STUDY AND EVALUATION SCHEME

Bachelor of Technology [B.Tech Biotechnology]
(Effective from Session 2020-2021)

YEAR I, SEMESTER I

COURSE CODE	COURSE TITLE	COURSE CATEGORY	HOURS			EVALUATION SCHEME		SUBJECT TOTAL	CREDIT
			L	T	P	CA	EE		
BAS101	Physics	BSC	3	1	0	30	70	100	4
BBT101	Elementary Mathematics I	BSC (Elective)	3	1	0	30	70	100	4
BBT102	Remedial Biology I	BSC (Elective)							
BBT103	Basic Electrical Engineering	ESC	3	1	0	30	70	100	4
BBT104	Introduction to Biotechnology	ESC	2	1	0	25	50	75	3
BAS151	Physics Lab	BSC	0	0	4	15	35	50	2
BBT153	Basic Electrical Engineering Lab	ESC	0	0	2	10	15	25	1
TOTAL						**140**	**310**	**450**	**18**

L - Lecture, **T** - Tutorial, **P** - Practical, **CA** - Continuous Assessment, **EE** - End Semester Exam; BSC-Basic Science Course; ESC-Engineering Science Course; PCC-Professional Core Course; AUC-Audit Course

YEAR I, SEMESTER II

COURSE CODE	COURSE TITLE	COURSE CATEGORY	HOURS			EVALUATION SCHEME		SUBJECT TOTAL	CREDIT
			L	T	P	CA	EE		
BCS201	Programming for Problem Solving	ESC	3	0	0	25	50	75	3
BBT201	Elementary Mathematics II	BSC (Elective)	3	1	0	30	70	100	4
BBT202	Remedial Biology II	BSC (Elective)							
BBT203	Advanced Biotechnology	ESC	2	1	0	25	50	75	3
BAS201	Chemistry	BSC	3	1	0	30	70	100	4
HAS201	English	HSS	2	0	0	15	35	50	2
BBT105	Sports and Yoga	AUC	2^	0	0	0	0	0	0
BCS251	Programming for Problem Solving Lab	ESC	0	0	4	15	35	50	2
HAS251	English Lab	HSS	0	0	2	10	15	25	1
BAS251	Chemistry Lab	BSC	0	0	2	10	15	25	1
TOTAL			**13+2^**	**3**	**8**	**160**	**340**	**500**	**20**

L - Lecture, **T** - Tutorial, **P** - Practical, **CA** - Continuous Assessment, **EE** - End Semester Exam; BSC-Basic Science Course; ESC-Engineering Science Course; HSS-Humanities & Social Science Course; ; PCC-Professional Core Course; AUC-Audit Course

B.Tech Biotechnology: Semester-I BAS-101- Physics	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective:
Understand physical sciences basics and applied knowledge

Course Learning Outcomes:
After completing the course, the student shall be able to:

CO1: To develop insights of fundamental physics
CO2: To develop applied understanding of physics for lifesciences
CO3: Better understanding of fundamentals of core physics in instrumental applications

UNIT- I Relativistic Mechanics and **Interference**

Frame of reference, Galilean transformation, Inertial and Non-inertial frames, Postulates of special theory of relativity, Michelson-Morley experiment, Lorentz transformation of space and time, Length contraction, Time dilation, Addition of velocities, Variation of mass with velocity, Equivalence of mass and energy, Momentum-energy transformation equations

Interference
Theory of interference of light, Conditions for sustained interference, Classification of interference, Fresnel‟s Biprism experiment, displacement of fringes, Interference in thin films- wedge shaped film and Newton‟s rings.

UNIT- II Diffraction and **Polarization**

Diffraction
Single, Double & N- slit Diffraction, Diffraction grating, Grating spectra, Rayleigh‟scriterion and resolving power of grating

Polarization
Phenomena of double refraction, Doubly refracting crystals, Quarter wave plate & Halfwave plate, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Optically active substance, Fresnel‟s theory of optical activity, Specific rotation and Polarimeters.

UNIT –III Laser, Holography and Fiber Optics

Laser and Holography

Spontaneous and stimulated emission of radiation, Einstein"s coefficients, construction and working of Ruby, He-Ne lasers and laser applications,

Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography

Fiber Optics

Fundamental ideas about optical fiber, Types of fibers, Acceptance angle and cone, Numerical aperture, Propagation mechanism and communication in optical fiber, Attenuation, Signal loss in optical fiber and dispersion.

Suggested Readings

- Aurthur Beiser, "Concepts of Modern Physics" - (Mc-Graw Hill)
- Robert Resnick – "Introduction to Special theory of Relativity" - Wiely
- AjoyGhatak , "Optics - (TMH)" Brijlal& Subramanian (S. Chand)
- Anuradha De.," Optical Fibre & Laser" - (New Age)
- Resnick, Halliday& Walker," Fundamental of Physics" - (Wiely)
- R.A. Serway& J.W. Jewett, "Principles of Physics" - (Thomson Asia Pvt. Ltd.)

