

FACULTY OF LIFE SCIENCES

SYLLABUS

Of

Bachelor of Science Bio-Technology (Semester: I-VI)

(Under Continuous Evaluation System)

Session: 2020-21



**The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)**

Upon successful completion of this course, students will be able to:

PSO1. gain and apply knowledge of Biotechnology and Science concepts to solve problems related to field of Biotechnology.

PSO2: design, perform experiments, analyze and interpret data for investigating complex problems in the field of biotechnology.

PSO3: apply ethical principles and commit to professional ethics and responsibilities and norms of the Biotechnological practices.

PSO4: design and develop solution to Biotechnology problems by applying appropriate tools while keeping in mind safety factor for environment & society.

PSO5: to undertake any responsibility as an individual and as a team in a multidisciplinary environment.

PSO6: contribute to the field of biotechnology and allied industries designing, developing and providing solutions for product/processes/technology development.

PSO7: able to justify societal, health, safety and legal issues and understand his responsibilities in biotechnological engineering practices.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTL-1421
Punjabi (Compulsory)

COURSE OUTCOMES

CO1: nksw nBksw' g[[[;se d/ eftsk Gkr Bz{ gVQkT[D dk wB'oE ftfdnkoEhnK nzdo eftsk gqsh fdbu;gh, ;{M Bz{ g?dk eoBk j? sK fe T[j nkX[fBe d"o ftu uZb ojhnK ekft XkoktK ns/ ethnK pko/ frnkB jkf;b eo ;eD.

CO2: fJ; dk j'o wB'oE eftsk dh ftnkfynk, ftPb/PD s/ w[bzeD dh gqfefonk s'A ikD{ eokT[Dk th j? sK fe T[j ;wekbh ;wki dhnK ;wZf;nktK Bz{ ;wM ;eD ns/ nkb'uBkswe fdqPNh pDk ;eD.

CO3: rZd gqtkj (o/yk fusq s/ jbe/ b/y) g[[[;se B{z f;b/p; ftu PkfwB eo e/ ftfdnkoEhnK nzdo gVQD dh o[uh Bz{ g?dk eoBk j? ns/ w[ZbtkB fJfsjk; s'A ikD{ eotkT[Dk j?.

CO4: g?oQk ouBk ns/ g?oQk gVQ e/ gqPBK d/ T[so d/D dk wBo'E ftfdnkoEhnK dh p[ZXh B{z shyD eofdnK T[BK dh fbyD gqfsGk B{z T[iKro eoBk j?.

CO5: X[Bh ftT[As gVQD Bkb ftfdnkoEh X[BhnK dh T[ukoB gqDkbh s'A tke| j'Dr/.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1031

Basic Punjabi

In lieu of Punjabi (Compulsory)

Course outcomes

CO1:w[ZYbh gzikph gVQkT[D dk wB'oE ftfdnkoEhnK B{z gzikph GkPk B{z f;ykT[D dh gqfefonk ftu gk e/ fJe j'o GkPk f;ZyD dk w"ek gqdkB eoBk j?.

CO2:fJ; ftu ftfdnkoEh B{z pkohephBh Bkb GkPk dk nfXn?B eotkfJnk ikt/rk.

CO3:ftfdnkoEhnK B{z gzikph Ppd ouBk s'A ikD{ eotkfJnk ikt/rk.

CO4:w[ZYbh gzikph gVQkT[D dk wB'oE ftfdnkoEhnK B{z fBZs tos'A dh gzikph Ppdktbh pko/ dZ;Dk j?.

CO5:w[ZYbh gzikph gVQkT[D dk wB'oE ftfdnkoEhnK dk Ppd x/ok ftPkb eoBk j?.

CO6:ftfdnkoEhnK B{z gzikph ftu j|s/ d/ ;Zs fdBK d/ BK, pkoQK wjhfbnK d/ BK, oZ[sK d/ BK, fJe s'A ;" sZe frDsh PpdK ftu f;ykT[Dk j?.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1431

PUNJAB HISTORY AND CULTURE

(Special paper in lieu of Punjabi Compulsory)

(For those students who are not domicile of Punjab)

COURSE OUTCOMES

After completing Semester I and course on Punjab History and Culture students of History will be able to identify and have a complete grasp on the sources & writings of Ancient Indian History of Punjab.

CO1: Identify and describe the emergence of earliest civilizations in: Indus Valley Civilization and Aryan Societies.

