



**AMITY UNIVERSITY**

MADHYA PRADESH

Established vide Government of Madhya Pradesh Act No. 27 of 2010

**Bachelor of Science Biotechnology-3YDC**  
**Bachelor of Science Biotechnology**  
**(Honours with Research)- 4YDC**

**Programme Code: BSB**

**Duration – 3 Years Full Time**

**Duration – 4 Years Full Time**

Programme Structure  
And  
Curriculum & Scheme of Examination

**Batch: 2023 -2026 (3YDC)**

**Batch: 2023 -2026 (4YDC)**

**AMITY UNIVERSITY**  
**MADHYA PRADESH**

*Vinay Dwivedi*  
Prof. (Dr.) Vinay Dwivedi  
Director, Amity Institute of Biotechnology  
Amity University Madhya Pradesh  
Maharajpura, Gwalior 474005



## PREAMBLE

Amity University aims to achieve academic excellence by providing multi-faceted education to students and encourage them to reach the pinnacle of success. The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Core and Elective), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

<u>Components</u>	<u>Codes</u>	<u>Weightage (%)</u>
Case Discussion/ Presentation/ Analysis	C	05 - 10
Home Assignment	H	05 - 10
Project	P	05 - 10
Seminar	S	05 - 10
Viva	V	05 - 10
Quiz	Q	05 - 10
Class Test	CT	10 - 15
Attendance	A	05
End Semester Examination	EE	70

It is hoped that it will help the students study in a planned and a structured manner and promote effective learning. Wishing you an intellectually stimulating stay at Amity University.

July 2023

## PROGRAMME OBJECTIVE

B. Sc. Biotechnology aims to develop highly specialized hard core specialization in various diversified areas of biotechnology and its application to medicine, agriculture, environment, nutraceuticals and functional food etc.

The curriculum has an inbuilt system of industrial summer training which keeps students abreast of latest industrial applications. Last semester is mainly devoted to research orientated project which helps the student to develop independent scientific temper with ability to execute a time bound fact finding initiative.

The curriculum imparts training in both fundamental and applied aspects of biotechnology. Each subject is adequately supported by applied practical conducted in well equipped laboratories in the area of Biotechnology, Animal Biotechnology & Immunology. The programme has a well conceived curriculum so as to fulfill the requirement for higher academic pursuits in Biotechnology.

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## PROGRAMME STRUCTURE: B.Sc. Biotechnology-3YDC B.Sc. Biotechnology (Honours With Research)-4YDC

### FIRST SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 101	Cell Biology	Discipline Specific Course (Core 1)	3	-	-	3
BSB 102	Maths & Biostatistics	Inter/ Multi-Disciplinary Course	3	-	-	3
BSB 103/ BSB 104	Plant Sciences – I/ Animal Sciences-I	Discipline Specific (Elective)	3	-	-	3
BSB 105	Chemistry – I	Discipline Specific (Minor 1)	2	-	-	2
	Minor Track (CBCS)	Minor 2	2	-	-	2
BSB 120	Biotechnology Lab - I	Discipline Specific Course (Core 1) Lab	-	-	2	1
BSB 121	Chemistry Lab – I	Discipline Specific (Minor 1) Lab	-	-	2	1
BSB 122/ BSB 123	Plant Sciences Lab - I/ Animal Sciences Lab-I	Discipline Specific (Elective) Lab	-	-	2	1
BCU 141	Communication Skill – I	Ability Enhancement Course (AEC)	2	-	-	2
<b>BSU143</b>	<b>Behavioural Science I</b>	<b>Value Added Course (VAC)</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>1</b>
EVS 142	Environmental Studies - I	Value Added Course (VAC)	2	-	-	2
FLU 144 FLU 145 FLU 146 FLU 147 FLU 148	Foreign Language - I French - I German Spanish Japanese Chinese	Skill Enhancement Course (SEC)	2	-	-	2
	<b>TOTAL</b>					<b>23</b>



## SECOND SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 201	Bioanalytical Techniques	Discipline Specific Course (core 1)	3	-	-	3
BSB 202	Introductory Biochemistry & Biophysics	Inter/ Multi-Disciplinary Course	3	-	-	3
BSB 203/ BSB 204	Plant Sciences – II/ Animal Sciences-II	Discipline Specific (Elective)	3	-	-	3
BSB 205	Chemistry – II	Discipline Specific (Minor 1)	2	-	-	2
	Minor Track (CBCS)	Minor 2	2	-	-	2
BSB 221	Biotechnology Lab - II	Discipline Specific Course (Core 1) Lab	-	-	2	1
BSB 222/ BSB 223	Chemistry Lab – II	Discipline Specific (Minor 1) Lab	-	-	2	1
BSB 122/ BSB 123	Plant Sciences Lab - II / Animal Sciences Lab-II	Discipline Specific (Elective) Lab	-	-	2	1
BCU 241	Communication Skill – II	Ability Enhancement Course (AEC)	2	-	-	2
<b>BSU243</b>	<b>Behavioural Science I</b>	<b>Value Added Course (VAC)</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>1</b>
EVS 242	Environmental Studies - II	Value Added Course (VAC)	2	-	-	2
FLU 244 FLU 245 FLU 246 FLU 247 FLU 248	Foreign Language - II French - II German Spanish Japanese Chinese	Skill Enhancement Course (SEC)	2	-	-	2
	<b>TOTAL</b>					<b>22</b>

- Vocational training for Certificate in bio-instrumentation (04 Credit).

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## THIRD SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 301	Genetics	Discipline Specific Course (core 1)	3	-	-	3
BSB 302	Microbiology	Discipline Specific Course (core 2)	3	-	-	3
BSB 303/ BSB 304	Anatomy & Plant Physiology/ Animal Physiology-I	Discipline Specific (Elective)	3	-	-	3
BSB 305	Chemistry – III	Discipline Specific (Minor 1)	2	-	-	2
	Minor Track (CBCS)	Minor 2	2	-	-	2
BSB 320	Biotechnology Lab - II	Discipline Specific Course (Core 1) Lab	-	-	2	1
BSB 321	Anatomy & Plant Physiology Lab/ Animal Physiology Lab-I	Discipline Specific (Elective) Lab	-	-	2	1
BSB 322	Chemistry Lab – II	Discipline Specific (Minor 1) Lab	-	-	2	1
BCU 341	Communication Skill – III	Ability Enhancement Course (AEC)	2	-	-	2
BSU343	Behavioural Science – III	Value Added Course (VAC)	1	-	-	1
FLU 344 FLU 345 FLU 346 FLU 347 FLU 348	Foreign Language – III French - III German Spanish Japanese Chinese	Skill Enhancement Course (SEC)	2	-	-	2
	<b>TOTAL</b>					<b>21</b>



## FOURTH SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 401	Molecular Cell Biology	Discipline Specific Course (core 1)	3	-	-	3
BSB 402	Bioinformatics	Inter/ Multi-Disciplinary Course	3	-	-	3
BSB 403/ BSB 404	Plant Breeding, Embryology, Pathology & Economic Botany/ Animal Physiology-II	Discipline Specific (Elective)	3	-	-	3
BSB 405	Chemistry – IV	Discipline Specific (Minor 1)	3	-	-	3
	Minor Track (CBCS)	Minor 2	2	-	-	2
BSB 420	Biotechnology Lab - IV	Discipline Specific Course (Core 1) Lab	-	-	2	1
BSB 421/ BSB 422	Plant Breeding, Embryology, Pathology & Economic Botany Lab/ Animal Physiology Lab-II	Discipline Specific (Elective) Lab	-	-	2	1
BSB 450	TERM PAPER/ Review Article	AEC	2	-	-	2
BSB-440	Behavioural Science – IV	VAC	2	-	-	2
FLU 444 FLU 445 FLU 446 FLU 447 FLU 448	Foreign Language – IV French - IV German Spanish Japanese Chinese	Skill Enhancement Course (SEC)	3	-	-	3
	<b>TOTAL</b>					<b>23</b>

- Vocational training for diploma in clinical biochemistry (4 credit).

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## FIFTH SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 501	Plant Biotechnology	Discipline Specific Course (core 1)	3	-	-	3
BSB 502	Animal Biotechnology	Discipline Specific Course (core 2)	3	-	-	3
BSB 503	Biochemistry and Metabolic Regulation	Discipline Specific Course (core 3)	3	-	-	3
BSB 504	Recombinant DNA Technology	Discipline Specific Course (core 4)	3	-	-	3
BSB-505	Enzyme Technology	Inter/ Multi-Disciplinary Course	2	-	-	2
	Minor Track (CBCS)	Minor 2	3	-	-	3
BSB- 521	Plant Biotechnology Lab	Discipline Specific Course (core 1) Lab	-	-	2	1
BSB-522	Animal Biotechnology lab	Discipline Specific Course (core 2) Lab	-	-	2	1
BSB- 523	Biochemistry and Metabolic Regulation Lab	Discipline Specific Course (core 3) Lab	-	-	2	1
BSB-524	Recombinant DNA Technology Lab	Discipline Specific Course (core 4) Lab	-	-	2	1
	<b>TOTAL</b>					<b>21</b>

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## SIXTH SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 601	Environmental Biotechnology	Discipline Specific Course (core 1)	3	-	-	3
BSB 602	Industrial Biology	Discipline Specific Course (core 2)	3	-	-	3
BSB 603	Immunology & Immunotechnology	Discipline Specific Course (core 3)	3	-	-	3
	Minor Track (CBCS)	Minor 2 (Project)	-	-	-	1
BSB 620	Environmental Biotechnology Lab	Discipline Specific Course (core 1) Lab	-	-	2	1
BSB 621	Industrial Biology lab	Discipline Specific Course (core 2) Lab	-	-	2	1
BSB 623	Immunology and immunology lab	Discipline Specific Course (core 3) Lab	-	-	2	1
BSB 660	Project (6-8 Week)	Field Project/ Summer Internship Project	-	-	-	6
	<b>TOTAL</b>					<b>19</b>

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## SEVENTH SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 701	Advanced Microbial Technology	Discipline Specific Course (core 1)	3	1	-	4
BSB 702	Advanced Cell Biology and Genetics	Discipline Specific Course (core 2)	3	1	-	4
BSB 703	Advanced Biophysics & Bioanalytical Techniques	Discipline Specific Course (core 3)	3	1	-	4
BSB 704	Advanced Biostatistics for Biologist	Discipline Specific Course (core 4)	3	1	-	4
BSB 720	Advanced Microbial Technology Lab	Discipline Specific Course (core 1) Lab	-	-	2	1
BSB 721	Advanced Cell Biology and Genetics Lab	Discipline Specific Course (core 2) Lab	-	-	2	1
BSB 722	Advanced Biophysics & Bioanalytical Techniques lab	Discipline Specific Course (core 3) Lab	-	-	2	1
	<b>TOTAL</b>					<b>19</b>

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## EIGHT SEMESTER

Course Code	Course Title	Broad Category of Courses	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credit
BSB 801	Genomics and Proteomics	Discipline Specific Course (core 1)	3	-	-	3
BSB 802	Drug Delivery System	Discipline Specific Course (core 2)	3	-	-	3
BCH 621	Management Accounting and Cost Control	Inter/ Multi-Disciplinary Course 1	1	-	-	1
BCH 622	Project Management	Inter/ Multi-Disciplinary Course 2	1	-	-	1
BCH 623	Principle of management and Entrepreneurship Development	SEC	1	-	-	1
BSB 860	Project (10-12 Week)	Dissertation	-	-	-	15
	<b>TOTAL</b>					<b>24</b>

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## Course structure: Cell Biology - Course Code-BSB 101

Course Title: Cell Biology

Credit Units: 03

Course Level: UG Level

Course Code: BSB 101

### Course Objectives:

- Enable students to understand the cell as a unit of living systems, its various organelles, their structure, function and metabolic processes
- Help students to practice a conceptual frame work for dealing with the evolving understanding of cell.
- Enable students to strengthen the cellular structure of cell organelle and their functions.

Pre-requisites: The students must possess fair understanding of prokaryotic and eukaryotic cell structure and function.

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I : Cell as a basic unit of living systems</b>	20 %
Descriptors/Topics The cell theory, precellular evolution; broad classification of cell types: archaeobacteria, PPLOs, bacteria, eukaryotic microbes, plant – and animal cells; cell, tissue, organ and organisms, different levels of organization.	
<b>Module II</b>	20 %
<b>Ultrastructure of the cell membrane and cell organelles</b>	
Descriptors/Topics Ultrastructure of cell membrane and function, Structure of cell organelles; golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes; cytoskeletal structures (actin, microtubules.), mitochondria, chloroplast, lysosomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus).	
<b>Module III Chromosomes</b>	20 %
Descriptors/Topics Structural organisation of chromosomes, chromatids, centromere, telomere, chromatin, nucleosome organisations; eu-and heterochromatin.	
<b>Module IV: Cell division and cell cycle</b>	15 %
Descriptors/Topics: Cell cycle, interphase, mitosis and meiosis	
<b>Module V: Cell – Cell interaction</b>	15 %
Descriptors/Topics: Cell locomotion (amoeboid, flagellar and ciliar); cell senescence and death (apoptosis)	
<b>Module VI: Cell differentiation</b>	10%
Descriptors/Topics: Mechanism of cell differentiation (e.g., RBC) ;difference between normal and cancer cells	

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**Student Learning Outcomes:**

- Understand the concepts theories given by scientists for the origin of cell along with different types of prokaryotic and eukaryotic cells
- Analyze various cellular structure of cell organelle and their functions.
- Identify, implement and evolve verbal and written skills of subject along with interdisciplinary approach
- Evaluate the Difference between chromosomal structures in different stages of a cell cycle.
- Enable students to understand the cell differentiation, malignancy and cell death.

**Pedagogy for Course Delivery:** Students are encouraged to engage in active interaction during lecture through discussion and questions.

Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	10	5	70

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

- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.
- Cell and Molecular Biology -Sheelar& Bianchi, John Wiley

**References:**

- Essential Cell Biology : An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company
- Molecular Cell Biology, H.Lodish, A.Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Preeman and Company.
- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell Biology, Singh & Tomar
- The world of the cell – Becker ,Klinshmith& Harden, Pearson



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## Course structure: Maths & Biostatistics – BSB 102

Course Title: Maths & Biostatistics

Credit Units: 03

Course Level: UG

Course Code: BSB 102

### Course Objectives:

The course involves a working understanding of tools of mathematical & statistical skills in the field of biology.

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I BRIDGE COURSE</b>	25%
Descriptors/Topics: Set theory and properties of subsets, Binomial theorem of integer, logarithm (definition & laws of logarithm, use of log table), surds, square root & cube root	
<b>Module II</b>	25%
Descriptors/Topics Function, limits of functions, (basic idea of limits of functions without analytic definition), derivatives of functions ( $e^x$ , $x^n$ , $\sin x$ , $\cos x$ , $\log x$ ), Maxima and Minima, Partial Differentiation, Integration of some basic functions, Matrices (Fundamental calculations and calculation of Eigen values) and Series	
<b>Module III BIOSTATISTICS</b>	25 %
Descriptors/Topics: Measure of central tendency and measure of dispersion Probability (classical & axiomatic definition of probability, theorem on total and compound probability), Addition and Multiplication theorem of Probability, Random variables and Probability Distribution Simple problems involving Binomial, Poisson and Normal variables,	
<b>Module IV</b>	25%
Descriptors/Topics: Correlation and regression, Methods of sampling, collection of data: primary & secondary data, Probability Sampling and non Probability Sampling methods.	

### Student Learning Outcomes:

- Understand the concepts of maths and central tendency and measure of dispersion.
- Analyze various methods of sampling.

**Pedagogy for Course Delivery:** Students are encouraged to engage in active interaction during lecture through discussion and questions.

Power point presentation and class room lecture.

### List of Professional Skill Development Activities (PSDA): If applicable

Lab/ Practical details, if applicable: NA

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**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	10	5	70

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

- Fundamental of Biostatistics, Bernard Rosner, Oxford University Press
- Mathematical Statistics, H.C. Saxena, S. Chand & Company

**References:**

- Introduction to Probability Theory, P.G. Hoel, Houghton Mifflin College
- Introduction to Statistical Theory, P.G. Hoel, S.C. Port, C.J. Schiller, R.A. Srinivasan, A. Srivasan, McGraw-Hill Trade
- Schaum's Outline of Probability, Random Variables and Random Processes, H.P. Hsu, McGraw-Hill Trade
- Statistics of Extremes, E.J. Gumbel, Columbia University Press



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## Course structure: Plant Sciences - I- Course Code: BSB 103

Course Title: **Plant Sciences – I**

Credit Units: 03

Course Level: UG

Course Code: BSB 103

**Course Objectives:**

- Enable students to understand the classification, morphology, reproduction in plants.
- Enable students to strengthen economic importance of various groups of lower plants which will provide the basic knowledge for the employment of these plants to study plant biotechnology.

**Pre-requisites:** The students must possess fair understanding of plants classification, morphology, reproduction and economic importance.

**Course Contents/Syllabus:**

	Weightage (%)
<b>Module I Algae</b>	25%
Descriptors/Topics : History of Botany and Indian Contribution, Morphological Characteristics of lower plants. Fritsch Classification, occurrence, structure, systematic position mode of reproduction and economic importance of the following genera: <i>Chlamydomonas</i> , <i>Chara</i> , <i>Sargassum</i> , <i>Polysiphonia</i> , <i>Nostoc</i> .	
<b>Module II Fungi</b>	25%
Descriptors/Topics: Outlines of classification of fungi, position, occurrence, structure and mode of reproduction in fungi, based on the following representatives: <i>Eurotium</i> , <i>Morchella</i> , <i>Agaricus</i> and <i>Alternaria</i> , Economic importance of fungi, Lichens: Classification, occurrence, systematic position, mode of nutrition, reproduction and economic importance, Mycorrhiza: Systematic position, general mode of reproduction and economic importance	
<b>Module III Bryophytes</b>	25%
Descriptors/Topics Outlines of classification and importance of bryophytes, Systematic position occurrence, morphology, anatomy and reproduction in, <i>Marchantia</i> , <i>Anthoceros</i> (Development of Sporophyte only).	
<b>Module IV Pteridophytes</b>	25%
Systematic Position, occurrence, morphology, anatomy and development of reproductive structures of <i>Selaginella</i> , <i>Equisetum</i> and <i>Marsilea</i> , Stellar system and its evolution in Pteridophytes, Heterospory and seed habit.	

**Student Learning Outcomes:**

- Understand the concepts of algal plants morphology, and economic features, evolutionary pathways & mode of reproduction.
- Analyze various role of algae in freshwater, marine and soil environments as primary producers, suppliers of nutrition to animals and as resources for humans.

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- Identify, implement and evolve the occurrence, distribution, structure, phylogeny, evolutionary concepts and life history of fungi, lichens & mycorrhiza
- Evaluate the general morphology, diversity, distribution, sexual reproduction, diversity of bryophytes, the significance of bryophytes as pioneer plants on land and their role in the origin of pteridophytes
- Enable students to classification, morphology, reproduction and economic importance plants.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable: NA**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	10	5	70

**Text & References:**

**Text:**

- College Botany Vol. I and II, Ganguli and Kar
- A Text Book of Botany, V. Singh, P.C. Pande & D.K. Jain

**References:**

- The Algae, V. J. Chapman and D. J. Chapman.
- Introductory Phycology, H. D. Kumar.
- A Text Book of Algae, H. D. Kumar and H.N. Singh.
- Introductory Mycology, Alexopoulos and Mims
- Cryptogamic Botany, G. M. Smith.
- A Text book of Algae, B. R. Vashishtha
- Bryophytes, N. S. Parihar
- Pteridophytes, N. S. Parihar
- An Introduction to Pteridophytes, A. Rashid.



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## Course structure: Animal Sciences - I- Course Code: BSB 104

Course Title: **Animal Sciences – I**

Credit Units: 03

Course Level: UG

Course Code: BSB 104

**Course Objectives:**

- Enable students to understand the characteristics and variation among different phylum of Invertebrates from Protozoa to Echinodermata.
- Enable students to strengthen economic importance of various characteristics and variations of invertebrates.

**Pre-requisites:** The students must possess fair understanding of invertebrate classification, morphology, reproduction and economic importance.

**Course Contents/Syllabus:**

	Weightage (%)
Module I	20%
Descriptors/Topics : Diversity among Invertebrates: Concept of species, Binomial nomenclature, classification-Hierarchy. -Salient features and out line classification of various phyla of lower and higher invertebrates upto class with suitable examples (According to Parker and Haswell latest edition).	
Module II	20%
Descriptors/Topics: -Protozoa: Type study of Plasmodium. -Porifera: Type of Sycon.	
Module III	20%
Descriptors/Topics: -Coelenterata: Type study of <i>Ovelia</i> . -Helminthes: Type Study of <i>Liverfluke</i> .	
Module IV	20%
<b>Higher Invertebrates</b> -Annelida: Type study of <i>Pheretima</i> (Earth worm) and <i>Vermicomposting</i> , -Arthropoda: Type Study of <i>Prawn</i>	
Module V	20%
Mollusca: Type Study of <i>Pila</i> Echinodermata: External features of Star fish and Echinoderm larvae, Hemichordata: General Characteristics and relationship with nonchordates and chordates, External morphology (Balanoglossus) structure and significance of Trocharia Larva	

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**Student Learning Outcomes:**

- Learn about characteristics and variations of invertebrates.
- Develop scientific outlook for research and innovation.
  