B.Tech Biotechnology.: Semester-I BBT-101 – Elementary Mathematics –I	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective:

To understand Mathematical sciences applications in biotechnology, population genetics

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To develop basic understanding of mathematics to explore its applied role in life sciences

UNIT- I Derivatives
Derivatives: Definition, algebra of derivatives of functions, Derivatives of polynomial and trigonometric functions, Exponential and Logarithmic function, Logarithmic differentiation, derivatives of function in parametric forms, Second order derivatives, nth order derivatives, Lebinitz's Theorem, Taylor's series, Maclaurin's series, Mean Value Theorems, Vector differentiation: Gradient, Divergence and Curl **Applications of Derivatives** Applications of derivatives: rate of change, increasing/decreasing functions, tangents & normals, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations), Partial and Total Differentiation, Envelopes and Radius of curvature, Jacobians.
UNIT- II Integrals
Integrals Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated. Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals. Multiple integrals: Volume, Surface integrals. Vector Integration: Stokes theorem, Gauss's Theorem. Gamma, Beta Functions. Complex integration: Analytic function and Cauchy integral theorem. **Applications of the Integrals** Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable). Fourier series, Laplace Transformation, Fourier Transformation.
UNIT –III Differential Equations
Differential Equations Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equationof first order.

Suggested Readings

- Mathematics Part I - Textbook for Class XI, NCERT Publication
- Mathematics Part II - Textbook for Class XI, NCERT Publication,
- Mathematics Class XI and XII by R D Sharma.
- Glyn James , "Higher engineering mathematics" (Tata Macgraw Hill)
- B.V.Ramana, "Advanced modern engineering mathematics" (Pearson education)
- Introduction to Engineering Mathematics Vol I and Vol II. H.K DASS (S.CHAND)

B.Tech Biotechnology: Semester-I BBT-102 – Remedial Biology –I	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective:

To give an overview of biomolecules and their significance.To give basic knowledge of Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids).To have an overview of Microorganism: Origin of microbiology, Types of microbes, Classification of microbes.To explain about the Introduction Genes & Genome.To explain the Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases).To explain the Human Health & Hygiene: Population and birth control, sexually transmitted diseases.

Course Learning Outcomes:
After completing the course, the student shall be able to:

CO1: To define the basic Science and biotechnology,
CO2: To summarize the different types of Origin of microbiology,
CO3: To determine basic principles of Biomolecules and their brief introduction - Carbohydrates, Proteins and Lipids.
CO4: compare Introduction to Genes & Genome, Human Genome Project.
CO5: To judge the significance of various Media: defined and undefined, Study of Microbes (culture techniques and staining method)
CO6: Introduction to Recombinant DNA technology: Restriction enzymes,vectors, how to isolate and clone a desired gene, Applications of RDT

UNIT- I Diversity in Living World:
Diversity in Living World: Diversity of living organisms Classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom). Systematics and binomial System of nomenclature. Salient features of animal and plant classification, viruses, viroids, lichens, Botanical gardens, herbaria, zoological parks and museums.
UNIT- II Cell: Structure and Function

Cell: Structure and Function Cell: Cell theory; Prokaryotic and eukaryotic cell, cell wall, cell membrane. Nucleus and nuclear organization. Tissue, organ and organ system (elementary idea) **Cell Division:** Cell Cycle (elementary idea), Somatic Cell division - Mitosis, Germ Cell division - meiosis **Biomolecules of Cell:** Basic chemical constituents of living bodies – Carbohydrate, Lipid, Protein, etc
UNIT- III Plant Physiology
Plant Physiology Movement of water, food, nutrients and gases, Respiration, Photosynthesis, Plant growth and development.

Suggested Readings

- Biology - Textbook for Class XI, NCERT Publication
- Peter H Raven, George B Johnson, Kenneth A. Mason, Jonathan Losos, Susan Singer, Biology,(Macgraw Hill)

B.Tech Biotechnology: Semester-I
BBT 103 - Basic Electrical Engineering

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective:

The course aims at imparting basic knowledge of electrical engineering and its applications in living world.

