



**AMITY UNIVERSITY**  
— R A J A S T H A N —

**Bachelor of Technology (Biotechnology)**

**Programme Code: BTB**

**12041**

**Duration – 4 Years Full Time**

**Programme Structure**

**Curriculum & Scheme of Examination  
With  
Choice Based Credit System (CBCS)**

AMITY UNIVERSITY R A J A S T H A N

## Credit Summary Sheet

B.Tech Biotechnology						
Semester	CC	DE	VA	NTCC	OE	Total
1	16	3	4	2	-	25
2	16	3	4	2	3	28
3	18	3	4	2	3	30
4	17	3	4	2	3	29
5	18	3	4	2	3	30
6	18	3	4	2	3	30
7	21	3	4	2	-	30
8	20	-	-	-	-	20
<b>Total</b>	<b>144</b>	<b>21</b>	<b>28</b>	<b>14</b>	<b>15</b>	<b>222</b>

Note:- CC – Core Course, VA – Value Added Course, OE – Open Elective, DE – Domain Elective

**Programme Learning Outcomes**

BTech Biotechnology is designed to prepare students to attain the following programme outcomes:

**PLO1:** To gain an ability to analyze and apply knowledge of Biotechnology, Science and Engineering idea to solve difficulties correlated with the field of Biotechnology and applied sciences and find practical solutions.

**PLO2:** To develop a scientific and technical approach for designing and performing multidisciplinary experiments, interpretation of data for investigating complex problems and come up with well logical conclusions.

**PLO3:** To enable them to correlate the biotechnological interventions in societal context keeping in view the sustainable development.

**PLO4:** To produce individuals with excellent communication and presentation skills, having the capability to innovate and in depth knowledge of information and Biotechnology.

**Minor Track:**

Course Code	Course Title	Category	Lectures (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Credits
<b>Minor Track-I: Plant Biotechnology</b>						
BTB231	Plant Science	DE	3	-	-	3
BTB305	Basic Bioanalytical Techniques	CC	3	-	-	3
BTB402	Genetics	CC	3	-	-	3
BTB503	Plant Biotechnology	CC	3	-	-	3
BTB601	Recombinant DNA Technology	CC	3	-	-	3
<b>Total</b>						<b>15</b>
<b>Minor Track-II: Animal Biotechnology</b>						
BTB232	Biodiversity	DE	3	-	-	3
BTB333	Animal Science	DE	3	-	-	3
BTB431	Developmental Biology	DE	3	-	-	3
BTB504	Animal Biotechnology	CC	3	-	-	3
BTB604	Immunology & Immunotechnology	CC	3	-	-	3
<b>Total</b>						<b>15</b>

## Program Structure

<b>B.Tech Biotechnology: I- SEMESTER</b>						
Course Code	Course Title	Category	Lectur es (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Credits
BTB101	Applied Mathematics - I	CC	3	1	-	4
BTB102	Applied Physics - I	CC	2	-	-	2
BTB103	Applied Chemistry - I	CC	2	-	-	2
BTB104	Introduction to Computers	CC	2	-	-	2
BTB105	Life Sciences	CC	2	-	-	2
BTB122	Applied Physics - I -Lab	CC	-	-	2	1
BTB123	Applied Chemistry – I-Lab	CC	-	-	2	1
BTB124	Introduction to Computers-Lab	CC	-	-	2	1
BTB125	Engineering Graphics-Lab	CC	-	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB130	Term Paper	DE	3	-	-	3
BTB131	Chemical Biology	DE				
BTB132	<b>Food Science</b>	DE				
BTB133	Basic and Applied Biotechnology	DE				
BCS 101	English	VA	1	-	-	1
BSS 104	Understanding Self for Effectiveness– I	VA	1	-	-	1
FLT 101 FLG 101 FLS 101 FLC 101	Foreign Language - I French German Spanish Chinese	VA	2	-	-	2
AND001	ANANDAM-I	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>25</b>

<b>B.Tech Biotechnology: II- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB201	Applied Mathematics - II	CC	3	1	-	4
BTB202	Applied Physics - II	CC	2	-	-	2
BTB203	Applied Chemistry - II	CC	2	-	-	2
BTB204	Object Oriented Programming in C++	CC	2	-	-	2
BTB205	Data Structure & Algorithms	CC	2	-	-	2
BTB222	Applied Physics - II -Lab	CC	-	-	2	1
BTB223	Applied Chemistry - II-Lab	CC	-	-	2	1
BTB224	Object Oriented Programming in C++-Lab	CC	-	-	2	1
BTB225	Data Structure & Algorithms-Lab	CC	-	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB230	Term Paper	DE	3	-	-	3
BTB231	Plant Science	DE				
BTB232	Biodiversity	DE				
BTB233	Food and Nutrition	DE				
OE	Open Elective-I	OE	3	-	-	3
BCS 201	English	VA	1	-	-	1
BSS 204	Behavioral Science – II	VA	1	-	-	1
FLT 201 FLG 201 FLS 201 FLC 201	Foreign Language - II French German Spanish Chinese	VA	2	-	-	2
AND002	ANANDAM-II	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>28</b>

<b>B.Tech Biotechnology: III- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB301	Cell Biology	CC	3	-	-	3
BTB302	Biochemistry - I	CC	2	-	-	2
BTB303	Microbiology	CC	3	-	-	3
BTB304	Basic Bioanalytical Techniques	CC	2	-	-	2
BTB321	Cell Biology-Lab	CC	-	-	2	1
BTB322	Biochemistry – I Lab	CC	-	-	2	1
BTB323	Microbiology Lab	CC	-	-	2	1
BTB324	Basic Bioanalytical Techniques Lab	CC	-	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB330	Term Paper	DE	3	-	-	3
BTB331	Biopesticides & Biofertilizers	DE				
BTB332	Industrial Waste Management	DE				
BTB333	Animal Science	DE				
OE	Open Elective-II	OE	3	-	-	3
EVS001	Environmental Sciences	VA	4	-	-	4
BCS 301	Communication Skills – I	VA	1	-	-	1
BSS 304	Understanding Self for Effectiveness– III	VA	1	-	-	1
FLT 301 FLG 301 FLS 301 FLC 301	Foreign Language - III French German Spanish Chinese	VA	2	-	-	2
AND003	ANANDAM-III	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>30</b>

<b>B.Tech Biotechnology: IV- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB401	Biochemistry - II	CC	3	-	-	3
BTB402	Genetics	CC	3	-	-	3
BTB403	Methods & Instrumentation in Biotechnology	CC	2	-	-	2
BTB404	Database Management Systems	CC	2	-	-	2
BTB405	Statistics for Biology	CC	3	-	-	3
BTB421	Biochemistry – II-Lab	CC	-	-	2	1
BTB422	Genetics-Lab	CC	-	-	2	1
BTB423	Methods & Instrumentation in Biotechnology-Lab	CC	-	-	2	1
BTB424	Database Management Systems-Lab	CC	-	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB430	Term Paper	DE	3	-	-	3
BTB431	Developmental Biology	DE				
BTB432	Industrial Biotechnology	DE				
BTB433	Food Microbiology	DE				
OE	Open Elective-III	OE	3			3
BCS 401	Communication Skills – II	VA	1	-	-	1
BSS 404	Understanding Self for Effectiveness– IV	VA	1	-	-	1
FLT 401 FLG 401 FLS 401 FLC 401	Foreign Language - IV French German Spanish Chinese	VA	2	-	-	2
AND004	ANANDAM-IV	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>29</b>

<b>B.Tech Biotechnology: V- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB501	Molecular Biology	CC	3	-	-	3
BTB502	Java – I	CC	2	-	-	2
BTB503	Plant Biotechnology	CC	3	-	-	3
BTB504	Animal Biotechnology	CC	3	-	-	3
BTB505	Fundamentals of Biochemical Engineering	CC	3	-	-	3
BTB521	Molecular Biology -Lab	CC	3	-	2	1
BTB522	Java - I-Lab	CC	2	-	2	1
BTB523	Plant Biotechnology-Lab	CC	3	-	2	1
BTB524	Animal Biotechnology-Lab	CC	3	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB530	Term Paper	DE	3	-	-	3
BTB531	Tissue engineering	DE				
BTB532	<b>Cancer Biology</b>	DE				
<b>BTB533</b>	<b>Clinical Microbiology</b>	DE				
BTB 534	<b>Scientific Writing</b>	DE				
OE	Open Elective-IV	OE	3			3
BCS 501	Communication Skills – III	VA	1	-	-	1
BSS 504	Understanding Self for Effectiveness– V	VA	1	-	-	1
FLT 501 FLG 501 FLS 501 FLC 501	Foreign Language - V French German Spanish Chinese	VA	2	-	-	2
AND005	ANANDAM-V	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>30</b>

<b>B.Tech Biotechnology: VI- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB601	Recombinant DNA Technology	CC	3	-	-	3
BTB602	Enzymology & Enzyme Technology	CC	3	-	-	3
BTB603	Structural Biology	CC	2	-	-	2
BTB604	Immunology & Immunotechnology	CC	3	-	-	3
BTB605	Bioresource Technology	CC	3	-	-	3
BTB621	Recombinant DNA Technology –Lab	CC	-	-	2	1
BTB622	Enzymology & Enzyme Technology-Lab	CC	-	-	2	1
BTB623	Structural Biology-Lab	CC	-	-	2	1
BTB624	Immunology & Immunotechnology-Lab	CC	-	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB630	Term Paper & Industry Visit	DE	3	-	-	3
BTB631	Virology	DE				
BTB632	Nanoscience and Nanotechnology	DE				
BTB633	IPR & Drug Regulatory Affairs	DE				
OE	Open Elective-V	OE	3			3
BCS 601	Communication Skills – IV	VA	1	-	-	1
BSS 604	Understanding Self for Effectiveness–V I	VA	1	-	-	1
FLT 601 FLG 601 FLS 601 FLC 601	Foreign Language - VI French German Spanish Chinese	VA	2	-	-	2
AND006	ANANDAM-VI	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>30</b>

**Note:** After completion of the End Term Examination the students must compulsorily undergo Industrial Training of 6 weeks. The evaluation of this training would be carried out in VII sem.

**For domain elective: BTB630- Term Paper & Industry Visit:** In addition to term paper Students must compulsorily undergo Industrial Visit (Cluster of 5-6 Industries) for One week and they will be graded on their learning outcome of the visit for one third component of this Term Paper & Industry Visit.

Evaluation will be as follows: Term Paper: 2 Credit (70 Marks); Industry Visit: 1 Credit (30 Marks)

<b>B.Tech Biotechnology: VII- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB701	Bioprocess Technology	CC	3	-	-	3
BTB702	Downstream Processing	CC	3	-	-	3
BTB703	Entrepreneurship Development	CC	3	-	-	3
BTB704	Genomic & Proteomics	CC	3	-	-	3
BTB705	Pharmaceutical Technology & Biotechnology	CC	3	-	-	3
BTB750	Industrial Training Evaluation	CC	-	-	-	3
BTB721	Bioprocess Technology-Lab	CC	-	-	2	1
BTB722	Downstream Processing-Lab	CC	-	-	2	1
BTB723	Genomic & Proteomics-Lab	CC	-	-	2	1
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
BTB730	Term Paper	DE	3	-	-	3
BTB731	Bioethics & Biosafety	DE				
BTB732	Protein Engineering	DE				
BTB733	Nanotoxicology	DE				
BCS 701	Communication Skills – V	VA	1	-	-	1
BSS 704	Understanding Self for Effectiveness– VII	VA	1	-	-	1
FLT 701	Foreign Language - VII	VA	2	-	-	2
FLG 701	French					
FLS 701	German					
FLC 701	Spanish					
AND007	ANANDAM-VII	NTCC	--	--	--	02
	<b>TOTAL</b>					<b>30</b>

<b>B.Tech Biotechnology: VIII- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB860	Project /Dissertation	CC	-	-	-	20
	<b>TOTAL</b>					<b>20</b>

**APPLIED MATHEMATICS – I****Course Code: BTB101****Credit Unit: 04 (3L, 1 T)****Course Objective:**

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

**Course Contents:****Module I**

Derivative of a function, Derivatives at a point, Fundamental rules for differentiation: Product Rule, Quotient Rule and Chain Rule, Differentiation of Implicit Functions, Parametric forms and Logarithmic Differentiation, Successive differentiation, Leibnitz's theorem (without proof), Mean value theorem, Taylor's and Maclaurin's Theorem, Asymptote & Curvature.

**Module II**

Partial Differentiation, Euler's Theorem, Maxima and Minima, Jacobians, Jacobians for Implicit Functions.

**Module III**

Fundamental Integral Formulae, Methods of Integration: Integration by Substitution, By Parts, Partial Fractions, Definite Integral and its Properties, Reduction Formulae, Application to length, Area and Volume.

**Module IV**

Definition of Order and Degree of differential equation, Formation of ODEs, Solution of Differential Equation of 1st Order and 1<sup>st</sup> Degree: Variable Separation, Homogeneous Differential Equations, Linear Differential Equations, Exact Differential Equations.

**Module V**

General Linear ODE of Second Order, Solution of Homogeneous Equation with constant coefficients, Solution of Homogeneous Equation with variable coefficients, Solution of Simple Simultaneous ODE.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- Narayan, S. (2005). Differential Calculus. S. Chand, 30th Revised edition.
- Narayan, S. (2005). Integral Calculus, S. Chand, New Delhi.

**References:**

- Forsyth, A. R. (2013). A Treatise on Differential Equations, BoD–Books on Demand.
- Dass, H. K. (2008). Advanced Engineering Mathematics, S. Chand, New Delhi.

**APPLIED PHYSICS - I  
(FIELDS AND WAVES)****Course Code: BTB102****Credit Unit: 02****Course Objective:**

Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering

**Course Contents:****Module I**

Simple Harmonic Motion – equation and energy conservation, superposition of two SHMs, damped and forced oscillations – equations, amplitude and frequency response, resonance, sharpness of resonance, equation of motion for plane progressive waves, superposition of waves

**Module II**

Interference: Conditions of interference, division of wavefront, Fresnel's biprism, division of amplitude, interference due to thin films, Newton's rings

Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, Transmission grating and its resolving power.

Polarization: Birefringence, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Half and quarter wave plates, Optical rotation

**Module III**

Results of Michelson-Morley experiment, Inertial & non-inertial frames, Special theory of Relativity, Relativistic space-time transformation, Transformation of velocity, Variation of mass with velocity, Mass-energy equivalence

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

- French, A. P. (1971). Vibrations and Waves, CRC press.
- William, C., William, C., Elmore., & Mark, A. (1969). Physics of Waves. Courier Corporation Elmore, Heald.
- Griffiths, D. J., Jackson, J. D., & Jackson, J. D. (1962). Introduction to Electrodynamics, Vol. 3, New York etc, Wiley.
- Ghatak, A. K., & Thyagarajan K. (1989). Optical Electronics, Cambridge University Press..

## APPLIED CHEMISTRY- I

Course Code: BTB103

Credit Unit: 02

**Course Objective:**

Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject starting from the very basic bonding mechanism to the application of materials.

**Course Contents:****Module I**

Types of bond: Ionic, Covalent and Co-ordinate bond; Fajan's rule; Hybridisation; H- bonding ; Valence bond and Molecular orbital theory for diatomic molecule. Electronegativity and dipole moment; Electron Displacement Effects: Inductive Effect; Mesomeric Effect; Electromeric Effects; Fission of covalent bonds; Intermediates of Organic reactions; Carbonium, Carbanion, Free Radical and Carbene; Types of organic reactions; Substitution, Elimination, Addition.

**Module II**

Introduction; Principles of spectroscopy; Law's of Absorbance; IR: Principle Instrumentation; Application; UV: Principle, Instrumentation and Application; NMR Principle and Instrumentation; Application; Chromatography; GC: Principle, Instrumentation and Application; HPLC: Principle, Instrumentation and Application. Introduction: Terminology; First Law; Heat Capacity; Calculation of thermodynamic quantities; Adiabatic and Isothermal Process; Reversible and Irreversible Process; Second law of Thermodynamics; Standard State; Gilbb's Helmholtz equation.

**Module III**

Introduction ; Le Chatelier's Principle; Equilibrium constant from Thermodynamic Constants; Acid-Base Concept; Weak acid and Weak base and their salts; Solubility Product; pH and pOH, Buffer Solution, Buffer Action. VantHoff Isotherm and Isochore; Maxwell Relation; Third law of Thermodynamics; Chemical Potential; Activity and Activity Coefficient; Coupled Reactions

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- Jain, P. C., & Jain M. (1998). Engineering Chemistry.
- Chawla S. (2002). A Text book of Engineering Chemistry, Dhanpat Rai and Co.(Pvt.) Ltd., Educational and Technical Publishers, Delhi.

**References:**

- Morrison, R. T., & Boyd, R. N. (1992). Organic Chemistry, 6th.
- Puri, B. R., Sharma, L. R., & Pathania S. M. (1993). Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., New Delhi.
- Finar, I. L. (1973). Organic Chemistry, Vol. 1.

## INTRODUCTION TO COMPUTERS

**Course Code: BTB: 104**

**Credit Unit: 02**

**Course Objective:**

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

**Course Contents:**

**Module I**

Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit. History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Precedence of Arithmetic operators, Operator precedence of Arithmetic Operators, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

**Module II**

C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types(automatic, register etc.), predefined processor, Command Line Argument. One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

**Module III**

Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments. Strings and C string library. Structures and Unions. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Kanetkar, Y. (2001). Let us C, BPB Publications, 2<sup>nd</sup> Edition.
- Balagurusamy, E. (2004). Programming in ANSI C, Tata McGraw-Hill Education.
- Herbert, S. (2002). The Complete Reference, Osbourne Mcgraw Hill, 4<sup>th</sup> Edition.
- Raja Raman V. (1995). Computer Programming in C , Prentice Hall of India.

## LIFE SCIENCES

Course Code: BTB: 105

Credit Unit: 02

**Course Objective:**

The objective of the course is to provide students an understanding of the very basic molecules of life-DNA,RNA, proteins and how these molecules, when form further complex molecules like carbohydrates, vitamins and lipids, then functioning of body takes place. Since technology is advancing in every field, emphasis is also given on the understanding of application of some biotechnological concepts used in our daily life like biofuels, biofertilizers. An introduction to the origin of earth, the environment-air, water and land, origin of life on Earth, how life evolved from a single cell, some environmental problems and measures to be taken to combat them.

**Course Contents:****Module I: Cell Biology**

Organization of cell (Inorganic-Water and Ions; Organic-Proteins, Lipids and Carbohydrates constituents)  
Physical structure of the cell-Brief introduction to the Cell Membrane, Cytoplasm and its Organelles (Nucleus, Mitochondria, Golgi, Endoplasmic Reticulum, Lysosomes, Peroxisomes, Ribosomes, Chloroplasts)  
Cell cycle.

**Module II: Introduction to Cell Physiology**

Transport of substances through the cell membrane- Osmosis, Diffusion and its types, Active transport (Sodium-potassium pump) and Passive transport  
Membrane potential, Measuring Membrane Potential, Action Potential  
Electrocardiogram (ECG)  
Electromyography (EMG)  
Electroencephalography (EEG)

**Module III: Environmental Biotechnology**

Biosensors, Biochips and Biofilms  
GMO's and Biofertilizers  
Biofuels,  
Gene Therapy, Stem cell and Nanobiomolecules  
Bio Informatics- Introduction and Applications

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

- Sodhi, G. S. (2005). Fundamental Concepts of Environmental Chemistry, Alpha Science Int'l Ltd.
- Sharma, B. K., & Kaur, H. (2001). An Introduction to Environmental Pollution, Krishna prakashan media (p) Ltd.
- Berg, J. M., Tymoczko, J. L., & Stryer L. (2011). Biochemistry, WH Freeman and Co., New York.
- Lodish, H. (2008). Molecular Cell Biology by. Macmillan, (2008).

**APPLIED PHYSICS – I-Lab****Course Code: BTB: 122****Credit Unit: 01****List of Experiments**

1. To determine the wavelength of sodium light by Newtons's rings method.
2. To determine the dispersive power of the material of prism with the help of a spectrometer.
3. To determine the specific rotation of sugar by Bi-quartz or Laurent half shade polarimeter.
4. To determine the speed of ultrasonic waves in liquid by diffraction method.
5. To determine the width of a narrow slit using diffraction phenomena.
6. To determine the temperature coefficient of platinum wire, using a platinum resistance thermometer and a Callender & Grif/ftth's bridge.
7. To determine the value of specific charge (ratio of  $e/m$ ) of an electron by Thomson method.
8. To determine the internal resistance of Leclanche cell with the help of Potentiometer.
9. To determine the resistance per unit length of a Carey Foster's bridge wire and also to find out the specific resistance of a given wire.
10. To plot graph showing the variation of magnetic field with distance along the axis of a circular coil carrying current, and hence estimate the radius of the coil.
11. To determine the value of acceleration due to gravity ("g") in the laboratory using bar pendulum.
12. To determine the moment of inertia of a flywheel about its own axis of rotation.
13. To determine the density of material of the given wire with the help of sonometer

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**APPLIED CHEMISTRY – I -Lab****Course Code: BTB: 123****Credit Unit: 01****List of Experiments**

1. Titration of phosphoric acid and sodium hydroxide solution using pH meter.
2. Verification and application of Beer's Law.
3. Spectroscopic analysis of iron in water sample.
4. Conductometric titration.
5. Determination of water modules of crystallization in Mohr's salt.
6. (A) Determination of surface Tension of liquid.  
(B) Application of surface tension method in mixture analysis.
7. Application of distribution law in the determination of equilibrium constant.
8. Analysis of iron ore.
9. Plant pigments separation by paper chromatography.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**INTRODUCTION TO COMPUTERS -Lab**

Course Code: BTB: 124

Credit Unit: 01

Software Required: Turbo C

**Course Contents:****Module I**

DOS commands; Creation of batch files

**Module II**

C program involving problems like finding the nth value of cosine series, Fibonacci series etc. C programs including user defined function calls

**Module III**

C programs involving pointers, and solving various problems with the help of those. File handling

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## ENGINEERING GRAPHICS -Lab

**Course Code: BTB: 125**

**Credit Unit: 01**

### Practicals

#### Course Objective:

This course will provide students concepts on the drawings of different curves like straight line, parabola, ellipse etc. After completion of this course, students will be able to draw different figures manually and will be capable of using various instruments involved in drawings.

#### Course Contents:

##### Module I

Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications.

##### Module II

Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines. Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

##### Module III

Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection. Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles. Development of simple objects with and without sectioning. Isometric Projection

#### Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

#### Text & References:

- Engineering drawing by Shah, Mahendrakumar Budhichand, and Bachubhai Chhibubhai Rana Pearson Education India, (2009).
- Geometric Dimensioning & Tolerancing by Gill, Pritam Singh. . Seagull Books Pvt Ltd, (2009).
- Engineering Drawing by Bhatt, N. D. Engineer 4 (1980).

## TERM PAPER

**Course Code: BTB 130**

**Credit Units: 03**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### **GUIDELINES FOR TERM PAPER**

The procedure for writing a term paper may consist of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

#### **1. Choosing a Subject**

The subject chosen should not be too general.

#### **2. Finding Sources of materials**

- a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- c) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### **3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- a) Get facts, not just opinions. Compare the facts with author's conclusion.
- b) In research studies, notice the methods and procedures, results & conclusions.
- c) Check cross references.

#### **4. Outlining the paper**

- a) Review notes to find main sub-divisions of the subject.
- b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

## **6. Editing & Preparing the final Paper**

- a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- c) Check for proper spelling, phrasing and sentence construction.
- d) Check for proper form on footnotes, quotes, and punctuation.
- e) Check to see that quotations serve one of the following purposes:
  - (i) Show evidence of what an author has said.
  - (ii) Avoid misrepresentation through restatement.
  - (iii) Save unnecessary writing when ideas have been well expressed by the original author.
- f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1. Title page
2. Table of contents
3. Introduction
4. Review
5. Discussion & Conclusion
6. Bibliography
7. Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

1. summary of question posed
2. summary of findings
3. summary of main limitations of the study at hand
4. details of possibilities for related future research

### **Bibliography**

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions:

#### **Monographs**

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

#### **Edited volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited articles**

Schmidt, R. /Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

### **Journal articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

### **Electronic book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic journal articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal [online]* 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished theses/ dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Assessment Scheme:**

#### **Continuous Evaluation:**

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

#### **Final Evaluation:**

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

## CHEMICAL BIOLOGY

**Course Code: BTB: 131**

**Credit Unit: 03**

**Course Objective:**

Chemical biology is that branch of life science, which deals with the study and manipulation of biological systems through the application of chemical techniques and tools. It differs from the more traditional disciplines of chemistry and biology in its emphasis on integrating a wider series of experimental techniques, ranging from synthetic organic chemistry, to biochemistry, to structural, molecular, and cellular biology. Chemical biology has historical and philosophical roots in medicinal chemistry, supramolecular chemistry (particularly host-guest chemistry), bioorganic chemistry, pharmacology, genetics, biochemistry and metabolic engineering.

