

National Institute of Technology , Raipur (C.G.)

Course of Study & Scheme of Examination								B. Tech. III Semester				Branch:	Biotechnology
S.No.	Board of Studies	Sub. Code	Subject Name	Periods/week				Examination Scheme				Total Marks	Credits L+(T+P)/2
				L	T	P	TA	FE	SE	T.C.A.	ESE		
1	Mathematics	MA 20311 BT	Mathematics III	3	1	-	20	15	15	50	70	120	4
2	Biotechnology	BT 20312 BT	Biochemistry	3	1	-	20	15	15	50	70	120	4
3	Biotechnology	BT 20313 BT	Cell & Molecular Biology	3	1	-	20	15	15	50	70	120	4
4	Information Technology	IT 20314 BT	Object Oriented Programming	3	1	-	20	15	15	50	70	120	4
5	Biotechnology	BT 20315 BT	Biophysics	3	1	-	20	15	15	50	70	120	4
6	Biotechnology	BT 20316 BT	Stoichiometric Calculations	4	1	-	20	15	15	50	70	120	5
7	Biotechnology	BT 20321 BT	Biochem Lab	-	-	3	30	-	-	30	20	50	2
8	Biotechnology	BT 20322 BT	Cell & Molecular Biology Lab	-	-	3	30	-	-	30	20	50	2
9	Information Technology	IT 20323 BT	Prog.Lang. Lab	-	-	3	30	-	-	30	20	50	2
10	Humanities	EN 20324 BT	Value Education	-	-	2	25	-	-	25	-	25	1
11			Discipline	-	-	-	25	-	-	25	-	25	1
			Total	19	6	11	260	90	90	440	480	920	33

Note : For attendance of a student in every theory and practical class, the teachers are supposed to keep records ultimately in the following format which will be included in the semester mark-sheets.

Format for attendance				
Attendance				Category
> 85			----->	High "H"
> 70 & < 85			----->	Medium "M"
> 60 & < 70			----->	Low "L"
< 60			----->	Detained "D"

Chairman (BOS)

Member (BOS)

Member (BOS)

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Biochemistry	Subject Code	BT20312BT
Semester	3rd	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
03	01	03	4+2

Unit I- Biomolecules

Classification of Biomolecules. Structure and function of Biomolecules; Carbohydrates, Lipids, Nucleic acids, and Protein.

Unit II –Biochemistry of Acid, Base, Water & Enzymes

Biochemistry of water, acid and base, Importance of buffer in homeostasis, Henderson-Hasselbach equation; Enzymes: - Concepts of ligands, activation energy, action mechanism, inhibition, Michaelis-Menton equation and its modification.

Unit III- Carbohydrate Metabolism

Glycolysis, Embden Meyerhoff pathway, TCA cycle, Gluconeogenesis, Glycogenesis, Glycogenolysis, Pentose Phosphate Pathway, Electron transport chain.

Unit IV- Protein and Nucleic Acid metabolism

Urea cycle, Plasma protein and their clinical significance, Biosynthesis and catabolism of some vital amino acid .Nucleic acid metabolism; Purine and Pyrimidine synthesis.

Unit V- Lipid Metabolism

Fatty acid biosynthesis, β - oxidation of fatty acid, Cholesterol metabolism, Steroid hormones and their role.

Text books:

1. A.L. Lehninger, D.L.Nelson and M.M Cox- Principles of Biochemistry, Werth publishers 2000.

Reference books

1. L. Stryer, J.M. Berge, J.L.Tymozeko- Biochemistry, W.H. Freeman and Co., 2002.
2. D. Voet and G. Voet- Biochemistry, John Wiley and sons 1994.

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Biophysics	Subject Code	BT20315BT
Semester	3rd	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
03	01	00	4

Unit I - Introduction to Biophysics; Concept of Biophysics, Division of Biophysics. Introduction to Thermodynamics; First and Second law of Thermodynamics, Concept of energy in Biological system in the light of Thermodynamics, Living body as a thermodynamics system. Hydrogen ion concentration- Biological importance of Ph, Experimental determination of Ph.

Unit II - Biophysical Principles: Diffusion ; Kinetics of Diffusion, Fick's law, Types of Diffusion, Active transport, Osmosis, Osmoregulation, Membrane hydrolysis, Endocytosis, Absorption, Adsorption, Viscosity, Surface Tension, Ultrafiltration. Biological importance of acids, bases and salts .Henderson- hasselbalch equation.

Unit III - Hemodynamics: General concept of viscosity for Newtonian and Non-Newtonian fluid. Rheological behavior of blood. Differences between Newtonian and Non-Newtonian fluid. Poiseuille's law, Blood flow- Laminar flow, Turbulent flow. Velocity of blood flow- Bernoulli's principle. Methods of measurement of blood flow.

Unit IV- Physical techniques in structure determination - X ray diffraction, Nuclear Magnetic Resonance, Electron microscopy, Optical Microscopy, Compound Microscopy, Mass Spectroscope, Infrared Spectroscope, UV Spectroscope, Lasers, Chromatography, Electrophoresis.