Course Learning Outcomes:
After completing the course, the student shall be able to:

CO1: To define the Circuit and Network, active and passive elements, Concept of linearity and linear network, unilateral and bilateral elements.
CO2: To summarize the Working principle of DC motor & single phase induction motor, working principles of PMMC and moving iron type voltmeters and ammeters, breakdown mechanism, breakdown characteristics, zener diode application as shunt regulator.
CO3: To determine the values of current and voltages using loop and nodal methods of analysis, Kirchhoff's law, Superposition Theorem, Thevenin's Theorem, Norton's Theorem.
CO4: To compare the Extrinsic & Intrinsic type semiconductors, ideal and practical diodes, non-inverting and unity gain configurations, Logic Gates.
CO5: To judge the significance of K-maps, canonical forms, applications of Op-Amp as adders, applications of Op-Amp as adders.
CO6: To create a Conversion of numbers into Binary to Hexadecimal, Decimal to Binary, Octal to Binary, Basic construction, transistor amplification action, input/output characteristics of CB and CE configurations.

UNIT 1: D C Circuit Analysis and Network Theorems

D C Circuit Analysis and Network Theorems
Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear element transformation. Kirchhoff's laws; loop and nodal methods of analysis.
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, and Maximum Power Transfer Theorem.
Electrical machines: Principles of electro mechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics and applications of dc motors
Single phase induction motor: Principle of operation and introduction to methods of starting applications.

UNIT 2: Semiconductor Diodes and Applications

Semiconductor Diodes and Applications
p-n junction, depletion layer, diode ratings (average current, repetitive peak current, peak inverse voltage) p-n junction as rectifiers (half wave and full wave) filter (Shunt capacitor filter), clippling circuits, clamping circuits, Zener Diode.
Bipolar Junction Transistor (BJT)
Basic construction, transistor action, CB, CE and CC configurations, input/ output characteristics, Different types of transistor biasing
JFET: Basic construction, principle of working, concept of pinch-off maximum drain saturation current, input and transfer characteristics characteristic equation, CG, CS and CD configurations, fixed and self-biasing of JFET amplifier

UNIT 3: Switching Theory and logic design

Switching Theory and logic design
Number system, conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gates canonical forms, minimization using K-map.
Electrical Instruments
Types of instruments, construction and working principles of PMMC and moving iron type Voltmeters& ammeters, single phase dynamometer wattmeter and induction type energy meter.
Electronics Instruments
working principle of digital voltmeter, digital multimeter (block diagram approach) CRO (its Working with block diagram) measurement of voltage, current, phase and frequency using CRO.

Suggested Readings

- Robert L. Boylestad/ Louis Nashelsky “Electronic Devices and Circuit Theory”, 9th Edition, Pearson Education.
- Devid A. Bell “Electronic Devices and Circuits”, 5th Edition, OXFORD University Press 2008.
- Morris Mano “Digital Computer Design”, PHI 2003.
- H.S. Kalsi “Electronic Instrumentation”, 2nd Edition, TMH 2007.
- D.E. Fitzgerald & A. Grabel Higginbotham, “Basic Electrical Engineering “.
- I.J. Nagarath, “Basic Electrical Engineering” Tata McGraw Hill.

B.Tech Biotechnology: Semester-I BBT-104 - Introduction to Biotechnology	
Teaching Scheme	**Examination Scheme**
Lectures: 2 hrs/Week	
Tutorials: 1 hr/Week	Internal Marks : 25 Marks
Credits: 3	End Semester Exam: 50 Marks

Course Objectives:

- To give an overview of biomolecules and their significance. To give basic knowledge of Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids).
- To have an overview of Microorganism: Origin of microbiology, Types of microbes, Classification of microbes.
- To explain about the Introduction Genes & Genome.
- To explain the Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases).
- To explain the Human Health & Hygiene: Population and birth control, sexually transmitted diseases.

Course outcomes:

CO1: To define the basicScience and biotechnology, basic principles of Biomolecules and their brief introduction -Carbohydrates, Proteins and Lipids.DNA and RNA

CO2: To summarize the different types of Origin of microbiology, Types of microbes, Classification of microbes, macro and micro molecules required for growth of microorganism

CO3: To determineProperties of Tools and Techniques: Brief Concept, types and applications of Chromatography, spectrophotometry, Electrophoresis and PCR

CO4: compare Introduction to Genes & Genome, Human Genome Project.

Enzymes: History, Nomenclature & Classification of Enzymes and its function

CO5: To judge the significance of various Media: defined and undefined, Study of Microbes (culture techniques and staining method)

CO6: To create a model on. Introduction to Recombinant DNA technology:Restrictionenzymes,vectors, how to isolate and clone a desired gene, Applications of RDT

UNIT –I Introduction to Biotechnology
Introduction to Biotechnology Fundamentals of Biochemical Engineering, Biotechnology and Society. Principles and Processes; Application in Health, food, medicine and Agriculture; genetically modified (GM)organisms; biosafety issues. **Biomolecules** Building Blocks of Biomolecules-Structure and dynamics. Structure and function of Macromolecules (Carbohydrates, Proteins ,Lipids). Classification of Enzymes; Purification and characterization of enzymes from natural sources. Comparison of chemical and enzyme.
UNIT- II Cell as a basic unit of life
Cell as a basic unit of life. Introduction: Definition, Study of Microbes, Types of microbes, Classification of microbes. Origin of microbiology. Application of microbes in fermentationBiotechnology. Cellular Techniques including chromatography.
UNIT- III Biological databases
History of Bioinformatics. Introduction and application. Biological databases (nucleotide andprotein data bases, Structure databases) and their retrieval.. Sequence file formats .information Sources Analysis using Bioinformatics tools. **Genomics:** Introduction Genome Sequencing Projects, Gene Prediction and counting,Genome similarity, SNP's and comparative genomics.