CO2: Identify and analyses the Buddhist, Jain and Hindu faith in the Punjab

CO3: Analyses the emergence of Early Aryans and Later Vedic Period, their Society, Culture, Polity and Economy

CO4: To make students understand the concepts of two faiths Jainism and Buddhism, its principles and their application and relevance in present times

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1102

Communication Skills in English

COURSE OUTCOMES

At the end of this course, the students will develop the following Skills:

CO 1: Reading skills that will facilitate them to become an efficient reader

CO 2: The ability to realise not only language productivity but also the pleasure of being able to articulate well

CO 3: The power to analyse, interpret and infer the ideas in the text

CO 4: The ability to have a comprehensive understanding of the ideas in the text and enhance their critical thinking

CO 5: Writing skills of students which will make them proficient enough to express ideas in clear and grammatically correct English

CO 6: Ability to plan, organise and present ideas coherently on a given topic

CO 7: The skill to use an appropriate style and format in writing letters (formal and informal)

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1483

Cell Biology

(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Understanding the basic unit of life – cell and broad classification of cell types.

CO2. Understanding the structure and functions of cell organelles.

CO3: Understand Cell Division and Cell Cycle.

CO4. Understanding the biological membranes along with membrane transport mechanism.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1483(P)
Cell Biology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Perform a variety of molecular and cellular biology techniques.

CO2. Describe cellular membrane structure and function, fine structure and function of cell organelles.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1074

Botany-I

(Theory)

Course outcomes:

After passing this course the student will be able to

CO1: Understand the diversity of plants.

CO2: Understand the structure of root and stem.

CO3: Understand structure and development of anther, male gametophyte, ovule and female gametophyte.

CO4: Understand different aspects of Pollination, fertilization and sterility.

CO5: Understand terminology related to floral descriptions.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1074 (P)

**Botany-I
(Practical)**

Course outcomes:

After passing this course the student will be able to:

CO1: Understand anatomy of root, stem and leaves.

CO2: Understand structure and development of anther, male gametophyte, ovule and female gametophyte.

CO3: Understand the floral identification and descriptions.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1085
Biochemistry-I
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain basic knowledge about water and pH.

CO2: Understand the basic concept of Carbohydrates and lipids and their classification.

CO3: Understand the structure and function of lipids and their subclasses.

CO4: Understand the structure, function and classification of proteins.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1085 (P)
Biochemistry-I
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Perform Beer Lamberts Law

CO2: Determine pKa value.

CO3: Estimate carbohydrates and sugars

CO4: Estimate proteins and fats

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1346
General Microbiology-I
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain basic knowledge about Microbiology and general features of microbes and those living in extreme environments

CO2: Gain knowledge about microbial growth and sterilization techniques

CO3: Understand the concept of microscopy.

CO4: Understand bacterial classification. Understand bacterial classification and microbial preservation methods.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1346(P)
General Microbiology-I
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Sterilize glassware & plastic ware while performing experiments.

CO2: Prepare media and cotton plugs.

CO3: Isolate, Identify, purify and preserve microbes.

CO4: Study motility of microbes.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1087

Chemistry-I

(Theory)

Course outcomes:

Students will be able to:

CO1: understand the key features of coordination compounds viz. variety of structures, oxidation numbers and electronic configurations, coordination numbers and explain the bonding and stability of complexes along with their nomenclature and structure.

CO2: describe the shapes and structures of coordination complexes with coordination numbers ranging from 1 to 12.

CO3: recognize, name and draw the structures of isomers in coordination compounds.

CO4: explain the valence bond approach for the co-ordinate complex.

CO5: describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.

CO6: understand macrocyclic effect, crown ethers, cryptands.

CO7: understand Crystal field Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planer fields of ligands.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1087 (P)

**Chemistry-I
(Practical)**

Course outcomes:

Students will be able to:

CO1: understand the technique of volumetric analysis

CO2: understand Iodimetry, Iodometry

CO3: understand Redox titrations using $K_2Cr_2O_7$ and $KMnO_4$.

CO4: identify the various ions present in the mixture.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2421

Punjabi (Compulsory)

(Theory)

COURSE OUTCOMES

CO1:nksw nBksw g[[[;se d/ ejkDh Gkr B{z f;b/p; ftu PkfwB eo e/
ftfdnkoEhnK nzdo ejkDh Bz{ gVQD dh o[uh Bz{ g?dk eoBk j? ns/ ejkDh
irs Bkb i'VDk j?.