- Get knowledge of typical invertebrates and their economic importance.
- Develop conservative outlook for animals.
- Generate written and verbal communication skills over the subject.
- Enable students to classification, morphology, reproduction and economic importance animal.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	10	5	70

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

- Jordan, E.K. and Verma, P.S., Invertebrate Zoology. S. Chand & Co. New Delhi.
- Kotpal, R.L., Refer to the series on Protozoa, porifera, Coelentrta, Annelida, Arthropoda, Mollusca, Echinodermata. Rastogi Publication, Merrut.
- Borradile, L.A. and Potts, F.A., Invertebrate Zoology, Cambridge Press, UK.
- Dhami, P.S. and Dhami, J.K., Invertebrate Zoology, S Chand & Co. New Delhi.
- Kotpal R.L., Text book of zoology: Invertebrates, Rastogi publication.



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## Course structure: Chemistry- I- Course Code: BSB 105

Course Title: **Chemistry– I**

Credit Units: 04

Course Level: UG

Course Code: BSB 105

### Course Objectives:

The objective of this course is to educate the students about molecules, their energy to form bonds, Periodicity and periodic table, different properties of the elements with reference to s & p-block elements in periodic table. In addition to this, the student will learn the concepts related to chemical kinetics and rate of reactions as well. The last objective of this course is associated with fundamentals of organic chemistry including structure and electron delocalization effects.

### Course Contents:

#### Module I: Basic Analytical Chemistry: (6 Hours)

Introduction to analytical chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

Calculations used in Analytical Chemistry Some Important units of measurements:

SI Units, distinction between mass and weight, mole, milli mole and Numerical Problems.

Solution and their concentrations: Concept of Molarity, molality and normality. Expressing the concentration in parts per million (ppm), parts per billion (ppb), Numerical problems.

Chemical Stoichiometry: Empirical and molecular formulas, Stoichiometric calculations, Numerical problems.

#### Module II: Chemical Bonding: (12 Hours)

Ionic Bonding: General characteristics of ionic bonding. Ionic bonding & Energy: lattice & solvation energies and their importance in the context of stability and solubility of ionic compounds.

Statement of Born-Landé equation for calculation of lattice energy, Madelung constant, Born-Haber cycle and its applications. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules.

Covalent bonding: Lewis structure, Valence Bond theory (Heitler London approach).

Hybridization – Concept, types (sp, sp<sup>2</sup>, sp<sup>3</sup>, dsp<sup>2</sup>, d<sup>2</sup>sp<sup>3</sup>) with suitable examples of inorganic and organic molecules

Ionic character in covalent compounds- dipole moment and percentage ionic character.

Valence shell electron pair repulsion theory (VSEPR) theory: Assumptions, need of theory, application of theory to explain geometries or shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements such as: NH<sub>3</sub>, H<sub>2</sub>O, SF<sub>4</sub>, CIF<sub>3</sub>, PCl<sub>5</sub>, SF<sub>6</sub>, CIF<sub>5</sub>, XeF<sub>4</sub>.

Molecular orbital (MO) concept of bonding The approximations of the theory, Linear combination of atomic orbitals (LCAO) (elementary pictorial approach) Rules for the LCAO method, bonding and antibonding Mos. Characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals.



MO diagrams of homonuclear diatomic molecules: H<sub>2</sub>, Be<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, F<sub>2</sub>, and their ions.  
Molecular orbitals of heteronuclear diatomic molecules: CO, NO, CN, HF.  
Bond parameters: Definition and factors affecting - bond orders, bond lengths, bond angles. Resonance and Hydrogen Bonding

Module III: Periodic table: (6 Hours)

Modern periodic table. Periodicity in properties of elements, atomic radii, ionic and covalent radii, ionization energies, electron affinity, electro-negativity. Effective nuclear Charge, shielding or screening effect Slater rules, variation of effective nuclear charge in periodic table.

Module IV: Elementary idea of s & p-block elements in periodic table: (6 Hours)

Detailed discussion of the following properties of the elements, with reference to s & p-blocks. Ionization energy. Successive ionization energy and factors affecting ionization energy. Applications of ionization energy. Electronegativity- Pauling's/ Mulliken's electronegativity scales. Variation of electronegativity with bond order, partial charge, hybridization.

Module V: Chemical Kinetics: (4 Hours)

Velocity of a reaction, Law of mass action; determination of rate constants for first and second order reactions, collision theory of bimolecular reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Catalysis: Promoters and Poisons, Enzyme catalysis.

Module VI: Fundamentals of Organic Chemistry: (6 Hours)

Structure, shape and reactivity of organic molecules: Physical effects, electronic displacements: Inductive effect, electromeric effect, resonance and hyperconjugation. Cleavage of bonds: homolysis and heterolysis. Reactive intermediates: carbocations, carbanions and free radicals. Nucleophiles and electrophiles

### Learning Outcomes:

After successful completion of the course students will have the knowledge and skill to understand the very basic concepts of analytical chemistry and calculations. Understand the very basic bonding mechanism and the application to materials in different field, periodicity and periodic table. Understand different properties of the elements with reference to s & p-block elements in periodic table, Understand the chemical kinetics and rate of reaction. Understand fundamentals of organic chemistry including structure and electron delocalization effects.

### Examination Scheme:

Components	CT	A	HA/S/V/Q	EE
Weightage (%)	15	5	10	70


### Examination

Text & References:

Text:

Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry - Volume I. (2000). India: S. Chand Limited. ISBN 9788121902632

Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry - Volume II. (2000). India: S. Chand Limited. ISBN 9788121917873

  
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Puri, Sharma & Pathania, Principles of Physical Chemistry. (2008). India: VISHAL PUBLISHING Company. ISBN 9788188646654

Morrison & Boyd. Organic Chemistry (2016) Pearson New Delhi. ISBN 8177581694

Bahl, A., Bahl, B. S. (1997). A textbook of organic chemistry : (for B.Sc. students). India: Chand. ISBN 9788121902595

References:

J.D. Lee. Concise Inorganic Chemistry, , Black Well Sciences. ISBN 9788126515547.

Keeler, J., De Paula, J., Atkins, P. W. (2018). Atkins' Physical Chemistry. United Kingdom: Oxford University Press. ISBN 9780198814740.

Snyder, S. A., Solomons, T. W. G., Fryhle, C. B. (n.d.). Organic Chemistry 12e. United Kingdom: John Wiley & Sons, Limited. ISBN 9781119572985.

Vogel's Quantitative Chemical Analysis. (2009). India: Pearson Education. ISBN 9788131723258

Snyder, S. A., Solomons, T. W. G., Fryhle, C. B. (n.d.). Organic Chemistry 12e. United Kingdom: John Wiley & Sons, Limited. ISBN 9781119572985.



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## Course structure: BIOTECHNOLOGY LAB – I- BSB 120

Course Title: Biotechnology lab–I (based on cell biology and biostatistics) Credit Units: 01

Course Level: UG

Course Code: **BSB 120**

Course Objectives: NA

Course Contents/Syllabus:

	Weightage (%)
<b>Module I Cell Biology</b>	50%
Descriptors/Topics: Cytological preparations to study plant /animal cell structure, Fixation, dehydration and staining, Onion root tip and pollen squash preparation. Study of different stages of Mitosis and Meiosis. Embedding and sectioning.	
<b>Module II Biostatistics</b>	50%
Descriptors/Topics Problems on test of significance, t-test, chi-square test for goodness of fit and analysis of variance (ANOVA)	

### Student Learning Outcomes:

- Understand the concepts of cell biology and biostatistics on the basis of practical.

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

**List of Professional Skill Development Activities (PSDA): If applicable: NA**

**Lab/ Practical details, if applicable:**

**Assessment/ 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

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## Course structure: CHEMISTRY LAB – I - Course Code-BSB 121

Course Title: **CHEMISTRY LAB – I**

Credit Units: 02

Course Level: UG

Course Code: BSB 121

Course Objectives:

Through this course, the students will learn the importance of chemical safety and lab safety while performing experiments in laboratory. Calibration of different weights and glass apparatus such as measuring cylinder, burette, pipette, volumetric flasks shall be detailed to the students for systematic initiation of their chemical lab classes.

Course Contents:

### Module I

(6 Hrs)

Importance of chemical safety and lab safety while performing experiments in laboratory  
Calibration of different weights and glass apparatus (measuring cylinder, burette, pipette, volumetric flasks).

### Module II

(10 Hrs)

Preparation of solutions of different molarity/normality by weighing and dilution.

### Module III

(8 Hrs)

Titrimetric Analysis  
Standardization of NaOH with Oxalic acid.  
Determination of Normality of given sample of oxalic acid using NaOH as secondary standard.

### Module IV

(4 Hrs)

Determination of surface tension and viscosity of liquids

### Module V

(6 Hrs)

Heat of neutralisation of a strong acid and a strong base  
Solubility curve of KNO<sub>3</sub> or benzoic acid.

### Module VI

(6 Hrs)

Determination Boiling Point, Melting Point  
Purification by crystallization  
Purification by simple distillation


Note:

Students are required to perform at least ten experiments by selecting minimum one experiment from each module.

Instructor may choose to assign value added experiments relevant to theory syllabus.

Course Outcomes:

After completion of this course the students will understand the importance of best practices of chemical safety and lab safety while performing experiments in laboratory. Calibration of different weights and glass apparatus such as measuring cylinder, burette, pipette, volumetric flasks shall be known to the students for systematic initiation of their chemical lab experiments.

  
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**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

CT: Class Test, A: Attendance, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

**Text & References:**

Pandey O.P. & et Al. Practical Chemistry (2010), S. Chand New Delhi. ISBN:978-8121908122.  
Das, Subash Chandra. Advanced practical chemistry, 3/e rev. / Kolkata Quality Printing 2003  
Vogel's Quantitative Chemical Analysis. (2009). India: Pearson Education. ISBN 9788131723258  
S K Bhasin & Sudha Rani. Laboratory Manual on Engineering Chemistry.(2019); Dhanpat Rai  
Publishing Company. ISBN: 978-8187433132  
Experiments in Applied Chemistry, Dr. Sunitta Rattan; CATSON Book Publishers.  
Unified Practical Chemistry, MMN Tandon, Shiv Lal Agrawal and Company



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## Course structure: Plant Sciences Lab - I Course Code BSB 122

Course Title: **Plant Sciences Lab - I.**

Credit Units: 01

Course Level: UG

Course Code: **BSB 122**

Course Objectives:

- Enable students to understand the morphology and anatomy of plant cell through specimen studies.

Pre-requisites: The students must possess fair understanding of algae, fungi, bryophytes and pteridophytes.

Course Contents/Syllabus:

	Weightage (%)
<b>Module I : Algae</b>	25 %
Descriptors/Topics: Study of Algal types with the help of permanent slides and also by preparing suitable slides as prescribed in the theory course. (Chlamydomonas,,Chara, Sargassum, Polysiphonia,)	
<b>Module II: Fungi</b>	25 %
Descriptors/Topics: Study of Fungal types with the help of permanent slides and also by preparing suitable slides as prescribed in the theory course. (Eurotium, Morchella, Agaricus)	
<b>Module III : Bryophytes</b>	25 %
Descriptors/Topics Study of Bryophytes like Riccia, Marchantia ,Anthoceros with the help of permanent slides and also by cutting sections and making suitable preparations.	
<b>Module IV : Pteridophytes</b>	25 %
Descriptors/Topics Study of the pteridophytes like Selaginella, Equisetum, and Marsilea with the help of permanent slides and also by cutting sections and making suitable preparations.	

### Student Learning Outcomes:

- Understand the concepts of plants.

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable:**

**Assessment/ 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



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## Course structure: Animal Sciences Lab- I - Course Code: BSB 123

Course Title: **Animal Sciences Lab- I**

Credit Units: 01

Course Level: UG

Course Code: BSB 123

Course Objectives:

- Enable students to understand the basic concept of animal structure.
- Help students to practice handling of microscopic
- Enable students to strengthen the various cosmopolitan microorganisms and its importance.

Pre-requisites: The students must possess fair understanding of various invertebrates phylum.

Course Contents/Syllabus:

Module	Weightage (%)
Descriptors/Topics : <ul style="list-style-type: none"> <li>• Study of museum specimens and slides, related to various phyla of invertebrates</li> <li>• Preparation of slides of amoeba, paramecium.</li> <li>• Dissection of earthworm and digestive system of earth worm, Prawn</li> <li>• Dissection of cockroach and glycerin preparation of mouth parts.</li> <li>• Dissection of Pila.</li> <li>• Use specimens and permanent slides (Mounting).</li> <li>• Examination of pond water for study of different kinds of microscopic non-chordate organisms</li> <li>• Economic importance of any two insects and parasitic adaptation of any one parasite</li> </ul>	1% -100%

### Student Learning Outcomes:

- Understand the various invertebrates
- Analyse various microorganism
- Identify, implement and evolve of various system of invertebrates.

**Pedagogy for Course Delivery: Dissections and Demonstrations of animal by brown papering, Through charts and model easy to understand the complete model.**

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable:**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	10	10	70

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## COMMUNICATION SKILL-I

**Course Code: BCU 141**

**Credit Units: 1**

**Course Objective:**

The course is intended to familiarize students with the basics of English language and help them to learn to identify language structures for correct English usage.

**Prerequisites: NIL**

Course Contents / Syllabus:		
1.	<b>Module I Essentials of English Grammar</b>	<b>30% Weightage</b>
	<ul style="list-style-type: none"> <li>• Common Errors</li> <li>• Parts of Speech</li> <li>• Collocations, Relative Pronoun</li> <li>• Subject-Verb Agreement</li> <li>• Articles</li> <li>• Punctuation</li> <li>• Sentence Structure- 'Wh' Questions</li> </ul>	
2.	<b>Module II Written English Communication</b>	<b>30% Weightage</b>
	<ul style="list-style-type: none"> <li>• Paragraph Writing</li> <li>• Essay Writing</li> </ul>	
3.	<b>Module III Spoken English Communication</b>	<b>30% Weightage</b>
	<ul style="list-style-type: none"> <li>• Introduction to Phonetics</li> <li>• Syllable-Consonant and Vowel Sounds</li> <li>• Stress and Intonation</li> </ul>	
4.	<b>Module IV : Prose</b>	<b>10% Weightage</b>
	<p>“Friends, Romans, Countrymen, lend me your ears” Speech by Marc Antony in Julius Caesar</p> <p>❖ Comprehension Questions will be set in the End-Semester Exam</p>	

**Student Learning Outcomes:**

The students should be able to :

- Identify Common Errors and Rectify Them
- Develop and Expand Writing Skills Through Controlled and Guided Activities
- To Develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.

**Pedagogy for Course Delivery:**

- Workshop
- Group Discussions
- Presentations
- Lectures
- Extempore



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**Text:** Rosenblum, M. How to Build Better Vocabulary, London: Bloomsbury Publication

Verma, Shalini. Word Power made Handy, S. Chand Publications

High School English Grammar & Composition by Wren & Martin

References: K.K.Sinha, Business Communication, Galgotia Publishing Company.

Additional Reading: Newspapers and Journals

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## ENVIRONMENTAL STUDIES-I

Course Code: EVS – 142

Credit Units: 02

Total Hours: 20

### Course Objectives

The term environment is used to describe, in the aggregate, all the external forces, influences and conditions, which affect the life, nature, behavior and the growth, development and maturity of living organisms. At present a great number of environmental issues, have grown and complexity day by day, threatening the survival of mankind on earth. Environment study is quite essential in all streams of studies including 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 / Syllabus:		
1.	<b>Module I The multidisciplinary nature of environmental studies (6 Hrs)</b>	<b>25% Weightage</b>
	<ul style="list-style-type: none"><li>• Definition, scope and importance</li><li>• Need for public awareness</li></ul>	
2.	<b>Module II Natural Resources (8 Hrs)</b>	<b>25% Weightage</b>
	<ul style="list-style-type: none"><li>• Renewable and non-renewable resources:</li><li>• Natural resources and associated problems</li><li>• Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.</li><li>• Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.</li><li>• Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.</li><li>• Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.</li><li>• Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.</li><li>• Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.</li><li>• Role of an individual in conservation of natural resources.</li><li>• Equitable use of resources for sustainable lifestyles.</li></ul>	
3.	<b>Module III Ecosystems (3 Hrs)</b>	<b>25% Weightage</b>
	<ul style="list-style-type: none"><li>• Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession</li><li>• Food chains, food webs and ecological pyramids</li><li>• Introduction, types, characteristic features, structure and function of the following ecosystem.</li><li>• Forest ecosystem</li><li>• Grassland ecosystem</li></ul>	

	<ul style="list-style-type: none"> <li>• Desert ecosystem</li> <li>• Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)</li> </ul>	
<b>4.</b>	<b>Module IV : Biodiversity and its conservation (3 Hrs)</b>	<b>25% Weightage</b>
	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	


### Course Outcome

Upon course completion, students will be able to understand:

- The multidisciplinary nature of environmental studies, including its definition, scope and need for public awareness.
- Our natural resources including renewable and non-renewable resources comprising of forest, water, mineral, food, energy and land resources.
- The ecosystem, their structure and function, energy flow, bio-geochemical cycles, community ecology, ecological succession, ecological pyramids, forest, grassland, aquatic and tundra ecosystem.
- Biodiversity and its conservation.
- Ecosystem diversity, species diversity and genetic diversity.
- Biological classification of India.
- Value of biodiversity.
- Biodiversity at global national and local level.
- Conservation of biodiversity.
- Characteristic of ideal ecosystem.
- Study of an artificial ecosystem.

### Text & References:

- Chauhan B. S. 2009: Environmental Studies, University Science Press New Delhi.
- Dhameja S.K., 2010; Environmental Studies, Katson Publisher, New Delhi.
- Smriti Srivastava, 2011: Energy Environment Ecology and Society, Katson Publisher, New Delhi.
- 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 Encyclopaedia, Jaico Publ. House, Mumbai, 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., Encyclopaedia 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.

  
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## Behavioural Science – I

**Course Code: BSU-143**

**Course Credit: 01**

### Course Objective:

This course aims at imparting an understanding of:

- 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 Competency

	Weightage (%)
<b>Module I Self: Core Competency</b>	20%
Descriptors/Topics <ul style="list-style-type: none"> <li>• Understanding of Self</li> <li>• Components of Self – Self identity</li> <li>• Self concept</li> <li>• Self confidence</li> <li>• Self image</li> </ul>	
<b>Module II Techniques of Self Awareness</b>	20%
Descriptors/Topics <ul style="list-style-type: none"> <li>• Exploration through Johari Window</li> <li>• Mapping the key characteristics of self</li> <li>• Framing a charter for self               <ul style="list-style-type: none"> <li>• Stages – self awareness, self acceptance and self realization</li> </ul> </li> </ul>	
<b>Module III Self Esteem &amp; Effectiveness</b>	20 %
Descriptors/Topics <ul style="list-style-type: none"> <li>• <input type="checkbox"/> Meaning</li> <li>• <input type="checkbox"/> Importance</li> <li>• <input type="checkbox"/> Components of self esteem</li> <li>• <input type="checkbox"/> High and low self esteem</li> <li>• <input type="checkbox"/> Measuring your self esteem.</li> </ul>	
<b>Module IV Building Positive Attitude</b>	20%
Descriptors/Topics <ul style="list-style-type: none"> <li><input type="checkbox"/> Meaning and nature of attitude</li> <li><input type="checkbox"/> Components and Types of attitude</li> <li><input type="checkbox"/> Importance and relevance of attitude</li> </ul>	
<b>Module V Building Emotional Competence</b>	20%
Descriptors/Topics <ul style="list-style-type: none"> <li><input type="checkbox"/> Emotional Intelligence – Meaning, components, Importance and Relevance</li> <li><input type="checkbox"/> Positive and negative emotions</li> <li><input type="checkbox"/> Healthy and Unhealthy expression of emotions</li> </ul>	

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### **Student learning outcomes**

- Student will Develop accurate sense of self
- Student will nurture a deep understanding of personal motivation
- Student will develop thorough understanding of personal and professional responsibility
- Student will able to analyse the emotions of others for better adjustment.

### **Book References**

- Organizational Behaviour, Davis, K.
- Hoover, Judith 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
- 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.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers



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## Français-I

**CourseCode: FLU144**

**Creditunits: 02**

### CourseObjective:

To familiarize students with the French language, with its phonetic system and its accents.