**Course Contents:**

**Module I**

Classification & chemistry of carbohydrates, proteins and nucleic acids. Chemical method to synthesise peptides, polynucleotides, Cellular Receptors for drug action, strategies for identifying the cellular target of physiologically active natural products (paclitaxel, vancomycin).

**Module II**

Classification of Enzymes, Introduction to enzyme chemistry: Redox reactions (1), Group transfer reactions, Isomerases, Carboxylation and decarboxylation,

**Module III**

Types of chemical reactions important in organic synthesis: Eliminations, additions, condensation (Aldol condensation) and Substitutions, and Rearrangements (Claisen Reactions).

**Module IV**

Purine biosynthesis, thiamine biosynthesis, vitamin E biosynthesis, Steroids (Cholesterol), porphyrin biosynthesis.

**Module V**

Specificity in DNA polymerase and the role of induced fit, Group I ribozyme: kinetics and mechanisms, RNA modifications and applications to catalysis, Unnatural amino acids

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Waldmann H., Janning, P., (2005). Chemical Biology: A practical course, Wiley-VCH.
- Dobson, C.M., Gerrard, J.A., & Pratt A.J. (2002). Foundations of Chemical Biology, Oxford Chemistry Primers.

**References:**

- Chan, L.L., Pineda, M., Heeres, James T. (2008). A General Method for Discovering Inhibitors of Protein–DNA Interactions Using Photonic Crystal Biosensors *Chem. Biol.*, 3 (7), pp 437–448.

## **FOOD SCIENCE**

**Course Code: BTB: 132**

**Credit Unit: 03**

### **Course Objective:**

Food science is the branch of biotechnology which deals with properties and reactions of various food components. It explains the principles behind analytical techniques associated with food.

### **Course Contents:**

#### **Module I**

Carbohydrates: Structure and functional properties of monooligo-polysaccharides including starch, cellulose, pectic substances and dietary fibre; Proteins: Classification and structure of proteins in food;

#### **Module II**

Lipids: Classification and structure of lipids, Rancidity of fats, Polymerization and polymorphism; Pigments: Carotenoids, chlorophylls, anthocyanins, tannins and myoglobin; Food flavours: Terpenes, esters, ketones and quinones;

#### **Module III**

Enzymes: Specificity, Kinetics and inhibition, Coenzymes, Enzymatic and non-enzymatic browning; Nutrition: Balanced diet, Essential amino acids and fatty acids, PER,

#### **Module IV**

Water soluble and fat soluble vitamins, Role of minerals in nutrition, Antinutrients, Nutrition deficiency diseases.

#### **Module V**

Chemistry of changes occurring during processing, storage and utilization, Principles, methods, and techniques of qualitative and quantitative physical, chemical, and biological analyses of food and food ingredients.

### **Text & References:**

#### **Text:**

- Robert K., Murray, M.D., Granner, D.K., Mayes P.A., & Rodwell V.I. Harper's Biochemistry, McGraw-Hill/Appleton and Lange.
- Stryer, L. Biochemistry, W.H. Freeman and Company.
- Cooper T.G. Tools of Biochemistry, John Wiley and Sons Inc.

#### **References:**

- Thomas F. W. (1995). Cellular Biophysics I & II, MIT Press.
- Segal I.H. Biochemical Calculations, John Wiley and Sons.
- Mathews, C.K., Van Holde, K.E., & Ahern K.G. Biochemistry, Benjamin / Cummings.
- Devlin's Textbook of Biochemistry with Clinical correlations by John Wiley and Sons Inc.
- Lehninger, A.L., Nelson, D.L., Cox M.M. Principles of Biochemistry, Worth Publishing.

**BASIC AND APPLIED BIOTECHNOLOGY****Course Code: BTB: 133****Credit Unit: 03****Course Objective**

Understanding the fundamental principles of biotechnology and its application in agriculture, veterinary sciences, medical sciences, industry and environment.

**Course Contents:****Module I**

History of biotechnology, scope of biotechnology, introduction of genetic engineering, plant and animal tissue culture.

**Module II**

Fermentation technology, immobilized enzymes, vaccines, antibodies and hybridoma technology, diagnostics, embryo transfer technology, sexing of embryo, transgenics.

**Module III**

Genome, genome mapping, physical maps, genetic maps, different types of DNA markers and their applications.

**Module IV**

Application of biotechnology in agriculture, veterinary sciences, pharmaceutical industry, food industry, chemical industry and environment.

**Module V**

Introduction and Historical Perspective: Discovery of the microbial world, theories of spontaneous generation, Methods in Microbiology-sterilization, culture media, pure culture techniques, antibiotics and their mode of action

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text and Reference Books:**

- Course Becker, J. M. , Cold Well, G. A. & Zachgo, E. A. (2007). Biotechnology a Laboratory, Academic Press
- Brown, C. M., Campbell, I., & Priest, F. G. (2005). Introduction to Biotechnology, Panima.
- Singh, B. D. (2006). Biotechnology Ey xpanding Horiozon, Kalyani.

## ENGLISH

**Course Code:** BCS 101

**Credit Unit:** 01

**Course Objective:**

The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

**Course Contents:**

**Module I**

Use of Dictionary  
 Use of Words: Diminutives, Homonyms & Homophones; Articles; Parts of Speech; Tenses  
 Sentence Structure  
 Subject -Verb agreement  
 Punctuation  
 The process and importance  
 Principles & benefits of Effective Communication

**Module II**

Speech Drills  
 Pronunciation and accent  
 Stress and Intonation  
 Developing listening skills  
 Developing speaking skills  
 Developing Reading Skills; Developing writing Skills

**Module III**

Progression of Thought/ideas  
 Structure of Paragraph  
 Structure of Essays; Of Studies, by Francis Bacon  
 Dream Children, by Charles Lamb  
 The Necklace, by Guy de Maupassant  
 A Shadow, by R.K.Narayan  
 Glory at Twilight, Bhabani Bhattacharya  
 All the Worlds a Stage                      Shakespeare  
 To Autumn                                      Keats  
 O! Captain, My Captain.                  Walt Whitman  
 Where the Mind is Without Fear         Rabindranath Tagore  
 Psalm of Life                                  H.W. Longfellow

**Examination Scheme:**

Components	A	CT	HA	EE
Weightage (%)	05	15	10	70

**Text & References:**

- Madhulika Jha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.

**\* 30 hrs Programme to be continued for Full year**

## UNDERSTANDING SELF FOR EFFECTIVENESS - I (UNDERSTANDING SELF FOR EFFECTIVENESS)

**Course Code:** BSS 101

**Credit Unit:** 01

### Course Objective:

This course aims at imparting:  
 Understanding self & process of self exploration  
 Learning strategies for development of a healthy self esteem  
 Importance of attitudes and its effective on personality  
 Building Emotional Competence

### Course Contents:

#### Module I

Understanding of Self  
 Components of Self – Self identity; Self concept; Self confidence; Self image; Exploration through Johari Window  
 Mapping the key characteristics of self  
 Framing a charter for self; Stages – self awareness, self acceptance and self realization  
 Meaning and Importance  
 Components of self esteem  
 High and low self esteem  
 Measuring your self esteem

#### Module II

Meaning and nature of attitude; Components and Types of attitude  
 Importance and relevance of attitude; Emotional Intelligence – Meaning, components, Importance and Relevance  
 Positive and Negative emotions  
 Healthy and Unhealthy expression of emotions

#### Module III

Viva based on personal journal  
 Assessment of Behavioural change as a result of training  
 Exit Level Rating by Self and Observer

### Examination Scheme:

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

### Text & References:

- Davis, K. Organizational Behaviour,
- Hoover, Judhith D. (2002). Effective Small Group and Team Communication, Harcourt College Publishers.
- Charles: Team Management, Dick, Mc Cann & Margerison, Edition, viva books (1992)
- Bates, A. P., & Julian, J. Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G. (1985). Oxford Textbook of Public Health, Vol. 4.
- LaFasto & Larson. (2001). When Teams Work Best, Response Books (Sage), New Delhi.
- Pfeiffer J W. (1996). Theories and Models in Applied Understanding Self for Effectiveness, Vol 2, Group Pfeiffer & Company.
- Smither R. D. (1994). The Psychology of Work and Human Performance, Harper Collins College Publishers.

## FRENCH - I

Course Code: FLT 101

Credit Unit: 02

### Course Objective:

To familiarize the students with the French language

- with the phonetic system
- with the syntax
- with the manners
- with the cultural aspects

### Course Contents:

#### Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Objectif 1,2

Only grammar of Unité 3: objectif 3, 4 and 5

#### Contenu lexical: Unité 1: Découvrir la langue française : (oral et écrit)

1. se présenter, présenter quelqu'un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

#### Unité 2: Faire connaissance

1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

#### Unité 3: Organiser son temps

1. dire la date et l'heure

#### Contenu grammatical:

1. organisation générale de la grammaire
2. article indéfini, défini, contracté
3. nom, adjectif, masculin, féminin, singulier et pluriel
4. négation avec « de », "moi aussi", "moi non plus"
5. interrogation : Inversion, est-ce que, qui, que, quoi, qu'est-ce que, où, quand, comment, quel(s), quelle(s)  
Interro-négatif : réponses : oui, si, non
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

#### Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

#### Text & References:

- le livre à suivre : Campus: Tome 1

## GERMAN - I

**Course Code:** FLG 101

**Credit Unit:** 02

**Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

**Course Contents:**

**Module I**

Self introduction: heissen, kommen, wohnwn, lernen, arbeiten, trinken, etc.

All personal pronouns in relation to the verbs taught so far.

Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),

Hallo, wie geht's?: Danke gut!, sehr gut!, prima!, ausgezeichnet!,  
Es geht!, nicht so gut!, so la la!, miserabel!

**Module II**

To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction; Sound system of the language with special stress on Diphthongs; To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country. The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

**Module III**

To acquaint the students with professions in both the genders with the help of the verb “sein”.

Simple possessive pronouns, the use of my, your, etc.

The family members, family Tree with the help of the verb “to have”

All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.

“Wie viel kostet das?”

W – Questions like who, what, where, when, which, how, how many, how much, etc.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

## SPANISH – I

**Course Code:** FLS 101

**Credit Unit:** 02

**Course Objective:**

To enable students acquire the relevance of the Spanish language in today's global context, how to greet each other. How to present / introduce each other using basic verbs and vocabulary

**Course Contents:**

**Module I**

A brief history of Spain, Latin America, the language, the culture...and the relevance of Spanish language in today's global context.

Introduction to alphabets

**Module II**

Introduction to '*Saludos*' (How to greet each other. How to present / introduce each other).

Goodbyes (*despedidas*)

The verb *llamarse* and practice of it. Concept of Gender and Number

Months of the years, days of the week, seasons. Introduction to numbers 1-100, Colors, Revision of numbers and introduction to ordinal numbers.

**Module III**

Introduction to *SER* and *ESTAR* (both of which mean To Be). Revision of '*Saludos*' and '*Llamarse*'. Some adjectives, nationalities, professions, physical/geographical location, the fact that spanish adjectives have to agree with gender and number of their nouns. Exercises highlighting usage of *Ser* and *Estar*. Time, demonstrative pronoun (*Este/esta, Aquel/aquella* etc). Introduction to some key AR /ER/IR ending regular verbs.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español, En Directo I A
- Español Sin Fronteras

## CHINESE – I

**Course Code:** FLC 101

**Credit Unit:** 02

### Course Objective:

There are many dialects spoken in China, but the language which will help you through wherever you go is Mandarin, or Putonghua, as it is called in Chinese. The most widely spoken forms of Chinese are Mandarin, Cantonese, Gan, Hakka, Min, Wu and Xiang. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

### Course Contents:

#### Module I

Show pictures, dialogue and retell. Getting to know each other.

Practicing chart with Initials and Finals. (CHART – The Chinese Phonetic Alphabet Called “Hanyu Pinyin” in Mandarin Chinese.)

Practicing of Tones as it is a tonal language.

Changes in 3<sup>rd</sup> tone and Neutral Tone.

#### Module II

Greetings

Let me Introduce

The modal particle “ne”.

Use of Please ‘qing’ – sit, have tea ..... etc.

A brief self introduction – Ni hao ma? Zaijian!

Use of “bu” negative.

Attributives showing possession. How is your Health? Thank you

Where are you from? A few Professions like – Engineer, Businessman, Doctor, Teacher, Worker.

Are you busy with your work? May I know your name?

#### Module III

Use of “How many” – People in your family?

Use of “zhe” and “na”.

Use of interrogative particle “shenme”, “shui”, “ma” and “nar”.

How to make interrogative sentences ending with “ma”.

Structural particle “de”.

Use of “Nin” when and where to use and with whom. Use of guixing.

Use of verb “zuo” and how to make sentences with it.

Family structure and Relations.

Use of “you” – “mei you”. Measure words. Days and Weekdays. Numbers.

Maps, different languages and Countries.

### Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

### Text & References:

- “Elementary Chinese Reader Part I” Lesson 1-10

**APPLIED MATHEMATICS – II**

Course Code: BTB: 201

Credit Unit: 04

**Course Objective:**

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from mathematics, which they need to pursue their Engineering degree in different disciplines.

**Course Contents:****Module I**

Definition of a Matrix, Operations on Matrices Determinants, Elementary Operations, Reduction of a Matrix to Row Echelon Form, Rank of a Matrix, Consistency of Linear Simultaneous Equations, Gauss Elimination and Gauss Jordan – Method, Eigen values and Eigen Vectors of Matrix, Caley-Hamilton theorem, Diagonalization of a matrix.

**Module II**

Definition of Complex Number, Equality, Conjugate and Modulus of a Complex Number, Polar form of a Complex Number, De-Moivre's Theorem, Roots of a Complex Number, Exponential and Circular function of a Complex Number, Hyperbolic Functions and their inverses.

**Module III**

Scalar and vector field, Gradient, Divergence and Curl, Directional Derivative, Evaluation of a Line Integral, Green's theorem in plain (without proof), Stoke's theorem (without proof) and Gauss Divergence theorem (without proof)

**Module IV**

Frequency Distribution, Arithmetic Mean, Median, Partition Values, Mode, Variance and Standard Deviation, Curve Fitting, Principle of least squares, Linear regression.

**Module V**

Introduction to Probability, Addition and Multiplication theorem of Probability, Random variables and Probability Distribution, Expected values, Binomial distribution, Poisson distribution and Normal Distribution and their Applications.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

- Dass, H.K. (2011). Higher Engineering Mathematics, S. Chand, Delhi.
- Mishra, S. (2013). Fundamentals of Mathematics Functions a: Functions and Graphs. Pearson Education, First ed.

**APPLIED PHYSICS - II**

Course Code: BTB: 202

Credit Unit: 02

**Course Objective:**

Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering.

**Course Contents:****Module I**

de-Broglie matter waves, wave nature of particles, phase and group velocity, Heisenberg uncertainty principle, wave function and its physics interpretation, Operators, expectation values. Time dependent & time independent Schrödinger wave equation for free & bound states, square well potential (rigid wall), Concept of step potential.

**Module II**

Vector atom model, LS and j-j coupling, Zeeman effect & Paschen-Back effect, Bragg's law, X-ray spectra and energy level diagram, Laser – Einstein coefficient, population inversion, condition of light amplification, He-Ne and Ruby laser

**Module III**

Sommerfield's free electron theory of metals, Fermi energy, Energy bands in solids, physics of semi-conductors, doping, intrinsic and extrinsic semiconductors, Depletion layer, characteristics of PN junction, Forward and reverse biasing, Breakdown voltage, Superconductivity, Meissner effect, Introduction to Nanomaterials

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

- Beiser, A. (2002). Concept of Modern Physics, McGraw-Hill Higher Education; 6<sup>th</sup> edition.
- Agarawal & Goel. (2011). Applied Physics II, Pragati Prakashan.
- Pallai, S. O. (2009). Solid State Physics, New Academic Science Ltd; 6 edition.
- Wehr & Richards. (1984). Physics of Atom, Addison-Wesley, 4 edition.

## APPLIED CHEMISTRY - II

**Course Code: BTB: 203**

**Credit Unit: 02**

**Course Objective:**

Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject starting from the very basic bonding mechanism to the application of materials.

**Course Contents:**

**Module I**

Hardness of Water; Boiler Feed Water; Scale and Sludge; Softening of Water; External and Internal Treatment of Boiler Water; Domestic Water Treatment; Desalination of Brackish Water; Chemical Analysis of Water; Dissolved O<sub>2</sub> (BOD, COD); Estimation of Free Chlorine; TDS.

**Module II**

Introduction; Mechanism of Lubrication; Types of Lubricants; Chemical structure related to Lubrication; Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point. Selection of Lubricants. Introduction; Characteristics of good Fuel ; Calorific value; Bomb Calorimeter; Proximate and Ultimate analysis of coal; Carbonization of coal; Gasification and Liquefaction of coal: Fischer Tropsch and Bergius Process; Water Gas and Producer Gas

**Module III**

Introduction; Polymerization: Addition and Condensation Polymerization; Thermosetting and Thermoplastic Polymers; Molecular Weight of Polymer; Rubber, Plastic and Fiber; Preparation, Properties and uses of PMMA, Polyester, Epoxy Resins and Bakelite, Silicone Polymers. Introduction, Mechanism of Dry and Wet Corrosion, Types of Corrosion, Galvanic Corrosion, Concentration Cell Corrosion, Passivity, Underground Soil Corrosion, Pitting Corrosion, Intergranular Corrosion, Waterline Influencing Corrosion, Corrosion Control.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Jain & Jain. (2008). Engineering Chemistry, Dhanpat Roy & Sons eds.
- Chawla, S. (2009). Engineering Chemistry, Dhanpat Roy & Sons eds.

**References:**

- Dara, S.S. (2004). Engineering Chemistry, S Chand, New Delhi.
- Ratan, S. (2013). Engineering Chemistry, S.K. Kataria & Sons.

## OBJECT ORIENTED PROGRAMMING IN C++

**Course Code: BTB: 204**

**Credit Unit: 02**

### Course Objective:

The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

### Course Contents:

#### Module I

Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

#### Module II

Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators. Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hierarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

#### Module III

Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions. Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

### Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

### Text & References:

#### Text:

- Venugopal, A.R., & Ravishanker, T. (1997). Mastering C++, TMH Publications.
- Lafore R. (2004). Object Oriented Programming using C++, BPB Publications.
- Balagurusamy E. (2013). Object Oriented Programming with C++, TMH; Sixth edition.

#### References:

- Parsons. (1999). Object Oriented Programming with C++, BPB Publication.
- Lawlor, S. C. (2002). The Art of Programming Computer Science with C++, Vikas Publication.

## DATA STRUCTURE AND ALGORITHMS

Course Code: BTB: 205

Credit Unit: 02

**Course Objective:**

It helps the students to utilize the information acquired through electronic media to access biological information network and data bases in order to understand biological functions and then to evaluate genetic diseases, their causes and risks related to human kind.

**Course Contents:****Module I**

Introduction; Objects and ADTs with example, Constructors and destructors, Data structure, methods, Pre and post conditions, C conventions, Error handling, Some programming language notes.

**Module II**

Arrays; lists; stacks and stack frames; Recursion -Recursive functions with example of factorial, Queue, Dequeue. Sequential and binary search, Trees, binary search tree, complexity. Priority queues and heaps. Bubble, Heap, Quick, Bin, Radix; Red-Black trees, AVL trees, general n-ary trees, hash tables; Hashing and collision resolution

**Module III**

Fibonacci numbers, binomial coefficients, optimal binary search trees, matrix chain multiplication, longest common subsequence, optimal triangulation. Minimum spanning tree and Dijkstra's algorithm. Eulerian or Hamiltonian paths, Travelling salesman problem.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- Data Structures and Algorithms, A.V. Aho, J.E. Hopcroft and J. Ullman, Addison-Wesley Publishing
- Database Design, Development and Deployment with Student CD, P. Rob and E. Semaan, McGraw-Hill/Irwin
- Schaum's Outline of Data Structures with C++, J.R. Hubbard, McGraw Hill Trade.

**References:**

- Database system concepts, A. Silberschatz, P.B. Galvin and G. Gagne, John Wiley and Sons Inc.
- Introduction to Data Structures and Application, J. Tremblay and P.G. Sorensen, McGraw Hill College Division

**APPLIED PHYSICS – II -Lab**

Course Code: BTB: 222

Credit Unit: 01

**Practicals****List of Experiments**

1. To determine the wavelength of prominent lines of mercury spectrum using plane transmission grating.
2. To determine the thickness of a given wire by Wedge method.
3. To determine the wavelength of He-Ne laser light using single slit.
4. To determine the frequency of an electrically maintained tuning fork by Melde's method.
5. To study the variation of magnetic field along the axis of Helmholtz coil and to find out reduction factor.
6. To draw the V – I characteristics of a forward and reverse bias PN junction diode.
7. To determine the frequency of AC mains using sonometer.
8. To determine the energy band-gap of Germanium crystal using four probes method.
9. To draw V – I characteristics of a photocell and to verify the inverse square law of radiation.
10. To determine the acceleration due to gravity ("g") using Kater's reversible pendulum.
11. To study the characteristics of photo voltaic cell (Solar cell).

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**APPLIED CHEMISTRY – II -Lab**

Course Code: BTB: 223

Credit Unit: 01

**Practicals****Course Contents:**

1. Determining the viscosity index of lubricating oil by using Redwood viscometer.
2. Determining the flash point and fire point of lubricating oil.
3. Determination of Hardness of Water.
4. Chemical Analysis of Water like Alkalinity, residual Chlorine.
5. Synthesis of Urea Formaldehyde resin.
6. Determination of Molecular weight of Polymer.
7. Determination of Ion exchange capacity of a region.
8. Determination of dissolved Oxygen in Water.
9. Determination of Iodine value in water.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**OBJECT ORIENTED PROGRAMMING IN C++ -Lab**

Course Code: BTB: 224

Credit Unit: 01

**Practicals****Software Required:** Turbo C++

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**DATA STRUCTURE AND ALGORITHMS -LAB****Course Code: BTB: 225****Credit Unit: 01****Course Contents:****Module I**

Stack implementation through arrays, link list. Programs for recursion functions

**Module II**

Implementation of queues and leap structures. Application of binary trees in pre-order, post-order and in-order evaluation

**Module III**

A VL tree implementation. Optimal matrix multiplication

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## TERM PAPER

**Course Code: BTB 230**

**Credit Units: 03**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### **GUIDELINES FOR TERM PAPER**

The procedure for writing a term paper may consist of the following steps:

7. Choosing a subject
8. Finding sources of materials
9. Collecting the notes
10. Outlining the paper
11. Writing the first draft
12. Editing & preparing the final paper

#### **1. Choosing a Subject**

The subject chosen should not be too general.

#### **2. Finding Sources of materials**

- d) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- e) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- f) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### **3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- d) Get facts, not just opinions. Compare the facts with author's conclusion.
- e) In research studies, notice the methods and procedures, results & conclusions.
- f) Check cross references.

#### **4. Outlining the paper**

- c) Review notes to find main sub-divisions of the subject.
- d) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- d) statement of purpose
- e) main body of the paper
- f) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

## **6. Editing & Preparing the final Paper**

- g) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- h) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- i) Check for proper spelling, phrasing and sentence construction.
- j) Check for proper form on footnotes, quotes, and punctuation.
- k) Check to see that quotations serve one of the following purposes:
  - (i) Show evidence of what an author has said.
  - (ii) Avoid misrepresentation through restatement.
  - (iii) Save unnecessary writing when ideas have been well expressed by the original author.
- l) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 8. Title page
- 9. Table of contents
- 10. Introduction
- 11. Review
- 12. Discussion & Conclusion
- 13. Bibliography
- 14. Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- 5. summary of question posed
- 6. summary of findings
- 7. summary of main limitations of the study at hand
- 8. details of possibilities for related future research

### **Bibliography**

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions:

#### **Monographs**

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

#### **Edited volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

**Edited articles**

Schmidt, R. /Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

**Journal articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

**Electronic book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

**Electronic journal articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal [online]* 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

**Other websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

**Unpublished papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

**Unpublished theses/ dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

**Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

**Assessment Scheme:**

**Continuous Evaluation:**

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

**Final Evaluation:**

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

## PLANT SCIENCE

**Course Code: BTB: 231**

**Credit Unit: 03**

### Module I

General characters of algae, Various habitat, Cell structure in algae (special reference flagilla, stigma, Neuromotor apparatus and pigments), Classification of algae (F. E. Fritsch), Economic importance of algae, Life cycle of *Polysiphonia*

### Module II

Outlines of classification of fungi, position, occurrence, structure and mode of reproduction in fungi, based on the following representatives: *Eurotium*, *Agaricus* and *Alternaria* Economic importance of fungi. General character and economic importance of bryophytes, life cycle of *Marchantia*.