Unit V- Biomechanics: Cardiac mechanics; Heart as a pump, Mechanical properties of blood vessels. Respiratory mechanics; Breathing mechanism. Structure and mechanical properties of skin. Cardiac mechanics, Lubrication of joint. Bone mechanics.

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Name of Text books:

1. Physical Biochemistry: David Friefelder, 5th Ed, PHI
2. Practical Biochemistry principles and techniques: Editor Wilson and Walker, Cambridge University Press.
3. Physical Biochemistry: Kensal E van Holde. PHI

Name of Reference books

1. A text book of Biophysics R.N.Roy, New Central Book Agency (P) Ltd.
2. Physical Biochemistry: Kensal E van Holde. PHI

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Cell & Molecular Biology	Subject Code	BT20313BT
Semester	3rd	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
03	01	03	4+2

Unit I – Cell structure & function

Cell structure and function of organelles. Cell Cycle and its Regulation. Cell Division: Mitosis and Meiosis.

Unit II – Membrane Transport

Transport phenomenon across cell membrane and its various types. Signal Transduction- cyclic AMP, IP₃, G-Protein, Ca²⁺ ions, Enzyme linked cell surface receptors.

Unit III -Genetics

Mendel's Laws, Linkage and Crossing Over, DNA as genetic material, Structure of DNA and RNA, Organization of DNA in chromosomes, Chromosome Aberrations, Special chromosomes, Genes, DNA Replication.

Unit IV – Gene Expression & Mutation

Transcription, Translation of Prokaryotes and Eukaryotes, Genetic code, Gene Expression in prokaryotes and eukaryotes- Regulation, Mutations: Types, Mutants

Unit V – Gene Transfer

Disorders due to chromosomal change and gene mutation, Transposons, Retrotransposons, Gene transfer mechanisms in Transformation, Transduction and Conjugation.

Text Books:

1. Cell and Molecular Biology- Concepts and Experiments, Gerald Karp, John Wiley and Sons
2. Cell and Molecular Biology- S.C Rastogi.

Reference Books:

1. Genes IX, Benjamin Lewin
2. Voet and Voet, Biochemistry, John Wiley and Sons
3. Nelson and Cox- Lehninger, Principles of Biochemistry, Werth Publishers
4. Fundamentals of Genetics, Simmons and Snustad.

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Mathematics III	Subject Code	MA20311BT
Semester	3rd	Board of Studies	Mathematics
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
03	01	00	04

Unit I - FOURIER SERIES AND FOURIER TRANSFORM

Expansion of function as Fourier series, Change of interval, Even and odd functions, Half-range Fourier series, Practical harmonic analysis, Fourier Sine and Cosine transforms, Properties of Fourier transform, Inverse Fourier transform, Fourier transform of derivatives.

Unit II - LAPLACE TRANSFORM

Laplace transform of elementary functions, properties of Laplace transform, Laplace transform of derivatives and integrals, multiplication by tn and division by t , Laplace transform of periodic functions, Inverse Laplace transform, Convolution theorem, Laplace transform of unit step function and Dirac delta function, Application of Laplace transform to solutions of ordinary differential equations.

Unit III - THEORY OF COMPLEX VARIABLES

Limit, Derivative and Analytic functions; Cauchy- Riemann equations and its applications to flow problems; complex Integration: Line and Contour integral, Cauchy integral theorem and Integral formula; Taylor series, Laurent series, singularities; Poles and their orders and residues; Evaluation of real definite integrals.

Unit IV - PARTIAL DIFFERENTIAL EQUATION

Formation of partial differential equations, Lagrange's solution of first order linear partial differentiation equation, Homogeneous and Non-homogeneous linear partial differential: Non-linear partial differential of first order, Charpit's method and Jacobi's method, Solution of partial differential equations by the method of separation of variables.

Unit V - PROBABILITY AND SAMPLING DISTRIBUTIONS

Discrete and Continuous probability distributions, Chebyshev's theorem, Binomial distribution, Poisson distribution, Normal distribution, Gamma distribution and exponential distribution, Relation between exponential, gamma and poisson distribution, Sampling distribution, sampling distribution of mean, variances, differences and sums.

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Text books

1. Higher engineering mathematics by Dr. B.S.Grewal- Khanna Publishers
2. Advanced Engg. Mathematics by Erwin Kreyszig- John Wiley and Hill Publishing
3. Higher Engg Mathematics by B V Ramana- Tata Mc Graw Hill Publishing
4. Elements of partial differential equations by I N Sneddan-Mc- Graw Hill International Editions

Reference Books:

1. Advanced engg. Mathematics by R.K. Jain and S R K Iyenger- Narosa Publishing house
2. Appied Mathematics by P.N. Wartikar and J.N Wartikar. Volume-II Pune Vidyarthi Griha Prakashan, Pune.
3. Applied Mathematics for engineers and Physicists by Louis A. Pipes -TMH

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Object Oriented Programming	Subject Code	IT20314BT
Semester	3rd	Board of Studies	Information Technology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
03	01	03	4+2

Unit I : Introduction : Basic concepts of OOP, Benefits of OOP, Object Oriented Language, Structure of C++ Program, Compiling & Linking , Operators & Expressions, Looping concepts, Arrays & Structures, functions.