To enable students

- to greet someone in French
- to present and describe oneself and people
- to enter in contact, and begin a conversation
- to talk about one's family, tastes and preferences

### CourseContents:

#### Dossiers 1, 2 – pg 5-24 Dossier 1: Toi, moi, nous Actes de Communication:

S'adresser poliment à quelqu'un, entrer en contact, se présenter, présenter quelqu'un, saluer, poser des questions

simples pour connaître quelqu'un, épeler et compter

#### Dossier 2: En famille Actes de Communication:

Parler de sa famille, Décrire quelqu'un, exprimer ses goûts, écrire et comprendre un message court, inviter

quelqu'un, exprimer la possession, la négation

### Grammaire :

1. articles indéfinis, articles définis, masculin et féminin des noms et des adjectifs, pluriel des noms et des adjectifs
2. pronom sujets toniques, on, c'est/il est + profession,
3. masculin et féminin des adjectifs de nationalité
4. verbes être, avoir, aller, 'er' groupe
5. l'interrogation – l'intonation, est-ce que, qui est-ce ? Qu'est-ce que ? L'inversion; où, comment, quand; quel
6. la négation
7. adjectifs possessifs

### Examination Scheme:

Components	INTERNAL				EXTERNAL	GRAND TOTAL
	MID-SEM	VIVA-VOCE	ATTENDANCE	TOTAL	END SEMESTER	
Weightage (%)	15	10	5	30	70	100

### Text & References:

#### Text:

#### Le livre à suivre:

- Andant, Christine et al. A propos A Livre de l'élève. Grenoble: Presses universitaires de Grenoble, 2010.

- Andant, Christine et al. A propos A Cahier d'exercices. Grenoble: Presses universitaires de Grenoble, 2010.

#### Références:

- Girardeau, Bruno et Nelly Mous Reuss. Le DELF A1 Paris. Didier, 2010.

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## Course structure: Introductory biochemistry and biophysics- Course Code BSB 201

Course Title: **Introductory biochemistry and biophysics**. Credit Units: 04

Course Level: UG

Course Code: BSB 201

Course Objectives: Basics in Biochemistry and Biophysics will be taught to the students in the first year itself, which will act as a foundation for all further courses in Biotechnology. The students will be familiarized with structures and functions of biomolecules and basic energetic that governs the biological reactions.

Pre-requisites: The students must possess fair understanding of Basics in Biochemistry and Biophysics

Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Classification of biomolecules, Nature of Biological materials</b>	20 %
Descriptors/Topics carbohydrates, lipids, proteins,, nucleic acids; oxidation-reduction properties, pH, pK and buffering, hormones and growth factors. High energy biomolecules ATP, GTP & Creatine phosphate	
<b>Module II: Perspectives of biological macromolecules</b>	20 %
Descriptors/Topics : Types of chemical bonds, Water structure and buffer, hydrophilic and hydrophobic groups in biomolecules, repeating units in proteins and nucleic acids, Basis for intermolecular interaction with examples.	
<b>Module III: Bio-energetic</b>	20 %
Descriptors/Topics Laws of thermodynamics (1 <sup>st</sup> & 2 <sup>nd</sup> laws), electrical properties of biological compartments; electrochemical gradients, membrane potential, chemiosmotic hypothesis.	
<b>Module IV: Energetic of a living body</b>	20 %
Descriptors/Topics Primary events in photosynthesis; strategies of light reception in microbes, plants and animals. Correction of vision faults, generation and reception of sonic vibrations.	
<b>Module V: Electrical properties of biological compartments</b>	20 %
Descriptors/Topics Electricity as a potential signal, Neurotransmitters, Intra and intermolecular interactions in biological system Spatial and charge compatibility as determinant of such interactions.	

### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Get familiarize with structures and functions of biomolecules like Carbohydrates, Fats and Nucleic Acids.
- Understand the role of covalent and non-covalent bonds, inter-and intramolecular interactions and their contribution to the native conformation of biomolecules.

- Know the molecular transport within the cell and across membranes and get familiar with the different laws of Physics that are valid in biological systems.
- \*Calculate energy changes in biological pathways, understand mechanism of light and sound reception.
- \*Understand how electricity can act as potent signal as well the role of neurotransmitters.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable: NA**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Outline of Biochemistry, Conn & Stumph
- Fundamentals of Biochemistry, J.L. Jain
- Cellular Biophysics I & II, Thomas F. Weiss, 1995 MIT Press
- Basic Biophysics for Biology, E.K. Yeager, 1992, CRC Press

**References:**

- Textbook of Biochemistry, Lehninger
- Biochemistry, L. Stryer, W.H. Freeman and Company
- Instant notes in Biochemistry, Hames & Hooper
- Anatomy and Physiology – Tortora & Grabowski
- Biochemistry -Voet&Voit



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MADHYA PRADESH

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## Course structure: BIOANALYTICAL TECHNIQUES- Course Code BSB 202

Course Title: **BIOANALYTICAL TECHNIQUES**

Credit Units: 03

Course Level: UG

Course Code: BSB 202

Course Objectives: The student will be exposed to principles, instrumentation & application of various instruments & techniques used in biological field.

Pre-requisites: The students must possess fair understanding of working of instruments.

Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Instruments, basic principles and usage</b>	25 %
Descriptors/Topics pH meter, Light Microscopy, absorption and emission spectroscopy, Principle and law of absorption, fluorimetry, colorimetry, spectrophotometry (visible, UV, infra-red), polarography, centrifugation, atomic absorption, NMR, X-ray crystallography, Circular Dichorism	
<b>Module II: Chromatography techniques</b>	25 %
Descriptors/Topics Paper chromatography, thin layer chromatography, affinity chromatography, column chromatography, HPLC, gas chromatography, gel filtration and ion exchange chromatography	
<b>Module III: Electrophoresis</b>	25 %
Descriptors/Topics Agarose gel electrophoresis, SDS polyacrylamide electrophoresis, immunoelectrophoresis, Isoelectric focussing.	
<b>Module IV: Radioisotope tracer techniques and autoradiography</b>	25 %
Descriptors/Topics	

### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Understand the principle and instrumentation of Colorimetry, spectrophotometry (visible, UV, infra-red), centrifugation, etc.
- Understand principle instrumentation of chromatographic techniques and their types.
- Principle and applications of electrophoresis i.e., PAGE, Immunoelectrophoresis etc.
- Understand radioisotope tracer techniques and application.
- Develop broad knowledge base, deep theoretical understanding of instruments and their practical implementation in the laboratory

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**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

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

- Practical Biochemistry, Principles and Techniques, Keith Wilson and John Walker
- Bioinstrumentation, Webster

**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
- 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.
- Principles and Practice of Bioanalysis, Richard F. Venn
- Microscopic Techniques in Biotechnology, Michael Hoppert
- Principles of Fermentation Technology, P.F. Stanbury, A. Whitaker, S.J. Hall



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## Course structure: PLANT SCIENCES - II- Course Code BSB 203

Course Title: **PLANT SCIENCES - II**

Credit Units: 03

Course Level: UG

Course Code: BSB 203

Course Objectives: The objective of this course is to acquaint the students with the details of gymnosperms, classification of angiosperms and taxonomy which will make a foundation for further studies.

Pre-requisites: The students must possess fair understanding of gymnosperm and angiosperms.

Course Contents/Syllabus:

	Weightage (%)
<b>GYMNOSPERMS</b>	
Module I	25 %
Descriptors/Topics General characteristics, affinities and classification of Gymnosperms (Chamberlains' and D.D Pant's classification), Evolution and diversity of Gymnosperms, Fossil Gymnosperms: <i>Lyginopteris</i> and <i>Lagenostoma</i> .	
Module II	25 %
Descriptors/Topics Systematic position, occurrence, morphology and development of reproductive structures of the following taxa- <i>Cycas</i> , <i>Pinus</i> , <i>Ephedra</i> , Economic importance of <i>Cycas</i> , <i>Pinus</i> and <i>Ephedra</i> .	
<b>ANGIOSPERMS</b>	
Module III	25 %
Descriptors/Topics Classification as proposed by Bentham and Hooker and Hutchinson, merits, demerits and comparison Binomial Nomenclature and elementary knowledge of International Code of Botanical nomenclature, Morphological Characteristics of Angiosperms.	
Module IV	25 %
Descriptors/Topics Systematic position, distinguishing characters and economic importance of family: Rutaceae, Cucurbitaceae, Rosaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae, and Poaceae.	

### Student Learning Outcomes:

1. The students will develop an understanding of the characteristics, life cycles & interrelationships among different forms of gymnosperm.
2. The course content will help the students to trace the evolutionary history, diversity of gymnosperms & develop an understanding of fossils, fossilization & geological time scale and its significance in the evolution of angiosperms.
3. The students will develop an understanding of the basis, guiding principles & salient features of the various classification systems of angiosperms.
4. Know the economic importance of the angiosperm plants.



5. Systematic position, distinguishing characters and economic importance of some important families like Rutaceae, Cucurbitaceae, Rosaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae, and Poaceae.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable:**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Modern Plant Taxonomy, N.S. Subrahmanyam, Vikas Publishing House.
- A Text Book of Botany, V. Singh, P.C. Pande & D.K. Jain, Rastogi Publication.

**References:**

- Plant Systematics Theory & Practice, Gurcharan Singh, Oxford & IBH Publishing Co.
- Taxonomy, V. Singh & D. K. Jain, Rastogi Publications.
- Botany for degree students – Gymnosperms, P.C. Vashishtha, S. Chand & Co.
- Gymnosperm, S. P. Bhatnagar & A. Moitra, New Age.
- College Botany Vol.2, B.P. Pandey, S. Chand & Co.
- Systematic Botany, S.C. Datta, New Age.
- Text Book of Botany Vol. II. S. N. Pandey, S. P Misra, P. S. Trivedi, Vikas Publishing House.
- Introductory Botany, A. Bendre & P. C. Pandey, Rastogi Publication.

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## Course structure: ANIMAL SCIENCES-II - Course Code: BSB 204

Course Title: **ANIMAL SCIENCES-II**

Credit Units: 03

Course Level: UG

Course Code: **BSB 204**

Course Objectives: This paper will provide the conceptual knowledge about Vertebrates, which includes from Pisces to Mammals. This paper will be helpful to understand the variations from one class to another. The knowledge gained from this subject will be helpful for students to realise the significance of animal sciences towards its applications in modern biotechnology.

Pre-requisites: The students must possess fair understanding of vertebrates.

Course Contents/Syllabus:

	Weightage (%)
Module I	25 %
Descriptors/Topics Salient features and outline classification of Phylum Chordata upto order with suitable examples (According to Parker and Haswell latest edition)	
Module II	25 %
Descriptors/Topics <ul style="list-style-type: none"> <li>• Urochordata: Type Study of <i>Herdmania</i> (Including development)</li> <li>• Cephalochordata: Type Study of <i>Amphioxus</i>. Affinities of <i>Amphioxus</i></li> <li>• <i>Petromyzon</i>: External Features</li> <li>• Comparison between <i>Petromyzon</i> and <i>Myxine</i></li> </ul>	
Module III	25 %
Descriptors/Topics <p>Comparative anatomy of vertebrates (Fish, Amphibia, Reptiles, Birds and Mammals)</p> <ul style="list-style-type: none"> <li>• Integumentary system</li> <li>• Skeletal System: Girdles only</li> <li>• Digestive system</li> </ul>	
Module IV	25 %
Descriptors/Topics <p>Comparative anatomy of vertebrates (Fish, Amphibia, Reptiles, Birds and Mammals)</p> <ul style="list-style-type: none"> <li>• Respiratory System</li> <li>• Circulatory System: Heart and Aortic Arches only</li> <li>• Nervous System; Brain only</li> <li>• Urinogenital System</li> </ul>	

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### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Develop knowledge about Chordates.
- Learn about comparative account of vertebrates.
- Learn about anatomical & physiological variability among vertebrates.
- Generates interdisciplinary and collaborative approach.
- Develops ethical and conservative outlook for animals.

### Pedagogy for Course Delivery:

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

### List of Professional Skill Development Activities (PSDA): If applicable

Lab/ Practical details, if applicable: NA

### Assessment/ Examination Scheme:

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

### Text & References:

- T. C. Majpuria. A text book of zoology.
- V.K Tiwari, A Text book of Zoology
- Ramesh Gupta, A Text book of Zoology



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MADHYA PRADESH

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## Course structure: CHEMISTRY - II - Course Code: BSB 205

Course Title: **CHEMISTRY - II**

Credit Units: 04

Course Level: UG

Course Code: BSB 205

Course Objective:

After completion of the course, the students will acquire knowledge about basic stereochemistry, structure, bonding mechanism & molar mass. They will get knowledge about chemical equilibrium and its applications. Students will have knowledge of ionic equilibrium and its applications. Students will have knowledge of different chromatographic methods, their principle, and its applications.

Course Contents:

Module I: Stereochemistry of Organic compounds: (12 Hours)

Concept of isomerism. Geometrical isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Optical isomerism: Elements of symmetry, molecular chirality, enantiomers & their properties, stereogenic centre, optical activity of enantiomers. Concept of chirality (up to two carbon atoms): chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro isomers, meso isomer, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Conformations and Conformational analysis: Conformations of ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newman, Sawhorse and Fischer representations.

Module II: Chemical Equilibrium: (8 Hours)

Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatelier's principle and its applications.

Module III: Ionic Equilibria: (8 Hours)

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Solubility and solubility product of sparingly soluble salts - applications of solubility product.

Module IV: Chromatography I: (4 Hours)

Introduction, Principle and Classification. Mechanism of separation: adsorption, partition & ion-exchange. Development of chromatograms: frontal, elution and displacement methods.

Paper Chromatography (ascending, descending and circular), Thin Layer Chromatography (TLC) and Column Chromatography (CC).

Module V: Chromatography II: (8 Hours)

Gas Chromatography (GC) and High-Pressure Liquid Chromatography (HPLC), types of column and column selection, applications, Limitations

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## Principle and Applications of Flash chromatography, Ion-exchange chromatography and Chiral chromatography

### Learning Outcomes:

After successful completion of the course students will have the knowledge and skill to apply the principles of chemical sciences:

To understand the basic stereochemistry, structure, bonding mechanism & molar mass, so that application of materials in different field can be understood.

To understand the nomenclature of various organic compounds

To understand chemical equilibrium and its applications.

To understand ionic equilibrium and its applications.

To learn and understand principles of chromatography and its applications.

### Assessment/ Examination Scheme:

Components	CT	Attendance	HA/S/V/Q	EE
Weightage (%)	15	5	10	70

### Text & References:

Text:

Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry - Volume I. (2000). India: S. Chand Limited. ISBN 9788121902632

Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry - Volume II. (2000). India: S. Chand Limited. ISBN 9788121917872

Puri, Sharma & Pathania, Principles of Physical Chemistry. (2008). India: VISHAL PUBLISHING Company. ISBN 9788188646654

Morrison & Boyd. Organic Chemistry (2016) Pearson New Delhi. ISBN 8177581694

Bahl, A., Bahl, B. S. (1997). A textbook of organic chemistry : (for B.Sc. students). India: Chand. ISBN 9788121902595

References:

J.D. Lee. Concise Inorganic Chemistry, , Black Well Sciences. ISBN 9788126515547.

Keeler, J., De Paula, J., Atkins, P. W. (2018). Atkins' Physical Chemistry. United Kingdom: Oxford University Press. ISBN 9780198814740.

Snyder, S. A., Solomons, T. W. G., Fryhle, C. B. (n.d.). Organic Chemistry 12e. United Kingdom: John Wiley & Sons, Limited. ISBN 9781119572985.

Vogel's Quantitative Chemical Analysis. (2009). India: Pearson Education. ISBN 9788131723258



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MADHYA PRADESH

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## Course structure: Biotechnology Lab – II - Course Code-BSB 220

Course Title: Biotechnology Lab – II

Credit Units: 01

Course Level: UG

Course Code: BSB 220

Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Biochemistry</b>	50 %
Descriptors/Topics Preparation of buffer, Colour reactions of Carbohydrates, Colour reactions of amino acids, Extraction and estimation of lipids, Estimation of protein by Bradford method.	
<b>Module II</b>	50 %
Descriptors/Topics Paper chromatography of sugars, Amino Acids, Plant pigments. Use of spectrophotometer.	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable:**

### Assessment/ 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

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## Course structure: CHEMISTRY LAB – II - Course Code-BSB 221

Course Title: CHEMISTRY LAB – II  
Course Level: UG

Credit Units: 02  
Course Code: BSB 221

### Course Objectives:

The course has been designed to introduce the topics of chemical analysis of inorganic and organic salts and mixtures. The students will get better understanding of the theoretical principles included in their parallel theory syllabus. Elementary separation techniques have been included in the lab syllabus to introduce the concept of separation of components from mixtures.

### Course Contents:

#### Module I (20 Hrs)

Qualitative analysis of inorganic mixtures, containing not more than four ionic species (excluding insoluble substances) out of the following:

Pb<sup>2+</sup>, Hg<sup>2+</sup>, Hg<sup>22+</sup>, Ag<sup>1+</sup>, Bi<sup>3+</sup>, Cu<sup>2+</sup>, Cd<sup>2+</sup>, As<sup>3+</sup>, Sn<sup>2+</sup>, Sn<sup>4+</sup>, Fe<sup>2+</sup>, Fe<sup>3+</sup>, Al<sup>3+</sup>, Co<sup>2+</sup>, Ni<sup>2+</sup>, Mn<sup>2+</sup>, Zn<sup>2+</sup>, Ba<sup>2+</sup>, Sr<sup>2+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, NH<sub>4</sub><sup>+</sup>, K<sup>1+</sup>, CO<sub>3</sub><sup>2-</sup>, S<sup>2-</sup>, SO<sub>3</sub><sup>2-</sup>, NO<sub>2</sub><sup>1-</sup>, CH<sub>3</sub>COO<sup>1-</sup>, F<sup>1-</sup>, Cl<sup>1-</sup>, Br<sup>1-</sup>, I<sup>1-</sup>, NO<sub>3</sub><sup>1-</sup>, SO<sub>4</sub><sup>2-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, PO<sub>4</sub><sup>3-</sup>, BO<sub>3</sub><sup>3-</sup>.

#### Module II (6 Hrs)

Elemental analysis of organic compounds (non-instrumental)

#### Module III (6 Hrs)

Qualitative identification of functional group of organic compounds – CHO, C=O, -COOH, Ester, Phenol, Amine, amides, Alcohols.

#### Module IV: Chromatography: (4 Hrs)

1. Identification by determination of the R<sub>f</sub> values of the given organic/ inorganic compounds by paper chromatography
2. Identification by determination of the R<sub>f</sub> values of the given organic/ inorganic compounds by thin layer chromatography

#### Module V (4 Hrs)

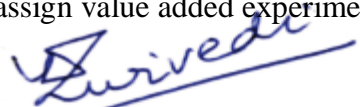
Separation of two component mixture using Column chromatography

### Note:

1. Students are required to perform at least ten experiments by selecting minimum one experiment from each module.
2. Instructor may choose to assign value added experiments relevant to theory syllabus.

### Course Outcomes:

The course will enable the students to understand the topics of chemical analysis of inorganic and organic salts and mixtures. The students will get clarity of understanding of the theoretical principles included in their parallel theory syllabus. Elementary separation techniques have been included in the lab syllabus to introduce the concept of separation of components from mixtures.