### Module III

General character pteridophytes, heterospory and seed habit in pteridophytes, steler system in pteridophytes and life cycle of *Marsilea*.

### Module IV

General character of gymnosperms, life cycle of *Pinus*, economic importance of pteridophytes and gymnosperms. General character and taxonomy of angiosperms,

### Module V

Description of Lamiaceae, Malvaceae, Poaceae, Cucurbitaceae and Rutaceae. Economically important plants for cereals, fibre, oil, timber and medicinal value

### Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

### Text Books:

- Singh, V., Pande, P.C., & Jain, D.K. (2010). A Text Book of Botany (Algae, Fungi, Bacteria, Virus, Microbiology, Plant Pathology, Bryophyte, Pteridophyta and Gymnosperms), Rastogi Publications, Meerut, 4<sup>th</sup> Ed.
- Singh, V., Pande, P.C., & Jain, D.K. (2013). A Text Book of Botany (Taxonomy, Economic Botany, Anatomy, Embryology and Morphogenesis), Rastogi Publications, Meerut, 4<sup>th</sup> Ed.

## **BIODIVERSITY**

**Course Code: BTB: 232**

**Credit Unit: 03**

### **Module I**

What is biodiversity, Scientific nomenclature and classification of biodiversity, Conservation and preservation of ecology, Measurement of species diversity, Ecosystem and community diversity, Distribution of biomes and global climate

### **Module II**

Energy, nutrient cycling and ecosystem services, Natural and sexual selection, Genetic diversity, genetics, and conservation genetics. Global patterns of biodiversity and Desert biogeography.

### **Module III**

Overview of threats to biodiversity, Overexploitation of natural resources, Global climate change, Ecological impacts of climate change, Invasive species, Habitat destruction and fragmentation, cumulative impacts of human population growth.

### **Module IV**

Approaches to the conservation of biodiversity and historical perspectives, Legal protection at the species level: The Endangered Species Act, Applied population ecology: monitoring populations and assessing extinction risk, management and establishment of populations,

### **Module V**

Ex-situ conservation, Protecting and managing ecosystems, Restoring ecosystems, Conservation insights from paleoecology and historical ecology.

### **Examination Scheme:**

<b>Components</b>	<b>CT</b>	<b>HA</b>	<b>S/V/Q</b>	<b>A</b>	<b>EE</b>
<b>Weightage (%)</b>	15	5	5	5	70

### **Text**

- Heywood, V.H., & Waston, R.T. (1995). Global Biodiversity Assessment, Cambridge Univ. Press.
- Cunningham, W.P., Cooper, T.H., Gorhani, E., & Hepworth, M.T. (2001). Environmental Encyclopedia, Jaico Publ. House, Mumabai.
- Gleick, H.P. (1993). Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security, Stockholm Env. Institute Oxford Univ. Press.

### **References:**

- Jadhav, H., & Bhosale, V.M. (1995). Environmental Protection and Laws, Himalaya Pub. House, Delhi .

## FOOD AND NUTRITION

**Course code BTB 233**

**Credit units: 03**

### Objective

To acquaint the students about importance of nutrition, balanced diets, therapeutic diets for health and role of food and nutraceuticals in health.

### UNIT I

Importance of nutrition to health and growth; Relation of food and diseases; Nutritional requirement of human body & RDA.

### UNIT II

Preparation of balanced diets; Deficiencies of essential nutrients; Assessment of nutritional status of population; Effect of cooking and processing on nutrients; Nutritional value of processed foods; Therapeutic nutrition.

### UNIT III

Nutritional requirements of special group of people such as infants, pregnant and lactating mothers, patients, aged, etc.; Planning of nutritionally balanced meals based upon the three food group system; Factors affecting meal planning; Formulation of special dietary foods.

### UNIT IV

Functional foods and nutraceuticals with attributes to control cardiovascular diseases, cancer, obesity, ageing.

### UNIT V

Functional aspects of dietary fibre, antioxidants, vitamins, fatty acids etc. Assessment of nutritional quality of food. Definition of Energy and Units of its measurement (Kcal), Concept of BMR, SDA.

### Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

### Text & References:

- Bamji MS, Rao NP & Reddy V (2003). *Textbook of Human Nutrition*. Oxford & IBH.
- Joshi SA. (1999). *Nutrition and Dietetics*. Tata McGraw Hill.
- Khanna K, Gupta S, Passi SJ, Seth R and Mahna R. (1997). *Nutrition and Dietetics*. Phoenix Publ.
- Swaminathan M. (1994). *Essentials of Foods and Nutrition*. Vol. II. Ganesh & Co.

## ENGLISH

**Course Code:** BCS 201**Credit Unit:** 01**Course Objective:**

The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

**Course Contents:****Module I**

Use of Dictionary  
 Use of Words: Diminutives, Homonyms & Homophones, Articles  
 Parts of Speech  
 Tenses Sentence Structure  
 Subject -Verb agreement  
 Punctuation

**Module II**

The process and importance  
 Principles & benefits of Effective Communication  
 Speech Drills Pronunciation and accent. Stress and Intonation  
 Developing listening skills. Developing speaking skills. Developing Reading Skills  
 Developing writing Skills

**Module III**

Progression of Thought/ideas  
 Structure of Paragraph Structure of Essays  
 Of Studies, by Francis Bacon Dream Children, by Charles Lamb  
 The Necklace, by Guy de Maupassant A Shadow, by R.K.Narayan Glory at Twilight, Bhabani Bhattacharya  
 All the Worlds a Stage Shakespeare  
 To Autumn Keats  
 O! Captain, My Captain. Walt Whitman  
 Where the Mind is Without Fear Rabindranath Tagore  
 Psalm of Life H.W. Longfellow

**Examination Scheme:**

Components	A	CT	HA	EE
Weightage (%)	05	15	10	70

**Text & References:**

- Madhulika Jha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.

## UNDERSTANDING SELF FOR EFFECTIVENESS - II (PROBLEM SOLVING AND CREATIVE THINKING)

Course Code: BSS205

Credit Unit: 01

### Course Objective:

To enable the students:  
Understand the process of problem solving and creative thinking.  
Facilitation and enhancement of skills required for decision-making.

### Course Contents:

#### Module I

What is thinking: The Mind/Brain/Behaviour Critical Thinking and Learning: Making Predictions and Reasoning  
Memory and Critical Thinking Emotions and Critical Thinking Thinking skills. Perception  
Expression..Emotion.Intellect.,Work environment

#### Module II

Recognizing and Defining a problem. Analyzing the problem (potential causes)  
Developing possible alternatives. Evaluating Solutions. Resolution of problem Implementation  
Barriers to problem solving:  
- Perception  
- Expression  
- Emotion  
- Intellect  
- Work environment

#### Module III

Construction of POA. Monitoring. Reviewing and analyzing the outcome. Definition and meaning of creativity  
The nature of creative thinking  
- Convergent and Divergent thinking  
- Idea generation and evaluation (Brain Storming)  
- Image generation and evaluation  
- Debating  
The six-phase model of Creative Thinking: ICEDIP model  
Viva based on personal journal  
Assessment of Behavioural change as a result of training  
Exit Level Rating by Self and Observer

### Examination Scheme:

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

### Text & References:

- Michael S. (1999). How to be a Better Problem Solver, Kogan Page, New Delhi.
- Geoff P. (1999). How to be a Better at creativity; by: Kogan Page, New Delhi, (1999)
- Richard Y. C., & Keith P., (1998). Wheeler Publishing, New Delhi.
- Phil Lowe Koge (1996). Page: Creativity and Problem Solving, New Delhi,
- Pfeiffer, J. W., (1996). Theories and Models in Applied Understanding Self for Effectiveness, Management Pfeiffer & Company.
- Bensley, A. D. (1998). Critical Thinking in Psychology – A Unified Skills Approach, Brooks/Cole Publishing Company.

## FRENCH - II

Course Code: FLT 201

Credit Unit: 02

### Course Objective:

To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French.

To make them learn the basic rules of French Grammar.

### Course Contents:

**Module A: pp.38 – 47: Unité 3: Objectif 3, 4, 5, 6**

**Module B: pp. 47 to 75 Unité 4, 5**

### Contenu lexical: Unité 3: Organiser son temps

1. donner/demander des informations sur un emploi du temps, un horaire SNCF  
– Imaginer un dialogue
2. rédiger un message/ une lettre pour ...
  - i) prendre un rendez-vous/ accepter et confirmer/ annuler
  - ii) inviter/accepter/refuser
3. Faire un programme d'activités  
imaginer une conversation téléphonique/un dialogue  
Propositions- interroger, répondre

### Unité 4: Découvrir son environnement

1. situer un lieu
2. s'orienter, s'informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

### Unité 5 : s'informer

1. demander/donner des informations sur un emploi du temps passé.
2. donner une explication, exprimer le doute ou la certitude.
3. découvrir les relations entre les mots
4. savoir s'informer

### Contenu grammatical:

1. Adjectifs démonstratifs
2. Adjectifs possessifs/exprimer la possession à l'aide de :  
i. « de » ii. A+nom/pronom disjoint
3. Conjugaison pronominale – négative, interrogative -  
construction à l'infinitif
4. Impératif/exprimer l'obligation/l'interdiction à l'aide de « il faut.... »/ «il ne faut pas... »
5. passé composé
6. Questions directes/indirectes

### Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

### Text & References:

- le livre à suivre : Campus: Tome 1

**GERMAN – II****Course Code:** FLG 201**Credit Unit:** 02**Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Introduction to Grammar to consolidate the language base learnt in Semester I

**Course Contents:****Module I**

Time and times of the day.

Weekdays, months, seasons.

Adverbs of time and time related prepositions. Introduction to irregular verbs like to be, and others, to learn the conjugations of the same, (fahren, essen, lessen, schlafen, sprechen und ähnliche). To comprehend the change in meaning that the verbs undergo when used as such

Treatment of such verbs with separable prefixes

**Module II**

Reading and deciphering railway schedules/school time table

Usage of separable verbs in the above context. Accusative case with the relevant articles

Introduction to 2 different kinds of sentences – Nominative and Accusative

**Module III**

Nominative and accusative in comparison

Emphasizing on the universal applicability of the pronouns to both persons and objects

Accusative propositions with their use

Both theoretical and figurative use

Dialogue reading: 'In the market place'

'At the Hotel'

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

## SPANISH – II

**Course Code:** FLS 201

**Credit Unit:** 02

**Course Objective:**

To enable students acquire more vocabulary, grammar, Verbal Phrases to understand simple texts and start describing any person or object in Simple Present Tense.

**Course Contents:**

**Module I**

Revision of earlier modules.

Some more AR/ER/IR verbs. Introduction to root changing and irregular AR/ER/IR ending verbs

**Module II**

More verbal phrases (eg, Dios Mio, Que lastima etc), adverbs (*bueno/malo, muy, mucho, bastante, poco*).

Simple texts based on grammar and vocabulary done in earlier modules.

**Module III**

Possessive pronouns

Writing/speaking essays like my friend, my house, my school/institution, myself....descriptions of people, objects etc, computer/internet related vocabulary

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español, En Directo I A
- Español Sin Fronteras

## CHINESE – II

Course Code: FLC 201

Credit Unit: 02

### Course Objective:

Chinese is a tonal language where each syllable in isolation has its definite tone (flat, falling, rising and rising/falling), and same syllables with different tones mean different things. When you say, “ma” with a third tone, it mean horse and “ma” with the first tone is Mother. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

### Course Contents:

#### Module I

Drills  
Practice reading aloud  
Observe Picture and answer the question.  
Tone practice.  
Practice using the language both by speaking and by taking notes.  
Introduction of basic sentence patterns.  
Measure words.  
Glad to meet you.

#### Module II

Where do you live?  
Learning different colors.  
Tones of “bu”  
Buying things and how muchit costs?  
Dialogue on change of Money.  
More sentence patterns on Days and Weekdays.  
How to tell time. Saying the units of time in Chinese. Learning to say useful phrases like – 8:00, 11:25, 10:30 P.M. everyday, afternoon, evening, night, morning 3:58, one hour, to begin, to end ..... etc.  
Morning, Afternoon, Evening, Night.

#### Module III

Use of words of location like-li, wais hang, xia  
Furniture – table, chair, bed, bookshelf,.. etc.  
Description of room, house or hostel room.. eg what is placed where and how many things are there in it?  
Review Lessons – Preview Lessons.  
Expression ‘yao”, “xiang” and “yaoshi” (if).  
Days of week, months in a year etc.  
I am learning Chinese. Is Chinese difficult?  
Counting from 1-1000  
Use of “chang-chang” .  
Making an Inquiry – What time is it now? Where is the Post Office?  
Days of the week. Months in a year.  
Use of Preposition – “zai”, “gen”.  
Use of interrogative pronoun – “duoshao” and “ji”.  
“Whose”??? Sweater etc is it?  
Different Games and going out for exercise in the morning.

The verb “qu”

- Going to the library issuing a book from the library
- Going to the cinema hall, buying tickets
- Going to the post office, buying stamps
- Going to the market to buy things.. etc
- Going to the buy clothes .... Etc.

Hobby. I also like swimming.

Comprehension and answer questions based on it.

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>C</b>	<b>I</b>	<b>V</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- “Elementary Chinese Reader Part I” Lesson 11-20

**CELL BIOLOGY****Course Code: BTB 301****Credit Unit: 03****Course Objective:**

Cell biology plays a central role to connect the different fields of biotechnology which is highly interdisciplinary. It incorporates elements of Biology, Maths, Physics and Chemistry with combination of Computers and Electronics. The object of the present course is to understand the structure and function of the cellular and sub cellular components of cells and tissues with the help of recent techniques.

**Course Contents:****Module I - Introduction to Cell Biology and Cell Cycle**

Cell biology historical perspectives, cell theory, pre cellular evolution, different classes of cell, prokaryotic and eukaryotic cells. Stem Cells, Properties of Stem cell, Types of Stem Cells. Overview of the cell cycle, cell cycle control system with phases, mitosis and meiosis.

**Module II**

Membrane structure-Lipid Bilayer, Fluidity of Membrane, Membrane Proteins.

Principles of Transmembrane transport, Types of Membrane Transport, Transport Proteins, Membrane channels in Transport process.

**Module III**

Cellular organelles: structure and function of- cell wall, Mitochondria, Chloroplast, Nucleus, Endoplasmic reticulum, Lysosomes, peroxisomes and Golgi bodies.

Cell locomotion- Cytoskeleton, structure and function of cilia and flagella.

**Module IV - Cellular Signaling**

General Principles of Cellular Signaling, Molecular tools involved in cell Signaling, Types of Cell Signaling, Signaling Pathway – cAMP Pathway, Notch Pathway.

**Module V - Cancer Biology**

Cancer-Evolution of Cancer, Hallmarks of Cancer, Causes, Organ specific Cancer, Genes related to Cancer, Metastasis and Angiogenesis, Apoptosis, Prevention of Cancer, Diagnosis and Treatment of Cancer.

**Examination Scheme:**

Components	CT	Attendance	Assignment/Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

Text:

- 1) Essential Cell Biology , B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, 4<sup>th</sup> Edition, Garland Publishing Company, pp:864.
- 2) Cell Biology, T. Devasena, 1<sup>st</sup> Edition, Oxford Publishing House, pp:659.

References:

- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.
- Cell in Development and Inheritance, E.B. Wilson, Macmillan
- Developmental Biology, S.F. Gilbert, Sinauer Associates Inc.
- Molecular Cell Biology, H.Lodish, A.Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Preeman and Company.

**BIOCHEMISTRY - I****Course Code: BTB 302****Credit Units: 02****Course Contents:****Module I**

Introduction; Chemical components of cell, Subcellular organelles, Nucleus, Endoplasmic reticulum, Golgi apparatus, Lysosomes, Peroxisomes, Mitochondria cellular organization and biological functions of cellular organelles. Chemical foundations of Biology -Properties of water, acids, bases and buffers, covalent bonds, Non-covalent interactions in biological system

**Module II**

Definition and classification. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids. Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats - hydrolysis, saponification value, acid value, rancidity of fats, Reichert-Meissel number and reaction of glycerol. Biological significance of fats. Lipids and biological membranes, Lipid linked proteins and lipoproteins. Lipid digestion, absorption and transport, fatty acid oxidation, ketone bodies, fatty acid biosynthesis, regulation of fatty acid metabolism.

**Module III**

Structure of monosaccharides, stereoisomerism and optical isomerism of sugars, reactions of aldehydes and ketone groups, ring structure and anomeric forms, mutarotation. Chemical reactions of sugars, important derivatives of monosaccharides, di- and tri-saccharides.

glycolysis pathway and reactions, Citric acid cycle - Overview, Metabolic sources of Acetyl Co-A, enzymes and regulation, The amphibolic nature of the Citric acid cycle, Electron transport chain and oxidative photophosphorylation. Glycogen breakdown and synthesis, glycogen storage and its diseases, Gluconeogenesis, The glyoxylate pathway, Pentose phosphate pathway

**Examination Scheme:**

Components	Mid Term Test	Attendance	Class test/ Assignment/ Project/ Seminar/Quiz	End term Exam
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- Lehninger Principles of Biochemistry by M.M. Cox and D.L. Nelson, 5<sup>th</sup> edition, 2008, W.H. Freeman and company, New York.
- Biochemistry by J.M. Berg, J.L. Tymoczko and L. Stryer, 5<sup>th</sup> edition, 2002, W.H. Freeman and Company, New York.
- Biochemistry by U.Satyanarayana, 3<sup>rd</sup> edition, 2006, New Central Book Agency (p) Lt.

**References:**

- Tools of Biochemistry, T.G. Cooper, John Wiley and Sons Inc.
- Harper's Biochemistry, K. Robert, M.D. Murray, D.K. Granner, P.A. Mayes and V.I. Rodwell, McGraw-Hill/Appleton and Lange.
- Biochemistry, C.K. Mathews, K.E. Van Holde and K.G. Ahern, Benjamin / Cummings.
- Text book of Biochemistry, E.S. West, W.R. Todd, H.S. Mason, and J.T. Van Bruggen Oxford & IBH Publisher, Forth Edition.

**MICROBIOLOGY****Course Code: BTB 303****Credit Units: 03****Course Objective:**

The course imparts the knowledge of different types of microorganisms that are invisible to our naked eyes. Discovery origin and evaluation of different forms of bacteria, fungi, protozoa and viruses constitute the basics of biotechnology.

**Course Contents:****Module I**

Introduction and historical perspective: Discovery of the microbial world, controversy over spontaneous generation, Methods in Microbiology - Theory and practice of sterilization, Chemical control of microorganisms, Antibiotics and their mode of action.

**Module II**

Principles of microbial nutrition, Culture media, Pure culture techniques.

Growth: The definition of growth, mathematical expression of growth, growth curve, measurement of growth, synchronous growth, continuous culture. Maintenance of cultures at lab and industrial level

**Module III**

Prokaryotic structure and function: Fine structure of bacteria: cell envelope, cell wall, cytoplasmic membrane, capsule, surface appendages, cytoplasm and cytoplasmic inclusions, plasmids, genophore  
Archae as earliest life forms

**Module IV**

Host-parasite relationship, Normal micro flora of human body, Infectious disease transmission and microbial pathogenesis, types of toxins (Exo, endo, entro) and their mode of actions,

Viruses: Bacterial, animal; structure of viruses; Reproduction and life cycle of RNA and DNA viruses; Brief account of viroids and prions.

Fungi: Characteristics, economic importance.

**Module V**

Metabolic Diversity among microorganisms – photosynthesis, nitrogen fixation, methanogenesis, fermentations and anaerobic respiration.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L. Wheelis and P.R. Painter, Macmillan

- Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill Microbiology by Prescott
- The microbes – An Introduction to their Nature and Importance, P.V. Vandenmark and B.L. Batzing, Benjamin Cummings.

### ***References:***

- The Microbial World, Roger Y. Stanier, Prentice Hall
- Microbiology, Tortora, Funke and Chase, Benzamin & Cummings
- Principles of Fermentation Technology, Salisbury, Whitaker and Hall, Aditya Books Pvt. Ltd.
- Industrial Microbiology, Casida, New Age International
- Industrial Microbiology, Prescott and Dunn, C.B.S. Publishers Principles of Microbiology, R.M. Atlas, WMC. Brown Publisher.

## BASIC BIOANALYTICAL TECHNIQUES

**Course Code: BTB 304**

**Credit Unit: 02**

**Course Objective:**

The students will be exposed to basic concepts related with techniques and instrumentation widely used in Biotechnology. It will also develop practical skills among the students.

**Course Objective:**

The students will be exposed to basic concepts related with techniques and instrumentation widely used in Biotechnology. It will also develop practical skills among the students.

**Course Contents:**

**Module I**

Preparation of solutions, concept of pH and buffer, types of buffers and their preparation, pH meter. Principle of centrifugation, rotors, different types of centrifuges, preparative and analytical centrifugation, ultra-centrifugation.

**Module II**

Optical microscopy, Bright field, Dark field, phase contrast and fluorescence microscopy. Electron microscopy: Transmission and scanning electron microscopy, Atomic force microscopy.

**Module III**

UV and visible spectroscopy, Infrared and Atomic absorption spectroscopy, fluorescence spectroscopy, Nuclear Magnetic Resonance and Electron Spin Resonance spectroscopy,

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text books**

- Wilson, K. and Walker, J. 2008. Principles and techniques of biochemistry and molecular biology. 6th Ed., Cambridge University press, New Delhi.
- Sawhney, S. K. and Singh, R. 2011. Introductory practical biochemistry, 2nd Ed., Narosa publishing house New Delhi.
- Upadhyay, A., Upadhyay, K. and Nath, N. 2010. *Biophysical Chemistry (Principles and Techniques)*. Himalaya Publishing House Pvt. Ltd, Mumbai.

**References:**

- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.

**CELL BIOLOGY LAB****Course Code: BTB 321****Credit Units: 01****Course Contents:****Module I**

Parts and types of Microscope. Study of Onion Cells, Study of cheek cells, Study of RBC. Study of chromoplasts using Tomato, Study of chloroplast using Chili, Study of Leucoplasts using Potato.

**Module II**

Mitosis and Meiosis. Study of permanent slides of Mitosis and Meiosis.

**Module III**

Study of osmosis. Study of apoptosis using RBC

**Examination Scheme:**

<b>Components</b>	<b>IA</b>			<b>EE</b>			
	CT (Practical Based)	Viva	Attendance	Major Experiment	Minor Experiment/ Spotting	Viva	Practical Record
<b>Weightage (%)</b>	15	10	5	35	15	10	10

**BIOCHEMISTRY-I LAB****Course Code: BTB 322****Credit Units: 01****Course Contents:****Module I**

Colorimetric determination of pK.

Colour reactions of sugars. (Molischs test, iodine test, Saliwanoff test, Fehlings test, Benedicts test, Bials test).

Quantitative estimation of Sugars

**Module II**

Cholestrol estimation

Estimation of free fatty acids

Estimation of iodine number.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**MICROBIOLOGY LAB****Course Code: BTB323****Credit Units: 01****Course Contents:**

1. Preparation of solid and liquid media.
2. Isolation of microorganisms by plating, streaking and serial dilution.
3. Preparation of slant and stab cultures for bacteria and fungi
4. Enumeration of microbial population.
5. Microscopic examination of bacteria by gram staining.
6. Endospore staining.
7. Capsule staining.
8. Negative staining
9. Observe the microbes in living condition by hanging drop method.
10. Fungal slide preparation and study of characteristics of fungi.
11. Antibiotic sensitivity test.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**BASIC BIOANALYTICAL TECHNIQUES LAB**

Course Code : BTB 324

Credit Units: 01

**Course Contents :****Module I**

Preparations of solutions and buffers

**Module II**

Centrifugations technique (Centrifugation – low speed and high speed)

**Module III**

Microscopy. UV-Vis Spectrophotometer

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## TERM PAPER

**Course Code: BTB 330**

**Credit Units: 03**

### **METHODOLOGY**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### **GUIDELINES FOR TERM PAPER**

The procedure for writing a term paper may consists of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

#### **1. Choosing a Subject**

The subject chosen should not be too general.

#### **2. Finding Sources of materials**

- a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- c) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### **3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- a) Get facts, not just opinions. Compare the facts with author's conclusion.
- b) In research studies, notice the methods and procedures, results & conclusions.
- c) Check cross references.