CO2: rZd gqtkj (o/yk fusq s/ jbe/ b/y) g[[[;se B{z f;b/p; ftu PkfwB eo
e/ ftfdnkoEhnK nzdo gVQD dh o[uh Bz{ g?dk eoBk j? ns/ w[ZbtkB fJfsjk;
s'A ikD{ eotkT[Dk j?.

CO3;;zy/g ouBk dk wB'oE ftfdnkoEhnK B{z ;w/A ns/ fwjBs dh pZus eoB pko/
dZ;Dk j?.

CO4:g?oQk gVQ e/ gqPBK d/ T[so d/D dk wBo'E ftfdnkoEhnK dh p[ZXh B{z
shyD eofdnK T[BK dh fbyD gqfsGk B{z T[iKro eoBk j?.

CO5:Ppd pDso ns/ Ppd ouBk gVQD Bkb ftfdnkoEh fJ;d/ w[ZYb/ ;zebgK B{z
nkXko pDk e/ fJjBK ;zebgK s'A ikD{ j'Dr/ .

CO6:Ppd Pq/DhnK Bz{ gVQkT[D dk wB'oE ftfdnkoEhnK nzdo gzikph GkPk dh
nwhoh dk ns/ pkohehnK Bz{ ;wMD bJh tZyo/ - tZyo/ f;XKsK dk ftek; eoBk
j?.

CO7: w[jktfonK dh tos'A Bkb rZbpks ftu gogZesk nkT[Adh j?.fJj
ftfdnkoEhnK dh rZbpks ftu fByko fbnkT[D dk ezW eoBr/.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2031

Basic Punjabi

**In lieu of Punjabi (Compulsory)
(Theory)**

Course outcomes

CO1:w[ZYbh gzikph gVQkT[D dk wB'oE ftfdnkoEhnK B{z gzikph GkPk B{z f;ykT[D dh gqfefonk ftu gk e/ fJe j'o GkPk f;ZyD d/ w"e/ gqdkB eoBk j?.

CO2:fJ; ftu ftfdnkoEh B{z pkohephBh Bkb GkPk dk nfXn?B eotkfJnk ikt/rk.

CO3:ftfdnkoEhnK B{z gzikph Ppd ouBk s'A ikD{ eotkfJnk ikt/rk.

CO4:Ppd Pq/DhnK Bz{ gVQkT[D dk wB'oE ftfdnkoEhnK nzdo gzikph GkPk dh nwhoh dk ns/ pkohehnK Bz{ ;wMD bJh tZyo/ - tZyo/ f;XKsK dk ftek; eoBk j?.

CO5:w[ZYbh gzikph gVQkT[D dk wB'oE ftfdnkoEhnK dk Ppd x/ok ftPkb eoBk j?.

CO6:ftfdnkoEh tke dh gfoGkPk ns/ fJ;dh pDso s'A ikD{ j'Dr/ ns/ GkPk s/ geV wip{s j't/rh.

CO7:g?oQk ouBk dk wB'oE ftfdnkoEhnK dh p[ZXh B{z shyD eofdnK T[BK dh fbyD gqfsGk B{z T[i kro eoBk j?.

CO8: ;zy/g ouBk eoB Bkb ftfdnkoEh nkgDh rZb B{z ;zy/g ftu efjD dh iku f;ZyDr/ ns/ fJj fdwkrh e;os ftu ;jkJh j't/rh.

CO9:xo/b{ ns/ d|soh fuZmh gZso fbyD dk wB'oE ftfdnkoEhnK B{z fJ; ebk ftu fBg[zB eoBk j?.

CO10: w[jktfonK dh tos'A Bkb rZbpks ftu gogZesk nkT[Adh j?.fJj ftfdnkoEhnK dh rZbpks ftu fByko fbnkT[D dk ezW eoBr/.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTL-2431
Punjab History and Culture (C. 320 to 1000 B.C.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

COURSE OUTCOMES

After completing Semester II and course on Ancient History of Punjab, students of History will be able to identify and have a complete grasp on the sources & writings of Ancient History of Punjab

CO 1: Analyse the emergence of Mauryan, Gupta empires during the classical age in India

CO 2: To understand the various factors leading to rise and fall of empires and emergence of new dynasties and their Culture, society, administration , polity and religion specifically of Kushans and Vardhanas in the Punjab

CO 3: Students will be adept in constructing original historical argument based on primary source material research

CO 4: To have an insight on the existing Literature of this period and understand the past developments in the light of present scenario.