Suggested Readings

- B.D.Singh,"Biotechnology " (Kalyani Publishers)
- R.C.Dubey, "Text book of Biotechnology" (S.Chand and company)
- William J. Thieman ," Introduction to Biotechnology", Michael A. Palladino, Publisher: Benjamin
- Cummings
- Colin Ratledge," Basic Biotechnology Publisher": Cambridge University Press

B.Tech Biotechnology: Semester-I BAS-151 Physics Lab	
Teaching Scheme	**Examination Scheme**
Lectures: 0 hrs/Week	Internal Marks:15 Marks
Tutorials: 0 hr/Week	
Practicals: 4 hr/Week Credits: 2	External Marks: 35 Marks

Any ten experiments, at least four from each group.

Course Objective:

Understand physical sciences basics and applied knowledge

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To develop insights of fundamental physics
CO2: To develop applied understanding of physics for lifesciences
CO3: Better understanding of fundamentals of core physics in instrumental applications
CO1: To develop insights of fundamental physics
CO2: To develop applied understanding of physics for lifesciences
CO3: Better understanding of fundamentals of core physics in instrumental applications

Group –A Classical Physics I

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B Classical Physics II

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.

13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

B.Tech Biotechnology: Semester-I BBT-153 Electrical Engineering Lab	
Teaching Scheme	**Examination Scheme**
Lectures: 0 hrs/Week	Internal Marks: 10
Tutorials: 0 hr/Week	
Practicals: 2 hr/Week Credits: 1	External Marks: 15 marks

Course Objectives:

1. To understand the basic of electrical and electronics instruments.
2. To learn the procedure for the Superposition theorem, Thevenin's Theorem, Maximum Power Transfer Theorem.
3. To learn Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
4. To understand how to determine of parameters of ac single phase series RLC circuit.
5. To learn the Determination of efficiency of a dc shunt motor by load test
6. To get expertise in method of full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic of electrical and electronics instruments.
CO2: Analyzeto learn the procedure for the Superposition theorem, Thevenin's Theorem, Maximum Power Transfer Theorem.
CO3: Understand learn Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
CO4: Understand how to determine of parameters of ac single phase series RLC circuit.
CO5: Will learn learn the Determination of efficiency of a dc shunt motor by load test
CO6: Will analysis get expertise in method of full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.

Detailed Syllabus:

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phases circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.

9. Determination of efficiency of a dc shunt motor by load test
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates.
15. To study Operational Amplifier as Adder and Subtractor.
16. To study transistor as a switch.

B.Tech Biotechnology: Semester-II BCS-201- Programming for Problem solving	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Internal Marks – 25 Marks
Tutorials: 0 hr/Week	
Credits: 3	End Semester Exam – 50 marks

Course Objective:

Understand computational sciences basics and applied knowledge

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To develop insights of fundamental computer science
CO2: To develop applied understanding of computational programming for lifesciences
CO3: Better understanding of fundamentals of core computer science in instrumental applications

UNIT-I: Introduction
Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types) Arithmetic expressions and precedence. Conditional Branching and Loops. Writing and evaluation of conditionals and consequent branching Iteration and loops
UNIT-II: Arrays
Arrays: Arrays (1-D, 2-D), Character arrays and Strings Basic Algorithms: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity Function and Recursion: Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.
UNIT-III: WRITING PRACTICES
Structure and Pointers. Pointers, Structures (including self referential structures e.g., linked list, notional introduction). File handling

Suggested Readings:

- Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C",

PearsonAddison-Wesley, 2006.

- Behrouz A. Forouzan, Richard F. Gilberg,Computer Science- "A Structured Programming Approach Using C, Thomson", Third Edition [India Edition], 2007.
- Victor Alvarado, Mocygo San Jose, "M. S. Office For ME Word, Excel, Power Point, CA"
- YashwantKanetker, "Let us C", BPB Publication, 2008.
- Balagurusamy, "Programming in ANSI 'C'", TMH, 3rd Edition.
- Detiel&Detiel, "'C' How to program, ISBN: 0132404168", 5th Edition, 2007.
- Dennis Ritchie, "'C' Programming", PHI

B.Tech Biotechnology: Semester-II BBT-201 – Elementary Mathematics –II	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective:

To give an overview of Mathematical sciences and their significance.To give basic knowledge of mathematics for understanding of evolutionary biology. To have an overview of new domain mathematical biology

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To define the basic application of mathematics in science and biotechnology,

CO2: To summarize the applied mathematics in life sciences,

CO3: To determine basic principles of vectors, algebra and 3D geometry.