#### **4. Outlining the paper**

- a) Review notes to find main sub-divisions of the subject.
- b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

## **6. Editing & Preparing the final Paper**

- a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- c) Check for proper spelling, phrasing and sentence construction.
- d) Check for proper form on footnotes, quotes, and punctuation.
- e) Check to see that quotations serve one of the following purposes:
  - (i) Show evidence of what an author has said.
  - (ii) Avoid misrepresentation through restatement.
  - (iii) Save unnecessary writing when ideas have been well expressed by the original author.
- f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 1) Title page
- 2) Table of contents
- 3) Introduction
- 4) Review
- 5) Discussion & Conclusion
- 6) References
- 7) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- a) summary of question posed
- b) summary of findings
- c) summary of main limitations of the study at hand
- d) details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Bibliographical conventions**

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

**Edited Articles**

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

**Journal Articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

**Electronic Book**

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

**Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

**Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

**Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

**Unpublished Theses/ Dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

**Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

**Assessment Scheme:**

**Continuous Evaluation:**

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

**Final Evaluation:**

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

## **BIOFERTILIZERS AND BIOPESTICIDES**

**Course Code: BTB331**

**Credit Unit: 03**

### **Module I**

**Biofertilizers** – Definition, kinds, microbes as biofertilizers, Symbiotic associates – Rhizobium taxonomy, Physiology, Host cell – Rhizobium interactions, mass cultivation, inoculants and serology.

### **Module II**

Frankia woodland and Actinornizal nitrogen fixing plants and its host plants, characteristics, identification, cultural method and maintenance of Azospirillum, Azotobacter, Azolla and anabaena.

### **Module III**

Mycorrhiza - VAM association, types, occurrence, Collection, isolation and inoculum production.

### **Module IV**

Large scale production of biofertilizer, Organic farming Carrier materials, general outline of microbes as fertilizers, Rhizosphere effect microbial products influencing plant growth.

### **Module V**

Biopesticides – Definition, kinds and commerce of biopesticide, Bacillus thuringiensis, insect viruses and entomopathogenic fungi – its characteristics, physiology, mechanism of action and application.

### **Reference:**

1. Subba Rao, N.S. 2000 Soil Microbiology. Oxford and IBH Publishing Co. Ltd.
2. Verma A and Hock B. 1995. Mycorrhiza. ISBN
3. Yaacovokan, 1994 - Axospirillum, CBC press.
4. Wicklow, D.T. and B.E. Soderstrom. 1997, Environmental and microbial relationships.. Springer ISBN.

## INDUSTRIAL WASTE MANAGEMENT

Course Code: BTB332

Credit Unit: 03

### OBJECTIVE

This subject deals with the pollution from major industries and methods of controlling the same. The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.

### Module I

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

### Module II

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

### Module III

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

### Module IV

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal

### Module V

Hazardous waste management - Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fills

### TEXT BOOKS:

1. M.N.Rao & A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.
2. W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi, 2000.
3. T.T.Shen, "Industrial Pollution Prevention", Springer, 1999.
4. R.L.Stephenson and J.B.Blackburn, Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New Yark, 1998
5. H.M.Freeman, "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 1995.
6. Bishop, P.L., "Pollution Prevention: Fundamental & Practice", McGraw-Hill, 2000.

## ANIMAL SCIENCE

**Course Code: BTB 333**

**Credit Unit: 03**

**Course Objective:**

To acquaint students with the general characters and classification of Acoelomates to chordates and the affinities between different groups.

**Course Contents:**

**Module I**

Protista, Parazoa and Metazoa: General characteristics. Life cycle and pathogenicity of Plasmodium vivax and Entamoeba histolytica. Porifera: General characteristics and classification. Canal system and spicules in sponges.

**Module II**

Cnidaria: General characteristics and classification; Metagenesis in Obelia; corals and coral reefs; polymorphism in Cnidaria. Platyhelminthes: General characteristics and classification. Life cycle and pathogenicity of Fasciola hepatica and Taenia solium

**Module III**

Nemathelminthes: General characteristics and classification; Life cycle, and pathogenicity of Ascaris lumbricoides and Wuchereria bancrofti; Parasitic adaptations in helminthes

Introduction to Coelomates: Evolution of Coelom and Metamerism, Annelida: General characteristics and classification up to orders. Excretion in Annelida

**Module IV**

Arthropoda: General characteristics and classification up to orders; vision and respiration in Arthropoda; Metamorphosis in Insects; social life in bees.

**Module V**

Mollusca: General characteristics and classification up to orders; Respiration in Mollusca

Echinodermata: General characteristics and classification up to classes; water vascular system in Asterozoa; Larval forms in Echinodermata; Affinities with Chordates. Introduction to Chordates: General Characteristics; outline classification, Protochordata: Hemichordata, Urochordata and Cephalochordata. General characteristics of Pisces, Amphibia, Reptilia, Aves and Mammals

**Examination Scheme**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text books:**

1. Dhama, P.S. and Dhama, J.K. Invertebrate Zoology. 5th ed. New Delhi: R. Chand & Co.,
2. Hyman L.H. The Invertebrates. Vol. I, II, III, IV and V. McGraw Hill Book Company. Inc., , 1959.

**Reference books**

1. Kotpal, R.L. Minor phyla. 5th ed. Meerut: Rastogi Publishers, 2006.
2. Kotpal, R.L. Modern Text Book of Zoology Invertebrates. 10th ed., Rastogi Publishers, Meerut, 2012.

## **ENVIRONMENTAL SCIENCES**

**Course Code:** EVS001

**Credit Units: 04**

### **Course Objective:**

The term environment is used to describe, in the aggregate, all the external forces, influences and conditions, which affect the life, nature, behaviour and the growth, development and maturity of living organisms. At present a great number of environment issues, have grown in size and complexity day by day, threatening the survival of mankind on earth. A study of environmental studies is quite essential in all types of environmental sciences, environmental engineering and industrial management. The objective of environmental studies is to enlighten the masses about the importance of the protection and conservation of our environment and control of human activities which has an adverse effect on the environment.

### **Course Contents:**

#### **Module I: The multidisciplinary nature of environmental studies**

Definition, scope and importance  
Need for public awareness

#### **Module II: Natural Resources**

##### **Renewable and non-renewable resources:**

Natural resources and associated problems

Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

#### **Module III: Ecosystems**

Concept of an ecosystem

Structure and function of an ecosystem

Producers, consumers and decomposers

Energy flow in the ecosystem

Ecological succession

Food chains, food webs and ecological pyramids

Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

#### **Module IV: Biodiversity and its conservation**

Introduction – Definition: genetic, species and ecosystem diversity

Biogeographical classification of India

Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values

Biodiversity at global, national and local levels

India as a mega-diversity nation

Hot-spots of biodiversity

Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts

Endangered and endemic species of India

Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

### **Module V: Environmental Pollution**

Definition

Causes, effects and control measures of:

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear pollution

Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Pollution case studies.

Disaster management: floods, earthquake, cyclone and landslides.

### **Module VI: Social Issues and the Environment**

From unsustainable to sustainable development

Urban problems and related to energy

Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environmental ethics: Issues and possible solutions

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.

Wasteland reclamation

Consumerism and waste products

Environmental Protection Act

Air (Prevention and Control of Pollution) Act

Water (Prevention and control of Pollution) Act

Wildlife Protection Act

Forest Conservation Act

Issues involved in enforcement of environmental legislation

Public awareness

### **Module VII: Human Population and the Environment**

Population growth, variation among nations

Population explosion – Family Welfare Programmes

Environment and human health

Human Rights

Value Education

HIV / AIDS

Women and Child Welfare

Role of Information Technology in Environment and Human Health

## Case Studies

**Module VIII: Field Work**

Visit to a local area to document environmental assets-river / forest/ grassland/ hill/ mountain.

Visit to a local polluted site – Urban / Rural / Industrial / Agricultural

Study of common plants, insects, birds

Study of simple ecosystems-pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

**Examination Scheme:**

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	15	5	5	5	70

**Text & References:**

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380 013, India, Email:mapin@icenet.net (R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
- Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
- Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
- Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
- Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
- Survey of the Environment, The Hindu (M)
- Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science
- Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
- Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
- Wanger K.D., 1998 Environnemental Management. W.B. Saunders Co. Philadelphia, USA 499p

## COMMUNICATION SKILLS - I

**Course Code:** BCS 301

**Credit Units:** 01

**Course Objective:**

To form written communication strategies necessary in the workplace.

**Course Contents:**

**Module I: Introduction to Writing Skills**

Effective Writing Skills  
 Avoiding Common Errors  
 Paragraph Writing  
 Note Taking  
 Writing Assignments  
 Types  
 Formats

**Module II**

Memo  
 Agenda and Minutes  
 Notice and Circulars

**Module III**

Purpose and Scope of a Report  
 Fundamental Principles of Report Writing  
 Project Report Writing  
 Summer Internship Reports

**Examination Scheme:**

Components	CT1	CT2	CAF	V	GD	GP	A
<b>Weightage (%)</b>	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References:**

- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Textbook of Business Communication, Ramaswami S, Macmillan
- Working in English, Jones, Cambridge
- A Writer's Workbook Fourth edition, Smoke, Cambridge
- Effective Writing, Withrow, Cambridge
- Writing Skills, Coe/Rycroft/Ernest, Cambridge
- Welcome!, Jones, Cambridge

## UNDERSTANDING SELF FOR EFFECTIVENESS - III (INTERPERSONAL COMMUNICATION)

**Course Code:** BSS305

**Credit Units:** 01

**Course Objective:**

This course provides practical guidance on:

Enhancing personal effectiveness and performance through effective interpersonal communication  
Enhancing their conflict management and negotiation skills

**Course Contents:**

**Module I**

Importance of Interpersonal Communication  
Types – Self and Other Oriented  
Rapport Building – NLP, Communication Mode  
Steps to improve Interpersonal Communication

**Module II**

Meaning and Nature of behavioural communication  
Persuasion, Influence, Listening and Questioning  
Guidelines for developing Human Communication skills  
Relevance of Behavioural Communication for personal and professional development  
Viva based on personal journal  
Assessment of Behavioural change as a result of training  
Exit Level Rating by Self and Observer

**Module III**

Transactional Analysis  
Life Position/Script Analysis  
Games Analysis  
Interactional and Transactional Styles  
Meaning and nature of conflicts  
Styles and techniques of conflict management  
Conflict management and interpersonal communication  
Meaning and Negotiation approaches (Traditional and Contemporary)  
Process and strategies of negotiations  
Negotiation and interpersonal communication

**Text & References:**

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1<sup>st</sup> Edition Cassel
- Goddard, Ken: Informative Writing, 1995 1<sup>st</sup> Edition, Cassell
- Harvard Business School, Effective Communication: United States of America
- Foster John, Effective Writing Skills: Volume-7, First Edition 2000, Institute of Public Relations (IPR)
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.

## FRENCH - III

**Course Code: FLT 301**

**Credit Units: 02**

**Course Objective:**

- To provide the students with the know-how
- To master the current social communication skills in oral and in written.
- To enrich the formulations, the linguistic tools and vary the sentence construction without repetition.

**Course Contents:**

**Module B: pp. 76 – 88 Unité 6**

**Module C: pp. 89 to 103 Unité 7**

**Contenu lexical: Unité 6: se faire plaisir**

1. acheter : exprimer ses choix, décrire un objet (forme, dimension, poids et matières) payer
2. parler de la nourriture, deux façons d'exprimer la quantité, commander un repas au restaurant
3. parler des différentes occasions de faire la fête

**Unité 7: Cultiver ses relations**

1. maîtriser les actes de la communication sociale courante (Salutations, présentations, invitations, remerciements)
2. annoncer un événement, exprimer un souhait, remercier, s'excuser par écrit.
3. caractériser une personne (aspect physique et caractère)

**Contenu grammatical:**

1. accord des adjectifs qualificatifs
2. articles partitifs
3. Négations avec de, ne...rien/personne/plus
4. Questions avec combien, quel...
5. expressions de la quantité
6. ne...plus/toujours - encore
7. pronoms compléments directs et indirects
8. accord du participe passé (auxiliaire « avoir ») avec l'objet direct
9. Impératif avec un pronom complément direct ou indirect
10. construction avec « que » - Je crois que/ Je pense que/ Je sais que

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- le livre à suivre : Campus: Tome 1

**GERMAN - III****Course Code: FLG 301****Credit Units: 02****Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

**Course Contents:****Module I: Modal verbs**

Modal verbs with conjugations and usage

Imparting the finer nuances of the language

Information about Germany in the form of presentations or "Referat" – neighbors, states and capitals, important cities and towns and characteristic features of the same, and also a few other topics related to Germany.

**Module II**

Dative case, comparison with accusative case

Dative case with the relevant articles

Introduction to 3 different kinds of sentences – nominative, accusative and dative

Nominative, accusative and dative pronouns in comparison

Dative preposition with their usage both theoretical and figurative use

**Module III**

In the Restaurant,

At the Tourist Information Office,

A telephone conversation

Names of the directions

Asking and telling the directions with the help of a roadmap

To assimilate the knowledge of the conjunctions learnt indirectly so far

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

**SPANISH – III****Course Code: FLS 301****Credit Units: 02****Course Objective:**

To enable students acquire knowledge of the Set/definite expressions (idiomatic expressions) in Spanish language and to handle some Spanish situations with ease.

**Course Contents:****Module I**

Revision of earlier semester modules

Set expressions (idiomatic expressions) with the verb *Tener, Poner, Ir...*

Weather

**Module II**

Introduction to *Gustar...* and all its forms. Revision of *Gustar* and usage of it

Translation of Spanish-English; English-Spanish. Practice sentences.

How to ask for directions (using *estar*)

Introduction to IR + A + INFINITIVE FORM OF A VERB

**Module III**

Simple conversation with help of texts and vocabulary

En el restaurante

En el instituto

En el aeropuerto

Reflexives

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español, En Directo I A
- Español Sin Fronteras -Nivel Elemental

**CHINESE – III****Course Code: FLC 301****Credit Units: 02****Course Objective:**

Foreign words are usually imported by translating the concept into Chinese, the emphasis is on the meaning rather than the sound. But the system runs into a problem because the underlying name of personal name is often obscure so they are almost always transcribed according to their pronunciation alone. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

**Course Contents:****Module I**

Drills

Dialogue practice

Observe picture and answer the question.

Introduction of written characters.

Practice reading aloud

Practice using the language both by speaking and by taking notes.

Character writing and stroke order

Measure words

Position words e.g. inside, outside, middle, in front, behind, top, bottom, side, left, right, straight.

Directional words – beibian, xibian, nanbian, dongbian, zhongjian.

Our school and its different building locations.

What game do you like?

Difference between “hii” and “neng”, “keyi”.

**Module II**

Changing affirmative sentences to negative ones and vice versa

Human body parts.

Not feeling well words e.g. ; fever, cold, stomach ache, head ache.

Use of the modal particle “le”

Making a telephone call

Use of “jiu” and “cal” (Grammar portion)

Automobiles e.g. Bus, train, boat, car, bike etc.

Traveling, by train, by airplane, by bus, on the bike, by boat.. etc.

**Module III**

The ordinal number “di”

“Mei” the demonstrative pronoun e.g. mei tian, mei nian etc.

use of to enter to exit

Structural particle “de” (Compliment of degree).

Going to the Park.

Description about class schedule during a week in school.

Grammar use of “li” and “cong”.

Comprehension reading followed by questions.

Persuasion-Please don't smoke.

Please speak slowly

Praise – This pictorial is very beautiful

Opposites e.g. Clean-Dirty, Little-More, Old-New, Young-Old, Easy-Difficult, Boy-Girl, Black-White, Big-Small, Slow-Fast ... etc.

Talking about studies and classmates

Use of “it doesn’t matter”

Enquiring about a student, description about study method.

Grammar: Negation of a sentence with a verbal predicate.

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>C</b>	<b>I</b>	<b>V</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- “Elementary Chinese Reader Part I, Part-2” Lesson 21-30

**BIOCHEMISTRY - II****Course Code:** BTB 401**Credit Units:** 03**Course Contents:****Module I**

Amino acids and peptides- classification, chemical reactions and physical properties.  
Introduction to protein structure and function. Glycoproteins -structure and function,  
Vitamins and Coenzymes: structure and function of water soluble vitamins.

**Module II**

Introduction to kinetic and catalytic mechanisms of enzymes; Regulation of enzyme activity;  
Effects of physical parameters on enzyme activity, enzyme inhibitors – types of inhibition.

**Module III**

Classification of Nitrogenous bases, Types and properties of nucleotides, Structure and properties of various nucleic acids (DNA & RNA)

**Module IV**

Amino acid deamination, urea cycle, biosynthesis and breakdown of nutritionally non-essential amino acids (asparagines, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, Tyrosine.)Specialized Products of Amino Acids, Nitrogen fixation

**Module V**

Metabolism of purines and pyrimidines, clinical significance of nucleotide metabolism, biosynthesis of nucleotide coenzymes (NAD, NADP, FAD, FMN), Catabolism of heam and clinical significance of bilirubin.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text Books:**

- Lehninger Principles of Biochemistry by M.M. Cox and D.L. Nelson, 5<sup>th</sup> edition, 2008, W.H. Freeman and company, New York.
- Biochemistry by J.M. Berg, J.L. Tymoczko and L. Stryer, 5<sup>th</sup> edition, 2002, W.H. Freeman and Company, New York.
- Biochemistry by U.Satyanarayana, 3<sup>rd</sup> edition, 2006, New Central Book Agency (p) Lt.

**Reference Books:**

- Tools of Biochemistry, T.G. Cooper, John Wiley and Sons Inc.
- Harper's Biochemistry, K. Robert, M.D. Murray, D.K. Granner, P.A. Mayes and V.I. Rodwell, McGraw-Hill/Appleton and Lange.
- Biochemistry, C.K. Mathews, K.E. Van Holde and K.G. Ahern, Benjamin / Cummings.
- Text book of Biochemistry, E.S. West, W.R. Todd, H.S. Mason, and J.T. Van Bruggen Oxford & IBH Publisher, Forth Edition.

## GENETICS

**Course code: BTB 402**

**Credit Unit : 3**

**Course Objective:**

The objective of the course is to focus on the basic principles of genetics incorporating the concepts of classical, molecular and population genetics. Compilation is required for recent advances in genetic principles for strong foundation in Biotechnology.

**Module I**

Gene and gene variation - Conventional and modern views. Mendelian inheritance and exceptions; Fine structure of gene, multiple alleles, Split genes, pseudogenes, non-coding genes, overlapping genes and multi-gene families, DNA markers -VNTR, STR, microsatellite, SNP and their detection, RFLP, RAPD, AFLP.

**Module II**

Chromatin structure and organization - DNA and higher level organization; centromere and kinetochore, telomere and its maintenance, Functional states of chromatin (Heterochromatin and euchromatin), position effect variegation; Numerical and structural chromosomal aberrations

**Module III**

Chromosome preparations, Chromosomal, G/Q- banding, radiation hybrid, Fluorescence in situ hybridization, comparative genome hybridization (CGH), Gene identification using positional and functional cloning approach.

**Module IV**

Hardy-Weinberg principle, Linkage and linkage disequilibrium, Sources responsible for changes in gene frequencies: Mutation, selection, migration and isolation; random genetic drift; insights into human migration, natural selection and evolution.

**Module V**

Human migration, Diseases and their diagnosis (Inborn errors of metabolism, Haemoglobinopathies; Multifactorial disorders) Mitochondrial myopathies, Molecular plant breeding fine mapping of QTL, Marker assisted breeding: Gene tagging.

**Examination Scheme:**

Components	CT	Attendance	Assignment/Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Suggested readings:**

1. Concepts of Genetics. Klug W. S. and Cummings M. R Prentice-Hall 10 edition (2011)
2. Genetics-a Conceptual Approach Pierce B. A. Freeman 3rd edition (2013)
3. An Introduction to Genetic Analysis Griffith A. F. et al Freeman 11<sup>th</sup> edition (2015)
4. Principles of Genetics Snustad D. P. and Simmons M. J. John Wiley & Sons. 5<sup>th</sup> edition (2009)
5. Genetics Strickberger M. W. Prentice-Hall Pearson India (2015)

**Reference**

1. Quantitative Genetics, Genomics and Plant Breeding Kang M. S. CABI Publishing
2. An Introduction to Human Molecular Genetics: Mechanism of Inherited Diseases Pasternak J Fitzgerald Science Press

## METHODS AND INSTRUMENTATION IN BIOTECHNOLOGY

Course Code: BTB 403

Credit Units: 02

### Course Objective:

The students will be exposed to techniques and instruments that are used in biotech industries.

### Course Contents:

#### Module I

Agarose Gel Electrophoresis, SDS-PAGE, Isoelectric Focusing, Two-Dimensional Electrophoresis, Capillary Electrophoresis, Immuno Electrophoresis, Rocket Electrophoresis.

#### Module II

Adsorption Chromatography (Paper Chromatography, TLC), Molecular Exclusion Chromatography, Ion-Exchange Chromatography, Affinity Chromatography, HPLC and Gas Chromatography.

#### Module III

UV and visible spectroscopy, Infrared and Atomic absorption spectroscopy, fluorescence spectroscopy, Mass Spectrometry (Ionization Technique, Mass Analyzers, Detectors, MSMS), Nuclear Magnetic Resonance and Electron Spin Resonance spectroscopy, PCR, RT-PCR, ELISA, X-ray diffraction and X-ray Crystallography

#### Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

#### Text & References:

##### Text:

- Wilson, K. and Walker, J. 2008. Principles and techniques of biochemistry and molecular biology. 6th Ed., Cambridge University press, New Delhi.
- Sawhney, S. K. and Singh, R. 2011. Introductory practical biochemistry, 2nd Ed., Narosa publishing house New Delhi.
- Upadhyay, A., Upadhyay, K. and Nath, N. 2010. *Biophysical Chemistry (Principles and Techniques)*. Himalaya Publishing House Pvt. Ltd, Mumbai.

##### References:

- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wiley and Sons Ltd.
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.

## DATABASE MANAGEMENT SYSTEMS

**Course Code:** BTB 404

**Credit Units:** 02

**Course Objective:**

It enables the students to access biological information networks and databases in order to understand the different techniques of biotechnology to build detection systems especially in the prevention and treatment of human diseases.

**Course Contents:**

**Module I**

File systems vs. DBMS, advantages of DBMS; SQL and Perl

**Module II**

Levels of abstraction and data independence; Data models and their comparison; Entity relationship model - concepts, design, keys and features; Relational model -introduction, structure of the relational databases, integrity constraints, Relational algebra and calculus -selection and projection, set operations, renaming, Joins, Division etc.

**Module III**

Functional dependencies, Normal forms; Concurrency control and database discovery -concept of transaction: atomicity, consistency, isolation and durability, transactions and schedules, concurrent execution of transactions, Lock based concurrency control, Database recovery. Data warehousing and Data Mining

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Data Mining: Concept and techniques, J. Han and M. Kamber, Morgan Kaufman.
- Data Mining, A.K. Pujari, Sangam Books Ltd.
- Database Management, P.C. Desai.
- Introduction to Database Systems, C.J. Date, Addison Wesley Publishing.

**References:**

- Principles of Database and Knowledge Based systems, J.D. Ullman, Computer Science Press.
- The Data Warehouse Lifecycle Toolkit, John Wiley and Sons Inc.
- The Data Warehouse Toolkit, R. Kimball et al, John Wiley and Sons Inc.

## STATISTICS FOR BIOLOGY

**Course Code:** BTB 405

**Credit Units:** 03

**Course Objective:**

The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques, methodology and the safe laboratory practice.

**Course Contents:**

**Module I**

Statistics and Biostatistics: Preliminary concepts.  
Measures of Central Tendency: Mean, Median, Mode  
Measures of Dispersion: Range, Standard deviation, Variance

**Module II**

Probability: Random Experiments, Trial and Event, Sample Space, Mutually Exclusive or Disjoint Events, Mutually Exhaustive Events, Equally Probable Events, Complementary Event, Classical definition of Probability, Statistical definition of Probability, Axiomatic definition of Probability, Addition theorem, Multiplication theorem, Conditional Probability, Bayes' Theorem. Expectation.

**Module III**

Normal Distribution, Properties of Normal distribution. Bivariate distribution Correlation, Types of Correlation, Simple Correlation Coefficient for ungrouped data, Properties and Interpretation of Correlation Coefficient, Coefficient of determination, Scatter diagram, Standard Error, Probable error of Correlation Coefficient. Rank correlation, Some examples.

**Module IV**

Regression - Definition, Regression lines and Regression Coefficients, Properties of Regression Coefficients, Some examples. Method of least square: Fitting of straight line. Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type I Error, Type II Error, Level of significance, P-value and its applications.

**Module V**

Test of Significance for Small samples: One sample t-test, Paired t-test, Degrees of freedom for t-test, F test for equality of Population variances, Degrees of freedom for F-test.  
Test of Significance for Large samples: Normal test for sample mean and population mean, Normal test for two sample means. Chi-square Test: Test of goodness of fit, Test of Independence of attributes, Degrees of freedom for Chi-square test, Coefficient of contingency, Yates' correction for continuity.  
Analysis of Variance: One way and Two way (only Examples)

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee, Publisher: Elsevier.

