"* Himalaya Publishing house 2009.

REFERENCES

1. Palanivelu P*"Analytical Biochemistry and Separation techniques*" 4th edition. Twenty First Century Publication, 2013.
2. Sawhney SK, Randhir Singh *"Introductory Practical Biochemistry"* 2nd edition. Alpha science International Ltd, 2005.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
UBT18303	**MOLECULAR BIOLOGY LABORATORY**	**0**	**0**	**4**	**4**	**3**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To acquire knowledge about basic molecular biology tools	b	i			
2.	To develop the skills in isolating and identifying the challenges in molecular biology related tools	j	l			
3.	To develop the skill for implementing new project plans	n				

1. Isolation of bacterial genomic DNA
2. Isolation of plasmid DNA
3. Agarose Gel electrophoresis
4. Lignin Staining

5. Affinity Chromatography
6. Bacterial transformation
7. Estimation of DNA by Diphenyl amine method
8. Estimation of RNA by Orcinol Method

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18304	BIOINSTRUMENTATION LABORATORY	0	0	4	4	3

INSTRUCTIONAL OBJECTIVES		Student Outcomes				
1.	To make the students to know separation of biomolecules.	a	i			
2.	To understand the applications of these techniques in life science research.	b	i	n		

1. Paper chromatography – Carbohydrates, Amino acids.
2. Thin-layer Chromatography – Plant pigments.
3. Column Chromatography.
4. Agarose Electrophoresis.
5. SDS- PAGE.
6. Differential Centrifugation.
7. Study of UV – Visible Spectroscopy.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18305	BIOSTATISTICS	3	2	0	5	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To apply statistical methods for analyzing biological data	a	b			
2.	To analyze biological data and to draw inferences	c	g			

UNIT I - INTRODUCTION (12 Hours)

Statistics – Definition, functions and its limitations – Collection, Classification, Tabulation of data – Diagrammatic and Graphical representation of data.

UNIT II - MEASURES OF CENTRAL TENDENCY AND MEASURES DISPERSION (12 Hours)

Measures of Central Tendency – Mean, Median, Mode, Geometric mean, Harmonic mean – Merits and demerits of these measures - Measures of Dispersion – Range, Quartile deviation, Mean deviation, Standard deviation, Variance, Coefficient of Variation, Skewness – Kurtosis.

UNIT III - CORRELATION AND REGRESSION ANALYSIS (10 Hours)

Correlation – Types, scatter diagram – Karl Pearson's coefficient of correlation, Spearman's Rank Correlation – Regression – Formation of Regression lines – Uses of Regression lines.

UNIT IV - BASICS OF PROBABILITY (12 Hours)

Basics of Probability Theory – Addition & Multiplication Rule – Binomial, Poisson and Normal Distribution and their uses in biological sciences.

UNIT V - LARGE SAMPLE TEST (14 Hours)

Test for Mean – Test for the difference between two means – Test for proportion – Test for the difference between two proportions – Small sample Tests: Student's t-test, F-test – Analysis of variance (one-way and two-way – Basic Ideas only).

TEXT BOOKS

1. S.P.Gupta (2011), Statistical methods, Sultan Chand & Sons,4th Edition.

REFERENCES

1. Jerold H.Zar (2009): Bio-statistical Analysis, 4th Edition, Pearson Education Inc.,
2. Dorling Kindersley (India) Pvt. Ltd., New Delhi.
3. Antonisamy.B, Solomon Christopher and PrasannaSamuel.P, (2010):
4. Bio-Statistics Principles and Practice, 1st Reprint 2011, Tata McGraw Hill Education
5. Pvt. Ltd., New Delhi.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E51	DISEASE MANAGEMENT	3	0	0	3	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To create awareness on disease	b	g			
2.	To understand the principles of disease management	a	j			

UNITI- INTRODUCTION (8 Hours)

Health – Basic concepts and Definition; Need for good health; factors affecting health, Basic sanitation and personal hygiene – Food (Balanced diet) food habits and cleanliness, food adulterants, avoiding smoking, drugs and alcohol.

UNITII- PUBLIC HEALTH (10 Hours)

Communicable diseases, Mode of disease transmission (Epidemic and endemic diseases), Vaccination, Management of Hygiene in public places (Railway stations, Bus stands and other public places) hospitals – Nosocomial / Hospital acquired infections.

UNITIII– OCCUPATIONAL HEALTH AND SAFETY (10 Hours)

Occupational health and hazards – physical, chemical and biological hazards. Occupational diseases – Prevention and control. Health protection measures for workers – health education – first aid.

UNITIV- DISEASE (10 Hours)

Disease: Introduction - principles of disease control - Infection- portal of entry; Disease- types of diseases (Deficiency, infection, pollution diseases).

UNITV– HEALTH INDICATORS (12 Hours)

Health and Disease: Basic concepts and Definition, International bodies in health protection and promotion. Role of quarantine rules, laws and enforcement in the preventive measures of pandemic diseases.

TEXT BOOKS

1. Robbin, Cotranand Kumar.,"Robbin's Textbook of Pathology" 6th edition, Elsevier publisher, 2013.

REFERENCES

1. Ananantanarayan, R. and Paniker, C.J.K "Textbook of Microbiology" 8th edition. Universities Press, Orient Blackswan, 2005.
2. Park K, "Textbook of Preventive & Social Medicine" 22nd edition, BanarsidasBhanotpublishers, 2013.
3. Roger Detels, Robert Beaglehole, Mary Ann Lansang, Martin Gulliford., "Oxford Textbook of Public Health", 5th edition. Oxford press, 2011

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**SUBJECT TITLE**	**L**	**P**	**T**	**Total Of LTP**	**C**
UBT18E52	**DIAGNOSTIC TOOLS**	**3**	**0**	**0**	**3**	**2**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the principles of diagnostic techniques.	c	k	n	i	
2.	To provide knowledge about stem cells	l	k	m	c	

UNIT- I BIOTECHNOLOGY MEDICAL APPLICATIONS

Diagnostics- Introduction, medical and diagnostic products: Diagnostic kits, DNA probe, Molecular Markers - SNPs, RAPD, RFLP.