CO 5: To enable students to have thorough insight into the various forms/styles of Architecture and synthesis of Indo - Muslim Art and Architecture in Punjab

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2102
Communication Skills in English
(Theory)

COURSE OUTCOMES

At the end of this course, the students will develop the following skills:

CO 1: Enhancement of listening skills with the help of listening exercises based on conversation, news and TV reports

CO 2: Improvement of speaking skills enabling them to converse in a specific situation

CO 3: Acquisition of knowledge of phonetics which will help them in learning about correct pronunciation as well as effective speaking

CO 4: The capability to present themselves well in a job interview

CO 5: The ability of Note-Taking to be able to distinguish the main points from the supporting details and the irrelevant information from the relevant one

CO 6: Speaking skills of the students enabling them to take active part in group discussion and present their own ideas

CO 7: The capability of narrating events and incidents in a logical sequence

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTL-2333
Biostatistics
(Theory)

Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Discuss and explain what Biostatistics is and how it is used in the field of Biology.

CO 2: Calculate summary statistics (mean, median, mode, range, standard deviation and variance) from the data.

CO 3: Apply basic statistical concepts commonly used in health and medical sciences.

CO 4: Familiar with the concepts of probability, conditional probability and Bayes theorem.

CO 5: Familiar with the concepts of correlation and regression.

CO 6: Know what drawing a random sample from a population means and why it is important.

CO 7: State the null hypothesis and alternative hypothesis (both one way and two ways) appropriate to a given scenario.

CO 8: Determine if it is appropriate to use the Chi-Square test for testing the significance of fit between data and predicted data.

CO 9: Perform basic test (Chi-Square test) to evaluate results

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2484

Zoology-I

(Theory)

COURSE OUTCOMES

After passing this course the student will be able to:

- **CO1.** Understand the general classification of Animal Kingdom.
- **CO2.** Familiarize with the various classes of animal Kingdom.
- **CO3.** Understand the digestive system, respiratory system, excretory and circulatory system of man..
- **CO4.** Come to know the various effects viz. bohr effect, haldane effect etc.
- **CO5.** Understand the skeletal system, neural integration and endocrine system of man.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2484(P)
Zoology-I
(Practical)

COURSE OUTCOMES

After passing this course the student will be able to:

CO1. Understand the estimation of blood haemoglobin

CO2. Familiarize with the various systems of human such as digestive, arterial, venous and urinogenital systems.

CO3. The students will be able to record blood pressure and blood groups.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2065

Genetics

(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian and Neo-mendelian genetics

CO2: Study the phenomenon of dominance, laws of segregation, independent assortment of genes.

CO3: Understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance.

CO4: Understand the principles and mechanisms of linkage and crossing over.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2065 (P)

**Genetics
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian laws.

CO2: Solve Paternity disputes.

CO3: Demonstrate segregation in preserved material.

CO4: Study polytene chromosomes and dermatoglyphics.

CO5: Study mitosis from onion root tips.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2086

**Biochemistry – II
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Metabolism and characteristics and regulation of metabolic pathways

CO2: Structure and metabolic role of ATP and energy rich metabolites

CO3: Understand characteristics of Enzymes and their enzymatic action

CO4: Understand the Enzyme kinetics

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2086(P)
Biochemistry – II
(Practical)

Upon completion of this course, the student will be able to understand:

CO1: Estimate salivary amylase and acid phosphatase activity.

CO2: Effect of temperature and pH on enzyme activity.

CO3: Determine K_m for acid phosphatase.

CO4: Understand Competitive and Non-Competitive inhibition.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2347

**General Microbiology-II
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Know the concept of microbial growth in batch and continuous system.

CO2: Learn the process of Natural resistance and Non-specific defense mechanism against microorganisms.

CO3: Understand the mechanism of action, diagnosis and treatment for Viral diseases, Bacterial diseases & Fungal diseases

CO4: Understand the concepts of Industrial Microbiology

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2347(P)

**General Microbiology-II
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Enumerate the microorganisms. Total vs viable counts.

CO2: Know the importance of Personal hygiene.

CO3: Identify fungus by lactophenol staining

CO4: Study the Growth curve of micro-organisms.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3081

**Physical Chemistry-A
(Theory)**

Course outcomes:

Students will be able to:

CO1: understand the various thermodynamic properties and laws of Thermodynamics.

CO2: acquire knowledge about the various thermodynamic terms like enthalpy of formation, enthalpy of ionisation, entropy, internal energy.

CO3: calculate entropy change for reversible and irreversible processes under isothermal and non-isothermal conditions and also absolute entropies of substances.

CO4: understand the relation between free energy change and equilibrium constants K_p , K_c and K_f .