- Statistical Methodology, S.P. Gupta, Publisher: S. Chand & Co.
- Fundamentals of Statistics, S.C. Gupta. Publisher: S.Chand & Co.

***References:***

- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. Visweswara Rao. Publisher: Jaypee Brothers  
Biostatistics: A foundation for analysis in the Health Sciences, W.W. Daniel, Publisher: John Wiley and Sons
- Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Publisher: S.Chand & Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers
- Statistical Methods, Potri, D. Kalyani Publishers.
- Mathematical Statistics, H.C. Saxena, and V.K. Kapoor: S. Chand & Company
- Biostatistics, P.N. Arora and P.K. Malhan, Publisher: Himalaya Publishing House.

**BIOCHEMISTRY- II LAB****Course Code: BTB 421****Credit Units: 01****Course Contents:****Module I**

Colour reactions of proteins (Ninhydrin test, Biuret test, Xanthoprotein test etc.).

Quantitative estimation of proteins.

**Module II**

Biochemical estimation of DNA

Biochemical estimation of RNA

Quantitative determination of DNA and RNA by spectrophotometric method using UV range.

Separation of DNA on Agrose gel.

**Module III**

Enzyme: Enzyme activity study of serum alkaline phosphatase

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**GENETICS LAB****Course Code : BTB 422****Credit Units: 01****Course Contents :**

1. Characterization of genes, monohybrid ratios, sex-linkage (Virtual FlyLab, FlyBase)
2. Human pedigree analysis (Biology Labs Online)
3. Dihybrid crosses, independent assortment (Virtual FlyLab)
4. Linked genes and gene mapping
5. Molecular markers (Biology Labs Online), Genealogical Markers: mtDNA and the Y Chromosome

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**References:**

- Desharnis, R. and Bell, J. 2001. Lab Manual for Biology Labs On-Line. Addison Wesley Longman.
- Genetic Variation: A Laboratory Manual 2007 Weiner M.P, Gabriel S.B, Stephens J.B *Motif BioSciences, New York* • 472 pp

**METHODS AND INSTRUMENTATION IN BIOTECHNOLOGY LAB****Course Code : BTB423****Credit Units: 01****Course Contents :****Module I**

Agarose Gel electrophoresis,  
SDS-PAGE,  
Immuno-Electrophoresis

**Module II**

Chromatography –Paper Chromatography and Thin Layer Chromatography

**Module III**

Spectrophotometer techniques

**Module IV**

PCR and ELISA

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**DATABASE MANAGEMENT LAB****Course Code: BTB 424****Credit Units: 01****Course Contents:****Module I**

Database creation using DDL and DML.

**Module II**

Defining the primary and secondary keys. Implementation of selection, projection and joins (internal and external) with SQL and Perl.

**Module III**

Normalization of databases with SQL and Perl. Implementation of transactions and schedules. Detection of association rules and knowledge recovery.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## TERM PAPER

**Course Code: BTB 430**

**Credit Units: 03**

### METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

7. Choosing a subject
8. Finding sources of materials
9. Collecting the notes
10. Outlining the paper
11. Writing the first draft
12. Editing & preparing the final paper

#### 1. Choosing a Subject

The subject chosen should not be too general.

#### 2. Finding Sources of materials

- d) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- e) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- f) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### 3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- d) Get facts, not just opinions. Compare the facts with author's conclusion.
- e) In research studies, notice the methods and procedures, results & conclusions.
- f) Check cross references.

#### 4. Outlining the paper

- c) Review notes to find main sub-divisions of the subject.
- d) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### 5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

## **6. Editing & Preparing the final Paper**

- g) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- h) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- i) Check for proper spelling, phrasing and sentence construction.
- j) Check for proper form on footnotes, quotes, and punctuation.
- k) Check to see that quotations serve one of the following purposes:
  - (iv) Show evidence of what an author has said.
  - (v) Avoid misrepresentation through restatement.
  - (vi) Save unnecessary writing when ideas have been well expressed by the original author.
- l) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 8) Title page
- 9) Table of contents
- 10) Introduction
- 11) Review
- 12) Discussion & Conclusion
- 13) References
- 14) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- e) summary of question posed
- f) summary of findings
- g) summary of main limitations of the study at hand
- h) details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Bibliographical conventions**

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited Articles**

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

### **Journal Articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

### **Electronic Book**

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished Theses/ Dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Assessment Scheme:**

#### **Continuous Evaluation:**

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

#### **Final Evaluation:**

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

## DEVELOPMENTAL BIOLOGY

**Course Code: BTB 431**

**Credit Unit: 03**

### THEORY

#### Course Objective:

To enable the students understand the process of development in various animals and the phenomena associated with it. It also includes the genetic involvement and the role of maternal environment on fetal development.

#### Course Contents:

##### Module I

Introduction to the basic concepts of embryology and developmental biology. Gametogenesis: Spermatogenesis, its cellular and hormonal regulation. Oogenesis-Folliculogenesis and oocyte maturation. Fertilization-The cellular and molecular events-cell surface molecules in sperm-egg recognition in animals and union of gametes.

##### Module II

Cleavage patterns in animals. Early embryonic development and role of maternal contributions. Blastula formation and embryonic fields. Gastrulation and formation of germ layers. Morphogenesis, morphogenetic cells and molecules.

##### Module III

Genetic regulation in early development of Drosophila-Homeotic genes, Neurulation and Organogenesis. Eye lens induction in Caenorhabditis elegans. Limb development and regeneration in vertebrates.

##### Module IV

Post embryonic development-larva formation. Metamorphosis-environmental regulation in normal development

##### Module V

Potency, commitment, specification of embryonic cells, Differentiation. Morphogenetic gradients in egg cytoplasm. Cell fate, cell lineages. Stem cells. Transgenics and their role in analysis of development. Programmed Cell Death, ageing and senescence

#### Examination Scheme

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

#### Text books:

3. Muller, W. A. Developmental Biology Springer, 1997.
4. Rastogi, V. B. and Jayaraj M. S. Developmental Biology. Meerut: Kedar Nath Ram Nath, 2009.

#### Reference books:

1. Wolpert, L. et al. Principles of Development. 2nd ed., Oxford, 2001.

## INDUSTRIAL BIOTECHNOLOGY

**Course Code: BTB 432**

**Credit units: 03**

**OBJECTIVE:** Biotechnological and pharmaceutical industries require specialized trained manpower with production and manufacturing skills. B.Tech students specializing in Biotechnology need to know the following for effective and Industry oriented research, hence the following syllabus is designed to be pursued by students specializing in this important discipline.

### Module I

Advantage of bioprocess over chemical process. Basic principle in bioprocess technology. Media formulation, Cell culture techniques; Inoculum development and aseptic transfers. Different types of pumps, valves, and line materials, piping conventions etc. used in Biochemical Process Operational modes of bioreactors-Fed batch cultivation, Cell recycle cultivation.

### Module II

Bioreactor scale up-regime analysis of bioreactor processes, oxygen mass transfer in bioreactors-microbial O<sub>2</sub> demand, methods for determination of mass transfer coefficient, mass transfer correlations. Sensors used in bioprocesses like pH, Temperature, Dissolved Oxygen, N, P, Anti foam etc.

### Module III

Characteristics of Bioproducts; Coagulation, Flocculation and conditioning of broth, Mechanical separation; Cell disruption techniques; Protein precipitation and separation, Aqueous- two- phase extraction, Adsorption-desorption processes, Chromatographic methods of separation based on size, charge, hydrophobic interactions and biological affinity Membrane based separation; Dialysis, Electrodialysis; Micro filtration, Ultra filtration; Electrophoresis; Crystallization; Drying

### Module IV

Introduction; general design information; Mass and energy balance. Flow sheeting; Piping and instrumentation; Materials of construction for bioprocess plants; Vessels for biotechnology application; Design of fermenters; Design considerations for maintaining sterility of process streams processing equipment.

### Module V

Design of facilities for cleaning of process equipment used in biochemical industries. Utilities of biotechnology production plant; Safety considerations.

### Examination Scheme:

Components	CT	Attendance	Assignment/Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

### TEXT BOOKS

- Shuler, Michael L. and Fikret Kargi, " Bioprocess Engineering ", Prentice Hall, 1992.
- Doran, Pauline "of Bioprocess Engineering Principles ". Elsevier, 1995
- Belter, P.A. E.L. Cussler And Wei-Houhu – "Bioseparations – Downstream Processing For Biotechnology, Wiley Interscience Pun. (1988).
- Sivasankar, B. "Bioseparations: Principles and Techniques". PHI, 2005.

### REFERENCES

- Lydersen, Bjorn K. "Bioprocess Engineering Systems, Equipment and Facilities" John Wiley, 1994.

2. Bailey, James E. and David F. Ollis, "Biochemical Engineering Fundamentals", 2nd Edition. McGraw Hill, 1986.

3. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, Principles of Fermentation Technology, Science & Technology Books.

## FOOD MICROBIOLOGY

**Course Code: BTB: 433**

**Credit Unit: 03**

**Course Objective:**

To introduce to students groups of microorganisms important for food industry with special emphasis on their role in manufacture, preservation, spoilage of foods and in food poisoning

**Course Contents:**

**Module I**

The scope of Food Microbiology, Classification and identification of microorganisms important for food industry; Sources of microbial contamination at pre- and post- processing stages; Microbial Growth, Factors which influence growth of microorganisms in foods

**Module II**

General methods of food preservation; Microbiology of Food preservations, Classification of preservation methods on the basis of action on microorganisms and severity of treatment

**Module III**

Microbiology of fermented food products- Tempeh, Soy sauce, Sauerkraut, Yoghurt, Kefir, Kumis, Acidophilus milk, Bulgaricus milk, Baker's yeast, Beer, Cider Vinegar, Indigenous food products; Nutritional and therapeutic values of fermented foods

**Module IV**

Microbial spoilage of fruit and vegetable products; Microbial spoilage of cereals based products; Microbial spoilage of milk and milk products; Microbial spoilage of meat, fish and poultry products

**Module V**

Growth of pathogens in foods and food borne diseases: Botulism, Salmonellosis, Shigellosis, Enteritis, Gastroenteritis, Listeriosis, Mycotoxins; Prevention of food-borne diseases; Food Hazards.

**Examination Scheme:**

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

**Text & References:**

- Adams, M. R., & Moss, M. O., (2008) Food Microbiology, 3rd edition, RSC Publishing

Jay, James M., Loessner, Martin J., Golden, & David, A., (2005) Modern Food Microbiology, 7th edition, Springer .

Frazier, W.C., & Westhoff, D.C., (1987) Food Microbiology, 4th edition, Tata McGraw-Hill Education.

## COMMUNICATION SKILLS - II

**Course Code :** BCS 401

**Credit Units:** 01

**Course Objective:**

To teach the participants strategies for improving academic reading and writing.

Emphasis is placed on increasing fluency, deepening vocabulary, and refining academic language proficiency.

**Course Contents:**

**Module I: Social Communication Skills**

Small Talk

Conversational English

Appropriateness

Building rapport

**Module II: Context Based Speaking**

In general situations

In specific professional situations

Discussion and associated vocabulary

Simulations/Role Play

**Module III: Professional Skills**

Presentations

Negotiations

Meetings

Telephony Skills

**Examination Scheme:**

Components	CT1	CT2	CAF	V	GD	GP	A
Weightage (%)	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References:**

- Essential Telephoning in English, Garside/Garside, Cambridge
- Working in English, Jones, Cambridge
- Business Communication, Raman –Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
- Business Communication, Raman –Prakash, Oxford

## **UNDERSTANDING SELF FOR EFFECTIVENESS - IV (RELATIONSHIP MANAGEMENT)**

**Course Code :** BSS405

**Credit Units: 01**

**Course Objective:**

To understand the basis of interpersonal relationship.

To understand various communication style.

To learn the strategies for effective interpersonal relationship.

**Course Contents:**

**Module I: Understanding Relationships**

Importance of relationships

Role and relationships

Maintaining healthy relationships

Understanding individual differences

Bridging differences in Interpersonal Relationship – TA

Communication Styles

**Module II**

Importance of Interpersonal Relationships

Interpersonal Relationships Skills

Types of Interpersonal Relationships

Theories: Social Exchange, Uncertainty Reduction Theory

Factors Affecting Interpersonal Relationships

Improving Interpersonal Relationships

**Module III**

Meaning & Components of Impression Management

Impression Management Techniques (Influencing Skills)

Impression Management Training-Self help and Formal approaches

Viva based on personal journal

Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

**Text & References:**

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1<sup>st</sup> Edition Cassell
- Goddard, Ken: Informative Writing, 1995 1<sup>st</sup> Edition, Cassell
- Harvard Business School, Effective Communication: United States of America
- Foster John, Effective Writing Skills: Volume-7, First Edition 2000, Institute of Public Relations (IPR)
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.

## FRENCH - IV

**Course Code:** FLT 401

**Credit Units:** 02

**Course Objective:**

To enable students:

- To develop strategies of comprehension of texts of different origin
- To present facts, projects, plans with precision

**Course Contents:**

**Module C: pp. 104 – 139: Unités 8, 9**

**Contenu lexical: Unité 8: Découvrir le passé**

1. parler du passé, des habitudes et des changements.
2. parler de la famille, raconter une suite d'événements/préciser leur date et leur durée.
3. connaître quelques moments de l'histoire

**Unité 9: Entreprendre**

1. faire un projet de la réalisation: (exprimer un besoin, préciser les étapes d'une réalisation)
2. parler d'une entreprise
3. parler du futur

**Contenu grammatical:**

1. Imparfait
2. Pronom « en »
3. Futur
4. Discours rapporté au présent
5. Passé récent
6. Présent progressif

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- le livre à suivre : Campus: Tome 1

**GERMAN - IV****Course Code: FLG 401****Credit Units: 02****Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany.

Introduction to Advanced Grammar Language and Professional Jargon

**Course Contents:****Module I: Present perfect tense**

Present perfect tense, usage and applicability

Usage of this tense to indicate near past

Universal applicability of this tense in German. Letter writing - To acquaint the students with the form of writing informal letters.

**Module II**

Usage of prepositions with both accusative and dative cases

Usage of verbs fixed with prepositions

Emphasizing on the action and position factor. Introduction to simple past tense

Learning the verb forms in past tense

Making a list of all verbs in the past tense and the participle forms

**Module III**

Comprehension and narration

- Rotkäppchen
- Froschprinzessin
- Die Fremdsprache

Genitive case – Explain the concept of possession in genitive

Mentioning the structure of weak nouns

Discuss the genitive prepositions and their usage: (während, wegen, statt, trotz)

Firstly recognize the persons or things in the picture and identify the situation depicted in the picture;

Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch

- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

## SPANISH - IV

**Course Code: FLS 401**

**Credit Units: 02**

**Course Objective:**

To enable students acquire working knowledge of the language; to give them vocabulary, grammar, voice modulations/intonations to handle everyday Spanish situations with ease.

**Course Contents:**

**Module I**

Revision of earlier semester modules

Introduction to Present Continuous Tense (Gerunds)

**Module II**

Translation with Present Continuous Tense

Introduction to Gustar, Parecer, Apetecer, doler

Imperatives (positive and negative commands of regular verbs)

**Module III**

Commercial/business vocabulary

Simple conversation with help of texts and vocabulary

En la recepcion del hotel

En el restaurante

En la agencia de viajes

En la tienda/supermercado

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español Sin Fronteras (Nivel – Elemental)

**CHINESE – IV****Course Code: FLC 401****Credit Units: 02****Course Objective:**

How many characters are there? The early Qing dynasty dictionary included nearly 50,000 characters the vast majority of which were rare accumulated characters over the centuries. An educate person in China can probably recognize around 6000 characters. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

**Course Contents:****Module I**

Dialogue Practice

Observe picture and answer the question

Pronunciation and intonation

Character writing and stroke order.

Electronic items

**Module II**

Traveling – The Scenery is very beautiful

Weather and climate

Grammar question with – “bu shi .... Ma?”

The construction “yao ... le” (Used to indicate that an action is going to take place)

Time words “yiqian”, “yiwai” (Before and after).

The adverb “geng”.

Going to a friend house for a visit meeting his family and talking about their customs.

Fallen sick and going to the Doctor, the doctor examines, takes temperature and writes prescription.

Aspect particle “guo” shows that an action has happened some time in the past.

Progressive aspect of an actin “zhengzai” Also the use if “zhe” with it.

To welcome someone and to see off someone .... I cant go the airport to see you off... etc.

**Module III**

Shipment. Is this the place to checking luggage?

Basic dialogue on – Where do u work?

Basic dialogue on – This is my address

Basic dialogue on – I understand Chinese

Basic dialogue on – What job do u do?

Basic dialogue on – What time is it now?

Basic dialogue on – What day (date) is it today?

Basic dialogue on – What is the weather like here.

Basic dialogue on – Do u like Chinese food?

Basic dialogue on – I am planning to go to China.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- “Elementary Chinese Reader, Part-2” Lesson 31-38

## MOLECULAR BIOLOGY

**Course Code:** BTB 501

**Credit Units:** 03

**Course Objective:**

The aim is to extend understanding of the molecular mechanisms via which genetic information is stored, expressed and transmitted among generations.

**Course Contents:**

**Module I**

DNA Replication and repair - Mechanism of Prokaryotic and Eukaryotic DNA replication, Enzymes and accessory proteins involved in DNA replication, DNA repair Mechanism.

**Module II:**

Transcription - Prokaryotic transcription, Eukaryotic transcription, RNA polymerase, General and specific transcription factors, Regulatory elements.

**Module III**

Modifications in RNA - 5'-cap formation, transcription termination, 3'-end processing and polyadenylation, Splicing, Editing, Nuclear export of mRNA and mRNA stability, inhibition of splicing, disruption of RNA structure and capping,

**Module IV**

Translation - Prokaryotic and Eukaryotic translation, the translation Machinery; Mechanisms of initiation, elongation and termination, regulation of translation, co-and post-translational modifications of proteins.

**Module V**

Regulation of Gene Expression in prokaryotic and eukaryotic systems - Lac operon, Ara operon, *trp* operon, regulation in Eukaryotes

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Concepts of Genetics, W.S. Klug, and M.R. Cummings 2004, Pearson Education
- Genome, T.A. Brown, John Willey & Sons Inc.
- Molecular Biology of the Cell. B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson, Garland Publishing
- Gene VIII, Benjamin Lewin 2005, Oxford University Press

**References:**

- Molecular Cell Biology, H. Lodish, A. Berk, S. Zipursky, P. Matsundaira, D. Baltimore and J.E. Barnell, W.H. Freeman and Company.

## **B.Tech. Biotechnology (Syllabus)**

- Molecular Cloning: A Laboratory Manual ( 3-Vilcume set), J. Sambrook, E.F. Fritsch and T. Maniatis, Cold spring Harbor Laboratory Press.
- Molecular Biology of the Gene, J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison-Wesley Publishing.

## **JAVA-1**

**Course Code: BTB 502**

**Credit Units: 02**

**Course Objective:**

This course will introduce the essential topics of Internet Programming predominately with the Java programming language. Students will design and write interactive WWW pages using Java, , CGI, VRML programming languages. Students will develop software that manipulates different forms of data such as hypertext, graphics, video, and sound. Advanced interactive/executable web pages will be developed.

**Course Contents:**

**Module I**

Basics of computer communication, OSI Model of ISO, LAN, WAN, Internet, Evolution of Internet, Internet Applications, TCP/IP, Introduction to RFC, Addressing in Internet – IP and Domains, Internet Service Providers.

**Module II**

Introduction to Java, Java features, An Overview of Java, Data Types, Variables, Arrays, Operators, and Control Statements.

**Module III**

Introducing Classes, A Closer look at Methods and Classes, Inheritance, Packages and Interfaces, Exception Handling, Multithreaded Programming, I/O, and Applets. The Java Library String Handling, Exploring java lang, Input/Output: Exploring java. io, Networking, and Event Handling. Introducing the AWT: Working with Windows, Layout Managers, and Images.

**Examination Scheme:**

<b>Components</b>	<b>CT</b>	<b>HA/V/Q</b>	<b>Attd</b>	<b>EE</b>
<b>Weightage (%)</b>	15	10	5	70

**Text & References:**

**Text:**

- Patrick Naughtn and Herbert Schildt The Complete Reference, Java 2, TMH
- Douglas E.Cmer, Computer Networks & Internet, Pearson.

**References:**

- The Internet :By- Douglas E.Cmer: TMH

## PLANT BIOTECHNOLOGY

**Course Code:** BTB 503

**Credit Units:** 03

**Course Objective:**

The application of Plant Biotechnology covers major areas related to commercial applications. Regeneration of plants through *in vitro* techniques offers a practical strategy for micro propagation. Importance will also be given to areas like *in vitro* fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal biotechnology.

**Course Contents:**

**Module I**

Historical perspective of plant tissue culture.  
Tissue culture lab and organization  
Sterilisation techniques  
Types of nutrient media and media composition  
Role of phytohormones

**Module II**

Cell culture techniques- tissue, organ cultures, callus culture,  
Plant regeneration pathways-Micropropagation  
Organogenesis and somatic embryogenesis.  
Somaclonal variation

**Module III**

Protoplast and cell culture. Protoplast fusion and applications.  
Suspension culture : Batch culture and continuous culture  
Applications of plant cell and tissue culture.  
Production haploids, Preservation of germplasm.

**Module IV**

Genetic engineering in plants: Identification of desired gene, Preparation of recombinant DNA, transformation vectors, Gene transfer techniques-vector mediated and vector less gene transfer. Transgenic plants plant development.

**Module V**

Transgenic crop with new traits-herbicide tolerance, insect and disease resistance, Golden rice  
Therapeutic proteins and compounds  
Oral vaccines  
Bioethics of plant genetic engineering

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

- An Introduction to Plant Tissue Culture, M.K. Razdan, Oxford and IBH Publishing
- Experiments in Plant Tissue Culture, J.H. Dodds and L.K. Roberts, Cambridge University Press

## **B.Tech. Biotechnology (Syllabus)**

- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker
- Plant Biotechnology, J. Hammond, P.McGarvy and V. Yusibov, Springer Verlag.
- Plant Cell & Tissue Culture for the Production of Food Ingredients, T-J Fu, G. Singh and W.R. Curtis, Kluwer Academic/Plenum Press
- Plant Tissue Culture: Theory & Practice, S.S. Bhojwani and M.K. Razdan, Elsevier Health Sciences

## ANIMAL BIOTECHNOLOGY

**Course Code:** BTB 504

**Credit Units:** 03

**Course Objective:**

**Course Contents:**

### Module I

Historical perspectives, sterilization methods, organ culture - culture techniques, plasma clot, raft methods, agar gel, grid method, organ engineering. Cell culture substrates, cultural media, natural and artificial media, initiation and maintenance of cell cultures, cell culture products, cryopreservation techniques, immobilized cultures.

### Module II

In vitro fertilization, Embryo transfer, Steps, Advantages and Disadvantages; Somatic cell hybridization, Monoclonal antibody, Hybridoma technology for monoclonal antibody production

### Module III

Animal genetic engineering, Types of vectors, Gene transfer methods – Viral based (Adenovirus, Lentivirus, Retrovirus, Adeno associated virus), Non-viral based (Microinjection, Liposome, Electroporation, Nucleofection) methods of gene transfer

### Module IV

Transgenic animal production, Steps, Advantages, Disadvantages, Transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutic etc.

### Module V

Bioethical issues related to animal biotechnology (In vitro fertilization, Embryo transfer, Transgenic animals). Animal diseases, Laboratory Diagnosis of Infectious Diseases, Host pathogen interaction, Immunological methods for diagnosis, Nucleic Acid Based Assays, Biomarkers for animal disease diagnosis, Vaccines for prevention of diseases.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References**

- Cell Culture LabFAX, M. Butler and M. Dawson, Bios scientific Publications Ltd.
- Cell Growth and Division – A Practical approach, R. Basega, IRL Press
- Culture of Animal Cells, R.I Freshney, Wiley-Leiss
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima Publication

## FUNDAMENTALS OF BIOCHEMICAL ENGINEERING

**Course Code:** BTB-505

**Credit Units:** 03

**Course Objective:**

The course material on the kinetics of microbial growth, substrate utilization and product formation etc. may help the students to understand the various principles involved in instrumentation and control of bioprocess.