UNIT- II VACCINE & HORMONES

Preventive- Vaccination, principles of vaccine preparation, history, killed vaccine (TAB), attenuated vaccine (BCG, Sabin, Salk), polysaccharide (Hib), toxoid, limitation to current mode of vaccine production, route of administration and side effect of vaccines. Hormones – Insulin, human growth hormone, somatostatin, erythropoietin.

UNIT- III IMMUNO DIAGNOSIS

RIA – ELISA-direct, indirect, sandwich. Flow cytometry. Monoclonal antibodies as diagnostic tools and application.

UNIT- IV STEM CELL THERAPHY

Stem cell Potential use of stem cells – Cell based therapy.

UNIT- V BIOSENSORS

Introduction to Biosensors: Concepts and applications. Application of Biosensors to environmental samples. Introduction to Biochips and their application in modern sciences. Biosensors for personal diabetes management.

TEXTBOOKS

1. Nanotechnology, Principles and practices, S. K. Kulkarni, Capital Publishing Co.

REFERENCES

1. Textbook of Biotechnology (2005),R.C.Dubey,S.Chand and Co.
2. Immunology, 6th Edition, Kuby, RA Goldsby, Thomas J. Kindt, Barbara, A. Osborne, Freeman, 2002.
3. Commercial Biosensor: Grahm Ramsay, John Wiley & Son, INC. (1998).

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
CAC18301	QUANTITATIVE APTITUDE AND LOGICAL REASONING - II	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes						
1.	To improve aptitude, problem solving skills and reasoning ability of the student	f	i	h				
2.	To help them qualify the written test of competitive exams, campus placements and PSUs	h	i					
3.	To collectively solve problems in teams and group	a	e	g				
4.	To adopt new techniques in solving problem	n	g					

UNIT – I **(6 hours)**

Percentage - Profit or loss – Discount

UNIT – II **(6 hours)**

Ratio, proportion - Mixtures and solutions

UNIT – III **(6 hours)**

Time and work - Time, Speed and distance; Problems related to pipes and cisterns, Problems related to train, Problems related to boats and streams, Problems related to races.

UNIT – IV **(6 hours)**

Set theory - Geometry and mensuration – Cubes.

UNIT – V **(6 hours)**

Data sufficiency - Data interpretation

REFERENCES

1. Dinesh Khattar-The Pearson Guide to QUANTITATIVE APTITUDE for competitive examinations**.**
2. Dr. Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chand and Company Limited
3. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata Mcgraw Hill, 3rd Edition
4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata Mcgraw Hill, 4th Edition
5. http://fw.freshersworld.com/placementweek/papers.asp

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SEMESTER IV

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18401	BIOPROCESS TECHNOLOGY	3	2	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To study the design of the bioreactors and the kinetics and dynamics behind the bioprocess technology.	i	k	a	m	
2.	To ensures the students to understand about the industrial processes and production of commercial products.	h	j	m	e	

UNIT I - BIOREACTOR AND TYPES (12 Hours)

Introduction to Bioprocess Technology: History and Scope- Bioreactor: Design, parts and accessories, functions- Modes of Operation of fermenter – Batch & continuous - Types of reactors - Applications of Bioprocess Technology.

UNIT II - MICROBIAL KINETICS AND BIOREACTOR INSTRUMENTATION (10 Hours)

Microbial growth kinetics: Batch and continuous reactors- Bioreactor instrumentation, control and monitoring variables. Computers in bioprocess control systems.

UNIT III - STRAIN IMPROVEMENT AND MEDIA FORMULATION (12 Hours)

Isolation and screening of microbes: Preservation of microbes- Strain improvement: General, mutation and recombination- Media and sterilization - Inoculum preparation- Immobilization.

UNIT IV - DOWNSTREAM PROCESSING (12 Hours)

Downstream processing- Cell disruption - Recovery and purification of products, Separation of soluble products – Purification - crystallization and drying.

UNIT V - INDUSTRIAL BIOTECHNOLOGY (14 Hours)

Industrial Bioprocesses: ethanol, lactic acid production - Citric acid, acetic acid - penicillin- Streptomycin - beer, Amylase and protease, vitamin B12, PHA, biofertilizers - vermicompost, biopesticides – *Bacillus thuringiensis*, recombinant insulin and hepatitis B – Waste water management.

TEXT BOOKS

1. Stanbury PF and Whitaker A. Pergamon, (2005), “Principles of Fermentation technology”, second edition reprinted 2012,Pergamon Press, Oxford.
2. P.T. Kalaichelvan and I. Arul Pandi, (2007), “Bioprocess Technology”.MJP Publishers, Chennai.

REFERENCES

1. WulfCrueger and Anneliese Crueger, (2000), "Biotechnology – A textbook of Industrial Microbiology", reprint 2005. Panima publishing corporation, New Delhi.
2. A.H.Patel, (2000), "Industrial microbiology", Macmillan Publishers India.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18402	ENZYMOLOGY	3	2	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To introduce students the different properties of enzymes and to explain how enzymes act and mediate biochemical reactions.	a	g	i		
2.	To understand the basics and mechanisms of enzyme catalysis.	m	i			

UNIT I - INTRODUCTION TO ENZYMES (12 Hours)

Classification - IUB system. Characteristics of enzymes, enzyme substrate complex. Concept of active centre, binding sites. Effect of temperature, pH and substrate concentration on reaction rate. Activation energy. Transition state theory. Enzyme activity, international units, specific activity, turnover number.

UNIT II - ENZYME ACTION (10 Hours)

Enzyme specificity: Group specificity, absolute specificity, Stereo-Specificity. Hypotheses of enzyme action- lock and key Hypothesis, induced fit Hypothesis. Enzyme mechanism of chymotrypsin.

UNIT III - ENZYME KINETICS (12 Hours)

Kinetics of single substrate enzyme catalyzed reactions- MichaelisMenten Equation and its significance. Lineweaver Burk plot and EadieHofstee plots. Enzyme Inhibition -Feedback and allosteric inhibition.