UNIT-I: ALGEBRA
ALGEBRA: Statement of Fundamental Theorem of Algebra, solution of quadratic equations . Solutions of cubic and biquardatic equations: Synthetic division, Cardan method, and Descarte Method. Linear Inequalities. Complex Numbers. Solution of system of linear equations (graphically). Series: Series. Arithmetic progression (A.P.). arithmetic mean (A.M.) Geometric progression (G.P.), general term of a G.P., sum of n terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to n terms of the special series _n, _n2 and _n3. Matrices Algebra: Basics, Cayley Hamilton theorem, Eigen values and Eigen Vectors.
UNIT- II: COORDINATE GEOMETRY
Straight Lines: Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two point form, intercepts form and normal form. General equation of a line. Distance of a point from a line. Conic Sections: Sections of a cone: circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle, Asymptotes.
UNIT- III: VECTORS
Vectors: Vectors and scalars, magnitude and direction of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

Suggested Readings:

- Mathematics Part I - Textbook for Class XI and XII, NCERT Publication
- Introduction to Engineering Mathematics Vol I and Vol II. H.K DASS(S-CHAND)
- Higher engineering Mathematics by B.V. Ramana (Tata Macgraw Hill)

B.Tech Biotechnology: Semester-II
BBT-202 - Remedial Biology II

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objectives:

1. To give an overview of biomolecules and their significance
2. To give basic knowledge of Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids).
3. To have an overview of Microorganism: Origin of microbiology, Types of microbes, Classification of microbes.
4. To explain about the Introduction Genes & Genome
5. To explain the Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases).
6. To explain the Human Health & Hygiene: Population and birth control, sexually transmitted diseases.

Course outcomes:

CO1: To understand basic human biology concepts
CO2: To summarize the different types of human health parameters

UNIT- I: AIMAL PHYSIOLOGY
Animal Physiology-I Digestion and absorption. Breathing and respiration. Body fluids and circulation. **Animal Physiology-II** Neural control and coordination, chemical coordination and regulation
UNIT- II: REPRODUCTION
Reproduction Reproductive system in male and female, menstrual cycle, production of gametes, fertilization, embryo development.
UNIT- III: HUMAN HEALTH
Human Health & Hygiene: Population and birth control, sexually transmitted diseases, infertility. Cancer and AIDS. Adolescence and drug / alcohol abuse. Basic concepts of immunology, vaccines.

Suggested Readings:

- Biology - Textbook for Class XI, NCERT Publication
- Biology - Textbook for Class XII, NCERT Publication
- Human anatomy and physiology by Marieb (pierson Education)
- Textbook of human physiology by Chakraborthy and Ghosh (2nd ed. Calcutta, The New
- Bookstall)
- 3) Human Physiology by Pocock and Richards (oxford University press)

B.Tech Biotechnology: Semester-II BBT-203 – Advanced Biotechnology	
Teaching Scheme	**Examination Scheme**
Lectures: 2 hrs/Week	Internal Marks – 25 Marks
Tutorials: 1 hr/Week	
Credits: 3	End Semester Exam – 50 marks

Course Objective:

At the end of this course the students will learn and systematically analyze the complexities defining regulation of various metabolic pathways. They will be able to design and learn strain-engineering strategies to alter cellular behavior, metabolic flux, and product formation. They will also appreciate the vast industrial applications of metabolic engineering in the field of medicine, energy and environment.

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To explain about the Introduction Genes & Genome

CO2: To create a model on. Introduction to Recombinant DNA technology: Restriction enzymes, vectors, how to isolate and clone a desired gene, Applications of RDT

CO3: To develop understanding of plant tissue culture

UNIT-I: ANIMAL CELL CULTURE
Animal Cell Culture: History of Animal Cell Culture, Characteristics of animal cell, metabolism, regulation and nutritional requirements, Culture Media and Growth Conditions, Development of Primary Culture and Cell Lines, Suspension Culture, Characterization and maintenance of cell lines, Cryopreservation, Common Cell Culture Contaminants, Marker Gene Characterization, Transfection and Transformation of Cells **Growth and Scale Up**: Need for scaling-up of cells for vaccine or antigen or pharmaceutical protein production, Hybridoma Technology, Cell culture reactors, Scale-Up in suspension and monolayer cultures, Factors affecting cell growth, Growth Monitoring, MassTransfer.
UNIT- II: ANIMAL BIOTECHNOLOGY
Animal Biotechnology: Concept of transgenic animals, Methods of transgene delivery, Microinjection of recombinant DNA into fertilized eggs/stem cells, Animal Pharming, Organ Culture, Regenerative Medicine, Human Embryonic Stem Cell research, Ethical Concerns and Biosafety. **Crop Improvement:** The need of crop improvement. Conventional methods of crop improvement, selection, mutation, polyploidy and clonal selection. Green revolution in India. Introduction to marker assisted breeding and selection
UNIT- III: PLANT TISSUE CULTURE
Plant tissue culture: History of plant tissue culture, plasticity and totipotency. Laboratory setup for a typical plant tissue culture facility. Sterilization methods used in plant tissue culture. Types