Unit II : Classes & Object: Specifying a class, Define member function, Scope of class and its member , Nested Class, Data hiding & encapsulation, Friend function, Array within a class, array of object as function argument, function returning object, static member.

Unit III: Constructors and Destructors: Constructor function, parameterized multiple constructor, default constructor, copy constructor, const and class, Data conversion between objects of different classes, Destructor function, Polymorphism, function overloading, Operator overloading.

Unit IV: Inheritance, Pointer & Virtual function: Define derived classes, single inheritance, multilevel inheritance, Hierarchical inheritance, Hybrid Inheritance, Pointers to objects, this pointer, Pointers to derived class, Virtual function, Pure Virtual function, Abstract classes.

Unit V: File I/O & Templates: files streams, opening & closing a file, read () & write() functions, detecting end-of-file, seekp(), seekg(), tellg(), tellp()function. Introduction to Templates & Exception, Creating and handling Templates and Exception in OOP.

Name of Text Books

1. OOPS with C++ : E. Balagurusamy
2. OOP with C++: Robert Laphore.

Name of Reference Books

1. Object Oriented Programming in C++ : StroutStrups.
2. Programming with C++ : Venugopal .
3. Programming with C++ : D Ravichandran
4. Let us C++ : Yashwant Kanetkar.

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5. C++ and OOPs Paradigm by Debasish Jana (PHI)
6. OOP-P Sengupta & B.B. Choudhari (PHI)
7. OOP with C++ by M.P. Bhawe & S. A. Patekar (Pearson Education)
8. OOP with C++ : Poonamchanda Sarang (PHI)

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Stoichiometric Calculations	Subject Code	BT20316BT
Semester	3rd	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
04	01	00	05

Unit I - Unit and its conversion: Normality, Molality, Molarity, PVT behaviors, Gas laws, Partial pressure and pure component volume methods. Limiting and excess reactant.

Unit II - Humidity and Saturation: Percentage Humidity, Relative Humidity, Molal Humidity, Cox Chart. Crystallization.

Unit III - Combustion calculations: fuel and flue gas analysis, air fuel ratio, theoretical oxygen, percentage excess air, limiting and excess reactant.

Unit IV- Material Balance: Material balance involving physical changes, chemical changes and biochemical reactions, chemical reactions, Recycle, bypass and purge operations.

Unit V - Energy Balance calculations: Thermo physics, Heat capacity calculations, Enthalpy changes of chemical and biochemical reactions, Dissolution and Laws of Thermo chemistry. Effect of pressure and temperature on heat of reaction.

Name of Text Books:

1. Bhatt and Vora, 'Stoichiometry', McGraw Hill Publications
2. Hougen and Watson, "Chemical Process Principles Part – I Material and Energy Balance 2nd Edition

Name of Reference Books:

1. K A Gavhane, Unit operations, Nirali publication
2. Himmelblau, basic principles and calculations in Chemical engineering, Prentice Hall
3. Ghoshal, Sanyal, Dutta, Introduction to chemical engineering]

Subject: Biochemistry Lab
Subject Code: BT20321BT
End Semester Marks : 20

List of Experiments:

1. Identification of given sample (Carbohydrate /Protein).
2. Estimation of carbohydrate.
3. Separation of amino acid by paper chromatography.
4. Estimation of Protein.
5. SDS-PAGE of protein.
6. Determination of Iodine value of fat.
7. Determination of saponification value of fat.
8. Isolation of DNA from plant cells
9. Isolation of RNA from plant cells
10. Citric Acid production by fermentation.
11. Isolation of Amylase Producing organisms.
12. Catalase production test.
13. Voges –Proskauer test.
14. Qualitative test for amylase activity
15. Detection of proteolytic enzymes produced by microorganisms on milk agar plate

List of Equipments/Machine Required:

1. Colorimeter
2. Spectrophotometer
3. Water Bath
4. Digital Balance
5. Electrophoresis apparatus for protein, DNA and RNA separation
6. Incubator

Recommended Books:

1. Biochemical Methods by Sadasivam and Manickam
2. Laboratory Manual in Biochemistry by Jayaraman
3. Refer Books mentioned in theory syllabus

Subject: Cell And Molecular Biology Lab

Subject Code : BT20322BT

End Semester Marks : 20

List of Experiments:

1. Study of different type of fungal and bacterial cell.
2. Study of unicellular organisms in pond water.
3. Study of leaf structure by section cutting.
4. Study of stem structure by section cutting.
5. Study of cell division in root tip/onion bud.
6. Isolation of DNA from onion Cell.
7. Measurement of cell size by ocular Microbiology.
8. Hanging drop method for studying motility of microorganisms from sewage water.
9. Determination of Leukocyte Cell.
10. R.B.C. Counting.
11. W.B.C. Counting.

List of Equipments/Machine Required:

1. Microscope
2. Micrometer (Ocular and stage)
3. Haemocytometer
4. Ultra-centrifuge

Recommended Books:

1. Experimental Microbiology, Plant Pathology and Biotechnology by K. R. Aneja
2. Refer books mentioned in theory syllabus