UNIT IV - CO–ENZYMES (12 Hours)

NAD, NADP, FAD, FMN, Thiamine Pyrophosphate, Pyridoxal Phosphate, Lipoic Acid, Tetrahydro folate & Vitamin B12.

UNIT V - EXTRACTION & PURIFICATION OF ENZYMES (14 Hours)

Physical and chemical methods of isolation and purification of enzymes using different electrophoresis and chromatographic methods.Enzyme Immobilization **–** methods & Importance of enzyme immobilization. Industrial application of immobilized enzymes.

TEXT BOOKS

1. Nicholas C. Price and Lewis Stevens, *"Fundamentals of Enzymology*", Oxford University Press, 2003.
2. Trevor Palmer and Philip Bonner, *"Enzymes - Biochemistry, Biotechnology, Clinical chemistry*", 2nd edition, East-West Press Pvt. Ltd, 2004.

REFERENCES

1. Lehninger, Nelson and Cox, *"Principles of biochemistry*", 6th edition, W.H. Freeman & Company,2013.
2. Prakash M., DigmartiBhaskaraRao,Jena T, Enzyme Biotechnology, 1st edition, Discovery Publication, 2010.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
UBT18403	**BIOPROCESS TECHNOLOGY LABORATORY**	**0**	**0**	**4**	**4**	**3**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To make the students to know about fermentation process	a	m	n		
2.	To study about the enzymes and their role in fermentation process.	d	l			

1. Isolation of starch /cellulose degrading microorganism
2. Growth kinetics.
3. Optimization of culture conditions for amylase production
4. Cell/Enzyme immobilization in alginate/polyacrylamide
5. Bread making
6. Production of wine
7. Mushroom cultivation
8. Vermicomposting – demonstration

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	**Assessment Tool**	**Observation Note Book**	**Performance in practical**	**Result of the experiment**	**Attendance**	**Total**
	Marks	**15**	**15**	**15**	**5**	**50%**
End Semester Weightage						**50%**
Total						**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18404	ENZYMOLOGY LABORATORY	0	0	4	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To make the students to know about enzymes and its functions	j	k			
2.	To know the applications of enzymes	i	j	l		

1. Determination of substrate concentration of protease activity.
2. Determination of optimum temperature of protease activity.
3. Determination of optimum pH of protease activity.
4. Determination of inhibitor of protease activity.
5. Assay of Urease.
6. Affinity chromatography.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	**Assessment Tool**	**Observation Note Book**	**Performance in practical**	**Result of the experiment**	**Attendance**	**Total**
	Marks	**15**	**15**	**15**	**5**	**50%**
End Semester Weightage						**50%**
Total						**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18405	BIOPHYSICS	3	2	0	5	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the structural organization of biological macromolecules.	a	b			
2.	To improve the knowledge of physics in biological systems.	c	h	n		

UNIT I - MACROMOLECULAR STRUCTURE – PROTEIN (12 Hours)

Peptide bond - Torsion angles - Structural organization of protein - primary, secondary, tertiary and quaternary levels, Ramachandran plot.

UNIT II - MACROMOLECULAR STRUCTURE - NUCLEIC ACIDS (10 Hours)

Structural components of nucleic acid - Nucleosides and nucleotides - Watson and Crick model of DNA - Polymorphism of DNA - Unusual structures of DNA- Structure of tRNA.

UNIT III - APPLICATIONS OF PHYSICAL METHODS IN BIOLOGY (12 Hours)

Southern blotting, Northern blotting, Western blotting, Dot blotting and hybridization, FTIR, Circular dichorism.

UNIT IV - BIOMOLECULAR STRUCTURE DETERMINATION (14 Hours)

Crystal - unit cell - seven crystal systems - Bravais Lattice - X-ray diffraction - Bragg's law - Principle, instrumentation and applications of NMR - ESR - Mass spectrometry – Light microscopy - Electron microscopy.

UNIT V - CONFORMATIONAL ANALYSIS (12 Hours)

Van der waals radii of atoms - contact distance criteria - Noncovalent forces determining biopolymer structure – dispersion forces - electrostatic interactions - van der waals interactions - hydrogen bonds - hydrophobic interactions.

TEXT BOOKS

1. VasanthaPattabhi and N. Gautham(2009), Biophysics ,NarosaPublishmg House, New Delhi,.
2. Narayanan .P (2010), Essentials of Biophysics, New Age International (P) Ltd. Publishers, New Delhi.

REFERENCES

1. D.Voet&J.G.Voet (2010), Biochemistry, John Wiley & Sons, Newyork.
2. P.S. Kalsi and N. Mahanta (2013), Biophysical Chemistry, New Academic science.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E53	BIOFERTILIZER TECHNOLOGY	3	0	0	3	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To provide knowledge on biofertilizer	e	i			
2.	To develop students technical skills on bio fertilizer production	m	d	a		

UNITI- BIOFERTILIZER

Biofertilizers: Definition and types. Importance of biofertilizers in agriculture - Strain selection - Inoculum preparation - Mass production. Plant-microbe interaction - Soil ecosystem.

UNIT II- ALGAL BIOFERTILIZER

Algal Biofertilizers - Cyanobacteria (BGA) as biofertilizers - *Anabaena, Nostoc* and *Tolypothrix*. Algalization, *Azolla* - *Anabaena* as biofertilizers. Mass cultivation of *Azolla* - Cyanobacterial biofertilizers - Symbiotic association - Field application of Cyanobacterial inoculants.

UNITIII - BACTERIAL BIOFERTILIZER

Bacterial biofertilizers - *Azospirillum*, *Azotobacter*, *Frankia*, Phosphobacteria and *Rhizobium*. Isolation - Mass production of *Azospirillum*, *Azotobacter* and Phosphobacteria. N_2 fixation - Phosphate solubilization and mobilization.

UNITIV- FUNGAL BIOFERTILIZER

Mycorrhizal fungi as biofertilizers – Importance of Ecto, Endo and Arbuscular mycorrhizae (AM). Methods of collection and inoculum production – Application - Techniques of Ectomycorrhizal inoculums, Endo mycorrohizae of orchids.