  
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**Assessment/ 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:**

1. Pandey O.P. & et Al. Practical Chemistry (2010), S. Chand New Delhi. ISBN:978-8121908122.
2. Das, Subash Chandra. Advanced practical chemistry, 3/e rev. / Kolkata Quality Printing 2003
3. Vogel's Quantitative Chemical Analysis. (2009). India: Pearson Education. ISBN 9788131723258
4. S K Bhasin & Sudha Rani. Laboratory Manual on Engineering Chemistry.(2019); Dhanpat Rai Publishing Company. ISBN: 978-8187433132
5. Experiments in Applied Chemistry, Dr. Sunitta Rattan; CATSON Book Publishers.
6. Unified Practical Chemistry, MMN Tandon, Shiv Lal Agrawal and Company



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MADHYA PRADESH

Established vide Government of Madhya Pradesh Act No. 27 of 2010

## Course structure: PLANT SCIENCES LAB - II - Course Code-BSB 222

Course Title: PLANT SCIENCES LAB - II

Credit Units: 01

Course Level: UG

Course Code: BSB 222

Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Gymnosperm</b>	50%
Descriptors/Topics Study of the Gymnosperms like <i>Cycas</i> , <i>Pinus</i> and <i>Ephedra</i> with the help of permanent slides and also by cutting sections and making suitable preparations.	
<b>Module II: Angiosperms</b>	50%
Descriptors/Topics: Study of various types of leaves, inflorescence, flowers and fruits. Detailed description and identification of locally available plants of the families as prescribed in theory course.	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

### List of Professional Skill Development Activities (PSDA): If applicable

### Lab/ Practical details, if applicable:

### Assessment/ 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

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## Course structure: ANIMAL SCIENCES LAB - II - Course Code-BSB 223

Course Title: ANIMAL SCIENCES LAB - II

Credit Units: 01

Course Level: UG

Course Code: BSB 223

Course Contents/Syllabus:

	Weightage (%)
Module I	25%
Descriptors/Topics Study of different types of scales in fishes, permanent slide preparations of scales. Internal ear Different types of important edible fishes of India .Study of specimens and slides related to Chordates should be added	
Module II	25%
Descriptors/Topics: Study of <i>Rana tigrina</i> , physiological systems through model	
Module III	25%
Descriptors/Topics Hyoid apparatus of home lizard, Demonstration of biting mechanism by using model	
Module IV	25%
Descriptors/Topics Mice: Arterial system and reproductive system.	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

### List of Professional Skill Development Activities (PSDA): If applicable

### Lab/ Practical details, if applicable:

### Assessment/ 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

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Maharajpura, Gwalior 474005



# AMITY UNIVERSITY

MADHYA PRADESH

Established vide Government of Madhya Pradesh Act No. 27 of 2010

## COMMUNICATION SKILL-II

**Course Code: BCU 241**

**Credit Units: 1**

**Course Objectives:**

To understand the different aspects of communication using the four macro skills – LSRW (Listening, Speaking, Reading, Writing)

**Prerequisites: NIL**

Course Contents / Syllabus:		
1.	<b>Module I Communication</b>	<b>35% Weightage</b>
	<ul style="list-style-type: none"><li>• Process and Importance</li><li>• Models of Communication (Linear &amp; Shannon Weaver)</li><li>• Role and Purpose</li><li>• Types &amp; Channels</li><li>• Communication Networks</li><li>• Principles &amp; Barriers</li></ul>	
2.	<b>Module II Verbal Communication</b>	<b>25% Weightage</b>
	Oral Communication: Forms, Advantages & Disadvantages  Written Communication: Forms, Advantages & Disadvantages  Introduction of Communication Skills (Listening, Speaking, Reading, Writing)	
3.	<b>Module III Non-Verbal Communication</b>	<b>30% Weightage</b>
	<ul style="list-style-type: none"><li>• Principles &amp; Significance of Nonverbal Communication</li><li>• KOPPACT (Kinesics, Oculistics, Proxemics, Para-Language, Artifacts, Chronemics, Tactilics)</li><li>• Visible Code</li></ul>	
4.	<b>Module IV : Prose</b>	<b>10% Weightage</b>
	TEXT: APJ Abdul Kalam and Arun Tiwari. <i>Wings of Fire: An Autobiography</i> , Universities Press, 2011 Comprehension Questions will be set in the End-Semester Exam	

**Student Learning Outcomes:**

The students should be able to :

Apply Verbal and Non-Verbal Communication Techniques in the Professional Environment

**Pedagogy for Course Delivery:**

- Extempore
- Presentations

Lectures

**Prof. (Dr.) Vinay Dwivedi**  
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***Text:***

Rosenblum, M. How to Build Better Vocabulary, London: Bloomsbury Publication.  
Verma, Shalini. Word Power made Handy, S. Chand Publications.  
High School English Grammar & Composition by Wren & Martin.

***Reference:***

K.K.Sinha , Business Communication, Galgotia Publishing Company.  
Alan Pease : Body Language  
Additional Reading: Newspapers and Journals



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## ENVIRONMENTAL STUDIES-II

**Course Code: EVS– 242**

**Credit Units: 02**

**Total Hours: 20**

### Course Objectives

- To understand various types of environmental pollution.
- To educate masses, in general and students, about the issues related to degradation of environment and social issues related to environment.
- To understand sustainable development.
- To understand environmental assets, local flora and fauna through field surveys.

### Course Contents:

#### Module I: Environmental Pollution (7 Hrs)

Definition, causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, 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 II: Social Issues and the Environment (7 Hrs)

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. Fireworks/Crackers – Introduction, ill effects on environment and humans.

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 III: Human Population and the Environment (4 Hrs)

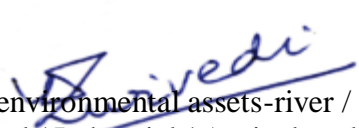
Population growth, variation among nations. Population explosion – Family Welfare Programmes

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 IV: Field Work (2 Hrs)

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.

  
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## Course Outcome

Upon course completion, students will be able to:

- Explain various types of environmental pollutions.
- Understand role of individual in abatement of environmental pollution.
- Explain methods to mitigate disasters.
- Learn various environmental protection laws.
- Learn role of IT in environment and human health.

## Examination Scheme:

Components	CT	HA	S/V/Q	A	ESE
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 Encyclopaedia, Jaico Publ. House, Mumbai, 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., Encyclopaedia of Indian Natural History, Bombay Natural History Society, Bombay (R) Heywood, V.H & Watson, 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

- 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 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

A handwritten signature in blue ink, reading "Dwivedi", with a horizontal line underneath the name.

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## Behavioral Science - II

**Course Code: BSU-243**

**Course Credit: 01**

**Total Hours: 10**

### 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

• Intuition, Judgment, Perception & Sensation (MBTI) • BIG5 Factors

Module II: Managing Diversity • Defining Diversity

- Affirmation Action and Managing Diversity • Increasing Diversity in Work Force
- Barriers and Challenges in Managing Diversity

Module III: Socialization (2 Hours)

(2 Hours)

(2 Hours)

- Nature of Socialization • Social Interaction
- Interaction of Socialization Process • Contributions to Society and Nation

Module IV: Patriotism and National Pride (2 Hours) • Sense of pride and patriotism

- Importance of discipline and hard work • Integrity and accountability

Module V: Human Rights, Values and Ethics (2 Hours) • Meaning and Importance of human rights

- Human rights awareness
- Values and Ethics- Learning based on project work on Scriptures like- Ramayana, Mahabharata, Gita etc.

Student learning outcomes

Student will be able to identify, understand, and apply contemporary theories of leadership to a wide range of situations and interactions

Student will be able to understand and respect individual difference, so to enhance the relationship

Learn social responsibility and develop a sense of citizenship

Student will be able to identify and understand the impact of culture on one's leadership style

Examination Scheme:

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Evaluation Components	Attendance	Journal of Success (JOS)	Social Awareness Program (SAP) SAP Report/SAP Presentation	End Semester Exam	Total
Weightage (%)	5	10	15	70	100

Suggested Readings:

- Davis, K. Organizational Behaviour,
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapierre, 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

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## Français-II

CourseCode: FLU244

Creditunits: 02

### CourseObjective:

To furnish the linguistic tools

- to talk about daily activities and sports, to express necessities
- to talk about activities in recent future,
- to have conversations and perform day-to-day life tasks like enquiring about time, take an appointment
- to enquire about products and place orders in a shop/ restaurant.

### CourseContents:

#### Dossiers 3,4 – pg 25-44 Dossier 3: Quelle journée! Actes de Communication:

Parler des activités quotidiennes, se situer dans le temps, demander l'heure et la date, parler des sports et des loisirs, exprimer la fréquence

#### Dossier 4: Vous désirez? Actes de Communication:

Exprimer la quantité, demander et donner le prix, exprimer la nécessité, la volonté et la capacité, comparer et exprimer ses préférences, s'exprimer au futur proche, prendre rendez-vous, s'exprimer au restaurant/dans les magasins

### Grammaire :

1. l'expression du temps
2. les articles contractés, les quantités indéterminées et déterminées
3. les adjectifs de fréquence
4. verbes - faire, prendre, venir, pouvoir, vouloir, les verbes pronominaux
5. la comparaison de l'adjectif
6. la négation (suite)
7. le futur proche

### Examination Scheme:

Components	INTERNAL				EXTERNAL	GRAND TOTAL
	MID-SEM	VIVA-VOCE	ATTENDANCE	TOTAL	END SEMESTER	
Weightage (%)	15	10	5	30	70	100

### Text & References:

#### Text:

#### Le livre à suivre:

- Andant, Christine et al. A propos A1 Livre de l'élève. Grenoble: Presses universitaires de Grenoble, 2010.
- Andant, Christine et al. A propos A1 Cahier d'exercices. Grenoble: Presses universitaires de Grenoble, 2010.

#### Références:

- Girardeau, Bruno et Nelly Mous. Réussir le DELFA1. Paris: Didier, 2010.

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## Course structure: GENETICS- Course Code-BSB 301

Course Title: GENETICS

Credit Units: 03

Course Level: UG Level

Course Code: BSB 301

Course Objectives:

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

Course Contents/Syllabus:

	Weightage (%)
Module I :	20 %
Descriptors/Topics Brief history, scope and significance of Genetics. Mendelian law of inheritance. Lethality and interaction of gene. Multiple allele and isoallele. Penetrance and Expressivity .Linkage and crossing over. Mapping of genes .interference and coincidence.	
Module II	15 %
Descriptors/Topics Basic microbial genetics, Conjugation, transformation, transduction and their use in genetic mapping.	
Module III	15 %
Descriptors/Topics Classical and modern concept of gene, pseudoallelism, position effect, intragenic crossing over and complementation test, Benzers work on rII locus in T4 Bacteriophage.	
Module IV:	15 %
Descriptors/Topics: Mutation; spontaneous and induced, Mutagen; chemical and physical. Chromosomal aberrations; structural and numerical. Economic importance of mutation. Genetic disorders in human; Klinefelter, Turner, Cri-du-Chat and Down syndrome.	
Module V:	15 %
Sex determination in plant and animal. Non disjunction as a proof of chromosomal theory of inheritance. Sex linked, sex influenced and sex limited inheritance.	
Module VI:	10%
Extra chromosomal inheritance; cytoplasmic inheritance, Mitochondrial and Chloroplast genetic system.	
Module VII:	10%
Descriptors/Topics: Population genetics, Hardy-Weinberg equilibrium law, Gene and genotype frequencies.	

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**Student Learning Outcomes:**

Having successfully completed this course, students will be able to:

- Understand the concept of classical genetics including Mendelian laws is easily grasped by students.
- Understand the basic microbial genetics including prokaryotic gene expression and regulation.
- Understand the concept of gene in terms of recon, muton and cistron including both classical and modern concept.
- Know various chemical and physical mutagens involved in causing mutation.
- Understand the concept of sex determination and populations genetics.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

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

- Principles of Genetics, E. J. Gardner, John Wiley & Sons Inc.
- Genetics, P.K. Gupta, Rastogi Publication.

**References:**

- Concepts of Genetics (Sixth Edition), William S. Klug and Michael R, Cummings, Pearson Education.
- Genetics, M.W. Strickberger, Prentice Hall College Division.
- Genetics, P.J. Russell, Benjamin/Cummings.
- Genetics, R. Goodenough, International Thomson Publishing.
- Introduction to Genetic Analysis, A.J. F. Griffiths, W.H. Freeman and Company.
- Principles of Genetics, D.P. Snustad & M.J. Simmons, John Wiley and Sons Inc.
- Molecular Biology of the Gene (Fifth Edition), J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison – Wesley Publishing.



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## Course structure: -Microbiology

Course Code-BSB 302

Course Title: Microbiology

Credit Units: 04

Course Level: UG Level

### Course Objectives:

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/Syllabus:

	Weightage (%)
<b>Module I :</b>	15 %
Descriptors/Topics: Introduction and historical perspective -Discovery of the microbial world, controversy over spontaneous generation, role of microorganisms in transformation of organic matter and in the causation of diseases, development of pure culture methods. Methods in Microbiology -Principles of microbial nutrition, Culture media, Theory and practice of sterilization.	
<b>Module II</b>	15 %
Descriptors/Topics: Prokaryotic structure and function - functional anatomy of bacteria: cell envelope, cell wall, cytoplasmic membrane, capsule, surface appendages, cytoplasm and cytoplasmic inclusions. Growth - The definition of growth, mathematical expression of growth, growth curve, measurement of growth, synchronous growth, continuous culture, culture collection and maintenance of cultures.	
<b>Module III</b>	15 %
Descriptors/Topics Systematics and taxonomy - new approaches to bacterial taxonomy, classification including ribotyping, ribosomal RNA sequencing, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual.	
<b>Module IV:</b>	15 %
Descriptors/Topics: Metabolic Diversity among microorganisms- photosynthesis in microorganisms, role of bacteriochlorophylls, carotenoids and phycobilins, Chemolithotrophy, hydrogen-iron-nitrite-oxidizing bacteria, nitrate and sulphate reduction, methanogenesis and acetogenesis, Fermentations, nitrogen fixation, plant microbe interactions (mycorrhizae).	
<b>Module V: <i>Archaea</i></b>	20 %
Descriptors/Topics: Archae as earliest life forms, thermophiles, psychrophiles, halophiles, alkalophiles, acidophiles, hyperthermophiles Viruses: Bacterial, animal; structure of viruses; Reproduction and life cycle of RNA and DNA viruses; Viroids and prions. Algae and Fungi: Classification and Reproduction.	
<b>Module VI:</b>	10%
Descriptors/Topics: Host-parasite relationship -Normal micro flora of skin, oral cavity, gastrointestinal tract, Respiratory infections; entry of pathogens into the host, types of toxins (Exo, endo, entro) and their mode of actions, Microbial pathogenesis -Disease reservoirs; Epidemiological terminologies; Infectious disease transmission; Sexually transmitted disease including AIDS, Food and water- borne diseases; pathogenic fungi.	
<b>Module VII:</b>	10%
Descriptors/Topics: Chemotherapy/antibiotics. Antimicrobial agents, sulfa drugs,	

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antibiotics -penicillin and cephalosporins, broad spectrum antibiotics, antifungal antibiotics; mode of action.	
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**Student Learning Outcomes:**

After successful completion of the course student will be able to:

- Understand the microbiological techniques for the isolation and characterization of microbes.
- Understand the mechanism of different metabolic processes.
- Know the physiology and survival mechanism of extremophilic bacteria.
- Know the concept of virus lytic and lysogenic cycle is quite clear to students.
- Understand the epidemiology and microbial pathogenesis.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

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

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



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## Course structure: Biochemistry and metabolic regulation-Code-BSB 303

Course Title: **Biochemistry and metabolic regulation** Credit Units: 03

Course Level: UG Level

Course Code: BSB 303

### Course Objectives:

The course aims on understanding of the relationships between structure and function in the major classes of biopolymers. It augurs understanding on central metabolic process and the role of enzymes in modulating pathways. The theoretical background of biochemical systems helps to interpret the results of laboratory experiments.

### Course Contents/Syllabus:

	Weightage (%)
Module I :	20 %
Descriptors/Topics Carbohydrate metabolism-glycolysis pathway and reactions, Glycogen breakdown and synthesis, control of glycogen metabolism, glycogen storage and its diseases, 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 -mitochondria and electron transport, phosphorylation and control of ATP production Gluconeogenesis, The glyoxylate pathway, Pentose phosphate pathway	
Module II	20 %
Descriptors/Topics Lipid metabolism - fatty acid oxidation, ketone bodies, fatty acid biosynthesis, regulation of fatty acid metabolism.	
Module III	20 %
Descriptors/Topics Amino acid metabolism -Amino acid deamination, urea cycle, amino acids as biosynthetic precursors, biosynthesis of amino acids, Nitrogen fixation	
Module IV:	20 %
Descriptors/Topics: Nucleotide Metabolism -structure and metabolism of purines and pyrimidines,	
Module V:	20%
Descriptors/Topics: Classification and nomenclature of enzymes, regulation of enzyme activity, coenzymes-structure and function of coenzyme A; kinetics of enzyme catalyzed reactions; isolation and purification of enzymes ; enzymes in food processing, medicines and production of chemical compounds	

### Student Learning Outcomes:

After successful completion of the course student will be able to

- Develop knowledge of Biochemical aspects of Biotechnology
- Learn about important metabolic pathways and their Regulation.

- Deals with pathways responsible for energy production.
- Study of various enzymatic reactions and their role in body.
- Develops collaborative and research approach.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable: NA**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

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

**References:**

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



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**Course structure: ANATOMY & PLANT PHYSIOLOGY - Course Code-BSB 304**

Course Title: ANATOMY & PLANT PHYSIOLOGY Credit Units: 03

Course Level: UG Level

Course Code: BSB 304

**Course Objectives:**

The objective of this course is to familiarize the students with mechanisms of various physiological activities of higher plants, anatomy and ecology which will help them to understand the various profiles of biotechnology and assessment of environment.

**Course Contents/Syllabus:**

	Weightage (%)
Module I :	25 %
Descriptors/Topics Meristems. Epidermis, Stoma, Leaf anatomy, origin, structure and function of the Vascular cambium including anomalous behaviour of cambium in Achyranthes, Boerhaavia, Bignonia and Dracaena. Structure of Xylem and Phloem. Cork cambium activity and products. Root-stem transition.	
Module II :	25 %
Descriptors/Topics Diffusion, osmosis, permeability, imbibition, plasmolysis, osmotic potential and water potential. Absorption of water: Passive and active absorption. Ascent of sap. Transpiration, closing and opening mechanism of stomata, significance of transpiration, guttation, factors affecting transpiration.	
Module III :	25 %
Descriptors/Topics Mechanism of absorption of mineral salts. Elementary knowledge of the macro- and micro- elements. Symptoms of mineral deficiency, Hydroponics and sand cultures. Mechanism of translocation of solutes.	
Module IV :	25 %
Descriptors/Topics Photosynthesis: Importance of the process, role of the pigments, light and dark reactions, photophosphorylation and electron transport system, C3 and C4 pathway and factors affecting photosynthesis, Respiration: Glycolysis, Krebs cycle, factors affecting respiration.	

**Student Learning Outcomes:**

1. The students will be conceptually integrated to plant internal structure & their functions
2. Will further reveal the relationship between the structure, function, taxonomy, ecology and developmental genetics in plants.
3. The contents of this course will help the students to relate crop physiological processes with water-plant interaction, mineral absorption, transportation & assimilation.
4. The concept of photosynthesis in plant, the role & significance of pigment system in photosynthesis, components of light and dark reaction, C3 & C4 pathways for carbon fixation & the influence of environmental factors on photosynthesis will be understood by the students.
5. The students will acquire an understanding of the concept of respiration: mechanisms, factors & its importance.

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**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable****Lab/ Practical details, if applicable: NA****Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

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

- Text Book of Plant Physiology, C. P. Malik & A. K. Srivastava, Kalyani Publishers.
- Anatomy of Seed Plants, V. Singh, P. C. Pande, D. K. Jain, Rastogi Publications.

**References:**

- Anatomy of Seed Plants, K. Esau, John Wiley & Sons.
- An introduction to Plant Anatomy, A. J. Eames and A. H. Mac Daniels, Tata McGraw - Hill.
- Plant Physiology, S. N. Pandey, B. K. Sinha, Vikas Publishing House.
- Plant Physiology, R. M. Devlin and F. H. Witham, CBS Publishers.
- Plant Physiology, S. Mukherji and A. K. Ghosh, Tata McGraw - Hill.
- Plant Physiology and Biochemistry, Prof. H. Srivastava, Rastogi Publications.
- Plant Anatomy A. Fahn, Aditya Books Pvt. Lmt.



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## Course structure: ANIMAL PHYSIOLOGY - I - Course Code-BSB 305

Course Title: ANIMAL PHYSIOLOGY - I

Credit Units: 03

Course Level: UG Level

Course Code: BSB 305

Course Objectives:

Course objective to provide the knowledge about animal physiology that should be useful to understand and apply different concepts of biotechnology.

Course Contents/Syllabus:

	Weightage (%)
Module I : Physiology of Respiratory System	20 %
Descriptors/Topics Organs for respiration in mammals, Mechanism of respiration, Physiology of respiration (transport of gases and chloride shift), Properties and function of respiratory pigments.	
Module II : Physiology of Digestive System	20 %
Descriptors/Topics Composition and function of saliva, Mechanical and chemical digestion, Functions of pancreatic juices and biles, Absorption and distribution of food	
Module III : Physiology of Cardiovascular System	20 %
Descriptors/Topics Blood composition and Hemopoiesis, Blood Groups and Blood Transfusion, Blood Clotting, Hemodynamics, Cardiac Cycle and its regulation	
Module IV: Physiology of Neuromuscular System	20 %
Descriptors/Topics Contraction and relaxation of muscle, Sarcomere, Cori's cycle, Organization of Nervous System, Neuron, Nerve Impulse, Synaptic Transmission, Neurotransmitters	
Module V	20 %
Descriptors/Topics: Physiology of Reproductive System (Male, Female), Gametogenesis, Sperms and Eggs, Gene Bank, Sperm Bank, Superovulation, IVF, ET, ZIFT, ICSI, Placenta Banking	

### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Learn about anatomical and physiological aspects of animal body.
- Gain knowledge about functioning of systems of body.
- Generate path for further research and innovation.
- Enhance new collaborative approaches with modern fields of biotechnology

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**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

- Guyton, A.C. and Hall, J.E. Textbook of Medical Physiology. XI Edition. Herculat Asia PTE Ltd. / W.B. Saunders Company.
- Tortora, G.J. and Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons, Inc.
- Ganong, H, Review of Medical Physiology 14th edition, Appleton & Lange Publisher, New York
- Shier, D., Butler, J. and Lewis, R., Hole's Human Anatomy and Physiology, (10th Edition) 2003. WCB/McGraw Hill, Boston.
- T. C. Majpuria. A text book of zoology.
- V.K Tiwari, A Text book of Zoology
- Ramesh Gupta, A Text book of Zoology



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# AMITY UNIVERSITY

MADHYA PRADESH

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## Course structure: CHEMISTRY - III - Course Code-BSB 306

Course Title: CHEMISTRY - III

Credit Units: 03

Course Level: UG Level

Course Code: BSB 306

### Course Objectives:

The students will learn about the various laws and conditions which govern the behaviour of liquid and solution and the phases in which they exist under different conditions.