**Course Contents:**

**Module I**

Kinetics of microbial growth, substrate utilization and product formation;

**Module II**

Sterilization of air and medium;

**Module III**

Batch, continuous and fed batch reactors; mass and energy balance in microbial processes

**Module IV**

Mass transfer in Biological reactions; Scale- up principles;

**Module V**

Instrumentation and control of bioprocesses

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
<b>Weightage (%)</b>	15	5	10	70

**Text & References:**

**Text:**

- Biochemical Engineering- Kinetics, Mass Transport, Reactors and Gene Expression, W F Weith, John Wiley and Sons Inc
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Biochemical Engineering Fundamentals, J E Baily and D F Oillis, McGraw Hill
- Bioprocess Engineering Principles, P Doran, Academic Press

**References:**

- Chemical Engineering, J M Coulson, and J F Richardson, Butterwirth Heinemann
- Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment, HC Vogel, CL Todaro, CC Todaro, Noyes Data Corporation/Noyes Publications
- Process Engineering in Biotechnology, A T Jackson, Prentice Hall

**MOLECULAR BIOLOGY LAB****Course Code: BTB 521****Credit Units: 01****Course Contents:****Module I**

Preparation of DNA: genomic, Plasmid

**Module II**

Isolation of RNA

**Module III**

RFLP analysis

**Module IV**

Gel filtration

Preparation of Competent Cells

Restriction Digestion and Ligation of DNA

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## JAVA-1 LAB

Course Code:

BTB 522

Credit Units: 01

### Course Contents:

1. Write a Java Program to calculate & print first n Fibonacci numbers.
2. Write a Java Program to reverse the digits of a numbers.
3. Write a Java Program to compute & print factorial of any given number.
4. Write a Java Program to compute the sum of digits of a given integer.
5. Assume that a bank maintains two kinds of account for its customers, one called saving and other current. The saving account provides compound interest and withdrawal facilities but not cheque book. The current account provides cheque book but no interest. Current account holders should also maintain a min balance & if the balance falls below, a service charge is imposed. Create a class Account that stores customer name, account number & type of account. From this derive the classes Curr-acc & Sav-acc to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:
  - a) Accept deposit from a customer and update the balance
  - b) Display the balance.
  - c) Compute and deposit interest
  - d) Permit withdrawal and update the balance.
  - e) Check for the minimum balance, impose penalty. If necessary, and update the balance
6. Write a Java Program to sort element of the array.
7. Write a Java Program to read marks out of 100 declare result as follows:
  - a. 60 or more      1st class
  - b. 50-59            2nd class
  - c. 40-49            pass
  - d. Less than 40    fail
8. Write a java program to check whether a year is a leap year or not.
9. Write a Java Program to read string from console and display the number of occurrence of each word
10. Write a Java Program to demonstrate use of Inheritance through vehicle, two wheeler, four wheeler and three-wheeler class.
11. Write a Java Program to take a filename as command line argument and display its contents.
12. Write a Java Program that reads a file and then displays it, with a line number before each line.
13. Write a Java Program that displays number of characters, lines and words in a text file.
14. Write a Java Program that appends the contents of one file to another.
15. Write a Java Program to demonstrate runtime polymorphism with the help of abstract classes.
16. Write a Java Program to demonstrate runtime polymorphism with the help of interfaces.
17. Write a java program to display the use of all access modifiers with the help of two packages
18. Write a Java Program to demonstrate how we can make sure that the main thread gets executed after the child threads finishes.
19. Write a Java Program to show exception handling. Also demonstrate the use of finally.
20. Write a Java program which takes as input a number and throws a user defined exception when number is greater than 10.

### Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**PLANT BIOTECHNOLOGY LAB****Course Code: BTB 523****Credit Units: 01****Course Contents:****Module I**

Sterilization of glasswares and equipments.  
Preparation of cotton plugs and culture media  
Preparation of stocks for culture media  
Preparation of culture media

**Module II**

Preparation and sterilization of different explants  
Inoculation of explants on culture media

**Module III**

Study of viability of seeds  
Embryo culture

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**ANIMAL BIOTECHNOLOGY LAB****Course Code: BTB 524****CreditUnits: 01****Course Contents:**

1. Preparation, standardization and sterilization of culture media
2. Inoculation of specific tissues for callusing
3. Inoculation and maintenance of cell lines
4. Study of toxicity on cell lines

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## TERM PAPER

**Course Code: BTB 530**

**Credit Units: 03**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### **GUIDELINES FOR TERM PAPER**

The procedure for writing a term paper may consist of the following steps:

13. Choosing a subject
14. Finding sources of materials
15. Collecting the notes
16. Outlining the paper
17. Writing the first draft
18. Editing & preparing the final paper

#### **1. Choosing a Subject**

The subject chosen should not be too general.

#### **2. Finding Sources of materials**

- g) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- h) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- i) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### **3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- g) Get facts, not just opinions. Compare the facts with author's conclusion.
- h) In research studies, notice the methods and procedures, results & conclusions.
- i) Check cross references.

#### **4. Outlining the paper**

- e) Review notes to find main sub-divisions of the subject.
- f) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

## **6. Editing & Preparing the final Paper**

- m) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- n) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- o) Check for proper spelling, phrasing and sentence construction.
- p) Check for proper form on footnotes, quotes, and punctuation.
- q) Check to see that quotations serve one of the following purposes:
  - (vii) Show evidence of what an author has said.
  - (viii) Avoid misrepresentation through restatement.
  - (ix) Save unnecessary writing when ideas have been well expressed by the original author.
- r) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 15) Title page
- 16) Table of contents
- 17) Introduction
- 18) Review
- 19) Discussion & Conclusion
- 20) Bibliography
- 21) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- i) summary of question posed
- j) summary of findings
- k) summary of main limitations of the study at hand
- l) details of possibilities for related future research

### **Bibliography**

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Bibliographical conventions**

#### *Monographs*

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

**Edited volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

**Edited articles**

Schmidt, R. /Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

**Journal articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

**Electronic book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

**Electronic journal articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal [online]* 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

**Other websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

**Unpublished papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

**Unpublished theses/ dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

**Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

**Assessment Scheme:**

**Continuous Evaluation:**

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

**Final Evaluation:**

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

## TISSUE ENGINEERING

**Course Code: BTB 531**

**Credit Units: 03**

### Course Objective:

This course will cover topics related to the design and functional assessment of bioengineered tissue substitutes. Strategies for engineering tissues with a load-bearing function will be of particular focus. Strategies to study cell-surface and cell-cell interactions to physical stimuli, bioreactors, biological scaffolds and 3D cell-tissue constructs will be explored through recent papers.

### Course Contents:

#### Module I

Basic definition, History, Concepts and overview, Principles and components, current scope of development; use in therapeutics and in vitro testing

#### Module II

Scaffolds: Functions, Types (ECM-like Scaffolds, Tissue-Derived Scaffolds, Fibrin Gel, Natural Sponge; Injectable Scaffolds, Elastic Scaffolds, Inorganic Scaffolds Composite Scaffolds). Biomaterials: properties, cellular adhesion, surface modifications. Polymers (Natural such as Protein and Polysaccharides; Synthetic such as Poly( $\alpha$ -hydroxyacids, Hydrogels and Polyurethanes), Composite.

#### Module III

Fundamental properties of cells, autologous, allogeneic, syngeneic, and xenogeneic cells, and genetically engineered cells, Stem and progenitor cells. Cell Extraction, Biomolecules /synthetic ECM: Growth Factors (Representative Growth factors), Delivery of Growth factors

#### Module IV

Biomechanics aspects of tissue engineering: application of physical forces, Principles of Scaffold Design – Material considerations, 2 D cell expansion, 3D Tissue Architecture and Function Transport considerations, Bioreactors, Cell seeding and metabolism considerations, Design of Polymeric Scaffolds, Interface Biology – Biocompatibility/Immunogenicity.

#### Module V

Musculoskeletal Tissue Engineering, Cardiovascular Tissue Engineering, Neural Tissue Engineering, Visceral Tissue Engineering. Other Key Issues and Emerging Areas of Interest: Nanobiotechnology, Ethical Issues, FDA and Regulatory Issues, Tissue Engineering Market

### Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

### Text & References:

#### Text:

- Frontiers in Tissue Engineering (ISBN 0080426891), Patrick, Mikos, McIntire, Pergamon
- Principles of Tissue Engineering (ISBN 0124366309), Lanza, Langer, Vacanti, Academic Press

***References:***

- Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues By W. Mark Saltzman; Published Oxford University Press US, 2004, pp 523
- Tissue engineering Fundamentals and Applications By Yoshito Ikada, Published Elsevier, 2006, pp 469
- Tissue Engineering Methods & Protocols (ISBN 0896035166, Morgan and Yarmush, Humana Press.

**CANCER BIOLOGY****Course Code: BTB 532****CreditUnits: 03**

**Course objective** - The profound impact of cancer on our society has been the driving force behind major research advances in this field. A better understanding of the basic biology of cancer and its impact on the human body has led to more effective treatments, enhanced detection methods, and the development of prevention strategies. This course will provide a comprehensive overview of the biology and pathology of cancer.

**Module I**

Introduction to Cancer, cellular immortalization, and tumorigenesis, multistep process of cancer

**Module II**

Tumor cells possess genetic abnormalities, the discovery of oncogenes, Mechanisms of oncogene activation, Role of growth factors and receptors in carcinogenesis

**Module III**

Overview of the hallmarks of cancer,  
Mutagens, carcinogens, and mutations, Tumor viruses

**Module IV**

RAS signaling in cancer, and the discovery of tumor suppressors, Cell cycle control and the pRb tumor suppressor  
Apoptosis and the p53 tumor suppressor

**Module V**

Cellular senescence, Telomeres, Familial cancer syndromes

**Examination Scheme:**

<b>Components</b>	<b>CT</b>	<b>Attendance</b>	<b>Assignment/ Project/Seminar/Quiz</b>	<b>EE</b>
<b>Weightage (%)</b>	15	5	10	70

**Text & References:**

1. Kleinsmith, L. J. (2006). Principles of cancer biology. Benjamin-Cummings Publishing Company.
2. Ruddon, R. W. (2007). Cancer biology. Oxford University Press.
3. Weinberg, R. (2013). The biology of cancer. Garland

## CLINICAL MICROBIOLOGY

**Course Code: BTB 533****Credit Units: 03****Course Objective:**

Aim of the course is to concentrate on principles of clinical microbiology developed through the units in basic microbiology and medical microbiology. Students will become familiar with diagnostic and public health microbiology, modern techniques for the identification of pathogens in diagnostic laboratories and antimicrobial chemotherapy in patient care.

**Course Contents:****Module I**

Introduction to clinical microbiology, history, scope, current status, diagnostic methods applied to clinical microbiology, host parasite interaction.

**Module II**

History, description mode of infection, treatment & prevention of bacterial diseases .i.e Anthrax, bacterial meningitis, Cholera, Diphtheria, Leprosy (Hansen's diseases), Pneumonia, Tuberculosis, Typhoid fever, Salmonella, Plague

**Module III**

History, description, mode of infection, treatment & prevention of fungal diseases. i.e. Respiratory diseases, Aspergillosis, Blastomycosis, Candidiasis, Coccidioides immitis, Cryptococcosis, Histoplasmosis, Tiniapidis

**Module IV**

History, description, mode of infection, treatment & prevention of Viral diseases i.e. AIDS, Hepatitis's, Influenza, Measles & Mums, Rabies, Small pox, Poliomyelitis, Dengue fever

**Module V**

History, description mode of infection, treatment & prevention of i.e. Protozoans and Helminthes, Amebiasis, Ascariasis Fasioliasis, Faciolopsiasis, Filariasis, Kala azar ( black fever ), Malaria, Taeniosis  
Systemic infection disease, Disease of upper respiratory tract, Disease of lower respiratory tract, Blood stream infection, Uro-genital tract

**Examination Scheme:**

Components	A	CT	H	S	EE
Weightage (%)	5	15	5	5	70

**Text & References:**

- Biotechnological applications of microorganisms by Maheshwari
- Environmental Biotechnology by Indu Shekhar
- Industrial Biotechnology by Indu Shekhar
- Industrial hygiene and chemical safety by Fulekar
- Textbook of environmental Biotechnology by Mohapatra

## SCIENTIFIC WRITING

**Course Code**     **BTB 534**

**Credit Units: 03**

**Course Objective:**

To develop understanding of information and science research issues in the domain of biotechnology through review of journal articles, invited talks, and critical group discussions of methods. The main objectives for this course are to develop: familiarity with information and science-oriented problems in the biotechnology, an understanding of research methods in the biomedical domain, critical thinking and evaluation skills and presentation and summarization skills.

**Course Contents:**

**Module I**

Introduction: Science, Scientific Field and Biological research. Role of a researcher in different stages of a project, Routes to research funding (academic and commercial).Plagiarism: Introduction; Tools for the detection of plagiarism; Avoiding plagiarism

**Module II**

Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature. Concept of impact factor

**Module III: Computing skills for scientific research**

Web browsing for information search; search engines and their mechanism of searching; hidden Web and its importance in scientific research; internet as a medium of interaction between scientists; effective email strategy using the right tone and conciseness. Graphic designing -Approach and Significance in research

**Module IV**

Type of Articles (review, letters etc). Scientific paper format (Abstract, Introduction, Materials and Methods, Results, Discussion). Writing, evaluating, presenting and publishing the results of scientific research in the academic press (journals, conferences etc). Choosing the appropriate journal (Sources, Information, Instructions to authors, peer review system, journal evaluation)

**Module V**

Case studies of areas of current research. Formulating a research plan and its presentation

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	30	50

**Text & References:**

**References:**

- Scientific journals and magazines

**COMMUNICATION SKILLS - III****Course Code:** BCS 501**Credit Units:** 01**Course Objective:**

To equip the participant with linguistic skills required in the field of science and technology while guiding them to excel in their academic field.

**Course Contents:****Module I**

Reading Comprehension  
Summarising  
Paraphrasing

**Module II**

Essay Writing  
Dialogue Report

**Module III**

Writing Emails  
Brochure  
Leaflets  
Vowels  
Consonants  
Accent and Rhythm  
Accent Neutralization  
Spoken English and Listening Practice

**Examination Scheme:**

Components	CT1	CT2	CAF	V	GD	GP	A
Weightage (%)	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References:**

- Effective English for Engineering Students, B Cauveri, Macmillan India
- Creative English for Communication, Krishnaswamy N, Macmillan
- A Textbook of English Phonetics, Balasubramanian T, Macmillan

## UNDERSTANDING SELF FOR EFFECTIVENESS - V (GROUP DYNAMICS AND TEAM BUILDING)

**Course Code:** BSS505

**Credit Units:** 01

**Course Objective:**

To inculcate in the students an elementary level of understanding of group/team functions.

To develop team spirit and to know the importance of working in teams.

**Course Contents:**

**Module I**

Definition and Characteristics

Importance of groups

Classification of groups

Stages of group formation

Benefits of group formation

**Module II**

External Conditions affecting group functioning: Authority, Structure, Org. Resources, Organizational policies etc.

Internal conditions affecting group functioning: Roles, Norms, Conformity, Status, Cohesiveness, Size, Inter group conflict.

Group Cohesiveness and Group Conflict

Adjustment in Groups

Meaning and nature of teams

External and internal factors effecting team

Building Effective Teams

Consensus Building

Collaboration

**Module III**

Meaning, Nature and Functions

Self leadership

Leadership styles in organization

Leadership in Teams

Meaning and Nature

Types of power

Relevance in organization and Society

Viva based on personal journal

Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

**Text & References:**

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002, Harcourt College Publishers
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressers, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change

- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Understanding Self for Effectiveness, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

## FRENCH - V

**Course Code:** FLT 501

**Credit Units:** 02

**Course Objective:**

To furnish some basic knowledge of French culture and civilization for understanding an authentic document and information relating to political and administrative life.

**Course Contents:**

**Module D: pp. 131 – 156 Unités 10, 11**

**Contenu lexical: Unité 10: Prendre des décisions**

1. Faire des comparaisons
2. décrire un lieu, le temps, les gens, l'ambiance
3. rédiger une carte postale

**Unité 11: faire face aux problèmes**

1. Exposer un problème.
2. parler de la santé, de la maladie
3. interdire/demander/donner une autorisation
4. connaître la vie politique française

**Contenu grammatical:**

1. comparatif - comparer des qualités/ quantités/actions
2. supposition : Si + présent, futur
3. adverbe - caractériser une action
4. pronom "Y"

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- le livre à suivre : Campus: Tome 1

**GERMAN - V****Course Code: FLG 501****Credit Units: 02****Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Introduction to Advanced Grammar and Business Language and Professional Jargon

**Course Contents:****Module I: Genitive case**

Genitive case – Explain the concept of possession in genitive

Mentioning the structure of weak nouns

Discuss the genitive propositions and their usage: (während, wegen, statt, trotz)

**Module II**

Reflexive verbs - Verbs with accusative case

Verbs with dative case

Difference in usage in the two cases

**Module III**

Verbs with fixed prepositions - Verbs with accusative case

Verbs with dative case. Difference in the usage of the two cases. A poem 'Maxi'

A text Rocko. Picture Description.

Firstly recognize the persons or things in the picture and identify the situation depicted in the picture;

Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

**SPANISH - V****Course Code: FLS 501****Credit Units: 02****Course Objective:**

To enable students acquire working knowledge of the language; to give them vocabulary, grammar, voice modulations/intonations to handle everyday Spanish situations with ease.

**Course Contents:****Module I**

Revision of earlier semester modules  
Future Tense

**Module II**

Presentations in English on  
Spanish speaking countries'  
Culture  
Sports  
Food  
People  
Politics  
Society  
Geography

**Module III**

Situations:  
En el hospital  
En la comisaria  
En la estacion de autobus/tren  
En el banco/cambio  
General revision of Spanish language learnt so far.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español Sin Fronteras, Greenfield

**CHINESE – V****Course Code: FLC 501****Credit Units: 02****Course Objective:**

What English words come from Chinese? Some of the more common English words with Chinese roots are ginseng, silk, dim sum, fengshui, typhoon, yin and yang, T'ai chi, kung-fu. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

**Course Contents:****Module I**

Drills

Dialogue practice

Observe picture and answer the question.

Pronunciation and intonation.

Character writing and stroke order

**Module II**

Intonation

Chinese foods and tastes – tofu, chowmian, noodle, Beijing duck, rice, sweet, sour...etc. Learning to say phrases like – Chinese food, Western food, delicious, hot and spicy, sour, salty, tasteless, tender, nutritious, good for health, fish, shrimps, vegetables, cholesterol is not high, pizza, milk, vitamins, to be able to cook, to be used to, cook well, once a week, once a month, once a year, twice a week.....

Repetition of the grammar and verbs taught in the previous module and making dialogues using it.

Compliment of degree “de”.

**Module III**

Grammar the complex sentence “suiran ... danshi....”

Comparison – It is colder today than it was yesterday.....etc.

The Expression “chule....yiwai”. (Besides)

Names of different animals.

Talking about Great Wall of China

Short stories

Use of “huozhe” and “haishi”

Is he/she married?

Going for a film with a friend.

Having a meal at the restaurant and ordering a meal.

Shopping – Talking about a thing you have bought, how much money you spent on it? How many kinds were there?

What did you think of others?

Talking about a day in your life using compliment of degree “de”. When you get up? When do you go for class? Do you sleep early or late? How is Chinese? Do you enjoy your life in the hostel?

Making up a dialogue by asking question on the year, month, day and the days of the week and answer them.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- “Elementary Chinese Reader ” Part-II Lesson 39-46

## RECOMBINANT DNA TECHNOLOGY

**Course Code:** BTB 601

**Credit Units:** 03

**Course Objective:**

A complete understanding of molecular techniques can be obtained through the course. The successful application of biotechnology largely depends on these advanced molecular techniques.

**Course Contents:**

**Module I**

Restriction endonuclease, methyltransferase, ligase, polymerase, kinase, phosphatase, nuclease, transferase, reverse transcriptase.

**Module II**

Plasmids, bacteriophages (Lambda and M13), phagemids, cosmids, artificial chromosomes (YAC, BAC). expression vectors (Bacteria and yeast), vector engineering (fusion tags, antibiotic markers), codon optimization, host engineering

**Module III**

Southern, Northern and Western blotting techniques. Radioactive and non-radioactive probes.

**Module IV**

Principles of PCR, designing of primers. Basic cloning experiment: Design of cloning strategy and stepwise experimental procedure , Complementation, colony and plaque hybridization, restriction, PCR, plus-minus screening, immunoscreening.

**Module V**

Purpose of constructing DNA libraries. Construction of cDNA and genomic libraries. DNA sequencing (Maxam Gilbert, Sanger's and automated), protein engineering.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc.
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company.

**References:**

- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press.
- Molecular and Cellular Cells Methods in Biology and Medicine, P.B Kaufman, W. Wu, D. Kim and C.J. Cseke, CRC Press.

## **B.Tech. Biotechnology (Syllabus)**

- Milestones in Biotechnology: Classic Papers on Genetic Engineering, J.A. Baviess and W.S. Reznikoff, Butterworth Heinemann.
- Gene Expression Technology, D.V. Goeddel in Methods in Enzymology, Academic Press Inc.
- DNA Cloning: A Practical Approach, D.M. Glover and B.D. Hames, IRL Press.
- Molecular Cloning: A Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press.

**ENZYMOLGY AND ENZYME TECHNOLOGY****Course Code:** BTB 602**Credit Units:** 03**Course Objective:**

The course aims to provide an understanding of the principles and application of proteins, secondary metabolites and enzyme biochemistry in therapeutic applications and clinical diagnosis. The theoretical understanding of biochemical systems would certainly help to interpret the results of laboratory experiments.

**Course Contents:****Module I**

Enzymes - Introduction and scope, Nomenclature, Mechanism of Catalysis.

**Module II**

**Enzyme Kinetics** - Single substrate steady state kinetics; Michaelis Menten equation, Linear plots, King-Altman's method; Inhibitors and activators; Multisubstrate systems; ping-pong mechanism, Albery equation, Sigmoidal kinetics and Allosteric enzymes

**Module III**

Immobilization of Enzymes; Advantages, Carriers, adsorption, covalent coupling, cross-linking and entrapment methods, Micro-environmental effects.

**Module IV**

Enzyme reactors - Reactors for batch/continuous enzymatic processing, choice of reactor type; idealized enzyme reactor systems, Mass transfer in enzyme reactors: Steady state analysis of mass transfer and biochemical reaction in enzyme reaction.

**Module V**

Bioprocess Design - Physical parameters, reactor operational stability, Immobilized cells. Challenges and future trends. Enzyme catalysis in organic media; catalytic antibodies and non protein biomolecules as catalysts, biocatalysts from extreme thermophilic and hyper thermophilic Archae and Bacteria.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- Biotechnological Innovations in Chemical Synthesis, R.C.B. Currell, V.D. Mieras, Biotol Partners Staff, Butterworth Heinemann.
- Enzyme Technology, M.F. Chaplin and C. Bucke, Cambridge University Press.
- Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis, R.A. Copeland, John Wiley and Sons Inc.

**References:**

## **B.Tech. Biotechnology (Syllabus)**

- Enzymes Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palner.
- Enzyme Kinetics: Behaviour and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H. Segel, Wiley-Interscience.
- Industrial Enzymes & their applications, H. Uhlig, John Wiley and Sons Inc.

## STRUCTURAL BIOLOGY

**Course Code:** BTB 603

**Credit Units:** 02

**Course Objective:**

The course aims to provide an understanding of the principles and applications of proteins, enzymes and nucleic acids for their role in biochemical pathway as well as interactions among themselves.

**Course Contents:**

**Module I: Chemistry of amino acids and peptides**

Side chain structure and function in protein folding and functionality: Secondary structure of proteins -helices, sheets, loops and turns; Structural and functional proteins. Tertiary structure of proteins, homo and hetero-dimers, trimers and tetramers; forces governing protein-protein interactions; open tertiary structure; Classification of proteins; Structure and function of an antibody; structure of hemoglobin, muscle proteins; Sequence and structural motifs in proteins.

**Module II**

Lock and key versus handshake mechanism of substrate recognition; structural basis of recognition; reaction mechanisms of enzymes, G-Protein coupled receptors. Salting in and salting out, Parameters affecting; enthalpic and entropic stabilization, mutations increasing stability, .helix capping; Native, partially denatured and denatured proteins; Protein denaturation, Physical and chemical denaturants; Refolding

**Module III**

Covalent structure of DNA, base pairing, hydrogen bonding, DNA melting and annealing, difference between AT and GC pairing, DNA models, The Watson Crick model; Crystal structure of B-DNA, major and minor grooves, dyad symmetry, base pair stacking, propellor twist, A and Z- DNA, triple stranded DNA, telomeric sequences and structure, G-quartets, palindromic and tandem sequences, Base pair flipping and DNA bulges, DNA methylation; Protein-DNA interactions; drug-DNA interactions; Databases of sequences and structure for protein and DNA, public domain softwares for visualizing and modeling biomolecules -Rasmol, Deepview, Whatif.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Biochemistry, R.H. Abeles, P.A. Frey and W.A. Jencks, Jones and Bartlett.
- Essentials of Molecular Biology, D. Freifelder, Jones and Bartlett Publications.
- Genes VII, B. Lewin, Oxford University Press.