UNITV- LIQUID BIOFERTILIZER

Liquid biofertilizers - Formulation – Advantages - Application methodology. Role of liquid biofertilizer in tissue culture. National and Regional biofertilizer production and development Centers.

TEXT BOOK

1. Dubey, R. C., "A Textbook of Biotechnology", S. Chand & Co., New Delhi.

REFERENCES

1. Newton, W. E. et al. "Recent Developments in Nitrogen Fixation", Academic Press, New York.
2. Schwintzer, C. R. and Tjepkema, J. D., "The Biology of Frankia and Actinorhizal Plants", Academic Press Inc., San Diego, USA.
3. Subba Rao, N. S., "Soil Microbiology", 4th ed. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Yadav,A.K., Motsara M.R and RaychaudhuriS.,"Recent Advances in Biofertilizer Technology" SPURT publication, New Delhi, 2001.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
UBT18E54	**AGRICULTURAL BIOTECHNOLOGY**	**3**	**0**	**0**	**3**	**2**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To make the students familiar about agriculture and the modern techniques in it.	a	f			
2.	To understand the challenges in the production and improvement of crops	i	j	k		

UNIT – I **(6 hours)**

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

UNIT – II **(6 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 **(6 hours)**

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

UNIT – IV **(6 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 **(6 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.

TEXT BOOK

1. Textbook of Agricultural Biotechnology by Dr. Ahindra Nag, PHI Learning Private Ltd., New Delhi, 2009.

REFERENCES

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.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
CAC18401	VERBAL ABILITY AND REASONING	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To enable the students understand the syntax of English and develop their lexical skills	b	c	e		
2.	To develop comprehension and interpretation skills	b	c	h	i	
3.	To enhance vocabulary skills and improve repertoire of words	c	h	i	e	
4.	To help the students succeed in competitive exams and placements	i	g			

UNIT –I **(6 hours)**

Spotting error, Change of speech, Change of voice.

UNIT –II **(6 hours)**

Synonyms, Antonyms, Idioms, Phrasal verbs, One word substitution.

UNIT–III **(6 hours)**

Sentence improvement, Sentence completion (Grammar based).

UNIT–IV **(6 hours)**

Sentence completion (Vocabulary based), Odd word.

UNIT–V **(6 hours)**

Reading comprehension, Word analogy, Para jumble.

REFERENCES

1. Hari Mohan Prasad and MeenakshiUpadhyay, Objective English for Competitive Examinations, McGraw Hill Education.
2. Norman Lewis, Word Power Made Easy New Revised and Expanded Edition, Goyal publication, 2011
3. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SEMESTER V

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18501	PLANT AND ANIMAL BIOTECHNOLOGY	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To study the culture techniques of the plant tissue and animal cell culture.	a	b	i		
2.	To ensures the students to understand about the production of transgenic plants and animals and transgenic products and their therapeutic application.	f	m			

PLANT BIOTECHNOLOGY

UNIT I - GENOME ORGANIZATION (10 Hours)

Plant genomic organization – nuclear, organelle genomes – mitochondria and chloroplast – inheritance pattern. Arabidopsis thaliana – a model plant for genome analysis.

UNIT II - PLANT TISSUE CULTURE (12 Hours)

Plant tissue culture – basis, plant hormones in PTC – micropropagation - callus induction, organogenesis, embryogenesis, somatic embryogenesis, somaclonal variation.

UNIT III - PLANT GENETIC ENGINEERING (12 Hours)

Plant genetic engineering – gene transfer methods – plant cloning vectors, Agrobacterium technology, Molecular biology of Nitrogen fixation, transgenic plants - Bt cotton, Bt corn, Golden rice, GURT.

ANIMAL BIOTECHNOLOGY

UNIT IV - CELL CULTURE TECHNIQUES (14 Hours)

Animal cell culture – basis, materials and methods - animal cell lines, biology of cultured cells – types of culture - Organ culture – Stem cells - basics – applications – transplantation.

UNIT V - ANIMAL GENETIC ENGINEERING (12 Hours)

Animal transgenesis- methods and applications. Assisted reproduction techniques – methods of cryopreservation. Animal cloning – case study Dolly, Applications of animal biotechnology in medicine - gene therapy.

TEXT BOOKS

1. IgnacimuthuS,*"Plant Biotechnology"*, Tata Mcgraw-Hill Pub., New Delhi, 2006.
2. Dubey R.C.,"Textbook of Biotechnology" reprint 2005.S. Chand publishers, 2001.

REFERENCES

1. Satyanarayana U., *"Biotechnology"*KrishnaPakashan, 2009.
2. Das H.K.,*"Textbook of Biotechnology*", third edition, S.ChandPublication, 2007.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
UBT18502	**GENOMICS AND PROTEOMICS**	**4**	**1**	**0**	**5**	**4**

INSTRUCTIONAL OBJECTIVES		**Student Outcomes**				
1.	To understand the molecular biology in agenomic and proteomic knowledge.	c	m			
2.	To study the gene expression systems through computational approaches	a	j			

UNIT I - DATA ANALYSIS (12 Hours)

Biological databases – Pairwise sequence alignment and multiple sequence alignment analysis of nucleic acid/protein sequence data using web-based tools.

UNIT II - GENE PREDICTION (12 Hours)

Gene prediction approaches – prokaryotes and eukaryotes - Open Reading Frame (ORF) prediction – Hidden Markov Model – NN model – discriminant analysis - Prediction of promoter sequences

UNIT III – PROTEIN SECONDARY STRUCTURE PREDICTION (12 Hours)

Protein Secondary structure prediction – Chou-Fasman, Garnier-Osguthorpe- Robson (GOR) methods – Neural network concepts. Globular and Transmembrane structure prediction.

UNIT IV - PROTEIN TERTIARY STRUCTURE PREDICTION (12 Hours)

Homology modeling, Threading, Ab initio prediction. Methods to construct phylogenetic tree

UNIT V – DRUG DISCOVERY (12 Hours)

Drug designing – characteristics of a drug compound – drug discovery pipeline – target identification, lead compound identification, serendipity, QSAR, ADME predictions.