### Course Contents/Syllabus:

	Weightage (%)
<b>INORGANIC CHEMISTRY</b>	
Module I :	20 %
Descriptors/Topics Acid and Bases: Elementary idea of Bronsted -Lowry and Lewis concept of acids and bases (Proton-donor acceptor and electrondonor acceptor systems), Relative strengths of Lewis acids bases and the effect of subsistent and the solvent on them.	
Module II :	15 %
Descriptors/Topics General properties of 3 <sup>rd</sup> elements & Co-ordination Compounds: Molecular compounds, Werners coordination theory, IUPAC system of nomenclature of coordination compounds. Discussion of outer and inner orbit complexes.	
Module III :	15 %
Descriptors/Topics Preparation, properties, uses and structure of the following compounds - Tin Chlorides, hydrazine, hydroxylamine and acides, Oxides, Oxyacids and halides of phosphorus, tartaremetic, hydrogen sulphide (analytical applications), Oxides and Oxyacids of sulphur, Oxyacids of chlorine.	
<b>PHYSICAL CHEMISTRY</b>	
Module IV :	20 %
Descriptors/Topics Liquids: Vapor pressure, variation of vapour pressure of liquids with temperature (Clausious – Claperon Equation). Surface tension, viscosity, their experimental determination and applications. Parachor, Rheochor and their applications.	
Module V :	15 %
Descriptors/Topics Solutions: Henery's Law, Raoult's Law, critical solutions temperatures, fractional distillation and steam distillation. Osmosis and measurement of osmotic pressure. Effect of solutes on boiling points and freezing points of solutions, Calculations of molecular weights, abnormal molecular weight.	
Module VI :	15 %
Descriptors/Topics	

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Heterogenous equilibria: Phase rule, phase diagrams of water and sulphur system. Nernst's distribution law, solvent extraction.	
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**Student Learning Outcomes:**

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable: NA**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

*Text:*

- Test book of Inorganic Chemistry, P.L. Soni, Sultan Chand & Sons
- Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Publishing Co.

*References:*

- Advanced Inorganic Chemistry Vol-I & II, Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, S.Chand & Co. Ltd.
- Simplified Course in Inorganic Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
- Concise Inorganic Chemistry, J.D. Lee, BlackWell Sciences
- Essentials of Physical Chemistry, Bahl & Tuli, S. Chand & Co. Ltd.
- Simplified course in Physical Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
- Atkin's Physical Chemistry, Atkin, Oxford Press.
- Physical Chemistry, Vemulapalli, Printice Hall of India



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### Course structure: BIOTECHNOLOGY LAB – III- Course Code-BSB 320

Course Title: **BIOTECHNOLOGY LAB – III**

Credit Units: 02

Course Level: UG

Course Code: BSB 320

Course Contents/Syllabus:

	Weightage (%)
Module I Module I: Genetics	20%
Descriptors/Topics Study of mendalian ratios Study of bacterial conjugation	
Module II	20%
Descriptors/Topics Study of gene interaction Study of chromosome structure & size Study of Genetics disorder in human	
Module III	20%
Descriptors/Topics Aseptic techniques: Cleaning of glassware, cotton plugging and sterilization. Preparation of growth media for fungi and bacteria., Staining methods- simple staining, Gram endospore staining, fungal staining, negative staining. Identification of bacteria based on staining, shape and size, Bacterial growth curve and generation time of E.coli Identification of pathogenic bacteria from sewage and waste water. isolation and identification of aquatic fungi from local water bodies.	
Module IV	20%
Descriptors/Topics Isolation of microorganisms from air, water and soil samples: dilution, pour plating, spread plate and colony purification. Enumeration of microorganisms: total vs. viable counts.	
Module V Biochemistry	20%
Descriptors/Topics Estimation of DNA, Estimation of RNA, Estimation of sugar in given solution, Assay of enzyme activity –amylase.	

#### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

#### List of Professional Skill Development Activities (PSDA): If applicable

Lab/ Practical details, if applicable:

Assessment/ Examination Scheme:

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

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## Course structure: CHEMISTRY LAB - III - Course Code-BSB 321

Course Title: CHEMISTRY LAB – III

Credit Units: 01

Course Level: UG

Course Code: BSB 321

Course Contents/Syllabus:

	Weightage (%)
<b>INORGANIC CHEMISTRY</b>	
Module I	50%
Descriptors/Topics Gravimetric estimation of barium and $\text{SO}_4^{2+}$ as $\text{BaSO}_4$ ions, iron as $\text{Fe}_2\text{O}_3$ and copper as $\text{CuCN}$ .	
<b>ORGANIC CHEMISTRY</b>	
Module II	50%
Descriptors/Topics Detection of functional groups in mono-functional Organic Compounds. (aldehyde, ester, phenol, amine, amides, alcohols.)	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

### List of Professional Skill Development Activities (PSDA): If applicable

### Lab/ Practical details, if applicable:

#### Assessment/ 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

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## Course structure: ANATOMY & PLANT PHYSIOLOGY LAB - Course Code-BSB 322

Course Title: ANATOMY & PLANT PHYSIOLOGY LAB

Credit Units: 01

Course Level: UG

Course Code: BSB 322

Course Contents/Syllabus:

	Weightage (%)
Module I Physiology	60%
Water, Soil, and Plant relations Demonstration: Permanent and Temporary wilting, seeding growth in clay. Experimentation- determination: iso-hypo-and-hyper tonic solution by plasmolytic methods, stomatal frequency by cobalt chloride method, Farmer's Potometer. Photosynthesis: Demonstration- CO <sub>2</sub> factor, light factors (red, blue, green and yellow light.) Experimentation- Separations of photosynthetic pigments by thin layer chromatography. Respiration – Determination of R.Q.	
Module II : <b>Plant Anatomy</b>	40%
Anatomy of normal dicot and monocot roots, stems & leaves Anatomy of anomalous structure of stems of Bignonia, Nyctanthes, Achryanthes, Boerhaavia and Dracaena	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

### List of Professional Skill Development Activities (PSDA): If applicable

### Lab/ Practical details, if applicable:

### Assessment/ 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

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## Course structure: Animal Physiology LAB - I - Course Code-BSB 323

Course Title: **Animal Physiology LAB – I**

Credit Units: 01

Course Level: UG

Course Code: BSB 323

Course Contents/Syllabus:

	Weightage (%)
Study of permanent slides: Study of Respiratory system, Digestive system, Cardiovascular System and Neuromuscular System.	100%
Determination of RBC count in blood sample	
Determination of Hb % using Sahl's Hemoglobinometer.	
Blood Group Testing (ABO & Rh)	
Determination of TLC & DLC in blood sample.	
Demonstrate amylase activity from saliva and squash preparation of salivary gland chromosome.	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable:**

**Assessment/ 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

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## COMMUNICATION SKILL-III

**Course Code: BCU 341**

**CreditUnits: 1**

**Course Objective:**

To emphasize the essential aspects of effective written communication necessary for professional success.

**Prerequisites: NIL**

<b>Course Contents / Syllabus:</b>			
<b>1</b>	<b>Module I Principles of Effective Writing</b>	<b>35% Weightage</b>	
.	<ul style="list-style-type: none"> <li>• Spellings-100 Most Misspelled Words in English</li> <li>• Web Based Writing</li> <li>• Note Taking: Process &amp; Techniques</li> </ul>		
<b>2</b>	<b>Module II Formal Letter Writing</b>	<b>35% Weightage</b>	
.	<ul style="list-style-type: none"> <li>• Block Format</li> <li>• Types of Letters</li> <li>• E-mail</li> <li>• Netiquette</li> </ul>		
<b>3</b>	<b>Module III Business Memos</b>	<b>20% Weightage</b>	
.	<ul style="list-style-type: none"> <li>• Format &amp; Characteristics</li> </ul>		
<b>4</b>	<b>Module IV Short Stories</b>	<b>10% Weightage</b>	
.	<ul style="list-style-type: none"> <li>• Stench of Kerosene-Amrita Pritam</li> <li>• A Flowering Tree-A.K. Ramanujan</li> <li>• The Gift of the Magi- O. Henry</li> <li>• A Fly in Buttermilk-James Baldwin</li> </ul>		
<b>5</b>	<b>Student Learning Outcomes:</b>		
.	The students should be able to write correctly and properly with special reference to Letter writing.		
<b>6</b>	<b>Pedagogy for Course Delivery:</b>		
.	<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussions</li> <li>• Presentations</li> <li>• Lectures</li> </ul>		
<b>7</b>	<b>Assessment/ Examination Scheme:</b>		
	<b>Theory L/T (%)</b>	<b>Lab/Practical/Studio (%)</b>	<b>End Term Examination</b>
	100%	NA	70%
	<b>Theory Assessment (L&amp;T):</b>		
<b>Components (Drop down)</b>	CIE	Mid Sem	Attendance
<b>Weightage (%)</b>	10%	15%	5%
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**Text:** *Rai, Urmila & S.M. Rai. Business Communication, Mumbai: Himalaya Publishing House, 2002.*

*K.K.Sinha, Business Communication, Galgotia Publishing Company.*

**Reference:** *Sanjay Kumar & Pushp Lata, Communication Skills, Oxford University Press.*

**Additional Reading:** Newspapers and Journals

A handwritten signature in blue ink, reading "Dwivedi", with a horizontal line underneath the name.

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## Behavioural Science – III

**Course Code: BSU-343**

**Course Credit: 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: Thinking as a tool for Problem Solving (2 Hours)**

- What is thinking: The Mind/Brain/Behavior
- Critical Thinking and Learning:
  - Making Predictions and Reasoning
  - Memory and Critical Thinking
  - Emotions and Critical Thinking
- Thinking skills

**Module II: Hindrances to Problem Solving Process (2 Hours)**

- Perception
- Expression
- Emotion
- Intellect
- Work environment

**Module III: Problem Solving (2 Hours)**

- 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 IV: Plan of Action (2 Hour)**

- Construction of POA
- Monitoring
- Reviewing and analyzing the outcome

**Module V: Creative Thinking (2 Hours)**

- 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

**Student learning outcomes**

- Student will be able to understand and solve the problems effectively in their personal and professional life.
- Students will outline multiple divergent solutions to a problem.
- Student will able to create and explore risky or controversial ideas, and synthesize ideas/expertise to generate innovations.

**Examination Scheme:**

Evaluation Components	Attendance	Journal of Success (JOS)	Social Awareness Program (SAP) Report/SAP Documentation	End Semester Exam	Total
Weightage (%)	5	10	10	70	100

**Suggested Readings:**

- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
- Richard Y. Chang and P. Keith, Kelly: Wheeler Publishing, New Delhi, 1998.
- Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer & Company
- Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.



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## Français-III

CourseCode:FLU344

Credit units:02

### Course Objective:

Toenablethe students

- totalkaboutthe qualitiesanddefectsofpeople.
- toask/give directions,toenquireabouta lodging.
- toaskandgive informationsaboutacertainplace.
- todescribe events inpast tense.

### CourseContents:

#### Dossiers5,6–pg45-64Dossier5: Ici etlà ActesdeCommunication:

Exprimer l’obligationetl’interdiction,parler desqualitésetdesdéfautsdequelqu’un,demander son chemin,

indiquerunitinéraire,se situerdansl’espace,serenseignersurunlogement.

#### Dossier6: Ailleurs ActesdeCommunication:

S’exprimeraupassécomposé,raconterunvoyage,

sesituerdanslemonde,exprimerletemps(avecindicateursde

temps–ilya,depuis),serenseignersurunhébergement,exprimerla satisfactionet l’insatisfaction.

#### Grammaire :

1. lesadjectifs démonstratifs
2. lesverbes: ‘irgroupe’ devoir,falloir
3. lesprépositionsdelieu,depays
4. l’impératif,lepassé composé,forme et accordduparticipe passé,lanégationaupassécomposé
5. les indicateursdetemps(il ya,depuis)

#### ExaminationScheme:

Components	INTERNAL			TOTAL	EXTERNAL	GRAND TOTAL
	MID-SEM	VIVA-VOCE	ATTENDANCE		END SEMESTER	
Weightage (%)	15	10	5	30	70	100

#### Text &References:

##### Text:

##### Le livre àsuivre:

· Andant,Christineet al.A proposA1Livre del’élève.Grenoble:Pressesuniversitairesde Grenoble,2010.

· Andant,Christineet al.A proposA1Cahierd’exercices.Grenoble:Pressesuniversitairesde Grenoble,2010.

##### Références:

· Girardeau,Brunoet NellyMous.Réussirle DELFA1.

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## TERM PAPER

**Course Code: BSB 330**

**Credit Units: 02**

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.

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- 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.

### Structure

It should be composed of the following sections:

- 1) Title page
- 2) Acknowledgement
- 3) Abstract
- 4) Table of contents
- 5) Introduction: This includes overview of topic or what is the issue or problem? What is the significance of the problem or topic?
- 6) Literature Review/Background: What is previous/current thinking, findings, and approaches on the topic/problem?
- 7) Methodology/Discussion: Explanation of topic, any comparison/observation/study. How did you search for information or data on the topic? What is your impression of the utility, relevance, or quality of the data you collected?
- 8) Results (If any)
- 9) Conclusion: Summarize the most important findings. It can include summary of main limitations of the study at hand. What conclusions can you draw? Also include details of possibilities for related future research
- 10) References/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.

**c) File Specifications:** The file should be submitted in plastic folder with following specifications:

- i. A4 size paper
- ii. Font: Arial(10 pts) or Times New Roman(12pts)
- iii. Line Spacing(1.5)
- iv. Top & Bottom Margins 1 inch/2.5 cm
- v. Left & Right Margins 1.25 inch/3 cm

### 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.

[1] Pandian, P.S. ,Safer, K.P., Shakunthala, D.T. ,Gopal, P, Padaki, V.C.” Internet Protocol Based Store and Forward Wireless Telemedicine System for VSAT and Wireless Local Area Network” IEEE - ICSCN 2007, MIT Campus, Anna University, Chennai, India. Feb. 22-24, 2007. pp.54-58.

[2] Shazia Karim, Imran Sarwar Bajwa,”Clinical Decision Support System based Virtual Telemedicine”2011 Third International Conference on Intelligent Human-Machine Systems and Cybernetics [3]Carlos Dafonte, Angel Gomez , Bernardino Arca, and Jose A. Taboada “Intelligent Management of Processes in a ICU Telemedicine System” Proceedings of the 22nd Annual EMBS International Conference, July 23-28,2000, Chicago IL.

### 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:

(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.)



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**Course structure: BIOINFORMATICS - Course Code-BSB 401**

Course Title: **BIOINFORMATICS**

Credit Units: 03

Course Level: UG Level

Course Code: BSB 401

Course Objectives: The course involves a basic understanding of computer and bioinformatics tools and skills in the field of biology.

Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Computers</b>	20 %
Descriptors/Topics General introduction (characteristics, capabilities, generations), software, hardware : organization of hardware (input devices, memory, control unit arithmetic logic unit, output devices); software : (System software; application software, languages -low level, high level), interpreter, compiler, data processing; batch, on-line, real-time (examples from bioindustries; e.g. application of computers in co-ordination of solute concentration, ph, temperature, etc., of a fermenter in operation); internet application.	
<b>Module II: Basic Bioinformatics</b>	20 %
Descriptors/Topics Introduction to Internet, Search Engines (Google, Yahoo, Entrez etc)	
<b>Module III: Biological Databases</b>	20 %
Descriptors/Topics Sequence databases (EMBL, GenBank, DDBJ, -UNIPROT, PIR, TrEMBL), Protein family/domain databases (PROSITE, PRINTS, Pfam, BLOCK, etc), Cluster databases-An Introduction, Specialised databases (KEGG, etc), Database technologies (Flat-file), Structural databases (PDB)	
<b>Module IV: Phylogenetic Analysis</b>	20 %
Descriptors/Topics Trees-splits and metrics on trees, tree interpretation, Distance – additive, ultrameric and nonadditive distances, tree building methods, phylogenetic analysis, parsimony, tree evaluation, maximum likelihood trees – continuous time markov chains, estimating the rate of change, likelihood and trees; analysis software.	
<b>Module V: Genome analysis</b>	20 %
Descriptors/Topics Annotation, comparison of different methods; ESTs – databases, clustering, gene discovery and identification, and functional classification. Reconstruction of metabolic pathways; Genome analysis, genome anatomy, genome rearrangements with inversions, signed inversions, gene identification, gene expression, expression analysis, gene identification and functional classification.	

**Student Learning Outcomes:**

Having successfully completed this course, students will be able to:

- Understand and explain the structural organization and characteristics of computers and its parts.
- Describe the concept of use of internet in bioinformatics.
- Explain the concept and organization of biological databases.
- Understand and explain the structure and functions of the phylogenetic analytic tools.
- Interrogate major database sources and be able to integrate this information with clinical data.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

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

- Computer Science, J.G. Brookshear, Pearson, Addison Wesley
- Introduction to Bioinformation – T.Attawood

**References:**

- A book on C by Kelley : Programming in C, Addison-Wesley Publishing
- Introduction to C++ for Engineers and Scientists, Prentice-Hall
- Schaum's Outline of Introduction of Computer Science, P. Cushman and R. Mata-Toledo, McGraw Hill Trade
- Bioinformatics – Managing Scientific Data, Zoe' Lacroix and Terence Critchlow
- Bioinformatics – Sequence, Structure and Databanks, Des Higgins & Willie Taylor
- Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
- Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer Verlag



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MADHYA PRADESH

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## Course structure: MOLECULAR CELL BIOLOGY- Course Code-BSB 402

Course Title: MOLECULAR CELL BIOLOGY

Credit Units: 03

Course Level: UG Level

Course Code: BSB 402

Course Objectives: The aim is to extend understanding of the molecular mechanisms via which genetic information's are stored, expressed and transmitted among generations.

Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Introduction to Molecular Biology</b>	20 %
Descriptors/Topics: Structure and composition of DNA, RNA structure and its types, Basic techniques in molecular biology (Agarose gel electrophoresis, PCR etc.) and its applications. Molecular basis of life:DNA replication in prokaryotes and eukaryotes; DNA recombination molecular mechanisms.	
<b>Module II: Insertion elements, transposons and retrotransposons</b>	20 %
Descriptors/Topics: Mobile genetic elements and its types in both prokaryotes and eukaryotes and their applications. Application of genetic engineering Organisation of genetic material: Split genes; overlapping genes; pseudogenes; cryptic genes Genetic Code: Properties of genetic code, codon assignment, chain termination codons, wobble hypothesis.	
<b>Module III: Structure of prokaryotic and eukaryotic genes</b>	15 %
Descriptors/Topics: Transcription mechanism in prokaryotes and eukaryotes. Translation :Translation mechanisms in prokaryotes and eukaryotes.	
<b>Module IV: Gene Expression in prokaryotes</b>	15 %
Descriptors/Topics: Operon concept, Positive and Negative control of operon (Lac, Tryptophan and Arabinose operon)	
<b>Module V: Eukaryotic gene Expression</b>	15 %
Descriptors/Topics: Overview of gene expression, polyadenylation, cap formation, RNA degradation.	
<b>Module VI: Oncogenes and Tumor Suppressor genes</b>	15 %
Descriptors/Topics: Oncogenes, tumorsuppressor genes in humans, role of genes in cancer development.	

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### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Develop deep understanding of DNA/ RNA structure, and mechanism of DNA replication.
- Understand Genetic Codes and Transposable elements
- Understand mechanism of transcription and translation in prokaryotes and eukaryotes.
- Enhance fine molecular understanding of operon gene regulation in prokaryotes.
- Understand the mechanism of Oncogenes and Tumor suppressor genes

### Pedagogy for Course Delivery:

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

### List of Professional Skill Development Activities (PSDA): If applicable

Lab/ Practical details, if applicable: NA

### Assessment/ Examination Scheme:

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

### Text & References:

#### Text:

- Gene VIII, Benjamin Lewin 2005, Oxford University Press
- Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson,  
Garland Publishing.

#### References:

- Concepts of Genetics, W.S. Klug, and M.R. Cummings 2004, Pearson Education
- Genome, T.A. Brown, John Willey & Sons Inc.
- Molecular Cell Biology, H. Lodish, A. Berk, S. Zipursky, P. Matsundaira, D. Baltimore and J.E. Barnell,  
W. H Freeman and Company.
- 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.
- Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley and Sons Inc.