**References:**

- Introduction to Protein Structure, C. Branden and J Tooze, Garland Publishing Company.
- Protein Structure, M. Perutz, Oxford University Press.
- Proteins (Structures and Molecular Properties), T.E. Creighton, W.H. Freeman and Company.
- Database Annotation in Molecular Biology, Arthur M. Lesk.

- From Genes to Clones, E.L. Winnacker.
- Genes & Genomes, M.S. Paul Berg.
- Structure and Mechanism in Protein Science, Alan Fersht.

**IMMUNOLOGY AND IMMUNOTECHNOLOGY****Course Code: BTB 604****Credit Units: 03****Course Objective:**

Role of antibody engineering in biomedical applications and the importance of immuno genetics in disease processes, tissue transplantation and immune regulation are some of the areas of attributes of this course which can help the students to understand the biotechnology related to human kind.

**Course Contents:****Module I**

Phylogeny of Immune System, Innate and acquired immunity, clonal nature of Immune Response. Organization and structure of lymphoid organs Nature and Biology of antigens and super antigens Antibody structure and function; Types of immunity- innate, acquired, active and passive.

**Module II**

MHC, BCR and TCR, generation of antibody diversity, Complement system

**Module III**

Hematopoiesis and differentiation, lymphocyte trafficking, B-Lymphocytes, T -Lymphocytes, macrophages, dendritic cells, natural killer, lymphokines and lymphokine activated killer cells, eosinophils, neutrophils and mast cells. . Immunological Techniques. Immuno diffusion, immuno-electrophoresis, ELISA, RIA, fluorescence activated cell sorter.

**Module IV**

Antigen processing and presentation, activation of B and T lymphocytes, cytokines and their role in immune regulation, T cell regulation and MHC restriction, immunological tolerance. Hybridoma technology and its applications - Fusion of myeloma cells with lymphocytes

**Module V**

Mechanism of T cell and NK cell mediated lysis and macrophage mediated cytotoxicity. Hypersensitivity. Autoimmunity. Tumor immunology, Immunity to infectious agents. Transplantation Immunology. Synthetic vaccines - General consideration, ideotype network hypothesis, Synthetic vaccines.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company

**References:**

- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins
- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).

## **B.Tech. Biotechnology (Syllabus)**

- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.
- Immunology, Roitt, Mosby – Yearbook Inc.
- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Free

## Bioresource Technology

**Course Code:** BTB- 605

**Credit Units: 03**

**Course Objective:**

This course has been designed with the objective to acquaint the students with bioresources, their traditional and non-traditional uses, current status and recent developments in value addition and future prospects.

**UNIT-I**

**RENEWABLE ENERGY SOURCE** Hydropower, geothermal power, solar power, wind power – Biofuel -Biomass - Feed stocks (agricultural crops, bioenergy crops, agricultural waste residues, wood residues, waste stream)

**UNIT-II**

**FUEL TECHNOLOGY AND BIOCONVERSION** History - Definition of biofuel, applications of biofuel (transport, direct electricity generation, home use and energy content of biofuel) - Bioconversion of lignocellulosics, cellulose saccharification, pretreatment technologies (air separation process, mechanical size reduction, autohydrolysis) - Pulping and bleaching – Enzymatic deinking.

**UNIT-III**

**BIOGAS** Biogas plant, feed stock materials, biogas production, factors affecting methane formation - Role of methanogens – Biohydrogen production - Oxygen sensitivity problems in hydrogenases

**UNIT-IV**

**BIO ETHANOL AND BUTANOL** Advantages of ethanol over fossil fuels, production of ethanol from cellulosic materials, ethanol recovery - Biobutanol production, energy content and effects on fuel economy - Octane rating, air fuel ratio, specific energy, viscosity, heat of vaporization -Butanol fuel mixtures

**UNIT-V**

**BIODIESEL** Production of biodiesel, oil extraction from algae by chemical solvents, enzymatic, expeller press - Osmotic shock and ultrasonic assisted extraction - Applications of biodiesel, environmental benefits and concerns

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
<b>Weightage (%)</b>	15	5	10	70

**Suggested Books:**

1. Alain A.V., Biomass to biofuels strategies for global Industries, John Wiley & sons Ltd, 1st Edition, 2010.
2. Twidell., J & Weir., T., Renewable energy resources, Taylor & Francis 2nd Edition, 2006.

**REFERENCE**

1. Luque, R., Camp, J., Hand book of biofuel production processes and technologies, Woodhead publishing ltd., 1st Edition, 2011.

**RECOMBINANT DNA TECHNOLOGY LAB****Course Code: BTB 621****Credit Units: 01****Course Objective:**

The laboratory experiments in Recombinant DNA Technology would certainly help to comprehend the theoretical aspects of the subject.

**Course Contents:****Module I****Study** of cloning (GFP CLONING)**Module II**

Study of PCR

**Module III**

Study of Southern hybridisation

**Study** of RAPD

Site directed mutagenesis

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**ENZYMOLGY AND ENZYME TECHNOLOGY LAB****Course Code: BTB 622****Credit Units: 01****Course Objective:**

The laboratory will help the students to isolate enzymes from different sources, enzyme assays and studying their kinetic parameters which have immense importance in industrial processes.

**Course Contents:****Module I**

Isolation of enzymes from plant and microbial sources.

**Module II**

Enzyme assay; activity and specific activity – determination of amylase, nitrate reductase, cellulase, protease. Purification of Enzyme by ammonium sulphate fractionation. Enzyme Kinetics: Effect of varying substrate concentration on enzyme activity, determination of Michaelis-Menten constant ( $K_m$ ) and Maximum Velocity ( $V_{max}$ ) using Lineweaver-Burk plot.

**Module III**

Effect of Temperature and pH on enzyme activity.  
Enzyme immobilization

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**Text & References:****Text:**

- Practical Biochemistry, Sawhney and Singh

**References:**

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker

**STRUCTURAL BIOLOGY LAB****Course Code: BTB 623****Credit Units: 01****Course Contents:**

1. Study of physical properties of proteins.
2. Analysis of protein structure.
3. Study of protein finger printing
4. Study of protein fractionation
5. Study of protein folding
6. Study of protein degradation.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**IMMUNOLOGY AND IMMUNOTECHNOLOGY LAB****Course Code: BTB 624****Credit Units: 01****Course Contents:****Module I**

Blood film preparation and identification of cells.

Identification of blood group.

Isolation of serum.

**Module II**

Lymphoid organs and their microscopic organization.

WIDAL Test. Radial Immuno Diffusion Test

**Module III**

Ouchterlony Double diffusion Test. ELISA, DOT, SANDWICH Purification of IgG through affinity chromatography.

Immunohistochemistry

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## **TERM PAPER & INDUSTRY VISIT**

**Course Code: BTB 630**

**Credit Units: 03**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### **GUIDELINES FOR TERM PAPER**

The procedure for writing a term paper may consist of the following steps:

19. Choosing a subject
20. Finding sources of materials
21. Collecting the notes
22. Outlining the paper
23. Writing the first draft
24. Editing & preparing the final paper

#### **1. Choosing a Subject**

The subject chosen should not be too general.

#### **2. Finding Sources of materials**

- j) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- k) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- l) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### **3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- j) Get facts, not just opinions. Compare the facts with author's conclusion.
- k) In research studies, notice the methods and procedures, results & conclusions.
- l) Check cross references.

#### **4. Outlining the paper**

- g) Review notes to find main sub-divisions of the subject.
- h) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

## **6. Editing & Preparing the final Paper**

- s) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- t) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- u) Check for proper spelling, phrasing and sentence construction.
- v) Check for proper form on footnotes, quotes, and punctuation.
- w) Check to see that quotations serve one of the following purposes:
  - (x) Show evidence of what an author has said.
  - (xi) Avoid misrepresentation through restatement.
  - (xii) Save unnecessary writing when ideas have been well expressed by the original author.
- x) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 22) Title page
- 23) Table of contents
- 24) Introduction
- 25) Review
- 26) Discussion & Conclusion
- 27) Bibliography
- 28) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- m) summary of question posed
- n) summary of findings
- o) summary of main limitations of the study at hand
- p) details of possibilities for related future research

### **Bibliography**

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Bibliographical conventions**

#### *Monographs*

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

**Edited volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

**Edited articles**

Schmidt, R. /Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

**Journal articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

**Electronic book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

**Electronic journal articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal [online]* 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

**Other websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

**Unpublished papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

**Unpublished theses/ dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

**Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

**Assessment Scheme:**

**Continuous Evaluation:** 40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

**Final Evaluation:** 60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

**In addition to term paper Students must compulsorily undergo Industrial Visit (Cluster of 5-6 Industries) for One week and they will be graded on their learning outcome of the visit for one third component of this Term Paper & Industry Visit.**

**Evaluation will be as follows;**

**Term Paper: 2 Credit (70 Marks)**

**Industry Visit: 1 Credit (30 Marks)**

## VIROLOGY

**Course Code:** BTB 631

**Credit Units:** 03

### Course Objective:

The aim of the course is to give a vision about the viruses, their classification, ultrastructure, importance in plants, animals and human beings. The course also gives a practical overview of the various viruses affecting living beings, their diagnostics by serology and molecular biology techniques, pathogenicity and control. The newly discovered viruses are also included in this course like SARS, Chikungunya, Bird flu etc.

### Course Contents:

#### Module I

Brief outline on discovery of viruses, nomenclature and classification of viruses; distinctive properties of viruses; morphology & ultrastructure; viral genome, their types and structures; virus related agents (viroids, prions).

#### Module II

Cultivation of viruses in embryonated eggs, experimental animals, and cell cultures; serological methods - haemagglutination; complement fixation; immunofluorescence methods, ELISA and Radioimmunoassays; assay of viruses - physical and chemical methods (protein, nucleic acid, radioactivity tracers, electron microscopy)- Infectivity assay (plaque method, end point method).

#### Module III

Bacteriophage structural organization; life cycle; brief details on M13, Mu, T3, T4, and Lambda P1.

#### Module IV

Classification and effects of viruses on plants; Symptomatology; common virus diseases of plants: paddy, cotton, tomato, and sugarcane; viruses of cyanobacteria, algae, fungi; life cycle; type species of plant viruses like TMV, Cauliflower mosaic virus and Potato virus X; transmission of plant viruses; diagnostics in seeds and diseased plants; prevention of crop loss due to virus infection, virus-free planting material; vector control.

#### Module V

Classification of animal human viruses; epidemiology, lifecycle, diagnosis, prevention and treatment of RNA Viruses Picorna, Orthomyxo, Paramyxo, Toga and other arthropod viruses, Rhabdo, Rota, HIV and other Oncogenic viruses; DNA viruses; Pox, Herpes. Adeno, SV 40; Hepatitis viruses. viral vaccines (conventional vaccines, genetic recombinant vaccines, newer generation vaccines including DNA Vaccines with examples) interferons, and antiviral drugs. Emerging viruses: West Nile, Nipah, SARS, Bird flu, Chikungunya

### Examination Scheme:

Components	A	CT	H	S	EE
Weightage (%)	5	15	5	5	70

### Text & References:

- Morag C and Timbury MC (1994) Medical virology-X Edition, Churchill Livingstone, London.
- Dimmock NJ, Primrose (1994) Introduction to Modern Virology, IV Edition, Blackwell Scientific Publications, Oxford

## **B.Tech. Biotechnology (Syllabus)**

- Conrat HF, Kimball PC and Levy JA (1994) Virology-III Edition, Prentice Hall, Englewood cliff, New Jersey.
- Mathews RE (1992) Functionals of Plant virology, Academic press, San Diego.
- Topley and Wilson's (1995) Text Book on Principles of Bacteriology, Virology and Immunology, Edward Arnold London.
- Lennetter EH (1984) Diagnostic procedures for Viral and Rickettsial diseases, American Public Health Association, NY.

William Hayes (1985) The genetics of Bacteria and their Viruses, Blackwell Scientific Publishers, London

## Nanoscience and Nanotechnology

**Course Code: BTB 632**

**Credit Units: 03**

**Course objective:** The objective of the course is to explain the fundamental principles of nanoscience and its application in diverse fields

### Module I

Scientific revolution- Atomic structures-Molecular and atomic size-Bohr radius – Emergence of Nanotechnology – Challenges in Nanotechnology - Carbon age–New form of carbon (from Graphene sheet to CNT).

### Module II

Influence of nucleation rate on the size of the crystals- macroscopic to microscopic crystals and nanocrystals - large surface to volume ratio, top-down and bottom-up approaches-self assembly process-grain boundary volume in nanocrystals-defects in nanocrystals-surface effects on the properties.

### Module III

Definition of a Nano system - Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) -Three Dimensional (3D) nanostructured materials - Quantum dots - Quantum wireCore/Shell structures.

### Module IV

Carbon Nanotubes (CNT) - Metals (Au, Ag) - Metal oxides (TiO<sub>2</sub>, CeO<sub>2</sub>, ZnO) - Semiconductors (Si, Ge, CdS, ZnSe) - Ceramics and Composites - Dilute magnetic semiconductor- Biological system - DNA and RNA - Lipids - Size dependent properties - Mechanical, Physical and Chemical properties.

### Module V

Molecular electronics and nanoelectronics – Quantum electronic devices - CNT based transistor and Field Emission Display - Biological applications - Biochemical sensor - Membrane based water purification.

### Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

### Texts and Reference books:

1. M. Wilson, K. Kannangara, G Smith, M. Simmons, B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.
2. C.N.R.Rao, A.Muller, A.K.Cheetham (Eds), The chemistry of nanomaterials: Synthesis, properties and applications, Wiley VCH Verlag GmbH&Co, Weinheim, 2004.
3. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, John Wiley & Sons, Inc, 2001.
4. C.S.S.R.Kumar, J.Hormes, C.Leuschner, Nanofabrication towards biomedical applications, Wiley –VCH Verlag GmbH & Co, Weinheim, 2004.
5. W. Rainer, Nano Electronics and information Technology, Wiley, 2003.
6. K.E.Drexler, Nano systems, Wiley, 1992.
7. G.Cao, Nanostructures and Nanomaterials: Synthesis, properties and applications, Imperial College Press, 2004.

**IPR & Drug Regulatory Affairs****Course Code:** BTB 633**Credit Units: 03****Course Objective:**

Objective: Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

**Module I**

a) Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, NonObviousness, Utility, enablement and Best mode)

**Module II**

a) History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).

b) Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and coowners

c) Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.

d) Patent filing procedure under PCT, advantages, patent search and literature

**Module III**

a) Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,

b) Background, Salient Features and Impact of International Treaties / Conventions like

i. Paris Convention, Berne convention

ii. World Trade Organization (WTO)

iii. World Intellectual Property Organization (WIPO)

iv. Trade Related Aspects of Intellectual Property Rights (TRIPS)

v. Patent Co-operation Treaty (PCT), Madrid Protocol

**Module IV****Drug Regulatory affairs and its importance.**

Pharmaceutical Regulatory Procedures in India: Hierarchy and working flow of FDA in India, Role of DCGI / CDSCO in drug control, Drug Control Authority and its documentation in the state.

**Module V**

National drug regulatory requirements, national drug policy, drug and cosmetic act and rules, over view of schedule M, schedule Y, US FDA guidelines on IND, new drug approvals(NDA), ANDA approvals, SUPAC Changes, SNDA & post marketing surveillance.

Overview of Good Manufacturing Practices (GMP), Good Laboratory Practices (GLP), ISOs- Production design, certification.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Suggested Books:**

1. Drug Regulatory Affairs by Dr. N.S. Vyawahare and SachinItkar, NiraliPrakashan.
2. Pharmaceutical Regulatory Affairs by C.V.S. Subrahmanyam & J. ThimmaSetty, VallabhPrakashan.
3. Quality Assurance of Pharmaceutics Vol I & II of WHO publications, 1999.
4. GMPs by Mehra
5. How to Practice GMP by P.P.Sharma.
6. GMP of Pharmaceuticals by Willing and Stoker.
7. **Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.**
8. Drugs and Cosmetics act by Vijay Malik.

## COMMUNICATION SKILLS - IV

**Course Code:** BCS 601

**Credit Units:** 01

**Course Objective:**

To enhance the skills needed to work in an English-speaking global business environment.

**Course Contents:**

**Module I: Business/Technical Language Development**

Advanced Grammar: Syntax, Tenses, Voices

Advanced Vocabulary skills: Jargons, Terminology, Colloquialism

Individualised pronunciation practice

**Module II: Social Communication**

Building relationships through Communication

Communication, Culture and Context

Entertainment and Communication

Informal business/ Technical Communication

**Module III: Business Communication**

Reading Business/ Technical press

Listening to Business/ Technical reports (TV, radio)

Researching for Business /Technology

Planning and getting started

Design and layout of presentation

Information Packaging

Making the Presentation

**Examination Scheme:**

Components	CT1	CT2	CAF	V	GD	GP	A
<b>Weightage (%)</b>	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References:**

- Business Vocabulary in Use: Advanced Mascull, Cambridge
- Business Communication, Raman –Prakash, Oxford
- Business Communications, Rodgers, Cambridge
- Working in English, Jones, Cambridge
- New International Business English, Jones/Alexander, Cambridge

## **UNDERSTANDING SELF FOR EFFECTIVENESS - VI (STRESS AND COPING STRATEGIES)**

**Course Code:** BSS605

**Credit Units:** 01

**Course Objective:**

To develop an understanding the concept of stress its causes, symptoms and consequences.

To develop an understanding the consequences of the stress on one's wellness, health, and work performance.

**Course Contents:**

**Module I**

Stress - meaning & Nature

Characteristics

Types of stress.

Stages of stress

The physiology of stress

Stimulus-oriented approach.

Response-oriented approach.

The transactional and interact ional model.

Pressure – environment fit model of stress.

**Module II**

Personal

Organizational

Environmental

Consequences of stress

Effect on behaviour and personality

Effect of stress on performance

Individual and Organizational consequences with special focus on health

**Module III**

Strategies for stress management

Importance of stress management

Healthy and Unhealthy strategies

Peer group and social support

Happiness and well-being.

End-of-Semester Appraisal

Viva based on personal journal

Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

**Text & References:**

- Blonna, Richard; Coping with Stress in a Changing World: Second edition
- Pestonjee, D.M, Pareek, Udai, Agarwal Rita; Studies in Stress And its Management
- Pestonjee, D.M.; Stress and Coping: The Indian Experience
- Clegg, Brian; Instant Stress Management – Bring calm to your life now

**FRENCH - VI****Course Code: FLT 601****Credit Units: 02****Course Objective:**

To strengthen the language of the students both in oral and written so that they can:

- i) express their sentiments, emotions and opinions, reacting to information, situations;
- ii) narrate incidents, events;
- iii) perform certain simple communicative tasks.

**Course Contents:****Module D: pp. 157 – 168 – Unité 12****Unité 12: s'évader**

1. présenter, caractériser, définir
2. parler de livres, de lectures
3. préparer et organiser un voyage
4. exprimer des sentiments et des opinions
5. téléphoner
6. faire une réservation

**Contenu grammatical:**

1. proposition relative avec pronom relatif "qui", "que", "où" - pour caractériser
2. faire + verbe

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>C</b>	<b>I</b>	<b>V</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- le livre à suivre : Campus: Tome 1

**GERMAN - VI****Course Code: FLG 601****Credit Units: 02****Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Introduction to Advanced Grammar and Business Language and Professional Jargon

**Course Contents:****Module I: Adjective endings**

Adjective endings in all the four cases discussed so far

Definite and indefinite articles

Cases without article

Comparative adverbs

Comparative adverbs as and like

**Module II**

Compound words

To learn the structure of compound words and the correct article which they take

Exploring the possibility of compound words in German

Infinitive sentence

Special usage of 'to' sentences called zu+ infinitive sentences

**Module III**

Texts

A Dialogue: 'Ein schwieriger Gast'

A text: 'Abgeschlossene Vergangenheit'

Comprehension texts

Reading and comprehending various texts to consolidate the usage of the constructions learnt so far in this semester.

Picture Description

Firstly recognize the persons or things in the picture and identify the situation depicted in the picture;

Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch

- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

**SPANISH – VI****Course Code:** FLS 601**Credit Units:** 02**Course Objective:**

To enable students acquire working knowledge of the language; to give them vocabulary, grammar, voice modulations/intonations to handle everyday Spanish situations in Present as well as in Present Perfect Tense with ease.

**Course Contents:****Module I**

Revision of the earlier modules  
Present Perfect Tense

**Module II**

Commands of irregular verbs

**Module III**

Expressions with **Tener que** and **Hay que**  
En la embajada  
Emergency situations like fire, illness, accident, theft

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>C</b>	<b>I</b>	<b>V</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español, En Directo I A
- Español Sin Fronteras

**CHINESE – VI****Course Code: FLC 601****Credit Units: 02****Course Objective:**

Chinese emperor Qin Shi Huang – Ti who built the great wall of China also built a network of 270 palaces, linked by tunnels, and was so afraid of assassination that he slept in a different palace each night. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

**Course Contents:****Module I**

Drills

Dialogue practice

Observe picture and answer the question.

Pronunciation and intonation.

Character writing and stroke order.

**Module II**

Going out to see a science exhibition

Going to the theatre.

Train or Plane is behind schedule.

Indian Economy-Chinese Economy

Talking about different Seasons of the Year and Weather conditions. Learning to say phrases like-spring, summer, fall, winter, fairly hot, very cold, very humid, very stuffy, neither hot nor cold, most comfortable, pleasant .... etc.

**Module III**

Temperature – how to say – What is the temperature in May here?

- How is the weather in summer in your area?
- Around 30 degrees
- Heating, air-conditioning
- Is winter in Shanghai very cold?

Talking about birthdays and where you were born?

The verb “shuo” (speak) saying useful phrases like speak very well, do not speak very well, if speak slowly then understand if speak fast then don’t understand, difficult to speak, difficult to write, speak too fast, speak too slow, listen and can understand, listen and cannot understand ... etc.

Tell the following in Chinese – My name is .... I was born in ... (year). My birthday is ..... Today is ... (date and day of the week). I go to work (school) everyday. I usually leave home at . (O’clock). In the evening, I usually ..... (do what)? At week end, I ..... On Sundays I usually ..... It is today..... It will soon be my younger sisters birthday. She was born in .... (year). She lives in ..... (where). She is working (or studying)..... where... She lives in ..... (where.)

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Elementary Chinese Reader Part-2 ,3 ; Lesson 47-54

**BIOPROCESS TECHNOLOGY****Course Code: BTB 701****Credit Units: 03****Course Objective:**

The objective of the course is to apply the principles of biochemical engineering in large scale cultivation of microorganism for production of important products.

**Course Contents:****Module I**

Advantage of bioprocess over chemical process. Basic principle in bioprocess technology. Bioseparation, Large scale recombinant protein production, Media formulation, Cell culture techniques; Inoculum development and aseptic transfers. Different types of pumps, valves, and line materials, piping conventions etc. used in Biochemical Process

**Module II**

Process technology for the production of primary metabolites, eg. biomass, ethanol, acetone-butanol, citric acid, amino acids, polysaccharides and plastics.

Ethanol: production by batch, continuous and cell recycle adopted by various technologies practiced in Indian distilleries using molasses and grains. Computation of fermentation efficiency, distillation efficiency and overall efficiency of ethanol production, recovery, uses, glucose effect etc. Power alcohol – definition, uses, merits and demerits of various technologies for its production.

**Module III**

Amino Acid: Genetic Control of metabolic pathway.

Lysine: Indirect and direct fermentation – mechanism of ph of metabolic block in accumulation of L- lysine by inhibition and repression mechanism.

Biomass: Bakers and distillers yeast production using various raw materials, “bios” factors for growth, Crabtree effect, harvesting, different forms and uses.

What are mushroom, different forms of common mushroom production from agro based raw materials and uses. Biofertilizers, biocompost and biopesticides

**Module IV**

Production of secondary metabolites – penicillin, cephalosporins, streptomycin, tetracycline etc. Metabolites from plant and animal cell culture. Penicillin: Classification, various penicillin as precursor and ‘R’ – side chain, penicillinase, 6-APA, penicillin production, harvest and recovery, uses of various forms etc. Streptomycin: chemical structure, production, harvest and recovery, use by-product of streptomycin fermentation etc. Tetracycline: chemical structure, production, harvest and recovery, use by-product of tetracycline fermentation etc.