TEXT BOOKS

1. Arthur Lesk "Introduction to Genomics" 2nd edition. Oxford University Press 2007.
2. Andreas D Baxevanis, B F Francis Oullette "Bioinformatics: A practical guide to the analysis of genes and proteins". 2nd edition. Wiley publishers, 2005.

REFERENCE

1. David Mount "Bioinformatics: sequence and genome analysis" 3rd edition. Cold Spring Harbor Laboratory Press, 2004.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
UBT18503	**PLANT AND ANIMAL BIOTECHNOLOGY LABORATORY**	**0**	**0**	**5**	**5**	**3**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To study the culture techniques of the plant tissue in-vitro and its applications	a	l	m		
2.	To learn about the animal cell culture techniques.	e	h	j		

1. Sterilization techniques – glassware's, media and laminar air flow chamber
2. Preparation of plant tissue culture media – MS, B5
3. Callus induction
4. Organogenesis – caulogenesis and rhizogenesis
5. Isolation of plant genomic DNA.
6. Isolation of RNA from plant leaf tissue.
7. Isolation of plant protoplasts enzymatic method
8. Preparation of animal cell culture medium.
9. Preparation of single cell suspensions from animal tissue.
10. Preparation of Animal cell monolayer.
11. Subculturing of cell lines.
12. Cell counting – Quantitation of cells in culture.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	**Assessment Tool**	**Observation Note Book**	**Performance in practical**	**Result of the experiment**	**Attendance**	**Total**
	Marks	**15**	**15**	**15**	**5**	**50%**
End Semester Weightage						**50%**
Total						**100%**

SUBJECT CODE	**TITLE OF THE SUBJECT**	**L**	**T**	**P**	**Total of LTP**	**C**
UBT18504	**GENOMICS AND PROTEOMICS LABORATORY**	**0**	**0**	**4**	**4**	**3**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the principles of genomic analysis at various levels	a	f	i		
2.	To know about bioinformatics tools	j	k			

1. Study of Internet resources in Bioinformatics.
2. Searches on MEDLINE, PubMed and CDROM bibliographic databases.
3. Introduction to sequence databases Protein sequence databank – UNIPROT. Nucleic acid sequence databank – Gene bank, EMBL, DDBJ.

4. Sequence alignment BLAST, FASTA Pair wise alignment- Needleman-Wunsch and Smith-Waterman algorithmsMultiple alignment- CLUSTALW, CLUSTAL X, T-COFFEE.
5. Evaluation of protein structure by Swiss PDB viewer and visualization tools – RASMOL.
6. Homology modeling of a given protein sequence.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E01	HUMAN PHYSIOLOGY	3	1	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To study about introduction to Human cell, blood	c	d	k		
2.	To study about the functioning of the cardiovascular, respiratory systems, nervous system, digestive and excretory system	l	m			

UNIT I- INTRODUCTION HUMAN BODY: CELL AND BLOOD (10 Hours)

Overview of organ systems, Cell: Different types of cells, Cell lineage - myeloid, lymphoid, Cell Structure and its organelles, Functions of each component in the cell , Blood-Composition RBC,WBC ,Platelets.

UNIT II- DIGESTIVE AND EXCRETORY SYSTEM (10 Hours)

Digestive system; Organization, function -salivary gland, Pancreas, stomach secretions, Bile absorption by SI, defecation. Excretory System- organization, Functions – Formation of urine.

UNIT III- ENDOCRINE GLANDS (10 Hours)

Endocrine glands, different glands and their hormones, Thyroid Parathyroid glands, secretions, Maintenance of Calcium homeostasis, Maintenance ofglucose homeostasis.

UNIT IV- CARDIOVASCULAR AND RESPIRATORY SYSTEMS (10 Hours)

Physiology of heart - Cardiac cycle, Heart rate, BP, Parts of respiratory system, Mechanics of respiration.

UNIT V- NERVOUS SYSTEM (12 Hours)

Nerve cell anatomy, CNS and PNS, Functions of nervous system - Brain anatomy, Spinal cord, neurotransmission.

TEXT BOOKS

1. G. K. Pal, 'Text Book Of Medical Physiology', Second Edition, 2014.

REFERENCES

1. T.S. Ranganathan,*Text Book of Human Anatomy* , S.Chand&Co. Ltd.,Fifth Edition ,1996
2. Arthur.C.Guyton, John E Hall, '*Textbook of Medical Physiology*', W.B. Saunders Company, Twelfth edition, 2006
3. Kim E. Barrett , Susan M. Barman , Scott Boitano ,*'Ganong's Review of Medical Physiology*', 24th Edition, 1 May 2012

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E02	MEDICAL BIOTECHNOLOGY	3	1	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To study about the medicinal approach of Biotechnology and recent advancements in diagnosis.	e	f	g		
2.	To understand the various techniques and advancements of biotechnology in the field of medicine	h	l			

UNIT I - ART AND ACC (12 Hours)

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 - CHROMOSOMAL DISORDERS (14 Hours)

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 - DIAGNOSTICS METHODS (10 Hours)

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 - PREVENTION AND TREATMENT (12 Hours)

Vaccines-conventional, recombinant, synthetic peptide, anti-idiotype, 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 - MODERN MEDICINE (12 Hours)

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

TEXT BOOKS

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.

REFERENCES

1. Ramasamy, P.*"Trends in Biotechnology*", University of Madras, Pearl press, 2002.
2. Trevan. "*Biotechnology"*. Tata McGraw-Hill, 2005.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E03	FOOD BIOTECHNOLOGY	3	1	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To study the production and analysis of food	k	m	n		
2.	To gain brief knowledge about food processing	a	c			

UNIT I – FOOD MICROBIOLOGY (10 Hours)

Introduction – definition, Significance of food microbiology. Microbiology of milk and milk products like cheese, butter, ice-cream and milk powder.

UNIT II – FOOD PROCESSING (10 Hours)

Thermal processing of fluid milk – Pasteurization (LTLT and HTST), sterilization and UHT techniques; Packaging of fluid milk; Fermentation of milk and fermented milk products – Cheese, yogurt, etc including probiotic dairy products.