CO5: understand the various types of solutions and their colligative properties like Osmotic pressure, Elevation in boiling point, Depression in freezing point.

CO6: understand the importance of Van't Hoff factor and its application to calculate degree of association and degree of dissociation.

CO7: describe the Phases and Phase rule and its thermodynamic derivation.

CO8: draw and explain the phase diagrams of water system, KI water system and lead-silver system

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3081(P)

**Physical Chemistry-A
(Practical)**

Course outcomes:

Students will be able to:

CO1: determine surface tension of a given liquid by Stalagmometer.

CO2: determine coefficient of viscosity of pure liquids.

CO3: understand the effect of Hydrogen Bonding on viscosity of various liquids.

CO4: work efficiently with the instruments like pH meter, colorimeter.

CO5: understand with the volumetric terms like normality, molarity, molality, indicator, standard solution, strength.

CO5: understand the technique of volumetric analysis.

CO6: apply the concept of acid-base titrations in daily life.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3482

**Zoology-C
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Understand the physiology of their own body and urge them to take precautionary measures to safeguard their health.

CO2. Understand the structure and function of each system in the human body.

CO3. Describe common physiological disorders, syndromes and diseases.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3482 (P)

**Zoology-C
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Identify the structure of different parasitic protozoans.

CO2. Able to perform the pathological examinations of urine and blood.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3083
Biochemistry-C
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the Basic principles of metabolism

CO2: Understand Carbohydrate metabolism.

CO3: Understand the Amphibolic nature of Kreb's cycle

CO4: Know ATP synthesis

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3083 (P)
Biochemistry-C
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the importance of absorbance maxima.

CO2: Determine reducing sugar and vitamin C.

CO3: Understand Quantitative estimation of triglycerides and cholesterol.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3484

**Cell Biology
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Develop deeper understanding of what life is and how it functions at cellular level.

CO2: Describe cellular membrane structure and function, fine structure and function of cell organelles.

CO3: Understand Cell Division and Cell Cycle

CO4: Perform a variety of molecular and cellular biology techniques.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3484 (P)

**Cell Biology
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1.Perform a variety of molecular and cellular biology techniques.

CO2.Describe cellular membrane structure and function, fine structure and function of cell organelles.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3065
Immunology-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the Concept of Immunology

CO2: Know about different immune cells providing immunity

CO3: Inculcate knowledge of immune response towards microorganisms.

CO4: Study Major Histocompatibility system.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3065(P)
Immunology-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Collect blood sample by different methods.

CO2: Calculate Differential leucocyte count, Total leucocytes and RBC count.

CO3: Perform Blood group testing.

CO4: Perform dye exclusion method

CO5. Isolate mononuclear cells from peripheral blood

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3066

**Genetics
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian and Neo-mendelian genetics

CO2: Study the phenomenon of dominance, laws of segregation, independent assortment of genes.

CO3: Understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance.

CO4: Understand the principles and mechanisms of linkage and crossing over.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3066 (P)
Genetics
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian laws.

CO2: Solve Paternity disputes.

CO3: Demonstrate segregation in preserved material.

CO4: Study polytene chromosomes and dermatoglyphics.

CO5: Study mitosis from onion root tips.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3067
Agro and Industrial Applications of Microbes-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Inculcate the basic concept of agriculture and food processing in industry

CO2: Gain knowledge of industrially important microbes & their improvement programmes

CO3: Understand the Microbial association.

CO4: Formulate the media.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3067 (P)
Agro and Industrial Applications of Microbes – A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

- CO1:** Isolate microbial cells by different methods.
- CO2:** Do Biochemical characterization of microbes.
- CO3:** Understand the concept of Fermentation.
- CO4:** Prepare starter culture
- CO5:** Determine nitrate reduction by bacteria.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: AECE-3221
Environmental Studies (Compulsory Paper)
(Theory)

COURSE OUTCOMES

After passing this course the student will be able to:

CO1: Demonstrate and Understand the ecological relationships between organisms and their environment.

CO2: Present an overview of diversity of life forms in an ecosystem.

CO3: Explain and identify the role of the organism in energy transfers.

CO4: Understand the Environmental Pollution and their management.

CO5: Understanding and awareness for wildlife conservation.

CO7: Knowledge of conservation of threatened animal species

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4081

Physical Chemistry-B

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Course outcome:

Students will be able to

CO1. determine rate of reaction, order and molecularity of reaction, half life, activation energy of reaction

CO2. understand Complex reactions, consecutive reactions, parallel reactions, chain reactions and opposing reactions.