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**Course structure: IMMUNOLOGY & IMMUNOTECHNOLOGY Course Code-BSB 403**

Course Title: IMMUNOLOGY & IMMUNOTECHNOLOGY

Credit Units: 03

Course Level: UG Level

Course Code: BSB 403

Course Objectives:

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/Syllabus:

	Weightage (%)
<b>Module I :</b> Historical perspective of immune system and immunity; Innate and specific immunity. Humoral immunity, Cell-mediated immunity and Clonal selection theory. The organs: Primary and secondary lymphoid organ. Hematopoiesis and regulation. Cells of the immune system: granulated and agranulated cells.	20 %
<b>Module II:</b> Histocompatibility: structure of MHC class I, II & III Antigens & their mode of antigen presentation MHC restriction. Antibody structure in relation to function and antigen-binding; Types of antibodies and their structures: isotypes, allotypes, idiotypes. Genetic basis of antibody diversity. Antibodies in targeting therapeutic agents. Fusion of myeloma cells with lymphocytes, production of monoclonal antibodies and their application	20 %
<b>Module III :</b> Measurement of antigen – antibody interaction: Affinity, Avidity, cross reactivity, Agglutination, Precipitation Immunodiffusion, Immuno-electrophoresis, ELISA, RIE, Western blotting, Fluorescent antibody techniques	20 %
<b>Module IV :</b> Immunity to infections of diseases; vaccines (attenuated and recombinant) and vaccination. Autoimmunity and autoimmune diseases: Hashimoto's thyroiditis; Myasthenia gravis; Rheumatoid Arthritis, Pernicious anemia, Asthma Hypersensitivity- type I, II, III, and IV hypersensitivity Tissue and organ transplantation	20 %
<b>Module V :</b> Immunoinformatics: Immunomics B cell and T cell databases. Webservers and tools for prediction of B-cell epitopes, T-cell epitopes, allergy and <i>in-silico</i> vaccine designing. Introduction of immunophysics techniques and applications.	20%

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**Student Learning Outcomes:**

Having successfully completed this course, students will be able to:

- Understand and explain the phylogeny of immune system, types of immunity, immune response.
- Describe the concept of clonal selection theory, humoral and cell mediated immunity.
- Understand and explain the structure and functions of the organs and cells of the immune system.
- Understand the mechanism of antigen-antibody interaction.
- Describe the structure of antibodies, their types and functions in immunity.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

Lab/ Practical details, if applicable: NA

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

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

- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Freeman

**References:**

- Immunology, Roitt, Mosby – Yearbook Inc.
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins
- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).
- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.



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**Course structure:** PLANT BREEDING, EMBRYOLOGY, PATHOLOGY & ECONOMIC BOTANY **CourseCode-BSB 404**

Course Title: Plant breeding, embryology, pathology & economic botany Credit Units: 03

Course Level: UG Level

Course Code: BSB 404

Course Objectives:

To familiarize the students, with basics of Plant embryology and pathology with details of phyto diseases. They will also be acquainted with economic importance of Timber, food, fiber and medicinal plants, current trends in Plant breeding programmes will also be explained. These studies will support them for understanding the various aspects of biotechnology

Course Contents/Syllabus:

	Weightage (%)
Module I :	25 %
Descriptors/Topics Structure of anther, microsporogenesis and development of the male gametophyte. Structure of Ovule, megasporogenesis and development of the female gametophyte with particular reference to Polygonum type. Fertilisation, Endosperm and embryo onagrad type.	
Module II :	25 %
Descriptors/Topics Nature and objectives of plant breeding. General methods of plant breeding. Role of Hybrid vigour in plant breeding	
Module III :	25 %
Descriptors/Topics General symptoms of fungal, bacterial and viral diseases and their control. Systematic position, morphology of the causal organisms, parasite relationship, disease cycles in the following diseases, Loose smut of wheat, Rust of wheat, Citrus canker and yellow vein disease of Bhindi	
Module IV :	25 %
Descriptors/Topics Economic importance with special reference to plants yielding: a) Food: Cereals (Wheat, Maize) , Sugarcane, Legumes – (Pigeon pea.), Oil yielding plants (sarson), b) Common fibre yielding plants - Cotton, Jute . c) Medicinal Plants – (Papaver somniferum, and Atropabeladona.) d) Common timber yielding plants –Dalbergiasisso, Tectonagrandis	

**Student Learning Outcomes:**

1. The students will develop modern approach to experimental plant embryology from developmental, structural and molecular point of view.
2. The course will provide in depth information on developmental cycles, regulation of the flowering process, of micro- and macrosporogenesis, on self-incompatibility & on embryo formation.

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3. The students will be able to analyse the historical evolution of plant breeding. Will be able to understand the basic Mendelian genetics, plant reproduction systems and breeding products.
4. The students will develop an understanding of the four interacting factors necessary for disease to occur: the pathogen, the host, the environment, and time. With knowledge of these factors they will begin to understand the nature of plant disease epidemics and how to manage them.
5. The students will develop an understanding of the vast economic importance of angiosperms with reference to their use as source of food, fuel, fibers & medicine.

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable: NA**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

- Angiosperms, S.S. Bhojwani, S.P. Bhatnagar, Vikas Publishing House Pvt. Ltd.
- Introduction to Plant Breeding, R.C. Chaudhary, Oxford & IBH Publishing C. Pvt. Ltd.
- Economic Botany in the Tropics, S.L. Kochhar, Macmillan
- Plant Pathology – Pathogen and Plant Disease, B.P. Pandey, S.Chand& Company Ltd.
- Ecology & Environment, P.D. Sharma, Rastogi Publications.

**References:**

- Plant Anatomy and Embryology, S.N. Pandey, A. Chadha, Vikas Publishing House Pvt. Ltd.
- Embryology of Angiosperm, Singh, Pandey and Jain, Rastogi Publication
- Introduction to Embryology of Angiosperm, A.K. Pandey, CBS Publishers and Distributors
- Principles and Practice of Plant Breeding, J.R. Sharma, Tata McGraw Hill Publishing Company Limited
- Economic Botany of Crop Plants, A.V.S.S. Sambamurthy, N.S. Subramanyam, Asiatech Publishers
- Plant Breeding: Theory & Techniques, S.K. Gupta, Agrobios (India)



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**Course structure: ANIMAL PHYSIOLOGY- II - Course Code-BSB 405**

Course Title: ANIMAL PHYSIOLOGY- II

Credit Units: 03

Course Level: UG Level

Course Code: BSB

**Course Objectives:**

Course objective to provide the knowledge about animal physiology that should be useful to understand and apply different concepts of biotechnology.

**Course Contents/Syllabus:**

	Weightage (%)
Module 1: Endocrine Physiology: Endocrine glands in mammals	25 %
Descriptors/Topics <ul style="list-style-type: none"> <li>• General anatomy and physiology Pituitary,</li> <li>• General anatomy and physiology of Thyroid,</li> <li>• General anatomy and physiology Parathyroid,</li> <li>• General anatomy and physiology Pancreatic islets</li> <li>• General anatomy and physiology Adrenal</li> </ul>	
Module II: Excretory System	25 %
Descriptors/Topics . <ul style="list-style-type: none"> <li>• General morphology and characteristics of Mammalian Kidney (Rabbit).</li> <li>• Structure &amp; Function of Tubular reabsorption and Secretion.</li> <li>• Structure &amp; Function of Nephron, Glomerular filtration.</li> </ul>	
Module III:Reproductive System	25 %
Descriptors/Topics <ul style="list-style-type: none"> <li>• Structure &amp; Function of Testes &amp; Ovary of Rabbit.</li> <li>• Spermatogenesis and its hormonal regulation</li> <li>• Oogenesis and its hormonal Regulation</li> <li>• Ovulation and fertilization</li> </ul>	
Module IV:Developmental Biology	25 %
Descriptors/Topics . <ul style="list-style-type: none"> <li>• Gametogenesis, structure of sperm and ovum, Egg types, Egg membrane, Cleavage: types.</li> <li>• Fertilization, Frog Embryology, Tadpole Metamorphosis, Parthenogenesis</li> <li>• Formation of blastula in chick</li> <li>• Fate Map, Morphogenetic Movement &amp; Gastrulation in Chick.</li> <li>• Extra embryonic membranes in chick, Embryology, Fate Map.</li> </ul>	

**Student Learning Outcomes:**

After successful completion of the course student will be able to:

- Learn about anatomical and physiological aspects of animal body.
- Understands functioning of important systems of body.
- Develops knowledge about endocrinology and developmental biology.
- Leads to enhance interest in research in advanced biotechnology.
- Exposure with other interdisciplinary subjects of Biology

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**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable****Lab/ Practical details, if applicable: NA****Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

- Guyton, A.C. and Hall, J.E. Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. / W.B. Saunders Company.
- Tortora, G.J. and Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons, Inc.
- Ganong, H, Review of Medial Physiology 14th edition, Appleton & Lange Publisher, New York
- Shier, D., Butler, J. and Lewis, R., Hole's Human Anatomy and Physiology, (10th Edition) 2003. WCB/McGraw Hill, Boston
- T. C. Majpuria. A text book of zoology.
- V.K Tiwari, A Text book of Zoology
- Ramesh Gupta, A Text book of Zoology



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## Course structure: CHEMISTRY - IV - Course Code-BSB 406

Course Title: CHEMISTRY - IV

Credit Units: 03

Course Level: UG Level

Course Code: BSB 406

Course Objectives:

The objective of this course is to educate the students about the laws of thermodynamics and its applications, tendency of carbon element to form aromatic & non aromatic compounds and their uses.

Course Contents/Syllabus:

	Weightage (%)
<b>ORGANIC CHEMISTRY</b>	
Module I: Carbohydrates	15 %
Descriptors/Topics Classification of carbohydrates, constitution of glucose and fructose, mutarotation, General reactions of monosaccharide. An overview of disaccharides	
Module II	15 %
Descriptors/Topics General study of aromatic compounds, orientation of aromatic compounds, aromaticity. Study of preparation and properties of Toluene, Halogen substituted aromatic compounds; Chlorobenzene, benzene diazonium chloride, Phenols, nitrobenzene, aniline.	
Module III	15 %
Descriptors/Topics General study of aromatic aldehydes and ketones, phenolic aldehydes & ketones, Aromatic carboxylic acids, phthalic acid and salicylic acid. Benzene sulphonic acid, sulphanilic acid	
Module IV	15 %
Descriptors/Topics Poly aromatic hydrocarbons; preparation and synthesis of Naphthalene, alpha and beta naphthol. Constitution of heterocyclic compounds for example pyridine and quinolene.	
<b>PHYSICAL CHEMICAL</b>	
Module V: Chemical Thermodynamics	20 %
Descriptors/Topics Energy, Work, Heat capacity. The first law of Thermodynamics, Heat of a reaction at constant pressure and constant volume. Hess's law, Kirchoff's Equations. The Second Law of Thermodynamics. Entropy (S). Determination of Entropy. Changes for reversible transition processes. Free Energy (G), Free Energy Change and chemical equilibrium.	
Module VI: Electrochemistry	10 %
Descriptors/Topics Galvanic cells, standard electrode potential, types of electrodes,	

measurement of pH.	
<b>Module VII: Photochemistry</b>	10 %
Descriptors/Topics Lambert-Beer's Law: Law of photochemical equivalence; quantum efficiency, High and low quantum yields, reasons for high and low quantum yields, photoelectric cell. Phosphorescence and fluorescence	

**Pedagogy for Course Delivery:**

- Students are encouraged to engage in active interaction during lecture through discussion and questions.
- Power point presentation and class room lecture.

**List of Professional Skill Development Activities (PSDA): If applicable**

**Lab/ Practical details, if applicable: NA**

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
<b>Weightage (%)</b>	15	5	10	70

**Text & References:**



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### Course structure: BIOTECHNOLOGY – IV LAB - Course Code-BSB 420

Course Title: BIOTECHNOLOGY – IV LAB

Credit Units: 02

Course Level: UG

Course Code: BSB 420

Course Contents/Syllabus:

	Weightage (%)
Module I: Computers	25%
Handling of computers and Protein and nucleotide sequence retrieval and analysis using different databases	
Module II: Bioinformatics	25%
Pubmed searching, Entrez (meta search engine), Phylogenic software – Phylip , Sequence analysis tools, Multiple sequence analysis Clustal W.	
Module III	25%
Isolation of nuclear DNA (genomic & plasmid DNA) and Agarose gel electrophoresis	
Module IV	25%
Descriptors/Topics Blood film preparation & identification of blood cells Enumeration of total WBC, RBC count in blood by hemocytometer, Enumeration of differential Leukocytes in blood sample Study of blood groups Study of ELISA.	

#### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

#### List of Professional Skill Development Activities (PSDA): If applicable

#### Lab/ Practical details, if applicable:

#### Assessment/ 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

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## Course structure: - PLANT BREEDING, EMBRYOLOGY, PATHOLOGY & ECONOMIC BOTANY LAB

Course Code-BSB 421

Course Title: PLANT BREEDING, EMBRYOLOGY, PATHOLOGY & ECONOMIC BOTANY LAB

Credit Units: 01

Course Level: UG

Course Code: BSB 421

Course Contents/Syllabus:

	Weightage (%)
Module I: Embryology	40%
Study of permanent slides of the: a) T.S. anther, pollen, germinating pollen b) L.S. ovule types c) Endosperm d) Embryos e) L.S. caryopsis f) Dissection of embryo	
Module II: Plant Pathology	30%
Examination of local diseased plants representing bacterial, viral, fungal parasites. Study of symptoms caused by parasites, study of selected diseased specimen (mentioned under theory) through specimens, temporary presentations.	
Module III: Economic Botany	30%
Descriptors/Topics Identification and comment on the plants and plant products belonging to cereals, pulses, sugarcane, fibre plants, timbers and medicinal plants	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

### List of Professional Skill Development Activities (PSDA): If applicable

### Lab/ Practical details, if applicable:

### Assessment/ 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

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## Course structure: ANIMAL PHYSIOLOGY LAB - II - Course Code-BSB 422

Course Title: ANIMAL PHYSIOLOGY LAB - II

Credit Units: 01

Course Level: UG

Course Code: BSB 422

Course Contents/Syllabus:

	Weightage (%)
Module I	25%
<ul style="list-style-type: none"> <li>Study of permanent slides: Endocrinae system</li> <li>- T.S of Pituitary gland</li> <li>- T.S of Thyroid gland</li> <li>- T.S of Parathyroid gland</li> <li>- T.S of Pancreatic islets</li> <li>- T.S of Adrenal gland</li> </ul>	
Module II	25%
<ul style="list-style-type: none"> <li>Study of permanent slides: <b>Excretory System</b></li> <li>- T.S of Kidney</li> <li>- T.S of Nephron</li> <li>- Estimation of Blood Urea, Bilirubin and Creatinine.</li> </ul>	
Module III	25%
<ul style="list-style-type: none"> <li>Descriptors/Topics</li> <li>Study of permanent slides: <b>Reproductive System</b></li> <li>- T.S of Ovary</li> <li>- T.S of Testes</li> </ul>	
Module IV	25%
Descriptors/Topics <ul style="list-style-type: none"> <li>Chick Embryology:</li> <li>- Permanent slide of different steps of development of Chick embryo.</li> <li>-Preparation of temporary slide of Chick embryo</li> </ul>	

### Pedagogy for Course Delivery:

Laboratory instructions

Methodology discussion

Hands on experiments

Data collection

### List of Professional Skill Development Activities (PSDA): If applicable

Lab/ Practical details, if applicable:

Assessment/ 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

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## COMMUNICATION SKILL –IV

**Course Code: BCU 441**

**Credit Units: 1**

**Course Objective:**

This course is designed to develop the skills of the students in preparing job search artifacts and negotiating their use in GDs and interviews.

**Prerequisites:** NIL

Course Contents / Syllabus:			
1.	<b>Module I Employment-Related Correspondence</b>		<b>35% Weightage</b>
	<ul style="list-style-type: none"> <li>Resume Writing</li> <li>Covering Letters</li> <li>Follow Up Letters</li> </ul>		
2.	<b>Module II Dynamics of Group Discussion</b>		<b>35% Weightage</b>
	<ul style="list-style-type: none"> <li>Significance of GD</li> <li>Methodology &amp; Guidelines</li> </ul>		
3.	<b>Module III Interviews</b>		<b>20% Weightage</b>
	<ul style="list-style-type: none"> <li>Types &amp; Styles of Interviews</li> <li>Fundamentals of facing Interviews</li> <li>Interview-Frequently Asked Questions</li> </ul>		
4.	<b>Module IV Short Stories</b>		<b>10% Weightage</b>
	<ul style="list-style-type: none"> <li>Proof of the Pudding - O. Henry</li> <li>“The Lottery” 1948 – Shirley Jackson</li> <li>The Eyes Have it- Ruskin Bond</li> <li>Kallu- Ismat Chughtai</li> </ul> <p>All the four stories will be discussed in one class. One Long Question will be set in the Exam from the Text.</p>		
5.	<b>Student Learning Outcomes:</b>		
	<ul style="list-style-type: none"> <li>Develop a resume for oneself</li> <li>Ability to handle the interview process confidently</li> <li>Learn the subtle nuances of an effective group discussion</li> </ul>		
6.	<b>Pedagogy for Course Delivery:</b>		
	<ul style="list-style-type: none"> <li>Workshop</li> <li>Group Discussions</li> <li>Presentations</li> <li>Lectures</li> </ul>		
7.	<b>Assessment/ Examination Scheme:</b>		
	<b>Theory L/T (%)</b>	<b>Lab/Practical/Studio (%)</b>	<b>End Examination</b>
	100%	NA	70%

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<b>Theory Assessment (L&amp;T):</b>			
<b>Components (Drop down)</b>	CIE	Attendance	<b>End Term Examination</b>
<b>Weightage (%)</b>	25%	5%	70%

**Text:** Sharma, R.C. & Krishna Mohan. *Business Correspondence and Report Writing: A Practical approach to Business & Technical Communication*, New Delhi: Tata McGraw Hill & Co. Ltd., 2002.

Rai, Urmila & S.M. Rai. *Business Communication*, Mumbai: Himalaya Publishing House, 2002.

Rizvi, M.Ashraf. *Effective Technical Communication*, New Delhi: Tata McGraw Hill, 2007.

**Reference:** Brusaw, Charles T., Gerald J. Alred & Walter E. Oliu. *The Business Writer's Companion*, Bedford: St. Martin's Press, 2010.

Lewis, Norman. *How to Read Better and Faster*. New Delhi: Binny Publishing House.

**Additional Reading:** Newspapers and Journals.

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## Behavioural Science - IV

**Course Code: BSU-443**

**Course Credit: 01**

**Total Hours: 10**

### Course Objective:

This course aims at imparting an understanding of Values, Ethics & Morality among students for making a balanced choice between personal & professional development.

### Course Contents:

**Module I: Introduction to Values & Ethics** (2 Hours)

Meaning & its type  
Relationship between Values and Ethics Its implication in one's life

**Module II: Values Clarification & Acceptance** (2Hours)

Core Values-Respect, Responsibility, Integrity, Resilience, Care, & Harmony Its process-Self Exploration  
Nurturing Good values

**Module III: Morality** (2 Hours)

Difference between morality, ethics & values Significance of moral values

**Module IV: Ethical Practice** (2 Hours)

Ethical Decision making  
Challenges in its implementation  
Prevention of Corruption & Crime

**Module V: Personal & Professional Values** (2 Hours)

Personal values-Empathy, honesty, courage, commitment Professional Values-Work ethics, respect for others  
Its role in personality development Character building-“New Self awareness.

### Student learning outcomes

- Able to answer the question: What do I stand for?
- Ability to apply a coherent set of moral principles within professional and specialized contexts
  - Willing to make unpopular but right decision
  - Committed to working for justice and peace locally and globally.

### Examination Scheme:

Evaluation Components	Attendance	Journal of Success (JOS)	Social Awareness Program (SAP) SAP Report/SAP Presentation	End Semester Exam	Total
Weightage (%)	5	10	15	70	100

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**Text & References:**

Cassuto Rothman, J. (1998). From the Front Lines, Student Cases in Social Work Ethics. Needham Heights, MA: Allyn and Bacon.

Gambrill, E. & Pruger, R. (Eds). (1996). Controversial Issues in Social Work Ethics, Values, & Obligations. Needham Heights, MA: Allyn and Bacon, Inc.



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## Français-IV

**CourseCode: FLU444**

**Creditunits:02**

**CourseObjective:**

To strengthen the language of the student's in both oral and written

To revise the grammar in application and the communication tasks related to topics covered already

To get acquainted with the current social communication skills, oral (dialogue, telephone conversations, etc.) and written and perform simple communication tasks such as

- talking about personal habits
- narrating events in the past, marking the stages, using appropriate connectors
- holding conversations on telephone
- asking for/giving advices

**CourseContents:**

**Dossier 7 – pg 65-74, Dossiers 1, 2 and 3 (révision) Dossier 7: auboulot Actes de Communication:**

Parler de ses habitudes et décrire une situation à l'imparfait, comparer (nom et verbe), qualifier (qui, que) s'exprimer

au téléphone, demander et donner un avis.

**Dossiers 1, 2, 3 – Révision**

Exercices d'écoute, production orale et écrite.

**Grammaire :**

1. l'imparfait,
2. la comparaison du verbe/dunom ; mieux/meilleur
3. les pronoms relatifs

**ExaminationScheme:**

Components	INTERNAL				EXTERNAL	GRAND TOTAL
	MID-SEM	VIVA-VOCE	ATTENDANCE	TOTAL	END SEMESTER	
Weightage (%)	15	10	5	30	70	100

**Text &References:**

**Text:**

**Le livre à suivre:**

· Andant, Christine et al. A propos A1 Livre de l'élève. Grenoble: Presses universitaires de Grenoble, 2010.