UNIT III– FOOD PRESERVATION (10 Hours)

Introduction to food preservation – Principles and techniques of food preservation - Canning: spoilage in canned foods; Food borne illnesses and diseases; Methods for the microbiological examination of water and foods.

UNIT IV– FOOD FERMENTATION (10 Hours)

Microbial cultures for food fermentation and their maintenance - strain development - Production of organic acids (vinegar, lactic acid).

UNIT V – FOOD PACKAGING (10 Hours)

Functions of packaging; Type of packaging materials; Selection of packaging material for different foods; Selective properties of packaging film; Methods of packaging and packaging equipment.

TEXT BOOKS

1. Essentials of Microbiology; K. S. Bilgrami; CBS Publishers, Delhi.
2. Food Microbiology; WC Frazier; Tata McGraw Hill, Delhi.

REFERENCES

1. Technology of Food Preservation by Desrosier.
2. Milk & Milk Processing; Herrington BL; 1948, McGraw-Hill Book Company.
3. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E04	BIOETHICS, IPR AND BIOSAFETY	3	1	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To help the students to understand the ethical, social, legal aspects in biology	e	f	g		
2.	To learn the importance of biosafety in research	k	l			

UNIT I - BIOETHICS **(12 Hours)**

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

UNIT II - INTELLECTUAL PROPERTY RIGHTS **(12 Hours)**

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

UNIT III - PATENTS AND PATENT LAWS **(12 Hours)**

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

UNIT IV - BIOSAFETY **(2 Hours)**

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

UNIT V - BIODIVERSITY **(12 Hours)**

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

TEXT BOOKS

1. Singh B.D., Biotechnology, kalyani publishers, 2009.
2. Chawla H.S., Introduction to plant Biotechnology, Science publishers, 2004.

REFERENCES

1. Shaleesha A, Stanley, Bioethics, Wisdom educational service, 2008.
2. Das H.K., Text book of Biotechnology, Wiley Publishers, 2010.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UES18501	ENVIRONMENTAL STUDIES	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To gain knowledge on the importance of natural resources and energy	a	g			
2.	To understand the structure and function of an ecosystem	b	h			
3.	To imbibe an aesthetic value with respect to biodiversity, understand the threats and its conservation and appreciate the concept of interdependence	f				
4.	To understand the causes of types of pollution and disaster management	e	j			
5.	To observe and discover the surrounding environment through field work	m	n			

UNIT I - INTRODUCTION TO NATURAL RESOURCES/ENERGY

Environmental Studies – Definition – Scope, objectives and awareness – Introduction to natural resources: food, forest, water and energy- renewable and non renewable resources- coal, oil, tidal, wind, geo-thermal, solar, biomass (overview)-nuclear fission and fusion-nuclear energy.

UNIT II - ECOSYSTEMS

Concept of an ecosystem-structure and function of an ecosystem-producers, consumers and decomposers- ecological succession- food chains(any2 Examples)-food webs(any 2 Examples)-ecological pyramids.

UNIT III – BIODIVERSITY AND ITS CONSERVATION

Introduction, definition: genetic, species and ecosystem diversity- Values of biodiversity: consumptive, productive, social, ethical, aesthetic and option values-hot spots of biodiversitry- Threats to biodiversity: habitat loss, poaching of wildlife- endangered and endemic species of India - conservation of biodiversity ; in-situ and ex-situ conservation of biodiversity.

UNIT IV - ENVIRONMENTAL POLLUTION /DISASTER MANAGEMENT

Definition-causes, effects and control measures of: Air, Water and Soil pollution- e-waste management- Disaster management: Natural and man-made-food/earthquake/cyclone, tsunami and landslides.

UNIT V - SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable development- Climate change: global warming, acid rain, ozone layer depletion and nuclear radiation- Environment Protection Act (any 2) air, water, wildlife and forest.

FIELD WORK

Students will visit any one of the following place of interest and submit a written report by the end of the semester:

1. Visit to a hospital/industry/canteen for solid waste management.
2. Visit to a chemical industry to study about the practices followed there for waste disposal.
3. Visit to Vandalur zoo for study of animal conservation/plants- flora and fauna.
4. Study of simple ecosystems-lake/hill slopes.
5. Naming the trees in the campus at SRM.
6. Study of common plants, insects, birds in the neighborhood.
7. Study of common diseases and their prevention.
8. Optional: Street plays and rally for awareness of obesity/diabetes/ vitamin D deficiency/health issues/ waste management/ solid waste management/ no plastics/ energy consumption/wild life protection.

TEXT BOOKS

1. Sharma B.K, (2001). Environmental Chemistry, Goel Pupl. House, Meerut.
2. Dr. R. Jayalakshmi, 2014) Text book of Environmental Studies. Devi Publications, Chennai.

REFERENCES

3. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

E-BOOK

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SEMESTER VI

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18601	BIOLOGY OF IMMUNE SYSTEMS AND IMMUNOTECHNOLOGY	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To access knowledge in Immunology and to understand their practical applications.	i	j	k		
2.	To understand the mechanism of immune system.	a	h			

UNIT I - OVERVIEW OF THE IMMUNE SYSTEM (12 Hours)

Introduction to immunology, Overview of immune system, Types of immunity, lymphoid organs.

UNIT II –ANTIGEN AND ANTIBODY STRUCTURE (12 Hours)

Antigen and antigenicity, Adjuvant, Hapten, Opsonization, Immunoglobulin – structure and function, Major Histocompatibility Complex.

UNIT III - ANTIGEN – ANTIBODY INTERACTIONS (12 Hours)

Antigen - Antibody interaction,Iimmunodiagnosis,Phagocytosis, Monoclonal antibody production and applications;Components of complement system.

UNIT IV - CELL MATURATION, ACTIVATION AND DIFFERENTIATION (12 Hours)

Cell mediated immunity; T cell activation - Humoral immune response; B cell activation and proliferation- Cytokines.