of nutrient media and plant growth regulators in plant regeneration.Pathways for invitro regeneration: organogenesis, somatic and gametic

Suggested Readings:

- H.S.Chawla, "Text book of Plant Biotechnology"
- B.D.Singh,"Biotechnology " (Kalyani Publishers)
- R.C.Dubey, "Text book of Biotechnology" (S.Chand and company)
- William J. Thieman ," Introduction to Biotechnology", Michael A. Palladino, Publisher: Benjamin
- Cummings
- Colin Ratledge," Basic Biotechnology Publisher": Cambridge University Press

B.Tech Biotechnology: Semester-II BAS-201 – Chemistry	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective:

1. To give an overview of Chemical sciences and their significance
2. To give basic knowledge of chemistry for understanding nature of biotechnology
3. To have an overview of molecular bonding and chemical interactions

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To define the basic application of chemistry in science and biotechnology,

CO2: To summarize the applied chemistry in biomolecules.

UNIT-I CHEMICAL BONDING
Chemical bonding: Molecular Orbital Theory and its applications to Homo and Hetero diatomic molecules. Hydrogen bonding and its consequences.Band theory of metals and its applications. Liquid crystalline state: Classification and its application. Solid state: Solid state: Unit cell, space lattice, limiting radius ratio (cubic).Braggs equation, Miller indices, mathematical expression for density of unit cell Distinctive allotropes of carbon such as graphite and fullerenes (two dimensional); properties and applications. Liquid state: Properties of liquids, viscosity, surface tension and effect of temperature Gaseous state: Gas laws: Boyle's law, Charles law, Gay lussac law and kinetic theory of gases. Reaction kinetics: Order and molecularity of reaction, integated rate equation for zero first and second order. Theories of reaction rate. Phase rule: Phase rule and its application to one component system (water), eutectic system of metal Bi-Cd and Pb-Ag system Electrochemistry: Electrode potential, electrochemical and concentration cell ,electrochemical theory of corrosion and its prevention ,fuel cell.
UNIT-II CONCEPTS OF ORGANICS
Concepts of organics: Electronic displacement in covalent bonded compound, Stability of reaction intermediates; carbocation, carboanian, free radical,vOptical isomerism of organic compounds. E-Z nomenclature and R-S configuration, Conformation of n butane Nucleophilic substitution reactions. Structural and mechanistics: Reaction mechanism of (i) Aldol Condensation, (ii) Cannizarro Reaction (iii) Hoffmann Rearrangement (iv) Beckmann rearrangement (v) Diels Alder reaction. Polymers: Classification of polymers, polymerization techniques; addition, condensation and co –ordination polymerization. Structure preparation, properties and application of Elastomers, plastomers, polyamides and polyesters .Conducting Polymers: biodegradable polymers.
UNIT-III SPECTROSCOPY

Spectroscopy: Elementary idea and simple application of U.V, IR and NMR spectral techniques. Water: Specifications of domestic water. Analysis of water BOD,COD,TDS,TSM, Water processing: boiler feed water (Calgon process), process water (Zeolite process) potable water, (ion exchange method); Fuel: Classification and analysis of coal (proximate and Ultimate) and their implications, calorific value and its determination (Bomb Calorimeter). Biomass,biogas and bio-fuel. Titrimetric analysis: Types of titrimetric analysis: Acid Base, Redox, Precipitation and Complexometric titrations

Suggested Readings:

- Cotton F.A., Wilkinson G.,Murillo,C.A. and Bochmann "Advanced inorganic chemistry", Wiley,chiester ,1992
- Smith,Michael B./March Jerry, March,s "Advanced organic chemistry": "Reaction , mechanism and structure".,Wilelly and Sons ,2007
- Glaston,Samuel B., "Elements of physical chemistry", ELBS,2005
- Finar,I.L, "Organic Chemistry(vol I&II)" , Addision-Wesley Longman Ltd.
- F.W. Billmeyer, "Text Book of Polymer Science", JonhonWielly&sons
- G.W. Gray and P.A. Winsor, Ellis Harwood series in "Physical Chemistry, Liquid crystals and plastic crystals (vol I)", ,New York
- M.G. Fontana, "Corrosion Engineering", Mc.Graw Hill Publications.