· Andant, Christine et al. A propos A1 Cahier d'exercices. Grenoble: Presses universitaires de Grenoble, 2010.

**Référence:**

· Girardeau, Bruno et Nelly Mous. Réussir le DELF A1

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### Course structure: Bachelor of Science (Honours) Biotechnology- BSB 501

Course Title: PLANT BIOTECHNOLOGY

Credit Units: 3

Course Level:UG Level

Course Code:BSB 501

#### Course Objectives:

The course aims to make the students understand the basic techniques of plant tissue culture. 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.

Pre-requisites: The course helps in developing a detailed understanding of plant biotechnology and applications.

#### Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Introduction to in vitro methods</b>	25%
Descriptors/Topics Terms and definitions. Beginning of in vitro cultures in our country (ovary and ovule culture, in vitro pollination and fertilization. Embryo culture, embryo rescue after wide hybridization, and its applications. Endosperm culture and production of triploids.	
<b>Module II:Introduction to the processes of embryogenesis and organogenesis and their practical applications</b>	25%
Descriptors/Topics Micropropagation, axillary bud, shoot-tip and meristem culture. Haploids and their applications. Somaclonal variations and applications (Treasure your exceptions).	
<b>Module III: Introduction to protoplast isolation</b>	25%
Descriptors/Topics Principles of protoplast isolation and applications. Testing of viability of isolated protoplasts. Various steps in the regeneration of protoplasts. Introduction of somatic hybridization. Various methods for fusing protoplasts, chemical and electrical. Cybrids- definition and application.	
<b>Module IV: Use of plant cell, protoplasts and tissue culture for genetic manipulation of plants</b>	25%
Descriptors/Topics Introduction to A tumefaciens. Tumor formation on plants using A.tumefaciens (Monocots vs. Dicots). Practical application of genetic transformation.	

#### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Handle the basic instruments used in plant biotechnology.
- Learn Preparation of stocks for culture media.
- Learn surface sterilization of different explants
- Understand *in-vitro* germination of seeds, seed viability and their maintenance in lab.

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- Get training of problems related to germination, callus induction and propagation.

**Pedagogy for Course Delivery:** Class room lecture and PowerPoint presentation, Students are encouraged in active interaction during classroom discussions on topic.

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

*Text:*

- An Introduction to Plant Tissue Culture, M.K. Razdan, Oxford and IBH Publishing

*References:*

- Experiments in Plant Tissue Culture, J.H. Dodds and L.K. Roberts, Cambridge University Press
- 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



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## Course structure: Bachelor of Science (Honours) Biotechnology- BSB 502

**Course Title:**ANIMAL BIOTECHNOLOGY

**Credit Units:**3

**Course Level:**UG Level

**Course Code:**BSB 502

**Course Objectives:**

The aim of the course is to provide equal importance to areas like in vitro fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal biotechnology.

**Pre-requisites:**The course helps in developing a detailed understanding of animal biotechnology and applications.

**Course Contents/Syllabus:**

	Weightage (%)
Module I	20%
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	15%
In-Vitro Fertilization (IVF) and Embryo Transfer Technology (ETT).	
Module III	20%
Somatic cell hybridization, Hybridoma technology and Production of Monoclonal antibodies.	
Module IV	20%
Animal genetic engineering -vectors, gene transfer methods - microinjection, virus mediated and other methods of gene transfer, Transgenic animals with new traits, transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutic etc. Bioethical issues related to animal biotechnology.	
Module V	15%
Growth factors promoting proliferation of animal cells (EGF, FGF, PDGF, IL-1, IL-2, NGF, erythropoietin).	
Module VI	10%
Fundamentals of Stem cell based therapy, Regenerative medicines	

**Student Learning Outcomes:**

After successful completion of the course student will be able to:

- Understand theory of animal cell culture, culture media, methods to develop cell lines. and their maintenance for commercial applications.
- Understand scale up production of monoclonal antibodies and hybridoma technology.

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- Understand the structure and function of variety of hormones and growth factors.
- Understand the technology and concept behind *invitro* fertilization and embryo transfer, and development of superior live stocks.
- Understand the concept of ethical value regarding the use of animal biotechnology.

**Pedagogy for Course Delivery:** Class room lecture and PowerPoint presentation, Students are encouraged in active interaction during classroom discussions on topic.

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

Text:

- Culture of Animal Cells, R.I Freshney, Wiley-Leiss.

**References:**

- Animal Cell Culture – A Practical approach, J.R.W. Masters, Oxford.
- Animal Cell Culture Techniques, M. Clynes, Springer Verlag.
- Cell Culture LabFax, M. Butler and M. Dawson, Bios scientific Publications Ltd.
- Cell Growth and Division – A Practical approach, R. Basega, IRL Press.
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima Publication.



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## Course structure: Bachelor of Science (Honours) Biotechnology- BSB 503

**Course Title:** GENOMICS & PROTEOMICS

**Credit Units:** 3

**Course Level:** UG Level

**Course Code:** BSB 503

**Course Objectives:**

The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. The students will be familiarised with the techniques in Genomics.

**Pre-requisites:** The course helps in developing a detailed understanding of genes and proteins.

**Course Contents/Syllabus:**

	Weightage (%)
<b>Module I-GENOMICS</b>	25%
Descriptors/Topics The origin of genomes. Acquisition of new Genes. DNA sequencing-chemical and enzymatic methods. The origins of introns. Restriction mapping .	
<b>Module II-GENOMICS</b>	25%
Descriptors/Topics DNA & RNA fingerprinting. The Human Genome. Phylogeny. SAGE, ESTs, AFLP & RFLP analysis.	
<b>Module III- PROTEOMICS</b>	25%
Descriptors/Topics Basic principles of protein structure. Analysis of Proteome :2D – gel electrophoresis, mass spectroscopy.	
<b>Module IV-PROTEOMICS</b>	25%
Descriptors/Topics Modeling of three-dimensional structure of a protein from amino acid sequence. Modeling mutants. Designing proteins. Analysis of nucleic acid / protein sequence and structure data, genome and proteome data using web-based tools. <b>Protein – protein interactions</b> : Yeast- two hybrid method, GFP Tags, Proteome- wide interaction maps.	

**Student Learning Outcomes:**

Upon completion of the course, students will be able to:

- Gain understanding of basic structure of protein and its separation by using various techniques.
- Get insight of modeling and *in silico* protein structure building.
- Get understanding of study of protein – protein interaction using various methods.

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**Pedagogy for Course Delivery:** Class room lecture and PowerPoint presentation, Students are encouraged in active interaction during classroom discussions on topic.

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Genes & Genomes, Maxine Singer and Paul Berg
- Genomes & proteomics From protein sequence to function - S R Pennington & M. J. Dunn

**References:**

- 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 Micro arrays: A Practical Approach, M. Schlena, Oxford University Press.
- Genomes II, T.A. Brown
- A Primer of Genome Science, Greg Gibson and Spencer V. Muse
- 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
- Essential of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Proteomics, T. Palzkill, Kluwer Academic Publishers
- Statistical Genomics: Linkage, Mapping and QTL Analysis, B. Liu, CRC Press.



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## Course structure: Bachelor of Science (Honours) Biotechnology- BSB 504

**Course Title:** RECOMBINANT DNA TECHNOLOGY

**Credit Units:** 3

**Course Level:** UG Level

**Course Code:** BSB 504

### Course Objectives:

A complete understanding of molecular techniques like DNA sequencing, restriction mapping, PCR for the cloning and expression of genes can be obtained through the course. Pre-requisites: The course helps in developing a detailed understanding of recombinants and applications.

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I</b>	20%
Descriptors/Topics Isolation and purification of plasmid DNA, Purification of DNA from bacterial, plant and animal cells, manipulation of purified DNA.	
<b>Module II</b>	20%
Descriptors/Topics Methods of DNA Introduction into living cells.	
<b>Module III</b>	20%
Descriptors/Topics Introduction to gene cloning and its uses, tools and techniques: plasmids and other vectors, DNA, RNA, cDNA.	
<b>Module IV</b>	20%
Descriptors/Topics Production of proteins from cloned genes: gene cloning in medicine (Pharmaceutical agents such as insulin, growth hormones, recombinant vaccines), gene therapy for genetic diseases.	
<b>Module V</b>	20%
Descriptors/Topics Analysis of DNA by Southern blotting, Analysis of RNA by Northern blotting, Analysis of proteins by Western blot techniques, Dot blots and slot blots, RFLP, AFLP. PCR: Basic principles and its modification application and uses.	

### Student Learning Outcomes:

After successful completion of the course student will be able to:

- \* Learn the procedure of DNA isolation from bacteria, plant and animal cell and its purification and modification.
- \* Know various methods of introducing DNA into living cells.
- \* Learn the technique of gene cloning, tools used in it and different vectors used for transforming host cells.
- \* Know the procedure of producing proteins from cloned genes, its uses in medicines with examples and gene therapy.
- \* Learn the theoretical aspects of DNA amplification using PCR and analysis of DNA by various molecular markers.

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**Pedagogy for Course Delivery:** Class room lecture and PowerPoint presentation, Students are encouraged in active interaction during classroom discussions on topic.

**Assessment/ Examination Scheme:**

Components	Mid Term	Assignment/ Project/Seminar/Quiz	Attendance	End Term
Weightage (%)	15	5	10	70

**Text & References:**

**Text:**

- Gene cloning and DNA analysis by T.A. Brown

**References:**

- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company
- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press
- Molecular Biology of gene by Watson, Baker, Bell, Gann, Levine, Losick
- DNA Science by MicklosFreyer
- Principles of Gene manipulation and Genomics by Primrose and Twyman



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## Course structure: Bachelor of Science (Honours) Biotechnology- BSB 520

**Course Title:**BIOTECHNOLOGY LAB – V(BASED ON ANIMAL BIOTECHNOLOGY, PLANT BIOTECHNOLOGY AND MICROBIAL TECHNOLOGY) **Credit Units:**2

**Course Level:**UG Level

**Course Code:**BSB 520

### Course Objectives:

The aim of the course is to provide equal importance to areas like in vitro fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal and plant biotechnology.

Pre-requisites: The course helps in developing a detailed understanding of animal and plant biotechnology.

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I</b>	25%
Descriptors/Topics Sterilization techniques of glass wares & equipments. Preparation of cotton plugs & culture media . Preparation and sterilization .of different explants. Inoculation of explants on culture media.	
<b>Module II</b>	25%
Descriptors/Topics Culture of plant embryos/seeds.Callus culture, Testing of seed viability.	
<b>Module III</b>	25%
Descriptors/Topics Culture of animal cell line.Preparation of competent cells by calcium chloride method.	
<b>Module IV</b>	25%
Descriptors/Topics Identification of isolated bacteria: Gram staining methods, metabolic characterisation (IMVIC) test. Growth curve of microorganisms Antibiotic sensitivity of microbes, use of antibiotic discs. Testing water quality (BOD, COD &E. coli count)	

### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Understand theory of animal and plant cell culture, culture media, methods to develop cell lines. and their maintenance for commercial applications.
- Understand scale up production of monoclonal antibodies and hybridoma technology.
- Understand the structure and function of variety of hormones and growth factors.
- Understand the technology and concept behind invitro fertilization and embryo transfer, and development of superior live stocks.
- Understand the concept of ethical value regarding the use of animal and plant biotechnology.

**Pedagogy for Course Delivery:** Demonstration, on-site training and hands on experiments and interpretation

**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



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## Course structure: Bachelor of Science (Honours) Biotechnology- BSB 521

**Course Title:** GENOMICS AND PROTEOMICS LAB

**Credit Units:** 2

**Course Level:** UG Level

**Course Code:** BSB 521

### Course Objectives:

The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. The students will be familiarised with the techniques in Genomics.

**Pre-requisites:** The course helps in developing a detailed understanding of genes and proteins.

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I</b>	25%
Descriptors/Topics Electrophoretic separation of plasmid DNA. Restriction, digestion & ligation of DNA.	
<b>Module II</b>	25%
Descriptors/Topics Gene finding tools and genome annotation- Gen Scan, Net Gene, Hmm gene.	
<b>Module III</b>	25%
Descriptors/Topics Comparison of two given genomes- Mummer.	
<b>Module IV</b>	25%
Descriptors/Topics Homology modeling of 3-D structure from amino acid sequence: SWISS-MODELLER Graphics tools: SWISS- PDB Viewer.	

### Student Learning Outcomes:

Upon completion of the course, students will be able to:

- Gain understanding of basic structure of protein and its separation by using various techniques.
- Get insight of modeling and *in silico* protein structure building.
- Get understanding of study of protein – protein interaction using various methods.

**Pedagogy for Course Delivery:** Demonstration, on-site training and hands on experiments and interpretation

### 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

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# AMITY UNIVERSITY

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## COMMUNICATION SKILL-V

Course Code: BCU 541

Credit Units: 1

### Course Objective:

- To enable the students to adopt strategies for effective reading and writing skills.
- The course would enhance student's vocabulary, language and fluency. It would also teach the students to deliver professional presentations.

Prerequisites: NIL

Course Contents / Syllabus:			
1.	<b>Module I Vocabulary</b>		<b>35% Weightage</b>
	<ul style="list-style-type: none"> <li>Define Vocabulary</li> <li>Significance of Vocabulary</li> <li>One Word Substitution, Synonyms &amp; Antonyms and Idioms &amp; Phrases</li> <li>Define and Differentiate Homonyms, Homophones and Homographs</li> <li>Vocabulary Drills</li> <li>Foreign Words</li> </ul>		
2.	<b>Module II Comprehension Skills</b>		<b>25% Weightage</b>
	<ul style="list-style-type: none"> <li>Reading Comprehension-SQ3R Reading Techniques</li> <li>Summarising and Paraphrasing</li> <li>Précis Writing</li> <li>Listening Comprehension</li> </ul>		
3.	<b>Module III Presentation Skills</b>		<b>30% Weightage</b>
	<ul style="list-style-type: none"> <li>Discussing the Significance of Audio-visual Aids, Audience and Feedback in Presentation Skills</li> <li>Analyzing the Significance of Non-Verbal Communication</li> </ul>		
4.	<b>Module IV Prose</b>		<b>10% Weightage</b>
	<ul style="list-style-type: none"> <li>How Far is the River-Ruskin Bond</li> <li>My Wood-E.M.Forster</li> <li>I have a Dream-Martin Luther King</li> <li>Spoken English and Broken English-G.B. Shaw</li> </ul>		
5.	<b>Student Learning Outcomes:</b>		
	<ul style="list-style-type: none"> <li>Communicate fluently and sustain comprehension of an extended discourse.</li> <li>Demonstrate ability to interpret texts and observe the rules of good writing.</li> <li>Prepare and present effective presentations aided by ICT tools.</li> </ul>		
	<b>Pedagogy for Course Delivery: Workshop</b>		
	<ul style="list-style-type: none"> <li>Group Discussions</li> <li>Presentations</li> </ul>		
6.	<ul style="list-style-type: none"> <li>Lectures</li> </ul>		
7.	<b>Assessment/ Examination Scheme:</b>		
	<b>Theory L/T (%)</b>	<b>Lab/Practical/Studio (%)</b>	<b>End Examination Term</b>
	100%	NA	70%
	<b>Theory Assessment (L&amp;T):</b>		
	<b>Components (Drop down)</b>	<b>CIE</b>	<b>Attendance</b>
	<b>Weightage (%)</b>	25%	5%
			<b>End Term Examination</b>
			70%

Text: Jaffe, C.I. Public Speaking: Concepts and Skills for a Diverse Society, 4<sup>th</sup> ed. Belmont, CA: Wadsworth, 2004.

Effective English for Engineering Students, B Cauveri, Macmillan India

Creative English for Communication, Krishnaswamy N, Macmillan

Reference: A Textbook of English Phonetics, Balasubramanian T, Macmillan

Additional Reading: Newspapers and Journals

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## BEHAVIOURAL SCIENCE-V

**Course Code: BSU-543**

**Course Credit: 01**

**Total Hours: 10**

### 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: Group formation (2 Hours)

- Definition and Characteristics
- Importance of groups
- Classification of groups
- Stages of group formation
- Benefits of group formation

#### Module II: Group Functions (2 Hours)

- 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

#### Module III: Teams (2 Hours)

- Meaning and nature of teams
- External and internal factors effecting team
- Building Effective Teams
- Consensus Building
- Collaboration

#### Module IV: Leadership (2 Hours)

- Meaning, Nature and Functions
- Self leadership
- Leadership styles in organization
- Leadership in Teams

#### Module V: Power to empower: Individual and Teams (2 Hours)

- Meaning and Nature
- Types of power
- Relevance in organization and Society

### Student learning outcomes

- Students will Develop critical and reflective thinking abilities
- Students will Demonstrate an understanding of group dynamics and effective teamwork
- Student will develop a range of leadership skills and abilities such as effectively leading change, resolving conflict, and motivating others
- Student will Gain knowledge and understanding of organization resources, policies, and involvement opportunities.
- Student will Develop strategies to recruit, retain, and continually motivate contributing members to the organization

Evaluation Components	Attendance	Journal of Success (JOS)	Social Awareness Program (SAP) SAP Report/SAP Presentation	End Semester Exam	Total
Weightage (%)	5	10	15	70	100

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

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- 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 Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers



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## Français-V

CourseCode: FLU544

Creditunits:02

### CourseObjective:

To strengthen the language of the student's in both oral and written

To revise the grammar in application and the communication tasks related to topics covered already

To get acquainted with the current social communication skills, oral (dialogue, telephone conversations, etc.) And written and perform simple communication tasks such as

- narrating events in the past, marking the stages, using appropriate connectors
- expressing causes and consequences, using appropriate logical connectors
- presenting a biography

### CourseContents:

#### Dossier 8 Pg 7584 Dossiers 4, 5 and 6 (révision) Dossier 8: Vivre ensemble Actes de Communication:

Exprimer la cause, l'opposition, la conséquence, décrire les étapes d'une action, s'exprimer sur l'environnement

, l'écologie, identifier et décrire les différences de comportement, décrire le fonctionnement d'une association, faire la biographie d'une personne.

#### Dossiers 4, 5, 6 – Révision

Exercices d'écoute, production orale et écrite.

#### Grammaire :

1. le présent (révision), le passé composé (révision)
2. les pronoms compléments directs, les pronoms compléments indirects
3. les marqueurs chronologiques
4. les articulateurs logiques

#### Examination Scheme:

Components	INTERNAL				EXTERNAL	GRAND
	MID-SEM	VIVA-	ATTENDANC	TOTAL	END	
Weightage	15	10	5	30	70	100

#### Text & References:

##### Text:

**Le livre à suivre:** Andant, Christine et al. A propos A1 Livre de l'élève. Grenoble: Presses universitaires de Grenoble, 2010. Andant, Christine et al. A propos A1 Cahier d'exercices. Grenoble: Presses universitaires de Grenoble, 2010.

**Références:** Girardeau, Bruno et Nelly Mous. Réussir le DELFA1. Paris: Didier, 2010

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# AMITY UNIVERSITY

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## SUMMER TRAINING (EVALUATION)

**Course Code: BSB 550**

**Credit Units: 05**

### GUIDELINES FOR SUMMER TRAINING

The main objective of summer training is to familiarize students to laboratory environment and make them learn to handle equipments and software's, design experiments and analyze the results. The student will be supervised by one or more faculty members and he or she will be required to submit a synopsis. While writing a synopsis emphasis should be given to make it publishable. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

#### **In general, the File should be comprehensive and include**

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

#### **Report Layout**

The report should contain the following components:

#### **1. Project Report Organization**

The Project report must be organized as follows. Format for few report pages is given after these guidelines:

##### **1.1 Title of the Report**

The title of the report should remain same as that given in the synopsis.

##### **1.2 Title Page**

The title page should be similar to the cover page but should contain a few additional items. This page will not only bear the title of the report and the candidate's name, but also the name of the degree for which the report is submitted, the name of the Institute, month and year of submission of the report.

##### **1.3 Declaration by the Students**


This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.

##### **1.4 Certificate**

This is page number (ii). The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).

##### **1.5 Acknowledgements**

This is page number (iii). Keep this brief and avoid using informal language. This page must be signed by the candidate.

  
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## 1.6 Abstract and Keywords

This is page number (iv). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results. The keywords (maximum 6) are a hint that what is contained in the report.

## 1.7 Contents

This is page number (v). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.

## 1.8 List of Figures and List of Tables

Use separate pages for list of figures and list of tables. . Each list should give, in tabular form, the figure or table number, its title/caption and its page number.

## 1.9 Nomenclature and Abbreviations

All symbols that appear in the report should be listed alphabetically. First give all Roman symbols, then Greek symbols.

## 1.10 List of Acronyms and Standards

## 1.11 The Chapters

Each chapter should begin with an Introduction and end with a Conclusion (a summing up) and, where applicable, a lead-in to the next chapter. The page on which chapter 1 starts is page 1. One chapter should follow immediately after another. Do not use an intervening blank or title page between chapters.

Each of the other chapters will have a precise title reflecting the contents of the chapter. A chapter can be subdivided into sections, subsections and sub subsection so as to present the content discretely and with due emphasis.