UNIT V - IMMUNE SYSTEM IN HEALTH & DISEASES (12 Hours)

Hypersensitive reactions –Autoimmunity -Vaccines and immune response to infectious diseases, Immunodeficiency diseases (AIDS) - Immune suppression and transplantation.

TEXT BOOKS

1. Richard A. Goldsby*"Immunology*"
2. Barbara, A. Osborne, Janis Kuby*Immunology*", 5th Edition, W. H. Freeman & Company, 2006.

REFERENCES

1. Janeway, Travers, Walport, Shlomchik, Garland, *"Immunobiology"* 6th Edition, 2007.
2. Ivan Riott, *"Essential immunology*". Blackwell Science, 9th Edition, 2007.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18602	rDNA TECHNOLOGY	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To help the students to understand about the cloning strategies, expression pattern, in genetic Engineering.	d	f	i		
2.	To understand techniques involved in the rDNA technology and applications in the advancement of Biotechnology.	m	n			

UNIT I - RESTRICTION ENZYMES (10 Hours)

History, origin, recognition site, types, artificial enzymes, nomenclature, application, factors influence restriction enzyme activity**,** DNA modifying enzymes..

UNIT II - RECOMBINANT VECTORS (12 Hours)

Plasmid cloning vector PBR322, Vectors based on the lambda Bacteriophage, Cosmids, M13 vectors, Expression vectors, Vectors for cloning and expression in Eukaryotic cells, Super vectors: YACs and BACs.

UNIT III - CLONING STRATEGIES (14 Hours)

History of molecular cloning, Steps in molecular cloning Choice of host organism and cloning vector, Preparation of vector DNA , Preparation of DNA to be cloned ,Creation of recombinant DNA with DNA ligase, Introduction of recombinant DNA into host organism ,Selection of organisms containing vector sequences, Applications of molecular cloning.

UNIT IV - GENE TRANSFER (12 Hours)

Bacterial Conjugation, Transformation, Transduction, Episomes,Microinjection, Electroporation, Microprojectile, Shot Gun method, Ultrasonication, Liposome fusion, Microlaser.

UNIT V - POLYMERASE CHAIN REACTION (12 Hours)

History, variants of PCR- RT - PCR, multiplex PCR, nested PCR- Identification of PCR product- Factors influencing PCR- Cloning of PCR products- Application of PCR technology - Molecular markers: RFLP, RAPD, AFLP, SSCP and SNP,

TEXT BOOKS

1. Sandy B. Primrose and Richard Twyman, *"Principles of Gene Manipulation and Genomics*", 2009.
2. Desmond S. T. Nicholl. *"An Introduction to Genetic Engineering*" 2008.

REFERENCES

1. Russ Hodge and Nadia Rosenthal, *"Genetic Engineering: Manipulating the Mechanisms of Life"* (Genetics & Evolution) 2009.
2. Howe C. J., *"Gene Cloning and Manipulation"* 2007.

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18603	IMMUNOTECHNOLOGYLABORATORY	0	0	3	3	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To access knowledge about immune cells and to understand their applications.	a	c	d		
2.	To know the applications immune cells in diagnosis	g	i			

1. Agglutination: ABO Blood grouping, WiDAL, Pregnancy test.
2. Single Radial immunodiffusion.
3. Ouchterlony double immunodiffusion(ODD).
4. Counter current immunoelectrophorosis.
5. Rocket immunoelectrophorosis.
6. Total count of RBC.
7. Total count of WBC.
8. DOT ELISA.

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18604	rDNA TECHNOLOGY LABORATORY	0	0	3	3	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand techniques involved in the rDNA technology.	a	f	l		
2.	To know applications in the advancement of Biotechnology	k	n			

1. Isolation of Genomic DNA
2. Plasmid preparation
3. Restriction enzyme digestion
4. Ligation
5. DNA molecular size determination
6. Transformation
7. Identification of Recombinants

Course Nature : Practical						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tool	Observation Note Book	Performance in practical	Result of the experiment	Attendance	Total
	Marks	15	15	15	5	50%
End Semester Weightage						50%
Total						100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E05	ENVIRONMENTAL BIOTECHNOLOGY	3	1	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To provide sound knowledge about ecosystem.	a	n			
2.	To make students understand the environmental crisis and about its control measures.	b	l	m		

UNIT I - ECOSYSTEM **(12 Hours)**

Ecosystem structure and functions, abiotic and biotic component, Energy flow, Food chain, Food web, Ecological pyramids-types, Biogeochemical cycles.

UNIT II - POLLUTION **(12 Hours)**

Environmental problems - ozone depletion, greenhouse effect. Pollution - water, air and soil - Control measures.

UNIT III - BIOREMEDIATION **(12 Hours)**

Bioremediation - Introduction, constraints and priorities, *in-situ and ex-situ*.Biostimulation of naturally occurring microbial activities, Bioaugmentation.

UNIT IV - METAL BIOTECHNOLOGY **(12 Hours)**

Mining–heavy metals, Microbial transformation, accumulation and concentration of metals, metal leaching, extraction and future prospects.

UNIT V - BIOFUELS **(12 Hours)**

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

TEXT BOOKS

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.

REFERENCES

1. ChandrawatiJee, Shagufta,,*"Environmental Biotechnology"*, APH Publishing, 2007.
2. Hans-Joachim Jördening, Josef Winter, *"Environmental Biotechnology: Concepts and Applications*", Wiley, 2006.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E06	NANOBIOTECHNOLOGY	3	1	0	4	3

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To learn the application of nanotechnology in biological system.	k	m	n		
2.	To help the students to understand about nanomaterial and nanomedicine.	f	l			

UNIT I - NANOMATERIALS **(12 Hours)**

Introduction to nanotechnology and nanobiotechnology - Nanomaterial: Carbon nanomaterial, Fullerenes, Nanotube, Nanowire.

UNIT II - TECHNIQUES IN NANOBIOTECHNOLOGY (14 Hours)

Nanofabrication: Photolithography -Electron-Beam Lithography - Nanoimprint lithography– Softlithography Patterning. Techniques used in nanotechnology:Electron Microscopy, X Ray Diffraction, Atomic Force Microscopy.