**Module V**

Microbial production of industrial enzymes – glucose isomerase, penicillin acylase, cellulase, amylase, lipase, protease etc.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

### Text & References:

- Biochemical Engineering- Kinetics, Mass Transport, Reactors and Gene Expression, W F Weith, John Wiley and Sons Inc
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Bioprocess Engineering Basic Concepts, M.L. Shuler and F. Kargi, Prentice Hall
- Bioprocess Engineering, B.K. Lydersen, K.L. Nelson, B.K. Lyderson and N. D'Elia, John Wiley and Sons Inc.
- Bioprocess Engineering Principles, P Doran, Academic Press
- Biotechnology. A Textbook of Industrial Microbiology, W. Crueger and a. Crueger, Sinauer Associates.
- Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press
- Process Engineering in Biotechnolgy, A T Jackson , Prentice Hall

## DOWNSTREAM PROCESSING

**Course Code:** BTB 702**Credit Units:** 03**Course Objective:**

The syllabus will help the students to characterize the Bioproducts due to downstreaming process of biotechnological importance.

**Course Contents:****Module I**

Characteristics of Bioproducts; Coagulation, Flocculation and conditioning of broth, Mechanical separation; Cell disruption techniques

**Module II**

Protein precipitation and separation, Aqueous- two- phase extraction, Adsorption-desorption processes

**Module III**

Chromatographic methods of separation based on size, charge, hydrophobic interactions and biological affinity

**Module IV**

Membrane based separation; Dialysis, Electrodialysis; Micro filtration, Ultra filtration; Nano filtration units, Electrophoresis

**Module V**

Crystallization; Drying; Formulation.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
<b>Weightage (%)</b>	15	5	10	70

**Text & References:****Text:**

- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill.
- Bioseparations, P.A. Belter, E.L. Cussler and W.S. Hu, John Wiley and Sons Inc. Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley and Sons Inc.

**References:**

- Biotreatment, Downstream Processing and Modelling (Advances in Biochemical Engineering / Biotechnology, Vol 56), T. Scheper et al, Springer Verlag.
- Chromatographic and Membrane Processes in Biotechnology, C.A. Costa and J.S. Cabral, Kluwer Academic Publisher.
- Downstream Processing, J.P. Hamel, J.B. Hunter and S.K. Sikdar, American Chemical Society.
- Protein Purification, M.R. Ladisch, R.C. Willson, C.C. Painton and S.E. Builder, American Chemical Society.

## ENTREPRENEURSHIP DEVELOPMENT

**Course Code: BTB 703**

**Credit Units: 03**

**Course Objective:**

The Management and Entrepreneurship program is designed to prepare students for an exciting career in today's competitive era.

The course will equip students with the knowledge to cope up with the changing environment because of the advent of technology and other influences. The course will also develop required entrepreneurship skills in the students from a variety of disciplinary perspectives known to be important for independent and corporate entrepreneurs.

**Course Contents:**

**Module I**

Principles and function of management, Planning and decision making, Line and staff relationship, management by objective.

**Module II**

Formal and informal organization, Performance appraisal, Training and development.

**Module III**

Entrepreneurship and entrepreneurial process, Business plan, Form of ownership suitable for business.

**Module IV**

Entrepreneurial motivation and leadership, entrepreneurial competencies, entrepreneurial development programme.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Essentials of Management, H. Koontz, H. Weihrich and C. O'Donnell, McGraw-Hill/Irwin
- David H Holt, Entrepreneurship : New Venture Creation

**References:**

- The Practice of Management, P. Drucker, Harper Business

## **GENOMIC AND PROTEOMICS**

**Course Code:** BTB 704

**Credit Units:** 03

### **Course Objective:**

The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. Current research on the molecular basis of the control of gene expression in eukaryotic system has developed a detailed understanding of techniques of gene diagnostics and DNA profile to acquire the fundamentals of genomics and Proteomics.

### **Course Contents:**

#### **GENOMICS**

##### **Module I**

Origin of genomes, Acquisition of new genes, DNA sequencing – chemical and enzymatic methods, The origins of introns, Genetics to genomics to functional genomics. Forward genetics (Phenotype to gene structure) and Reverse genetics (Gene structure to phenotype).

##### **Module II**

Chromosome structure and Genome organization, Genome sequencing methods, Genome assembly, Gene identification methods, Sequences Comparison Techniques, Genome annotation techniques.

##### **Module III**

Phylogeny, COGS [Cluster of orthologues genes], paralogues and gene displacement, Metabolic Reconstruction, The Basic Principles and Methodology. ESTs, SAGE, cDNA Microarrays, Oligonucleotide Microarray Chips, Cancer and genomic microarrays, Application of Microarrays with examples, Microarray Data Analysis; Real Time PCR; Gene finding tools

##### **Module IV**

Genetic and physical mapping: Introduction to molecular markers-RFLP, RAPD, AFLP, SSRs and others. Genetic and physical maps, map based cloning, mapping population, southern and *in situ* hybridization for genome analysis, DNA fingerprinting; Single nucleotide polymorphisms, RNA interference, antisense RNA, siRNA, MiRNA, ; Human Genome Project; Pharmacogenomics: Ethical considerations of genetic testing; Genomics in drug discovery.

##### **Module V**

Proteomics Basics and 2D Gel Electrophoresis,

Protein Identification and Analysis:

- a. Protein preparation and Separation
- b. Protein Identification by mass spectrometry
- c. Identification of post translation modification

Protein Expression Mapping,

High-throughput cloning of ORFs,

Protein Protein Interaction Mapping: Experimental and Computational. Its application in health and disease.

Microarray - the technique, Experimental design & mass spectrometric data analysis, Application of Microarray in proteome analysis, Proteins Arrays and Protein Chips,

Proteomics Tools and Databases

### **Examination Scheme:**

<b>Components</b>	<b>CT</b>	<b>Attendance</b>	<b>Assignment/ Project/Seminar/Quiz</b>	<b>EE</b>
<b>Weightage (%)</b>	15	5	10	70

**Text & References:****Text:**

- Bioinformatics: A practical guide to the analysis of genes and proteins, A.D. Baxevanis and B.F.F. Ouellette, John Wiley and Sons Inc.
- Bioinformatics: From Genomes to Drugs, T. Lengauer, John Wiley and Sons Inc.
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- DNA Microarrays: A Practical Approach, M. Schlena, Oxford University Press.
- Genomes II, T.A. Brown
- Biotechnology and Genomics by P.K.Gupta

**References:**

- A Primer of Genome Science, Greg Gibson and Spencer V. Muse
- Database Annotation in Molecular Biology : Principles and Practice, Arthur M. Lesk
- DNA : Structure and Function, Richard R. Sinden
- Recombinant DNA (Second Edition), James D. Watson and Mark Zoller
- Gene Cloning and DNA Analysis – An introduction (Fourth Edition), T.A. Brown
- Genes & Genomes, Maxine Singer and Paul Berg
- Essential of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Functional Genomics – A Practical Approach, S.P. Hunt and R. Livesey, Oxford University Press
- Proteomics, T. Palzkill, Kluwer Academic Publishers
- Statistical Genomics: Linkage, Mapping and QTL Analysis, B. Liu, CRC Press.
- Genome II by T.A.Brown

## PHARMACEUTICAL TECHNOLOGY AND BIOTECHNOLOGY

**Course Code:** BTB 705

**Credit Units:** 03

### Course Objective:

The main objectives are to cover representative pharmaceutical dosage forms and general issues of formulation, production, quality requirements, validation and uses and to gain an understanding of the challenges associated with quality pharmaceutical manufacturing

### Pharmaceutical Technology:

#### Module –I:

Introduction to Physical Pharmaceutics – Metrology, Calculations and Posology.

Pharmacopoeias & Formularies: IP,BP,USP

Packaging of Pharmaceuticals: Polymer Science and Applications, Formulations and Development, Packaging

Particulate Technology: Particle Size, Size reduction, Size Separation, Powder Flow and Compaction

Unit Operations: Mixing, Evaporation, Filtration, Centrifugation, Extraction, Distillation, Sterilization, and Drying

#### Module-II

Pharmaceutical Dosage Forms & New Drug Delivery Systems:

Introduction to different dosage forms, their classification with examples (Official formulation), their relative application. Various route of drug administration.

Drug delivery systems: transdermal, parenteral, oral, mucosal, ocular, buccal, rectal and pulmonary delivery. Novel formulation approaches for better delivery of biotechnology derived drugs, such as reverse micelles, liposomes, microemulsions and microencapsulation.

#### Module III

Immunity and Immunological preparations. Introduction about Immunity, Types of Immunity, Immunological preparations, Classification of Immunological preparations, Bacterial & Viral Vaccines, Method of preparation using animals, Alternative method using eggs, Diagnostic preparations containing bacterial toxins, Preparation containing antibodies used to produce passive immunity.

Blood & blood Products

#### Module IV

Blood Products and Plasma Substitutes: Collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin, fibrin foam, plasma substitutes: ideal requirements, PVP, dextran.

#### Module-V

Pharmaceutical Biotechnology based drug Products - Introduction, Method of Preparation and Use of :Activase, Humulin,Streptokinase Humatrope, Hepatitis B vaccine. Introduction, Method of Preparation and Use of: Penicillins, streptomycins, tetracyclines, vitamin B12 & ethanol.

### Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

### Text & References:

1. Daan J. A. Crommelin and Robert D. Sindelar, (2014). Pharmaceutical Biotechnology, 3<sup>rd</sup> Ed. Informa Healthcare USA, Inc.
2. Chandrakant Kokate, Pramod H.J and S.S. Jalalpure, (2012). Textbook of Pharmaceutical Biotechnology, Elsevier Health Sciences.
3. Vyas S.P and Dixit V.K. (2007) Pharmaceutical Biotechnology 1<sup>st</sup>Ed.CBS Publishers & Distributors.

**INDUSTRIAL TRAINING EVALUATION****Course Code:****BTB 750****Credit Units: 03****Methodology**

The students will go to various research institutes/R&D Labs of industries to learn various biotechnological tools and procedures and their utility in commercial applications. The aim of this training is to train the students in the various industrial/Research aspects of commercialization of biotechnological systems.

The students will be supervised by the internal faculty during the tenure of training.

The students shall submit a dissertation on the training undertaken which shall be evaluated by the concerned internal faculty. The Viva Voce shall then be conducted by an external Examiner

**Examination Scheme:**

Dissertation: 50

Viva Voce: 50

**Total: 100**

**BIOPROCESS TECHNOLOGY LAB****Course Code: BTB 721****Credit Units: 01****Course Contents:****Module I**

Isolation of industrially important micro organisms for microbial processes.

Determination of Thermal Death Point and Thermal death time of micro organisms for design of a sterilizer

Determination of growth curve of a supplied micro organism and also determine substrate degradation profile and to compute specific growth rate and growth yield from the data obtained.

**Module II**

Comparative studies of ethanol production using different substrates.

Production of single cell protein

Production and estimation of alkaline protease

**Module III**

Sauer Krant fermentation

Use of alginate for cell immobilization

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**DOWNSTREAM PROCESSING LAB****Course Code: BTB 722****Credit Units: 01****Course Objective:**

The laboratory will help the students to extract different bioproducts during their characterization since any of these products may be of biotechnological importance. They can be exploited in exploring the future biotechnology.

**Course Contents:****Module I**

Conventional filtration and membrane based filtration. Protein precipitation and recovery

**Module II**

Aqueous two-phase separation. Ion exchange chromatography

**Module III**

Gel Permeation chromatography. Electrophoresis

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**Text & References:****Text:**

- Practical Biochemistry, Sawhney and Singh

**References:**

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Chromatographic and Membrane Processes in Biotechnology, C.A. Costa and J.S. Cabral, Kluwer Academic Publisher
- Protein Purification, M.R. Lodisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society

**GENOMICS AND PROTEOMICS LAB****Course Code: BTB 723****Credit Units: 01****Course Contents:****Module I**

Three dimensional Structures – In silico study – large molecular complexes RNA polymerase II, ribosome, unstructured proteins. DNA sequencing methods

**Module II**

Gene finding tools and Genome annotation. Comparison of two given genomes. Analysis of 2D – IEF data

**Module III**

Microarray and Microarray data analysis. Inference of protein function from structure. Two-hybrid methods

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## TERM PAPER

**Course Code: BTB 730**

**Credit Units: 03**

### **METHODOLOGY**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

### **GUIDELINES FOR TERM PAPER**

The procedure for writing a term paper may consists of the following steps:

25. Choosing a subject
26. Finding sources of materials
27. Collecting the notes
28. Outlining the paper
29. Writing the first draft
30. Editing & preparing the final paper

#### **1. Choosing a Subject**

The subject chosen should not be too general.

#### **2. Finding Sources of materials**

- m) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- n) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- o) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### **3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- m) Get facts, not just opinions. Compare the facts with author's conclusion.
- n) In research studies, notice the methods and procedures, results & conclusions.
- o) Check cross references.

#### **4. Outlining the paper**

- i) Review notes to find main sub-divisions of the subject.
- j) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.

You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

## **6. Editing & Preparing the final Paper**

- y) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- z) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- aa) Check for proper spelling, phrasing and sentence construction.
- bb) Check for proper form on footnotes, quotes, and punctuation.
- cc) Check to see that quotations serve one of the following purposes:
  - (xiii) Show evidence of what an author has said.
  - (xiv) Avoid misrepresentation through restatement.
  - (xv) Save unnecessary writing when ideas have been well expressed by the original author.
- dd) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 29) Title page
- 30) Table of contents
- 31) Introduction
- 32) Review
- 33) Discussion & Conclusion
- 34) References
- 35) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- q) summary of question posed
- r) summary of findings
- s) summary of main limitations of the study at hand
- t) details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Bibliographical conventions**

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited Articles**

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

### **Journal Articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

### **Electronic Book**

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished Theses/ Dissertations**

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Assessment Scheme:**

#### **Continuous Evaluation:**

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

#### **Final Evaluation:**

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

**BIOETHICS & BIOSAFETY****Course code: BTB731****Credit Units: 03****Course Objective:**

The objectives of the course are to explain the fundamental principles of biosafety and bioethics issues from different perspectives

**Module I**

Public acceptance issues for biotechnology: Case studies/experiences from developing and developed countries.

**Module II**

Biotechnology and hunger: Challenges for the Indian Biotechnological research and industries.

**Module III**

The Cartagena protocol on biosafety. Biosafety management: Key to the environmentally responsible use of biotechnology.

**Module IV**

Ethical implications of biotechnological products and techniques.

**Module V**

Social and ethical implications of biological weapons.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Text & References:****Text:**

- The Law & Strategy of Biotechnology Patents, Sibley Kenneth,
- Safety Considerations for Biotechnology, Paris, OECD, 1992 and latest publications.

**References:**

- Biological Warfare in the 21st century, by M.R. Dano, Brassies London, 1994.
- Biosafety Management by P.L. Traynor, Virginia polytechnic Institute Publication, 2000.
- Cartagena Protocol on Biosafety, January 2000.

## PROTEIN ENGINEERING

**Course Code: BTB 732**

**Credit Units: 03**

**Course Objective:**

The aim of the course is to teach the students the basic methodology of recombinant DNA technology leading to the generation of genetically engineered proteins, protein folding and its characterization. The course would also emphasize the requirement of protein engineering technique in the generation of novel proteins for specific purposes of industrial importance.

**Course Contents:**

**Module I**

Dynamics and Structural Evolution Protein Engineering: Study of molecular interaction forces (Hydrogen, Ionic, covalent, van- der Waals and others), Structure and chemical properties of the building blocks of biological materials (amino acids, sugars, nucleic acids).

**Module II**

Protein structure and folding; Mechanism of folding; Principles of protein secondary structures, alpha-helix, beta-helix, beta-sheet, beta-turns, random coils, coiled coils, and others and case studies with Keratin, collagen and green fluorescence protein. Methods and tools used to characterize the molecular structures of biological materials (Circular dichroism, NMR, X-ray diffraction, FTIR, scanning electron microscopy and others).

**Module III**

Protein dynamics, Protein Folding (10,20,30 & 40), Proteins design and engineering, Random and site directed mutagenesis; Strategies to alter catalytic efficiency; structure prediction and modeling proteins; Molecular graphics in protein engineering; Dynamics and mechanics; Signal transduction.

**Module IV**

Receptors and hormones; antigen-antibody relationship; Drug-protein interactions and Design applications of engineered proteins.

**Module V**

Molecular chaperons, Heat shock protein, case study of misfolded prions; Drugs-protein interactions and Design; Protein engineering benefits in industry and medicine; Engineering of antibodies

**Examination Scheme:**

Components	H/Q	S	CT	EE
Weightage (%)	10	10	10	70

**Text & References:**

**Text:**

- Protein Engineering Protocol: Methods in Molecular Biology, Vol. 352 Muller, Kristian.
- Protein Engineering in Industrial Biotechnology, Lilia Alberghina (Editor), Hard wood academic Publisher.

**References:**

- Plant Protein Engineering: edited by Peter R Shewry and Steven Gutteridge, Press Syndicate of the University of Cambridge.
- Protein Engineering Hand book Vol, Stefan Lutz, Uwe Theo Bornscheuer.

**NANOTOXICOLOGY****BTB733****Credit Units: 03**

**Course objective:** The objective of the course is to explain the fundamental principles of nanotoxicity on different organisms and mechanism involved in it

**Module I**

Nanomaterials and Toxicity - Toxicity – nanoparticles in the environment – Health threats- nanomaterials and biotoxicity –Iron oxide –Titanium dioxide-dark studies –UV irradiation- In vivo - In Vitro and cytotoxicity studies.

**Module II**

Toxicity of Carbon nanotube - CNT implication for toxicological studies – Effect of CNT on Keratinocyte protein expression – exposure and risk and cardiovascular effects – insights from drug delivery

**Module III**

Toxicity: Handling of Nanomaterials - Physicochemical characteristics of nanomaterials – Nanoparticle interaction with biological membrane – Neurotoxicology - Toxicity of nanoparticles in the EYE.

**Module IV**

Health impact of Nanomaterials - Introduction – source of nanoparticles –epidemiological evidence –entry routes into the human body: Lungs – Inhalation – Deposition and translocation – Intestinal tract - Skin –

**Module V**

Environmental toxicity - Classifications and source of pollutants - Air - Water - Soil - biomarkers – Environmental implication of nanomaterials – Occurrences, Fate and characterisation of Nanomaterials in the environment.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

**Reference books :**

1. Nancy A. Monteiro – Riviere and C. Lang Tran, Nanotoxicology: Characterization, Dosing and Health Effects, Informa Healthcare. 2007.
2. Kumar, Challa S. S. R. (ed.) Nanomaterials - Toxicity, Health and Environmental Issues, Wiley-VCH, Weinheim, 2006.

**COMMUNICATION SKILLS - V****Course Code: BCS 701****Credit Units: 01****Course Objective:**

To facilitate the learner with Academic Language Proficiency and make them effective users of functional language to excel in their profession.

**Course Contents:****Module I**

Introduction to Public Speaking  
 Business Conversation  
 Effective Public Speaking  
 Art of Persuasion  
 Types of Interview  
 Styles of Interview  
 Facing Interviews-Fundamentals and Practice Session  
 Conducting Interviews- Fundamentals and Practice Session  
 Question Answer on Various Dimensions

**Module III**

Resume Writing  
 Covering Letters  
 Interview Follow Up Letters  
 Guidelines for Making a Call  
 Guidelines for Answering a Call

**Module III**

Negotiations  
 Participation in Meetings  
 Keynote Speeches

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>CAF</b>	<b>V</b>	<b>GD</b>	<b>GP</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References:**

- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice

## UNDERSTANDING SELF FOR EFFECTIVENESS - VII (INDIVIDUAL, SOCIETY AND NATION)

**Course Code:** BSS705

**Credit Units:** 01

**Course Objective:**

This course aims at enabling students towards:  
Understand the importance of individual differences  
Better understanding of self in relation to society and nation  
Facilitation for a meaningful existence and adjustment in society  
Inculcating patriotism and national pride

**Course Contents:**

**Module I: Individual differences & Personality**

Personality: Definition & Relevance  
Importance of nature & nurture in Personality Development  
Importance and Recognition of Individual differences in Personality  
Accepting and Managing Individual differences (adjustment mechanisms)  
Intuition, Judgment, Perception & Sensation (MBTI)  
BIG5 Factors  
Defining Diversity  
Affirmation Action and Managing Diversity  
Increasing Diversity in Work Force  
Barriers and Challenges in Managing Diversity

**Module II**

Nature of Socialization  
Social Interaction  
Interaction of Socialization Process  
Contributions to Society and Nation

**Module III**

Sense of pride and patriotism  
Importance of discipline and hard work  
Integrity and accountability  
Human Rights, Values and Ethics  
Meaning and Importance of human rights  
Human rights awareness  
Values and Ethics- Learning based on project work on Scriptures like- Ramayana, Mahabharata, Gita etc.  
End-of-Semester Appraisal  
Viva based on personal journal  
Assessment of Behavioural change as a result of training  
Exit Level Rating by Self and Observer

**Text & References:**

- Davis, K. Organizational Behaviour,
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction

- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- Robbins O.B.Stephen;. Organizational Behaviour

## FRENCH - VII

**Course Code:** FLT 701

**Credit Units:** 02

**Course Objective:**

Revise the portion covered in the first volume, give proper orientation in communication and culture.

**Course Contents:**

**Module A: Unités 1 – 3: pp. 06 - 46**

**Contenu lexical: Unité 1:** Rédiger et présenter son curriculum vitae

- Exprimer une opinion
- Caractériser, mettre en valeur
- Parler des rencontres, des lieux, des gens

**Unité 2:** Imaginer - Faire des projets

- Proposer - conseiller
- Parler des qualités et des défauts
- Faire une demande écrite
- Raconter une anecdote
- Améliorer son image

**Unité 3:** Exprimer la volonté et l'obligation

- Formuler des souhaits
- Exprimer un manque/un besoin
- Parler de l'environnement, des animaux, des catastrophes naturelles

**Contenu grammatical:**

1. Le passé : passé composé/imparfait
2. Pronoms compléments directs/indirects, y/en (idées/choses)
3. Propositions relatives introduites par qui, que, où
4. Comparatif et superlatif
5. Le conditionnel présent
6. Situer dans le temps
7. Féminin des adjectifs
8. La prise de paroles : expressions
9. Le subjonctif : volonté, obligation

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- le livre à suivre : Campus: Tome 2

**GERMAN - VII****Course Code:** FLG 701**Credit Units: 02****Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Introduction to Advanced Grammar and Business Language and Professional Jargon

**Course Contents:****Module I: Dass- Sätze**

Explain the use of the conjunction “-that”, where verb comes at the end of the sentence

**Module II: Indirekte Fragesätze**

To explain the usage of the “Question Pronoun” as the Relative Pronoun in a Relative Sentence, where again the verb falls in the last place in that sentence. Wenn- Sätze - Equivalent to the conditional “If-” sentence in English. Explain that the verb comes at the end of the sentence.

**Module III**

Weil- Sätze - Explain the use of the conjunction “because-” and also tell that the verb falls in the last place in the sentence. Comprehension texts - Reading and comprehending various texts to consolidate the usage of the constructions learnt so far in this semester. Picture Description - Firstly recognize the persons or things in the picture and identify the situation depicted in the picture; Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

**SPANISH - VII****Course Code: FLS 701****Credit Units: 02****Course Objective:**

To enable students acquire working knowledge of the language; to give them vocabulary, grammar, expressions used on telephonic conversation and other situations to handle everyday Spanish situations with ease.

**Course Contents:****Module I**

Revision of earlier semester modules

**Module II**

Zodiac signs. More adjectives...to describe situations, state of minds, surroundings, people and places. Various expressions used on telephonic conversation (formal and informal)

**Module III**

Being able to read newspaper headlines and extracts (Material to be provided by teacher). Negative commands (AR ending verbs) Revision of earlier sessions and introduction to negative ER ending commands, introduction to negative IR ending verbs

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>C</b>	<b>I</b>	<b>V</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español En Directo I A, 1B
- Español Sin Fronteras
- Material provided by the teacher from various sources

## CHINESE – VII

**Course Code:** FLC 701

**Credit Units: 02**

**Course Objective:**

The story of Cinderella first appears in a Chinese book written between 850 and 860 A.D. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

**Course Contents:**

**Module I**

Drills  
 Dialogue practice  
 Observe picture and answer the question.  
 About china part –I Lesson 1, 2. Pronunciation and intonation  
 Character Writing and stroke order.

**Module II**

Ask someone what he/she usually does on weekends?  
 Visiting people, Party, Meeting, After work....etc. Conversation practice  
 Translation from English to Chinese and vice-versa.  
 Short fables.

**Module III**

A brief summary of grammar.  
 The optative verb “yuanyi”.  
 The pronoun “ziji”.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- “Kan tu shuo hua” Part-I Lesson 1-7

<b>B.Tech Biotechnology: VIII- SEMESTER</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
BTB860	Project /Dissertation	CC	-	-	-	20
	<b>TOTAL</b>					<b>20</b>