## 1.12 References/ Bibliography

Number all the references. Use alphabetical ordering for referencing. Each listed reference must be cited in the text of the report. (Use prescribed format according to International guidelines)

## 1.13 Appendices (if applicable).

Number the Appendices A, B, etc. Figures, tables and equations in an appendix are numbered as in the case of a chapter with the appendix letter taking the place of the chapter number.

## 2. Production of Project Report

### 2.1 Report Size

The maximum number of pages of the Report should be preferably between 30-50 pages.

### 2.2 Paper Size

The standard size of paper of a Report is A4 paper must be used for printing the report.

### 2.3 Single-Sided Printing

It is suggested that the report be printed on one side of the paper.

### 2.4 Non-Paper Material

Digital or magnetic materials, such as CDs and DVDs, may be included in the report. They have to be given in a closed pocket in the inside of the back cover page of the report. All non-paper materials must have a label each indicating the name of the student and the date of submission.

### 2.5 Binding

First submit a loosely bound report to your supervisor(s) for checking and after getting it checked the final report must be hard bound. Refer NTCC guidelines for colour coding scheme. Two copies (Minor project) and three

copies (Major project/Dissertation) of hard bound report along with CD (report in MS-Word 2007 format) must be submitted to the department. The degree, the name of the candidate and the year of submission shall also be embossed on the bound (side) in gold.

### 3. Format of Project Report

After the text of the report is written, it is to be formatted in an appropriate manner for printing. The following guidelines are provided to format the report for easy readability.

#### 3.1 Font

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

#### 3.2 Margins

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

#### 3.3 Line Spacing

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

#### 3.4 Tables and Figures

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

#### 3.5 Drawings

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

#### 3.6 Equations

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

#### 3.7 SI

Make sure proper units, SI as far as possible, appear wherever required.

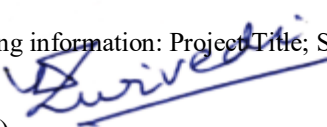
#### ➤ Title or Cover Page

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

#### ➤ Acknowledgements (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

#### ➤ Abstract



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A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

### ➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

### ➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

### ➤ **Review of Literature and Definition of Problem**

### ➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

### ➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

➤ Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

### ➤ **Conclusion and Future prospects**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

### ➤ **Summary**

### ➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

### ➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

## **Examples**

### ***For research article***

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect* ,8 (suppl 1): 116–117.

### ***For book:***

Kowalski, M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

## **Chapter 1**

( **Chapter No: Times New Roman, 18 Pts.**)

## **INTRODUCTION**

( **Chapter Name: Times New Roman, CAPS, 18 Pts., Bold**)

### **1.1 Heading**


( **Main Heading: Times New Roman, 16 Pts., Bold**)

#### **1.1.1 Sub-Heading**

( **Sub- Heading: Times New Roman, 14 Pts., Bold**)

##### **1.1.1 (a) Subsections under Sub-Heading**

( **Sub- Sections: Times New Roman, 12 Pts., Bold**)

  
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For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

### **BIBLIOGRAPHY/REFERENCES** (16 bold, caps)

Leave 1½” space from the top edge and 2 blank lines after the title. Page numbering is a continuation of preceding material. References should be in alphabetical order.

- This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

### **ASSESSMENT OF THE PROJECT FILE**

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.. Evaluation will compose of two components - Project report assessment and Viva - voce. Project report assessment will be done by the two internal faculty members in respective fields. A committee of three faculty members will conduct Viva-voce.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project will be assessed as per evaluation format.

### **Examination Scheme:**

Project Report:	50
Viva Voce:	50
Total:	<b>100</b>



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### Course structure: Bachelor of Science (Honours) Biotechnology- BSB 601

Course Title: ENVIRONMENTAL BIOTECHNOLOGY

Credit Units: 4

Course Level: UG Level

Course Code: BSB 601

#### Course Objectives:

The objective of this course is to familiarize the students with different processes and use of microbial technology that can be employed for a cleaner environment. The course also aims to make the students aware of legislation and rules prevalent to control the degradation of our environment.

**Pre-requisites:** The course helps in developing a detailed understanding of Environmental Biotechnology.

#### Course Contents/Syllabus:

	Weightage (%)
<b>Module I</b>	20%
Descriptors/Topics Environmental components, Environmental pollution and its types, Non-renewable and renewable energy resources.	
<b>Module II</b>	20%
Descriptors/Topics Conventional fuels and their major impacts: Global warming and greenhouse effect, Global Ozone Problem, Acid rain, Eutrophication, Biomagnification, Concept of clean fuel technology: Biomass energy and biofuels	
<b>Module III</b>	20%
Descriptors/Topics Biodegradation of Xenobiotic compounds i.e. oil, pesticide and PAHs and bioremediation of major pollutants Biomineralisation: Use of microbial technology for mining	
<b>Module IV</b>	20%
Descriptors/Topics Treatment of municipal solid and liquid wastes Environmental impact assessment and Environmental audit	
<b>Module V</b>	20%
Descriptors/Topics Bioassessment of Environmental Quality, Biofertilizers and Biopesticides	

#### Student Learning Outcomes:

After successful completion of the course student will be able to:

- Understand the delicate interrelationship of different components of environment.
- Understand conventional fuels, their impact and concept of clean fuel technology.
- Learn approaches and concepts behind bioremediation xenobiotic compounds, mechanism of microbial leaching and mining.
- Learn the concept of municipal solid and liquid wastes management and EIA.

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- Understand the concept and assessment of environmental quality.

**Pedagogy for Course Delivery:** Class room lecture and PowerPoint presentation, Students are encouraged in active interaction during classroom discussions on topic.

**Assessment/ Examination Scheme:**

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

**Text & References:**

**Text:**

- Environmental Science, S.C. Santra
- Environmental Biotechnology, Pradipta Kumar Mohapatra

**References:**

- Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening and Jeseff Winter
- Waste Water Engineering, Metcalf and Eddy, Tata McGraw hill
- Agricultural Biotechnology, S.S. Purohit
- Environmental Microbiology : Methods and Protocols, Alicia L. Ragout De Spencer, John F.T. Spencer
- Introduction to Environmental Biotechnology, Milton Wainwright
- Principles of Environmental Engineering, Gilbert Masters
- Principles of fermentation Technology, Salisbury, Whitaker and Hall
- Industrial Microbiology – Cassida
- Agricultural Biotechnology – S.S. Purohit
- Wastewater Engineering – Metcalf & Eddy.



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## Course structure: Bachelor of Science (Honours) Biotechnology- BSB 602

Course Title: INDUSTRIAL BIOLOGY

Credit Units: 4

Course Level: UG Level

Course Code: BSB 602

### Course Objectives:

The objective of this course is to use microorganism to produce various compounds of commercial interest. The student will be exposed to various techniques available for large scale cultivation of microorganisms.

**Pre-requisites:** The course helps in developing a detailed understanding of Industrial applications of Biotechnology.

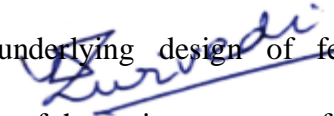
### Course Contents/Syllabus:

	Weightage (%)
<b>Module I</b>	20%
Descriptors/Topics Introduction to industrially important microbes, Introduction to fermentation, the fermentation industry, Production process batch and Continuous system of cultivation, Solid-state fermentation.	
<b>Module II</b>	20%
Descriptors/Topics Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.	
<b>Module III</b>	20%
Descriptors/Topics Microbial fermentative products, Production of compounds like antibiotics, enzymes, organic acids, solvents, beverages, food products from microbes (Dairy & SCP etc)	
<b>Module IV</b>	20%
Descriptors/Topics Production of fermented dairy products	
<b>Module V</b>	20%
Descriptors/Topics Immobilized enzymes systems, production and applications.	

### Student Learning Outcomes:

Upon completion of the course, students will be able to:

- Develop an understanding of the various aspects of Bioprocess Technology.
- Develop skills associated with screening of Industrially Important Strains and media formulation for industry.
- Understand principles underlying design of fermentor, fermentation process and downstream processing
- Develop an understanding of the various aspects of dairy Technology.
- Understand principles underlying immobilization and their application.

  
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**Pedagogy for Course Delivery:** Class room lecture and PowerPoint presentation, Students are encouraged in active interaction during classroom discussions on topic.

**Assessment/ Examination Scheme:**

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

**Text & References:**

**Text:**

- Industrial Microbiology – Cassida

**References:**

- Principles of fermentation Technology, Salisbury, Whitaker and Hall
- Industrial microbiology – Prescott&Duhn.



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## PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

**Course Code: BCH 623**

**Credit Units: 01**

### 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

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**Course structure: Bachelor of Science (Honours) Biotechnology- BSB 620**

**Course Title:** ENVIRONMENTAL AND INDUSTRIAL BIOTECHNOLOGY LAB      **Credit Units:** 2

**Course Level:** UG Level

**Course Code:** BSB 620

**Course Objectives:**

The aim of the course is to provide equal importance to areas like in vitro fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal and plant biotechnology.

Pre-requisites: The course helps in developing a detailed understanding of various techniques available for large scale cultivation of microorganisms.

**Course Contents/Syllabus:**

	Weightage (%)
<b>Module I-ENVIRONMENTAL BIOTECHNOLOGY</b>	25%
Descriptors/Topics Symptomological studies of the impacts of conventional fuel Comparative and statistical analysis of the pigment content due to air pollution.	
<b>Module II-ENVIRONMENTAL BIOTECHNOLOGY</b>	25%
Descriptors/Topics Comparative and statistical analysis of the sugar content as an impact of air pollution NR activity estimation and its statistical analysis under pollution stress conditions.	
<b>Module III- INDUSTRIAL BIOTECHNOLOGY</b>	50%
Descriptors/Topics Production & downstream processing of alcoholic fermentation.	

**Student Learning Outcomes:**

After successful completion of the course student will be able to:

- Understand theory of animal and plant cell culture, culture media, methods to develop cell lines. and their maintenance for commercial applications.
- Understand scale up production of monoclonal antibodies and hybridoma technology.
- Understand the structure and function of variety of hormones and growth factors.
- Understand the technology and concept behind invitro fertilization and embryo transfer, and development of superior live stocks.
- Understand the concept of ethical value regarding the use of animal and plant biotechnology.

**Pedagogy for Course Delivery:** Demonstration, on-site training and hands on experiments and interpretation

**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

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## COMMUNICATION SKILLS VI

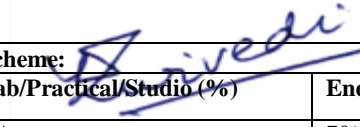
**Course Code: BCU 641**

**Credit Units: 1**

**Course Objective:** The main emphasis of this course is to enable students to learn the dynamics of social communication and to demonstrate the ability to learn the nuances of informal communication.

**Prerequisites:** NIL

Course Contents / Syllabus:			
1.	<b>Module I Social Communication Essentials</b>	<b>30% Weightage</b>	
	<ul style="list-style-type: none"> <li>• Small talk</li> <li>• Building rapport</li> <li>• Expand social and Corporate Associations</li> <li>• Informal Communication: Grapevine, Chat</li> </ul>		
2.	<b>Module II Workplace Interpersonal Skills</b>	<b>25% Weightage</b>	
	<ul style="list-style-type: none"> <li>• Understanding Social Communication in Workplace environment.</li> <li>• Employee feedback: Assess employee performance and satisfaction.</li> <li>• Simulation</li> <li>➤ <b>Humour in Communication-Use of 'Puns'</b></li> <li>➤ <b>Entertainment and Communication (Infotainment)</b></li> <li>• Infotainment and Social Media</li> <li>• Entertainment in Journalism</li> <li>➤ <b>Social Networking</b></li> </ul>		
3.	<b>Module III Visual Code / Social Etiquette</b>	<b>35% Weightage</b>	
	<ul style="list-style-type: none"> <li>• Power Dressing</li> <li>• Fine Dining</li> <li>• Office Party Etiquette</li> <li>• Business Travel Etiquette</li> <li>➤ <b>Work Place and Business Etiquette</b></li> <li>• Proper Greetings</li> <li>• Thank You Notes</li> <li>• Telephonic Manners/ Voice Mail Etiquette</li> <li>• Business Salutation Etiquette</li> <li>• Guest Etiquette</li> <li>• Cubicle Etiquette</li> <li>• Business Card Etiquette</li> <li>➤ <b>Different Cultural Etiquette &amp; Protocol</b></li> </ul>		
4.	<b>Module IV Prose</b>	<b>10% Weightage</b>	
	<ul style="list-style-type: none"> <li>• Secret of Socrates - Dale Carnegie</li> <li>• My Financial Career-Stephen Leacock</li> <li>• The Luncheon - W. Somerset Maugham</li> <li>• The National Flag - Jawahar Lal Nehru</li> </ul> <p>All the four stories will be discussed in one class One Long Question will be set in the Exam from the Text</p>		
5.	<b>Student Learning Outcomes:</b>		
	<ul style="list-style-type: none"> <li>• To communicate contextually in specific personal and professional situations with courtesy.</li> <li>• To inject humour in their regular interactions.</li> <li>• To strengthen their creative learning process through individual expression and collaborative peer activities.</li> </ul>		
6.	<b>Pedagogy for Course Delivery:</b>		
	<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussions</li> <li>• Presentations</li> <li>• Lectures</li> </ul>		
7.	<b>Assessment/ Examination Scheme:</b>		
	<b>Theory L/T (%)</b>	<b>Lab/Practical/Studio (%)</b>	<b>End Term Examination</b>
	100%	NA	70%
<b>Theory Assessment (L&amp;T):</b>			
Continuous Assessment/Internal Assessment		End Term	

  
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Components (Drop down)	CIE	Attn	Examination
Weightage (%)	25%	5%	70%

**Text:** Krizan, Merrier, Logan & Williams. *Effective Business Communication*, New Delhi: Cengage, 2011

- *Communication and Organizational Culture*. Keyton. Joann. Sage Publications
- *Social Communication (Frontiers of Social Psychology)*. Fiedler, Klaus. Psychology Press

**Reference:** *Cyberpunks: Freedom and the Future of the Internet*. [Assange, Julian Assange](#). OR Books.

Additional Reading: Newspapers and Journals



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## BEHAVIOURAL SCIENCE –VI

**Course Code: BSU-643**

**Total Hours: 10**

**Course Credit: 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 (2 Hours)**

- Meaning & Nature
- Characteristics
- Types of stress

**Module II: Stages and Models of Stress (2 Hours)**

- 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 III: Causes and symptoms of stress (2Hours)**

- Personal
- Organizational
- Environmental

**Module IV: Consequences of stress (2 Hours)**

- Effect on behavior and personality
- Effect of stress on performance
- Individual and Organizational consequences with special focus on health

**Module V: Strategies for stress management (2 Hours)**

- Importance of stress management
- Healthy and Unhealthy strategies
- Peer group and social support
- Happiness and well-being.

**Student learning outcomes**

- Student will able demonstrate thorough understanding of stress and its effects
- Student will able to learn various coping strategies to deal stress effectively so to overcome the consequences and impact of stress on their health and wellbeing, ultimately it will enhance their performance.

**Examination Scheme:**

Evaluation Components	Attendance	Journal of Success (JOS)	Social Awareness Program (SAP) SAP Report/SAP Presentation	End Semester Exam	Total
Weightage (%)	5	10	15	70	100

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**Suggested Readings:**

- 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.

A handwritten signature in blue ink, reading "Dwivedi", with a horizontal line underneath the name.

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# AMITY UNIVERSITY

MADHYA PRADESH

Established vide Government of Madhya Pradesh Act No. 27 of 2010

## FRENCH - VI

**Course Code: FLU 644**

**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:

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

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## PROJECT

**Course Code: BSB 660**

**Credit Units: 12**

### GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

#### **In general, the File should be comprehensive and include:**

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

#### **Report Layout**

The report should contain the following components:

##### **1. Project Report Organization**

The Project report must be organized as follows. Format for few report pages is given after these guidelines:

##### **1.1 Title of the Report**

The title of the report should remain same as that given in the synopsis.

##### **1.2 Title Page**


The title page should be similar to the cover page but should contain a few additional items. This page will not only bear the title of the report and the candidate's name, but also the name of the degree for which the report is submitted, the name of the Institute, month and year of submission of the report.

##### **1.3 Declaration by the Students**

This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.

##### **1.4 Certificate**

This is page number (ii). The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).



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## 1.5 Acknowledgements

This is page number (iii). Keep this brief and avoid using informal language. This page must be signed by the candidate.

## 1.6 Abstract and Keywords

This is page number (iv). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.

The keywords (maximum 6) are a hint that what is contained in the report.

## 1.7 Contents

This is page number (v). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.

## 1.8 List of Figures and List of Tables

Use separate pages for list of figures and list of tables. . Each list should give, in tabular form, the figure or table number, its title/caption and its page number.

## 1.9 Nomenclature and Abbreviations

All symbols that appear in the report should be listed alphabetically. First give all Roman symbols, then Greek symbols.

## 1.10 List of Acronyms and Standards

## 1.11 The Chapters

Each chapter should begin with an Introduction and end with a Conclusion (a summing up) and, where applicable, a lead-in to the next chapter. The page on which chapter 1 starts is page 1. One chapter should follow immediately after another. Do not use an intervening blank or title page between chapters.

Each of the other chapters will have a precise title reflecting the contents of the chapter. A chapter can be subdivided into sections, subsections and sub subsection so as to present the content discretely and with due emphasis.

## 1.12 References/ Bibliography

Number all the references. Use alphabetical ordering for referencing. Each listed reference must be cited in the text of the report. (Use prescribed format according to International guidelines)

## 1.13 Appendices (if applicable).

Number the Appendices A, B, etc. Figures, tables and equations in an appendix are numbered as in the case of a chapter with the appendix letter taking the place of the chapter number.

## 2. Production of Project Report

### 2.1 Report Size

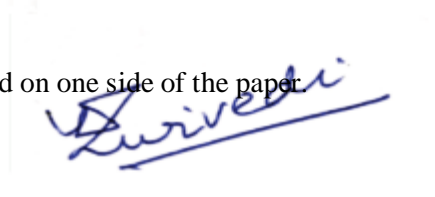
The maximum number of pages of the Report should be preferably between 30-50 pages.

### 2.2 Paper Size

The standard size of paper of a Report is A4 paper must be used for printing the report.

### 2.3 Single-Sided Printing

It is suggested that the report be printed on one side of the paper.



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## 2.4 Non-Paper Material

Digital or magnetic materials, such as CDs and DVDs, may be included in the report. They have to be given in a closed pocket in the inside of the back cover page of the report. All non-paper materials must have a label each indicating the name of the student and the date of submission.

## 2.5 Binding

First submit a loosely bound report to your supervisor(s) for checking and after getting it checked the final report must be hard bound. Refer NTCC guidelines for colour coding scheme. Two copies (Minor project) and three copies (Major project/Dissertation) of hard bound report along with CD (report in MS-Word 2007 format) must be submitted to the department. The degree, the name of the candidate and the year of submission shall also be embossed on the bound (side) in gold.

## 3. Format of Project Report

After the text of the report is written, it is to be formatted in an appropriate manner for printing. The following guidelines are provided to format the report for easy readability.

### 3.1 Font

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

### 3.2 Margins

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

### 3.3 Line Spacing

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

### 3.4 Tables and Figures

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

### 3.5 Drawings

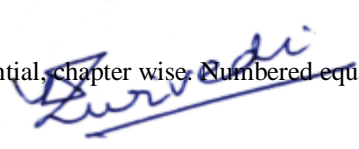
All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

### 3.6 Equations

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

### 3.7 SI

Make sure proper units, SI as far as possible, appear wherever required.

  
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➤ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➤ **Acknowledgements (optional)**

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➤ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➤ **Review of Literature and Definition of Problem**

➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

➤ Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

➤ **Conclusion and Future prospects**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Summary**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

**Examples**

*For research article*

Voravuthikunchai SP, Lortheeranuwat A, Ninprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect* ,8 (suppl 1): 116–117.

*For book:*

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Kowalski, M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

## **Chapter 1**

( **Chapter No: Times New Roman, 18 Pts.**)

### **INTRODUCTION**

( **Chapter Name: Times New Roman, CAPS, 18 Pts., Bold**)

#### **1.2 Heading**

( **Main Heading: Times New Roman, 16 Pts., Bold**)

##### **1.2.1 Sub-Heading**

( **Sub- Heading: Times New Roman, 14 Pts., Bold**)

###### *1.1.2 (a) Subsections under Sub-Heading*

( **Sub- Sections: Times New Roman, 14 Pts., Italics**)

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

### **BIBLIOGRAPHY/REFERENCES (16 bold, caps)**

Leave 1½” space from the top edge and 2 blank lines after the title. Page numbering is a continuation of preceding material. References should be in alphabetical order.

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

### **ASSESSMENT OF THE PROJECT FILE**

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives*:

#### **Range of Research Methods used to obtain information**

#### **Execution of Research**

#### **Data Analysis**

Analyse Quantitative/ Qualitative information

Control Quality

#### **Draw Conclusions**

#### **Examination Scheme:**

Project Report	100
Viva voce	50
<b>Total</b>	<b>150</b>



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