B.Tech Biotechnology: Semester-II HAS-201 – English	
Teaching Scheme	**Examination Scheme**
Lectures: 2 hrs/Week	Internal Marks – 15 Marks
Tutorials: 0 hr/Week	
Credits: 2	End Semester Exam – 35 marks

Course Objective:
1. To give an overview of English
2. To give basic knowledge of grammar

Course Learning Outcomes:
After completing the course, the student shall be able to:
CO1: To define the basic application of English language in science and biotechnology

UNIT-I: VOCABULARY BUILDING
The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations. Basic Writing Skills, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.
UNIT-II: IDENTIFYING COMMON ERRORS IN WRITING
Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés, Nature and Style of sensibleWriting, Describing, Defining, Classifying, Providing examples or evidence Writing introduction and conclusion.
UNIT-III: WRITING PRACTICES
Comprehension, Précis Writing, Essay Writing.
UNIT-IV: ORAL COMMUNICATION (This unit involves interactive practice sessions in Language Lab)
Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations.

Suggested Readings:

- Practical English Usage. Michael Swan. OUP.1995.
- Remedial English Grammar. F.T. Wood.Macmillan.2007
- On Writing Well. William Zinsser. Harper Resource Book.2001
- Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
- Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press.2011.
- Effective Communication Skills. Kulbhushan Kumar. Khanna Publishing House.2018.
- Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress.

B.Tech Biotechnology: Semester-II BBT-105 – Sports and Yoga	
Teaching Scheme	**Examination Scheme**
Lectures: 2 hrs/Week	Audit Course
Tutorials: 0 hr/Week	
Credits: 0	
	End Semester Exam – 0 marks

Course Objective:

To make the students understand the importance of sound health and fitness principles as they relate to better health

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: Practice Physical activities and Yoga focusing on yoga for strength, flexibility, and relaxation

UNIT-I: INTRODUCTION TO PHYSICAL EDUCATION

Meaning & definition of PhysicalEducation

Aims & Objectives of PhysicalEducation

Changing trends in PhysicalEducation

OlympicMovement

Ancient & Modern Olympics (Summer &Winter)

Olympic Symbols, Ideals, Objectives &Values

Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi KhelRatna Awardetc.)

Physical Fitness, Wellness &Lifestyle

Meaning & Importance of Physical Fitness &Wellness

Components of Physicalfitness

Components of Health relatedfitness

Components ofwellness

Preventing Health Threats through LifestyleChange

Concept of PositiveLifestyle

Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

Define Anatomy, Physiology & ItsImportance

Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular Systemetc.)

UNIT-II: KINESIOLOGY, BIOMECHANICS & SPORTS

Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
Newton's Law of Motion & its application in sports.
Friction and its effects in Sports.

Postures

Meaning and Concept of Postures.
Causes of Bad Posture.
Advantages & disadvantages of weight training.
Concept & advantages of Correct Posture.
Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
Corrective Measures for Postural Deformities

Yoga

Meaning & Importance of Yoga
Elements of Yoga
Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
Yoga for concentration & related Asanas (Sukhasana;Tadasana;Padmasana&Shashankasana)
Relaxation Techniques for improving concentration -Yog-nidra

Yoga & Lifestyle

Asanas as preventive measures.
Hypertension: Tadasana, Vajrasana, PavanMuktasana, ArdhaChakrasana, Bhujangasana,Sharasana.
Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
Back Pain: Tadasana, ArdhMatsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.

Diabetes: Procedure, Benefits & contraindications forBhujangasana, Paschimottasana, PavanMuktasana, Ardh Matsyendrasana.

Suggested Readings:

- Modern Trends and Physical Education by Prof. AjmerSingh.
- Light On Yoga by B.K.S.Iyengar.
- Health and Physical Education – NCERT (11th and 12thClasses)

B.Tech Biotechnology: Semester-II BCS 251 –Programming for problem solving Lab	
Teaching Scheme	**Examination Scheme**
Lectures: 0 hrs/Week	
Tutorials: 0 hr/Week	Internal Practical – 15 Marks
Practicals: 4 hr/Week	External Practical – 35 Marks
Credits: 2	End Semester Exam – 50 marks

Course Objective:

Understand computer sciences basics and applied knowledge

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To develop insights of fundamental computer science
CO2: To develop applied understanding of computational programming for life sciences
CO3: Better understanding of fundamentals of core computer science in instrumental applications