CO3. know the variation of equivalent conductance with dilution of weak and strong electrolytes

CO4. determine of degree of ionisation of weak electrolyte, solubility, solubility product of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt

CO5. calculate hydrolysis constant

CO6. to select indicators in different acid base titration

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4081(P)
Physical Chemistry-B
(Practical)

Course outcome:

Students will be able to

CO1. know the principle and mechanism of Conductometric titrations and polarimetric experiments

CO2. determine the heat of neutralization and Heat of solution Calorimetrically

CO3. know the principle and working of Abbe's Refractometer

CO4. determine the composition of unknown mixture of two liquids by refractive index measurements.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4074

Botany-C

(Theory)

Course outcome: -

After passing this course the student will develop:

CO1. Understand the plants and plant cells in relation to water.

CO2. Understand the chemical contents of the plant products.

CO3. Know the concept and characteristics of antiseptic, disinfectant and their mode of action.

CO4. Know the prevention and control measures of plant diseases and its effect on economy of crops.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4074(P)

Botany-C

(Practical)

Time: 3 Hrs.

Max. Marks: 18

Course outcome: -

After passing this course the student will develop:

CO1. practical on plants and plant cells in relation to water

CO2. Know the symptoms and control measures of plant diseases and its effect on economy of crops.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4083
Biochemistry-D
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand lipid catabolism and its regulation.

CO2: Study lipid Anabolism.

CO3: Study amino acid metabolism and its regulation.

CO4: Understand nucleic acid metabolism,

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4083(P)

**Biochemistry-D
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Estimate amino acids.

CO2: Purify proteins.

CO3: Estimate Blood cholesterol.

CO4: Determine fat content in milk

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4064
Skill Development in Biotechnology-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Detect mechanism of food borne infections.

CO2: Test food adulterants Biochemically/microbially.

CO3: Learn nutritional aspects of the carbohydrates, lipids & proteins.

CO4: Study advanced techniques used in food borne pathogens and toxins.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4064(P)

Skill Development in Biotechnology-A

(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Detect adulterants in food products.

CO2: Determine Gluten content in wheat flour.

CO3: Determine fat content in different food products.

CO4: Determine the BMR.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4065

**Immunology-B
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn T-cell subsets and its surface markers

CO2: Study different Immunodiagnostics techniques.

CO3: Understand the concept of immunization

CO4: Have sound Knowledge of Vaccines and its different types

CO5: Understand the Immunity to viruses, Bacteria as well as its immuno-pathological consequences.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4065(P)
Immunology-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Prepare Vaccine chart of child.

CO2: Study Haemagglutination & Haemagglutination inhibition assay.

CO3: Perform Direct and indirect ELISA.

CO4: Perform Double immunodiffusion test.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4066

**Molecular Biology
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Study Molecular aspects of genetics.

CO2: Know the basic mechanism and essential component required for prokaryotic & eukaryotic DNA replication.

CO3: Understand the DNA recombination molecular mechanisms.

CO4: Learn the concept of operon and its structure and regulation.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4066(P)
Molecular Biology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Isolate genomic DNA and RNA from plants

CO2: Perform agarose gel electrophoresis.

CO3: Quantify DNA.

CO4: SDS-PAGE electrophoresis of different protein samples.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4067
Agro and Industrial Applications of Microbes – B
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

- CO1:** Understand Industrial and Agro-industrial Microbes.
- CO2:** Get Acquainted with Microbial Processes in Agrobiotechnology.
- CO3:** Know industrially important Primary and secondary metabolites.
- CO4:** Study Microbial Processes used in Industrial Biotechnology.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4067(P)
Agro and Industrial Applications of Microbes – B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Screen cellulase producing microorganism from wood degrading soil.

CO2: Understand Additive and Synergistic effect of two antibiotics on the microorganism.

CO3: Isolate and identify microbes from spoiled food sample.

CO4: Study Antimicrobial activity of essential oils.

CO5: Determine milk quality.

CO6: Isolate prebiotics from curd

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4068
Enzymology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the concept of Enzymes.

CO2: Understand enzyme kinetics.

CO3: Study the effect of pH and temperature on rate of enzyme catalyzed reactions.

CO4: Study importance of Isozymes.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4068(P)
Enzymology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the concept of Enzymes.

CO2: Understand enzyme kinetics.

CO3: Study the effect of pH and temperature on rate of enzyme catalyzed reactions.

CO4: Understand the importance of Isozymes

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTL-5061
Patent Laws in Biotechnology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Know the Procedure for obtaining patent.