UNIT III - BIOSENSORS (12 Hours)

Nanobiotechnological devices: Nanoparticles, Dendrimers, Nanorobots, Nubot, Nanoshell. Biosensors -Antibodies as biosensors - Biosensors detects glucose levels for management of diabetes.

UNIT IV - BIOPOLYMERS (12 Hours)

Biopolymer - polymer nanofibers - electrospinning method and their biomedical applications, polymer nanocomposite- bone and dental restorations, polymer controlled drug delivery for the treatment of cancer.

UNIT V - NANOMEDICINE (10 Hours)

Nanomedicine today - Drugs may be delivered with liposomes –Artificial blood saves life – Gene therapy corrects genetic. Implications of nanotechnolgy in the society. Positive and negative aspects of nanotechnology.

TEXT BOOKS

1. David S. Goodsell, *"Bionanotechnology",* John wiley&sonsinc., publications, 2004.
2. Shanmugam.S, *"Nanotechnology",* MJP publishers, 2010.

REFERENCES

1. Niemeyer, C.M. Mirking C.A., "*Nanobiotechnology concepts, Applications and Perpectives*", 2004.
2. ManasiKarkare, *"Nanotechnology"*, I.K. International publishing House Pvt.Ltd, 2008.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E07	CANCER BIOLOGY	3	0	0	3	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To provide knowledge about biological aspects of cancer	a	c	i		
2.	To impart basic concepts of cancer biology, molecular cell biology of cancer and cancer therapy	k	l			

UNIT - I FUNDAMENTALS OF CANCER BIOLOGY (6 Hours)

Regulation of Cell cycle, Mutations that cause changes in signal molecules, effects on receptor, signal switches, tumor suppressor genes.

UNIT - II PRINCIPLES OF CARCINOGENESIS (6 Hours)

Chemical Carcinogenesis, Metabolism of Carcinogenesis, Natural History of Carcinogenesis.

UNIT - III PRINCIPLES OF MOLECULAR CELL BIOLOGY OF CANCER (6 Hours)

Oncogenes, Identification of Oncogenes, Retroviruses and Oncogenes, detection of Oncogenes, Growth factors related to transformations.

UNIT –IV PRINCIPLES OF CANCER METASTASIS (6 Hours)

Clinical significances of invasion, heterogeneity of metastatic phenotype, three step theory of invasion, Proteinases and tumor cell invasion.

UNIT –V NEW MOLECULUS FOR CANCER THERAPY (6 Hours)

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

TEXT BOOKS

1. King R.J.B., *Cancer Biology*, Addision Wesley Longmann Ltd, U.K., 1996.

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. Ruddon.R.W.,*Cancer Biology*, Oxford University Press, Oxford, 1995.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	**Assessment Tool**	**Cycle Test I**	**Cycle Test II**	**Model Examination**	**Assignment**	**Attendance**	**Total**
	Marks	**10**	**10**	**20**	**5**	**5**	**50%**
End Semester Weightage							**50%**
Total							**100%**

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
UBT18E08	STRUCTURAL BIOINFORAMATICS	3	0	0	3	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To learn the computational structure analysis of molecules.	a	c	d		
2.	To understand the bioinformatic methods	i	k			

UNIT –I **(6 hours)**

Protein Structure: Primary, Secondary, Super Secondary, Domains, Tertiary, Quaternary, Ramachandran plot.

UNIT –II **(8 hours)**

Protein secondary structure classification databases: HSSP, FSSP, CATH, SCOP. Protein secondary structure prediction methods: GOR,Chou-Fasman,PHD, PSI PRED,J-Pred. Protein folding.

UNIT –III **(8 hours)**

Protein Tertiary structure prediction methods: Homology Modeling, Fold Recognition, Ab-intio Method. Molecular Dynamics of Protein, Molecular Docking of Protein, Small molecule and Nucleotide, Concepts of Force Field.

UNIT– IV **(6 hours)**

Motif and Domain: Motif databases and analysis tools. Domain databases (CDD, SMART, ProDom) and Analysis tools. HMM (Hidden Markov Model): Introduction to HMM, its application in Sequence alignment and Structure prediction, HMM based Softwares (HMMER and HMMSTR).

UNIT –V **(6 hours)**

Structural features of RNA: Primary, Secondary, RNA Secondary structure prediction, Limitation of RNA Secondary structure prediction

TEXTBOOK

1. Concepts in Pharmacogenomics:Edited By: Dr. M. Zdanowicz, ASHP Publications, 2010.

REFERENCES

1. Pharmacogenomics Werner Kalow, Urs B. Meyer, Rachel F. Tyndale CRC Press, 08-May-2001
2. Handbook of Pharmacogenomics and Stratified Medicine, SandoshPadmanabhan, Imprint: Academic Press May 2014

3. Pharmacogenomics An Introduction and Clinical Perspective by Joseph S. Bertino , Angela Kashuba , Joseph D. Ma, Uwe Fuhr , 2012.

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	Total of LTP	C
CAC18601	COMMUNICATION SKILLS	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To actively participate in formal discussions and manifest professional skills such as working in team, empathy, communicating appropriately and assertiveness	a	i			
2.	To build confidence to face audience and overcome stage fear with necessary training in public speaking and presentation skills.	b	c			
3.	To develop written business communication skills	a				

UNIT –I **(6 hours)**

Etiquettes- social, professional, communication, dinning and grooming etiquettes

UNIT –II **(6 hours)**

Interpersonal skills- Empathy, Managing conflicts, Effective decision making

UNIT-III **(6 hours)**

Team work- Role of leader and effective leadership, Role of team members and team ethics, Case study analysis (in teams) to understand team dynamics

UNIT-IV **(6 hours)**

Professional writing- Report, Letter, Summary and e-mail

UNIT-V **(6 hours)**

Presentation skills- Importance of verbal and non-verbal communication, Body language, Use of appropriate language

REFERENCES

1. 'How to deliver a presentation' By Paul Newton; e-book
2. 'A-Z of Presentation' By Eric Garner; e-book
3. 'Emotional Intelligence' By Daniel Coleman.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50%
End Semester Weightage							50%
Total							100%