UNIT –I: COMPUTER PRACTICAL I

1. Introduction of Computer System: I/O devices, storage devices.
2. Getting familiar with software: OS and C compiler.
3. Write a program to print Hello.
4. Write a program to add two integers.
5. Write a program to compute factorial of a number.
6. Write a program to determine whether a number is prime or not.
7. Write a program to print Fibonacci series. .
8. Write a program in C to check whether a given number is Armstrong or not?
9. Write a program to calculate factorial of an integer using recursion.
10. Show with example (program) how arguments are passed using ‘Call by value’ and ‘Call by

reference' respectively

UNIT – II: COMPUTER PRACTICAL II

1. Write a program to print the sum of all values of an array.
2. Write a program in C that accepts N x N matrix as input and prints transpose of this matrix.
3. Write a program to add the elements of two arrays in to third array using dynamic memory allocation.
4. Write a program in C to calculate the sum of series up to first 10 terms
   1^ 4+ 2^4+ 3^4 + 4^4 + 5^4 + 6^4 + 7^4…..... 10 terms.
5. Write a program in C that takes input from a file and write it into another file.
6. Write a program to implement stack operation (Push & Pop).
7. Write a program to create a link list.

Suggested Readings:

- Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", PearsonAddison-Wesley, 2006.
- Behrouz A. Forouzan, Richard F. Gilberg,Computer Science- "A Structured Programming Approach Using C, Thomson", Third Edition [India Edition], 2007.
- Victor Alvarado, Mocygo San Jose, "M. S. Office For ME Word, Excel, Power Point, CA"
- YashwantKanetker, "Let us C", BPB Publication, 2008.
- Balagurusamy, "Programming in ANSI 'C'", TMH, 3rd Edition.
- Detiel&Detiel, "'C' How to program, ISBN: 0132404168", 5th Edition, 2007.
- Dennis Ritchie, "'C' Programming", PHI.

B.Tech Biotechnology: Semester-II HAS-251 English Lab	
Teaching Scheme	**Examination Scheme**
Lectures: 0 hrs/Week	
Tutorials: 0 hr/Week	Internal Practical – 10 Marks
Practicals: 2 hr/Week	External Practical – 15 Marks
Credits: 1	End Semester Exam – 25 marks

Course Objective:

To give an overview of English. To give basic knowledge of grammar

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To define the basic application of English language in science and biotechnology

UNIT-I: ENGLISH PRACTICAL'S
1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Official/Public Speaking based on suitable Rhythmic Patterns.
4. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
5. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
6. Argumentative Skills/Role Play Presentation with Stress and Intonation.
7. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Suggested Readings:

1. Bansal R.K. & Harrison: "Phonetics in English", Orient Longman, New Delhi.
2. Sethi&Dhamija:" A Course in Phonetics and Spoken English", Prentice Hall, New Delhi.
3. L.U.B.Pandey&R.P.Singh, "A Manual of Practical Communication", A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, "English Pronouncing Dictionary", Cambridge Univ. Press.

B.Tech Biotechnology: Semester-II BBT-251 Chemistry Lab	
Teaching Scheme	**Examination Scheme**
Lectures: 0 hrs/Week	
Tutorials: 0 hr/Week	Internal Practical – 10 Marks
Practicals: 2 hr/Week	External Practical – 15 Marks
Credits: 1	End Semester Exam – 25 marks

Course Objective:

To give an overview of Chemical sciences and their significance. To give basic knowledge of chemistry for understanding nature of biotechnology. To have an overview of molecular bonding and chemical interactions

Course Learning Outcomes:

After completing the course, the student shall be able to:

CO1: To define the basic application of chemistry in science and biotechnology,
CO2: To summarize the applied chemistry in biomolecules.

UNIT-I: VOLUMETRIC ANALYSIS (ANY FIVE)
Determination of constituents and amount of alkalinity of water sample. Determination of temporary and permanent hardness (Complexometric titration). Determination of available chlorine in bleaching powder. Determination of chloride content in water (Mohr,s Method). Determination of iron content in the ore sample using external indicator. Analysis of river water: suspended matter, TDS, heavy metals and pH. Determination of BOD and COD of river water sample. Determination of equivalent wt. of iron by chemical displacement method
UNIT-II: INSTRUMENTAL ANALYSIS (ANY TWO)
Determination of strength of a unknown acid solution by pH metric titration. Determination of iron concentration in water by calorimetric method. Determination of viscosity of addition polymer by viscometer.(Polystyrene)
UNIT-III: MISCELLANEOUS [PREP (1) AND ELEMENTAL & FUNCTIONAL (2)]
Preparation of Bakelite resin. Synthesis of Aspirin, Elemental analysis of organic compounds Determination of functional groups in organic compounds

Suggested Readings:

- F.W. Billmeyer, "Text Book of Polymer Science", JohnWilley&sons
- G.W. Gray and P.A. Winsor, Ellis Harwood series in "Physical Chemistry, Liquid crystals and plastic crystals (vol I)", ,New York
- M.G. Fontana, "Corrosion Engineering", Mc.Graw Hill Publications.