CO2: Understand the Legal aspects of patenting.

CO3: Understand Patents related to Bacteria, Virus, Fungi and medicinal plants.

CO4: Get knowledge about TRIPs articles relevant to Biotechnology Sector.

CO5: Know about the ethical issues in Biotechnology.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTL-5062
rDNA Technology-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about different DNA Modifying enzymes.

CO2: Understand the different features of plasmids and development of plasmids as vector.

CO3: Know about the different methods of Transformation.

CO4: Study the labelling of DNA and RNA.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5062(P)
rDNA Technology-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Grow *E.coli* bacterial culture.

CO2: Isolate genomic DNA from bacteria.

CO3: Quantify DNA using Spectrophotometer and determine their purity.

CO4: Perform Agarose Gel Electrophoresis.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5063
Concepts of Plant Tissue Culture
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Study the macronutrients and micronutrients and their deficiency symptoms in plants.

CO2: Know about the different physiological functions & biosynthesis of major plant growth regulators.

CO3: Understand the concept of Totipotency.

CO4: Understand the different methods of gene transfer in plants.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5063(P)
Concepts of Plant Tissue Culture
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Get acquainted with functions and operations of various instruments used in plant tissue culture laboratory.

CO2: Prepare cotton plugs.

CO3: Prepare stock solutions of Murashige & Skoog (1962) medium.

CO4: Clean glassware, plasticware and contaminated cultures.

CO5: Prepare, sterilize and inoculate the explants.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5064
Animal Tissue Culture
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the different aseptic techniques used in Animal Tissue Culture (ATC).

CO2: Know about the different sources, types and eradication of contamination.

CO3: Study the different culture media and reagents used in ATC.

CO4: Study different safety considerations in ATC laboratory.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5064(P)
Animal Tissue Culture
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Perform different Sterilization techniques.

CO2: Prepare Hanks Balanced salt solution.

CO3: Prepare Minimal Essential Growth medium.

CO4: Isolate lymphocytes for culturing.

CO5: Isolate macrophages from blood for culturing.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5065
Bioprocess Engineering-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the fundamental principles of chemical Engineering and biochemical engineering.

CO2: Study the Microbial Growth Kinetics.

CO3: Learn about different types of microbial culture: Batch, Fed batch and continuous culture.

CO4: Study the effect of temperature, pH and inducer on product synthesis.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5065(P)
Bioprocess Engineering-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: To study the growth curve of microorganism.

CO2: To determine the specific growth rate and generation time of a bacterium during submerged fermentation.

CO3: To study the effect of temperature, pH and aeration on growth of microbes.

CO4: Produce an enzyme in a Bioreactor/shaking flask.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5066
Biophysical & Biochemical Techniques-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain fundamental knowledge about the basic principles of sedimentation.

CO2: Study the different types of centrifugation machines and rotors.

CO3: Understand the principles of different types of chromatography (Paper, column, ion-exchange etc).

CO4: Understand the principles of single and double beam UV/Visible spectroscopy.

CO5: Understand the basic principle and instrumentation of NMR and ESR.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5066(P)
Biophysical & Biochemical Techniques-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Separate bio-molecules by paper chromatography.

CO2: Separate bio-molecules by thin layer chromatography.

CO3: Separate proteins by ion-exchange column chromatography.

CO4: Separate proteins by affinity column chromatography.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5087
Physical, Organic & Inorganic Aspects of Spectroscopy-A
(Theory)

Course outcomes:

Students will be able to:

CO1: understand the various regions of electromagnetic spectrum and use of it in spectroscopic studies.

CO2: understand basic features of different spectrometers.

CO3: explain the phenomenon of Fluorescence and Phosphorescence.

CO4: explain the common terms related to UV and IR spectroscopy like Chromophore, auxochromes, force Constant, vibrational Coupling, field Effect.

CO5: use UV and IR spectroscopy data in elucidating the chemical structure of a compound.

CO6: apply the various selection rules of UV and IR Spectroscopy, explain the common terms related to UV and IR spectroscopy like Chromophore, auxochromes, force Constant, vibrational Coupling, field Effect.

CO7: study the UV and IR spectra of different organic compounds.

CO8: calculate λ_{max} of conjugated and α , β -unsaturated carbonyl compounds and also understand the factors affecting λ_{max} .

CO9: understand the various sampling Techniques used in spectroscopy.

CO10: solve the numerical problems based on UV and IR spectroscopy.

CO11: understand the various Sampling Techniques used in spectroscopy.

CO12: understand the various applications of UV and IR spectroscopy.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5087(P)
Physical, Organic & Inorganic Aspects of Spectroscopy-A
(Practical)

Course outcomes:

Students will be able to:

CO1: record and compare IR spectra of various organic compounds.

CO2: compare the UV-Vis spectra of various organic compounds.

CO3: do the preparation and IR characterisation of various inorganic compounds.

CO4: verify Beer Lambert Law for different solutions.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6061
Intellectual Property Rights & Entrepreneurship
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand about Intellectual property right (IPR) and different forms of protection under IPR.

CO2: Understand about World Trade Organization and its related intellectual property provisions.

CO3: Know about World Intellectual Property Organisation and International depository authorities

CO4: Understand the concept of Entrepreneurship

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6062

**rDNA Technology-B
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand basics of cloning and expression vectors.

CO2: Understand both genomic and cDNA cloning.

CO3: Understand fundamental concepts of PCR and microarray.

CO4: Understand DNA sequencing and site directed mutagenesis.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6062(P)
rDNA Technology-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Isolate plasmid DNA and treat it with restriction enzymes.

CO2: Prepare and transform competent cells.

CO3: Select transformants.

CO4: Perform polymerase chain reaction.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6063
Applications of Plant Tissue Culture
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand concept of Micropropagation and its application

CO2: Understand about somatic embryogenesis and its applications

CO3: Know about Haploid and triploid plant production and embryo culture

CO4: Understand the concept of protoplast fusion and somatic cell hybridization and secondary metabolite production

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6063(P)
Applications of Plant Tissue Culture
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Practically perform steps of micropropagation.

CO2: Understand about significance of growth hormones in culture medium.

CO3: Perform regeneration of shoots/embryos

CO4: Perform suspension culture

CO5: Perform Anther culture, ovary culture and embryo rescue.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6064
Animal Biotechnology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about commonly used cell lines and their characteristics

CO2: Understand about Transfection methods and expression vectors

CO3: Know about Stem cells and their applications

CO4: Understand the concept of genetic engineering and its applications

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6064(P)
Animal Biotechnology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about DNA isolation from blood

CO2: Perform RNA isolation from blood

CO3: Know about IgG purification

CO4: Know about cell line maintenance

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6065
Bioprocess Engineering-B
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the Design of a Fermenter and its types.

CO2: Study about D.O and pH Probes.

CO3: Study about different techniques of Downstream Processing.

CO4: Learn about Effluent treatment and fermentation Economics.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6065(P)
Bioprocess Engineering-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Undergo two-week training in fermentation technology in industry/institute and learn practical aspects of fermentation technology

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6066
Biophysical & Biochemical Techniques-B
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the Mass Spectroscopy and its applications.

CO2: Study about electrophoresis.

CO3: Study about Two dimensional gel electrophoresis and capillary electrophoresis.

CO4: Learn about concepts of radio-isotopy.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6066(P)
Biophysical & Biochemical Techniques-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the qualitative and quantitative analysis of DNA sample

CO2: Prepare standard curve of protein

CO3: Prepare standard curve of DNA

CO4: Separation of bio-molecules by vertical and horizontal gel electrophoresis

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6087
Physical, Organic & Inorganic Aspects of Spectroscopy-B
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Course outcomes:

Students will be able to:

CO1:explain common terms in NMR spectroscopy such as chemical shift, coupling constant, and anisotropic effect, spin spin splitting, shielding constant and their affect on the spectra of the compound.

CO2:study thevarious measurement techniques in NMR spectroscopy.

CO3:understand the various cleavages and rearrangements in Mass spectroscopy.

CO4:factors affecting cleavage patterns in Mass spectroscopy.

CO5: interpret the spectrum of unknown compounds on the basis of NMR and Mass spectroscopy.

CO6:understand the various applications of NMR and Mass spectroscopy.

CO7:use NMR and Mass spectroscopy data in elucidating the chemical structure of a compound.

CO8:solve the numerical problems based on use NMR and Mass spectroscopy.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6087 (P)
Physical, Organic & Inorganic Aspects of Spectroscopy-B
(Practical)

Course outcomes:

Students will be able to:

CO1: interpret the spectrum of unknown compounds on the basis of NMR spectroscopy.

CO2: use NMR data in elucidating the chemical structure of a compound.

CO3: understand the concept of Green Chemistry and will be able to use green approach in preparation of organic compounds.

CO4: understand the concept of chromatography and its applications in separation of various components of the given mixture.